



Surgical Site Infection Post Cesarean Section: Incidence And Associated Risk Factors. A Hospital Based Study

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Abstract

Background: Surgical Site Infection after cesarean section is one of the commonest nosocomial infection, accounting for overall 38% of hospital acquired infections. Therefore the present study was designed to find out incidence of SSIs and associated risk factors following C-section in a tertiary care hospital.

Materials and Methods: The present study was conducted in the department of Obstetrics and Gynecology SKIMS MCH Bemina Srinagar from Jan 2019 to March 2020. A total of 470 patients who underwent cesarean section were taken in study. The incidence of SSIs and associated risk factors were studied and data was analysed.

Results: The SSIs developed in 13.2% of study patients. The statistically strong risk factors associated with SSIs included emergency C-section, compared to elective, vertical skin incision compared to horizontal, and interrupted skin suturing compared to subcuticular.

Keywords: C-section, Surgical Site Infection, Risk factors

Introduction

Cesarean section is the commonest obstetrical surgical procedure. Globally, the cesarean section rates are ranging from 5-20 %, and the rates have increased exponentially over the past three decades.¹ There are a lot of reasons for increasing trend of cesarean section over the years, including persistent maternal request for cesarean,^{2,3} advancing maternal age,⁴ and the fear of litigation among health care professionals.⁵

The Centre for disease prevention and Control [CDC] defines Surgical Site Infection [SSI] as an infection which happens within a month following surgical intervention and includes three types; superficial incisional SSIs [primary and secondary], deep incisional SSIs [primary and secondary] and organ/space SSIs⁶ Surgical site infection after C-section is one of the commonest nosocomial

infection, accounting for 38% of overall hospital acquired infections.⁷ The various risk factors for SSIs following C-Section include obesity, diabetes, anemia, history of p.prom, chorioamnitis, prolonged labor, obstructed labor, poor prenatal care, immunosuppressive disorders, previous cesarean section, use of certain drugs like steroids, poor operative techniques, type of incision, type of suturing, lack of pre-incision antibiotic care, excessive blood loss during surgery, emergency rather than elective procedure and increased operative time⁸⁻¹² The SSIs occur not only in poor resource countries with poor hygienic facilities but also in well developed countries. Therefore it is necessary to identify the risk factors associated with SSIs after C-section and to take preventive measures as well. Therefore the present study was designed to find out incidence of

SSIs and associated risk factors following C-Section, in a tertiary care Hospital.

Materials And Methods

The study was conducted in the department of Obstetrics and Gynecology SKIMS MCH Bemina Srinagar from Jan 2019 to march 2020. The study population consisted of all women who underwent cesarean section in this time interval. A total of 470 patients were taken in the study design. The sociodemographic factors of patients like age, educational status, occupation were studied. All study patients were followed for a time period of 30 days following C-section to look for presence of any SSI. The associated risk factors were studied and data was analysed.

Statistical Methods

Statistical Methods: The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and

then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean±SD and categorical variables were summarized as frequencies and percentages. Graphically the data was presented by bar and pie diagrams. Chi-square test or Fisher’s exact test, whichever appropriate, was applied for comparison of categorical variables. A P-value of less than 0.05 was considered statistically significant.

Observation And Results

The results of study are described in tabular and graphic form. The sociodemographic factors are described in table [1] and graph [1]. Among study population, most of the patients were in the age group of 25-35 years [84.7%], <25 years [11.9%] and >35 years [3.4%]. Also, 76.8% patients were literate and 23.2% were illiterate. Among study patients, 77.4% had taken proper antenatal checkup.

