

*Research Article***Prevalence and indicators of post cesarean surgical site infection in Minia maternity university hospital****Ayman N. Abdel magid, Ameer A. Abdallah, Reham R. Taha and Amal K. Saad**

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Abstract

background: Surgical site infection (SSI) after a cesarean section increases maternal morbidity and medical costs (Cooper et al., 2002). **Objective of this study:** Was to determine the prevalence and indicators of surgical site infection among women having elective cesarean section in maternity hospital Minia University during the period of the study. **Methods:** A across sectional study was conducted on all 500 women who had elective cesarean section during period from 1st February 2018 till 30 July 2018 in maternity hospital Minia university, obstetrics and gynecology department. Data on history of the patient, patient specific demographic information on potential risk factors and the occurrence of Surgical Site infections in the first 30 days following surgery were collected using pretested data collection form. In addition, relevant data were also abstracted from the medical files of the cases. Then data were cleaned, edited and fed to computer and analyzed using SPSS for window version 19. Finally Statistical test for significance was employed using chi-squared (X^2) where appropriate at 5% level of significance. **Results:** Among 471 mothers included in the study 119 (23.3%) developed SSI after elective LSCS mainly superficial type (93.3%) include only skin and subcutaneous tissue, body mass index more than 30 were 68.1%, lack of antenatal care 90(75.6%) thickness of subcutaneous fat more than 2 cm 93.3% and Suturing techniques had significantly increased odds of SSI. **Conclusion:** It has been revealed that Surgical Site Infections rate is (23.3%) mainly superficial. BMI, Thickness of subcutaneous fat, Antenatal care and type of sutures were significantly increased odds of SSI.

Keywords: Surgical site infection, antenatal care, Minia university.**Introduction**

The incidence of cesarean deliveries, both repeat and primary, has risen dramatically over the last few decades, with an estimated global number of 22.9 million cesarean deliveries in 2012 (Miller ES et al., 2013; Molina G, et al., 2015).

surgical site infection (SSI), which refers to infection of the skin and subcutaneous tissue at the surgical incision site and is typically caused by skin flora such as *Streptococcus* species, *Staphylococcus* species, or mixed aerobic/anaerobic bacteria (Duff et al., 2007).

Several risk factors for developing post cesarean section SSI are noted in the literature. Identification of these factors is vital for creating targeted practices for reducing SSI rate. Risk factors can be divided into three categories host-related factors pregnancy and intrapartum-related factor and procedure related factors

(Rubin RH et al.,). Host-related risk factors include maternal age, obesity, residence in rural (compared to urban) area, pregestational diabetes mellitus, previous cesarean delivery, maternal preoperative condition. Pre-existing Remote body Site Infection smoking, Malnutrition, hypothermia and blood trans-fusion. Pregnancy related factors include hypertensive disorder, gestational diabetes mellitus, epidural use of internal fetal monitoring. In regard to itself, the procedure itself, SSI was more common among cesarean sections performed in an emergency setting use of prophylactic antibiotics, cases accompanied by uterine rupture, cesarean hysterectomy need for blood transfusion, in surgeries of longer duration. (Schneid-Kofman N et al., 2005) (Krieger Y et al., 2016) (Salim R, et al., 2012) (Mitt P et al., 2005) (Tran TS et al., 2000) Surgery duration of more than 1 hour had been reported to increase the risk for SSI more than two fold (Killian CA et al., 2001) (Suonio S et al., 1989).

Patients with surgical site infections have a 2–11 times higher risk of death than those without surgical site infections and 77% of deaths associated with surgical site infections are directly related to the surgical site infection. Further it caused to increase stay of hospital and the cost of treatment [Larsen JW., 2003].

Recognizing risk factors, particularly those that are modifiable, proper perioperative preparation, and use of distinct surgical techniques have been reported to affect the rate of SSI (McKibben et al., 2015).

Patients and Method

This is across sectional study. All cases underwent elective cesarean section were recruited in the study and cases who developed surgical site infection were recorded. The study was done in maternity hospital Minia University, Obstetrics and Gynecology Department during period from 1st February 2018 till 30 July 2018.

Administrative and Ethical Design:

- Informed consent was obtained from all participants after being informed about the aims and details of the study.
- The study had been approved by the local ethics committee on research of obstetrics and gynecology department, maternity hospital Minia University, faculty of medicine.
- The study procedures were free from any harmful effects on the participants as well as the service provided.