Table 1: Demographic characteristics of study patients			
Parameter		Number	Percentage
Age (Years)	< 25	56	11.9
	25-35	398	84.7
	> 35	16	3.4
Educational status	Literate	361	76.8
	Illiterate	109	23.2
Occupation	Housewife	335	71.3
	Employee	112	23.8
	Business	14	3.0
	Others	9	1.9
Antenatal checkup	Yes	364	77.4
	No	106	22.6

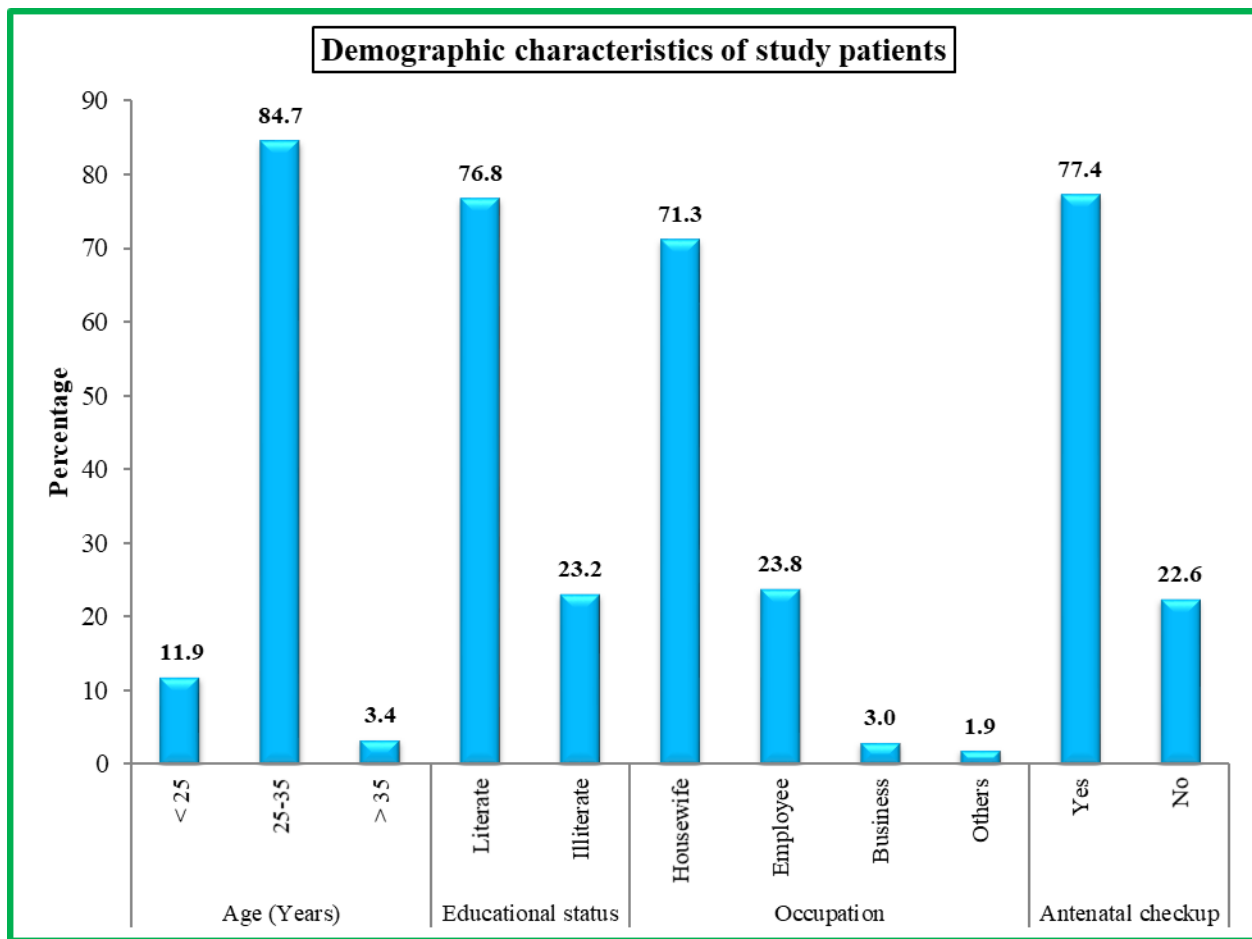
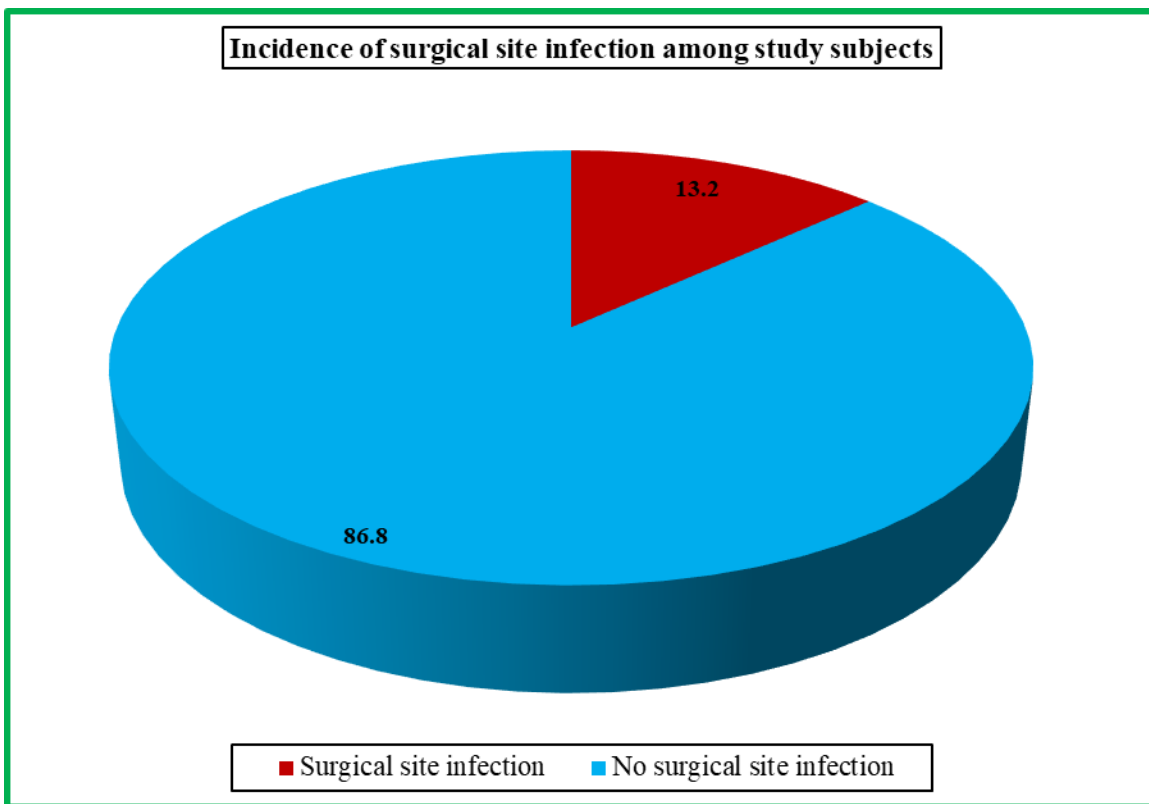


Table 2: Incidence of surgical site infection among study subjects

Surgical site infection	Number	Percentage
Yes	62	13.2
No	408	86.8
Total	470	100



The associated risk factors of Surgical site infection among study patients is tabulated in table[3].

Most of the patients who developed SSIs were in the age group of 25-35 years Among the different age groups, there was statistically insignificant difference in the incidence of SSI. Also educational status, antenatal checkup, per vaginal examination, vaginal toileting and prophylactic antibiotic didn't affect the incidence of SSIs. [3]

Variable		N	SSI		P-value
			No.	%age	
Age (Years)	< 25	56	5	8.9	0.597
	25-35	398	55	13.8	
	> 35	16	2	12.5	
Educational status	Literate	361	45	12.5	0.397
	Illiterate	109	17	15.6	
Antenatal checkup	Yes	364	43	11.8	0.102
	No	106	19	17.9	
Type of surgery	Elective	258	11	4.3	<0.001*

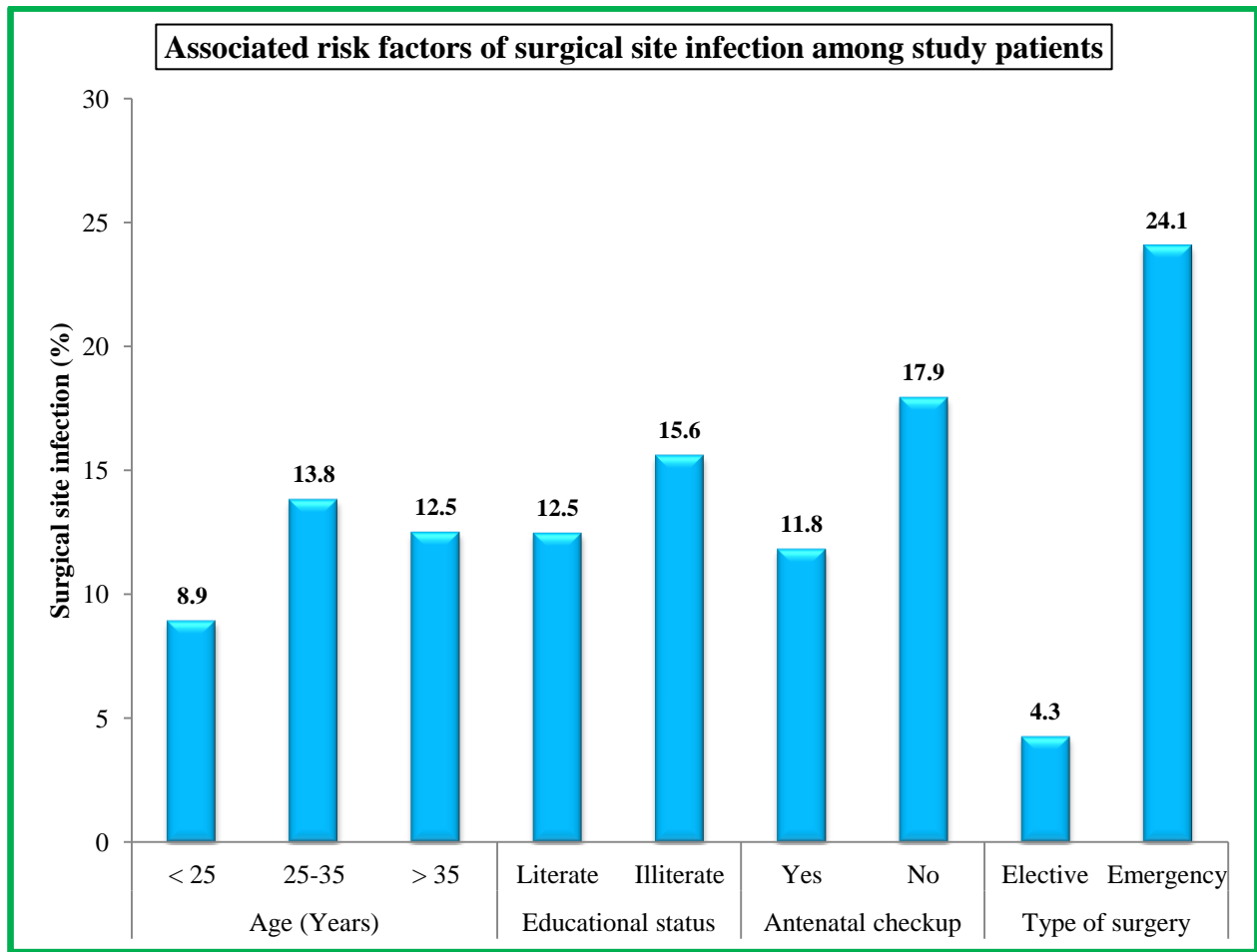
	Emergency	212	51	24.1	
Per vaginal examination	< 2 Times	33	2	6.1	0.428
	2-6 Times	412	56	13.6	
	> 6 Times	25	4	16.0	
Type of incision	Vertical	20	6	30.0	0.023*
	Horizontal	450	56	12.4	
Type of suturing	Interrupted	287	52	18.1	<0.001*
	Subcuticular	183	10	5.5	
Prophylactic antibiotic	Given	286	29	10.1	0.141
	Not Given	184	33	17.9	
Vaginal toileting	Done	423	58	13.7	0.318
	Not done	47	4	8.5	