Inclusion criteria:

1. Cases of SSIs underwent elective surgery at maternity hospital Minia University during the period of the study.
2. SSIs were occurred within 30 days of surgery.
3. Patient approval: study details were explained to the patient and informed consent was taken before inclusion in the study.

Exclusion criteria:

- Immune compromised patients (HIV, uncontrolled diabetes, high steroid therapy, severe anemia (hemoglobin concentration less than 7 gm/dl).
- Emergency cases
- patient refusal

Methods and tools of the study: The data were collected by the following tools: data was collected from files of patient, and by attending operations, follow up after 30 days of operation at outpatient clinic and telephon calls. Data was recorded at structured sheet.

The sheet was used in order to address the following topics:

preoperative data:- include detailed history and examination.

Preoperative investigations include:

Complete blood picture (CBC), random blood sugar, liver function renal function, coagulation profile, special investigation according to the case.

Operative criteria

Indication of cesarean section, Surgeon (consultant, specialist, senior resident), Type of anesthesia, Nurse assist in surgery (senior, junior) Intraoperative complications (eg: hemorage, organ injury, adhesions) Duration of operation (Less than 30 minute, 30 minute-60 minute, More than 60 minute), Thickness of subcutaneous fat (Less or more than 2 cm) Blood transfusion, Type of sutures (subcutaneous, interrupted mattress, vicryl sutures or proline or monocryl).

Postoperative criteria:-

- Thromboembolic complication
- Infection
- Postpartum hemorage
- Anemia
- Blood transfusion
- Postpartum depression
- Lactation
- Compliance to treatment and regular following up dressing.
- Cases who developed surgical site infection
 - Onset
 - Type (superficial, deep)
 - Management
 - Blood transfusion
 - Follow up (inpatient, outpatient, telephon calls).

Results

471 patients underwent elective cesarean section at period of the study in maternity

hospital Minia university, gynecology and obstetrics department. The majority age of women 234(49.7%) were between 25 -35 years of age,

470(99.8%) were house wife, 455 (96.6%) were from rural areas, and 296(62.8%) their body mass index were between 26-30.

Table (1): demographic Characters of the studied patients

Data	TOTAL N=471	Without SSI N=352	With SSI N=119	P
BMI				
18-25	31(6.6%)	28(8%)	3(2.5%)	0.001*
26-30	296(62.8%)	261(74.1%)	35(29.4%)	
>30	144(30.6%)	63(17.9%)	81(68.1%)	
Residence				
Urban	16(3.4%)	13(3.7%)	3(2.5%)	.05
Rural	455(96.6%)	339(96.3%)	116(97.5%)	
Age				
15-25	185(39.3%)	140(39.8%)	45(37.8%)	0.8
-25-35	234(49.7%)	175(49.7%)	59(49.6%)	
>35	52(11%)	37(10.5%)	15(12.6%)	
Occupation				
No occupation	470(99.8%)	351(99.8%)	119(100%)	0.6
Employed	1(0.2%)	1(0.2%)	0	

Table (2): logistic regression analysis of factors as risk for SSI regarding to demographic and obstetric data:-

Data	OR	95% CI OF OR	P
Age			
15-25	0.95	0.61-1.4	0.8
-25-35 (REFERENCE)	-	-	-
>35	1.2	0.61-2.3	0.5
BMI			
18-25	0.79	23-2.7	0.7
26-30(REFERENCE)	-	-	-
>30	9.5	5.9-15.3	0.001*
Parity			
PG (REFERENCE)	-	-	-
Second	0.66	0.30-1.4	0.3
MP	1.004	0.56-1.7	0.9
Gestational age			
<24	0	0	0
24-37	0	0	0
-37-40(REFERENCE)	-	-	-
>40	1.06	0.46-2.4	0.8
Antenatal care			
Irregular	1.1	0.7.6-1.7	0.4
Regular (REFERENCE)	-	-	-

Table (3): logistic regression analysis of factors as risk for SSI regarding to preoperative and operative data.