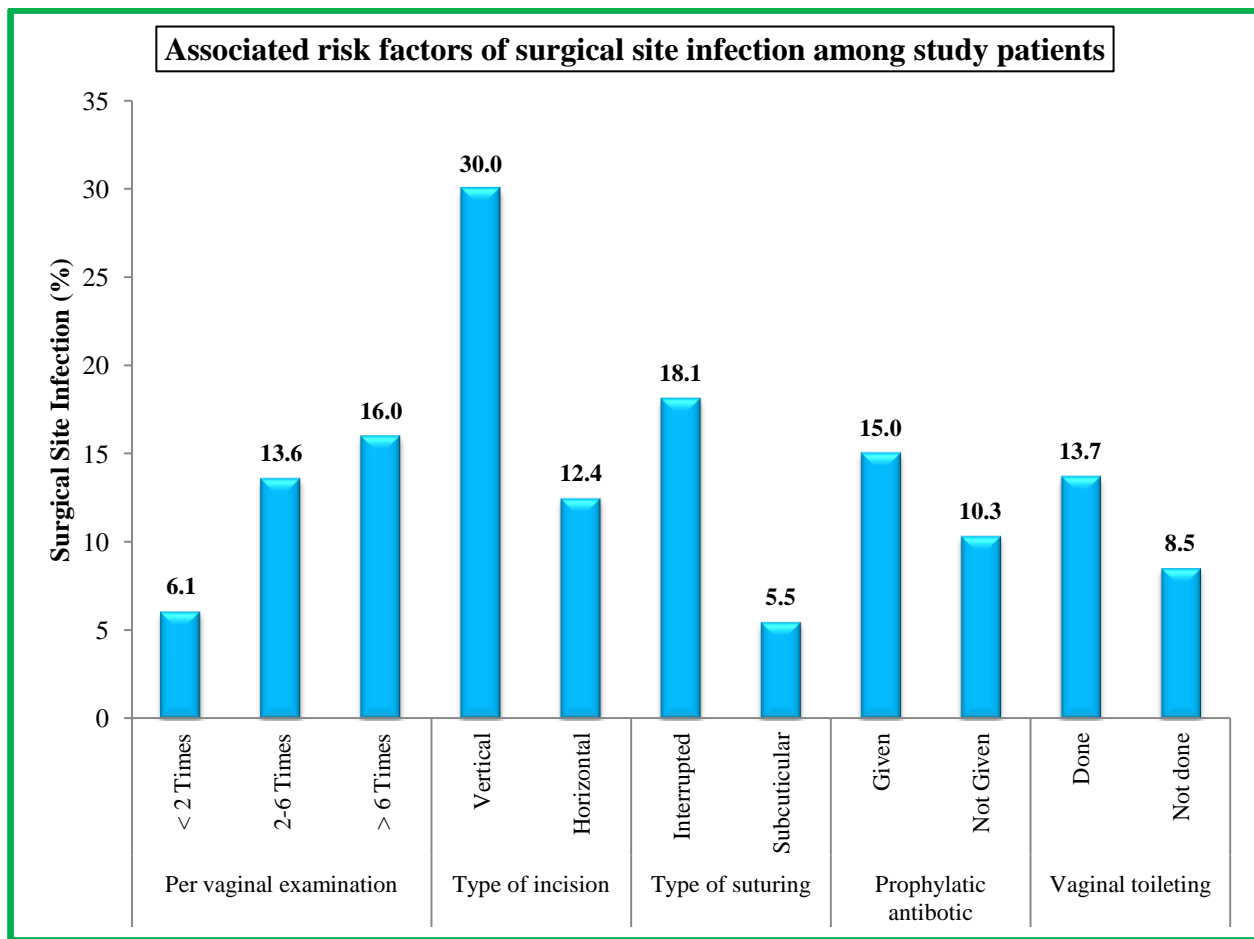
*Statistically Significant Difference (P-value<0.05)

Out of 62 patients, who developed SSIs, 51 patients belonged to emergency c-section group, whereas 11 patients belonged to elective group. There was significant statistical difference between the two groups with a p value of less than 0.001.