Data	OR	95% CI OF OR	P
HB			
<11	1.1	0.76-1.7	0.4
≥11(REFERENCE)	-	-	-
WBCs			
<4	1.5	0.27-8.4	0.6
4-11(REFERENCE)	-	-	-
>11	1.1	0.63-2.2	0.5
Platelets			
<100	2.7	0.73-10.3	0.1
100-150(REFERENCE)	-	-	-
>150	0.88	0.52-1.4	0.6
RBS			
<100	1.3	0.15-12.2	0.7
100-200(REFERENCE)	-	-	-
SC fat thickness			
<2 cm (REFERENCE)	-	-	-
> 2cm	4.5	2.1-9.7	0.001*
Indication of CS			
Primary CS (REFERENCE)	-	-	-
Repeated CS 324	1.04	0.66-1.6	0.8
Surgeon			
Consultant	0	0	0
Consultant and senior resident	1.02	0.1-9.9	0.9
Consultant and specialist	0.001	0.001	1
Senior resident(REFERENCE)	-	-	-
Specialist	1.1	0.73-1.8	0.8
Specialist and senior resident	1.02	0.1-9.9	0.9
Specialist and junior resident	0.001	0.001	1
Assisted nurse			
Junior	0.80	0.5-1.2	0.3
Senior (REFERENCE)	-	-	-
Un known	0.68	0.07-6.2	0.7
Blood transfusion			
No(REFERENCE)	-	-	-
Cross matched	1.05	0.54-2.1	0.8
FFP	.001	0.001	1
Platelets	2.01	0.33-12.1	0.4
Cross matched and FFP	3.01	0.18-48.5	0.4
Type of suture			
interrupted mattress with vicryl	2.6	1.2-5.8	0.01*
sc monocryl	0.74	0.31-1.7	0.5
sc praline	0.001	0.001	1
sc vicryl (REFERENCE)	-	-	-

Discussion

Surgical site infections (SSI) are the most common postoperative complications which accounts for \$3.2 billion in contributable cost per year in hospitals which are giving acute care. Surgical site infections (SSI) are the most common reason to be (20%) unplanned admitted after discharging of the patient to their home (Zimlichman et al., 2013/ Merkow et al., 2015).

The present study was carried at maternity hospital Minia University at obstetric and gynecological department during the period between February 2018 to July 2018. 500 women recruited for eligibility, 29 cases were excluded due to 9 with incomplete data, 10 cases refused to participate, 10 cases missed in follow up. The remaining 471 cases were recruited in our study. The data were collected from files of patient, and by attending operations; follow up 30 days after operation by outpatient clinic visits and telephone calls. Data was recorded at structured sheet.

Our study showed the prevalence surgical site infection rate (23.3%) after elective cesarean section mainly superficial type (93.3%) includes only skin and subcutaneous tissue. Others study revealed variable rates of wound infection after CS such as 9.9% (Jill et al., 2005) a retrospective case-control study of patients undergoing elective CS for 6 years period at a tertiary center which include 1250 elective cesarean section, 16.2% in University College Hospital Ibadan Nigeria (Morhason-Bello, 2009). It was an observational study of all women that had caesarean (elective and emergency) delivery for 3 months period. In Kenya which was 22% (Kabau Ddm, 2014) women who had caesarean delivery (elective and emergency) at Kenyatta National Hospital during the study period included 184 participants and in Zimbabwe which was 29% (Maruta A, Surveillance, 2015). A total of 290 women consented to participate in the study following caesarean section delivery (elective and emergency) for 6 months DURATION.

Our study revealed some important risk factors of surgical site infection (SSI) mainly women who developed SSI their body mass index more than (30) were 68.1% with significant P

value (0.001). Obesity is a well-known risk factor for SSI which also agreed with a study included 1,605 women who underwent low transverse cesarean section a higher body mass index at admission (aOR, 1.1 [95% CI, 1.0–1.1]) During the 2-year study period (Margaret et al., 2008).

In our study also Factors that significantly increase the risk of surgical site infection lack of antenatal care 90(75.6%) with significant P value (0.04) agreed with previous studies that revealed <7 prenatal visits (OR, 3.99; CI₉₅, 1.74-9.15; P=0.001 (Killian et al., 2001) which included population based sample of 765 patients who underwent cesarean sections 6 month periods each year from 1996 through 1998.

Also thickness of subcutaneous fat more than 2 cm was important risk factor for develop surgical site infection in this study represented about (93.3%) with significant P value (0.001). Similar findings have been reported by a study showed a statistically significant increase in the rate of wound complications when the subcutaneous thickness was greater than 2 cm (RR 0.66; 95% CI 0.48, 0.91) (Chelmow et al., 2004).

Suturing techniques played an important role in SSI development after CS, interrupted suturing was a good predictor of SSI, when compared to a subcuticular technique which had lower infection events. (Shrestha et al., 2015). SSI was found to be common in women who had interrupted skin suturing (p=0.0001) during surgery also confirmed with (Caesarean section surgical site infection surveillance. Wexford general hospital. 2009 to 2011 comparative).

Also study revealed other risk factors increase rate of SSI include age, rural residence, repeated cesarean section, qualification of the health professional who conducted the procedure, duration of operation, anemia and DM but these factors not significantly increased odds of SSI.

Most important strengths of our study are: our study was done using standard data collection method, risk factor analysis included a large number of variable on patient characteristics, operative detail and timing of antibiotic prophylaxis.

laxis, we included special criteria and excluded most exaggerated factors for SSI (emergency cesarean section, uncontrolled DM).

Our study has certain limitations. Our study period was short which resulted in small sample size. We did not collect socio-economic data, We did not calculate the cumulative experience of the operating team, lack of antibiotic policy might have affected the SSI rates, Variables related to antiseptics used for patient preparation and methods used for equipment sterilization and type of anesthesia used were not included due to resource shortage.

Conclusion

In our study the prevalence surgical site infection rate (23.3%) after elective LSCS mainly superficial type (93.3%) include only skin and subcutaneous tissue In this study Risk factors which were highly significant independent predictors of occurrence of SSI after CS were; obesity, thickness of subcutaneous fat, antenatal care and type of sutures used to close skin.

References

1. Cooper NJ, Sutton AJ, Abrams KR. Decision analytical economic modelling within a Bayesian framework: application to prophylactic antibiotics use for caesarean section. *Stat Methods Med Res* 2002;11:491–512.
2. Miller ES, Hahn K, Grobman WA. Consequences of a primary elective cesarean delivery across the reproductive life. *Obstet Gynecol.* 2013; 121 (4):789–797. [PubMed].
3. Molina G, Weiser TG, Lipsitz SR, et al., Relationship between cesarean delivery rate and maternal and neonatal mortality. *JAMA.* 2015; 314 (21):2263–2270. [PubMed].
4. Duff P, Park RC. Antibiotic prophylaxis in vaginal hysterectomy: a review. *Obstet Gynecol.* 1980; 55(5 Suppl): 193S–202S. [PubMed]
5. Rubin RH. Surgical wound infection: epidemiology, pathogenesis, diagnosis and management. *BMC Infect Dis.* 2006;6:171. [PMC free article] [PubMed].
6. Schneid-Kofman N, Sheiner E, Levy A, Holcberg G. Risk factors for wound infection following cesarean deliveries. *J Int Gynecol Obstet.* 2005; 90(1):10–15. [PubMed].
7. Krieger Y, Walfisch A, Sheiner E. Surgical site infection following cesarean deliveries: trends and risk factors. *J Matern Fetal Neonatal Med.* 2016;705:1–5. [PubMed].
8. Mitt P, Lang K, Peri A, Maimets M. Surgical-site infections following cesarean section in an Estonian university hospital: postdischarge surveillance and analysis of risk factors. *Infect Control Hosp Epidemiol.* 2005;26(5):449–454. [PubMed].
9. Tran TS, Jamulitrat S, Chongsuvivatwong V, Geater A. Risk factors for postcesarean surgical site infection. *Obstet Gynecol.* 2000; 95(3):367–371. [PubMed].
10. Killian CA, Graffunder EM, Vinciguerra TJ, Venezia RA. Risk factors for surgical-site infections following cesarean section. *Infect Control Hosp Epidemiol.* 2001;22 (10):613–617. [PubMed].
11. Suonio S, Saarikoski S, Vohlonen I, Kauhanen O. Risk factors for fever, endometritis and wound infection after abdominal delivery. *Int J Gynecol Obstet.* 1989; 29(2):135–142 [PubMed]
12. Larsen JW. Guidelines for the diagnosis, treatment and prevention of postoperative infections. *Infect Dis Obstet Gynecol.* 2003; 11(1): 65–70. doi: 10.1155/S1064744903000097. [PMC free article] [PubMed] [Cross Ref].
13. McKibben RA, Pitts SI, Suarez-Cuervo C, Perl TM, Bass EB. Practices to reduce surgical site infections among women undergoing cesarean section: a review. *Infect Control Hosp Epidemiol.* 2015;36 (8):915–921. [PubMed]