There was no significant statistical difference between two groups with respect to number of per vaginal examinations, prophylactic antibiotic use and vaginal toileting. Out of 450 patients who were given horizontal incision, 56 patients [12.4%] developed SSIs, and out of 20 patients who were given vertical

incision, 6 patients [30%] developed SSIs. There was significant statistical difference between two groups with respect to type of skin incision with p value of 0.023. Out of 287 patients who were given interrupted stitches, 52 patients [18.1%] developed SSIs, and out of 183 patients who were given subcuticular stitches, 10 patients [5.5 %] developed SSIs. There was significant statistical difference between the two groups with respect to type of stitching with a p value of less than 0.001. Table [3] and graphs.





Discussion

Surgical site infection is commonly observed among pregnant women post cesarean section. In our study, majority of the patients were in the age group of 25-35 years [84.7%]. This was consistent with study of S Gupta *et al*¹³ where majority of patients were in the age group of 25-35 years [86.5%]. In our study, 76.8% were literates and 23.2% were illiterates. Also in our study, 77.4% had antenatal attendance and 22.6% had no antenatal attendance. Shrestha *et al*¹⁴ reported 92% literacy rate and 8% were illiterates. Likewise, they reported higher proportion of patients with antenatal attendance [97.7% vs 77.4%].

In our study, the incidence of SSIs was 13.2%, while as 86.8% had no SSI. The incidence of SSIs has been reportedly varying in literature ranging from 3 to 15%. Shrestha *et al*, Onuzo *et al* and Johnson *et al* reported the incidence of SSI post cesarean section as 12.8%, 12.6% and 11.2% respectively; these results are comparable with our results.¹⁴⁻¹⁶ In contrast, in a study conducted by Alnajjar M S *et al*¹⁷ the incidence of SSI following C-section was 2.1%. Also in a

study conducted by Gomma K *et al*,¹⁸ the incidence of SSI following cesarean section was 5.34%.

In our study, we didn't find any association of surgical site infection with age, educational status, antenatal checkup, number of pv examinations, prophylactic antibiotic use and vaginal toileting. This was similar to the study of S Gupta *et al*.¹³ In our study, we observed that the risk of developing SSI after C-Section was significantly influenced by type of surgery. Patients who underwent emergency surgery had higher incidence of SSI compared to patients who had elective surgery [24.1% vs 4.3%]. Also in our study, patients with vertical incision had higher risk of developing SSI compared to patients who had horizontal incision [30% vs 12.4%]. And patients who were given interrupted sutures had higher chances of developing SSI, compared to patients who had subcuticular sutures [18.1% vs 5.5%]. These results were comparable to study of S Gupta *et al*,¹³ where incidence of SSI following C-section was higher with emergency C-section, vertical skin incision and interrupted skin suturing compared to elective C-

Section, horizontal skin incision and subcuticular skin suturing respectively [19.1% vs 5.1%], [29.4% vs 10.6%] and 15.8% vs 4.6% respectively. Similarly, Shrestha et al¹⁴ documented in their study that emergency C-Section, vertical skin incision and interrupted skin suturing are significantly associated with development of SSIs. Also in our study, we didn't find any significant statistical difference in developing of SSI following prophylactic antibiotic use. This was comparable to study of Zejnullahu et al.¹⁹

Conclusion

Surgical site infection post cesarean section is most common problem among pregnant women seen in tertiary care hospitals. Also in our study we found that type of C-section, type of skin incision and type of suturing significantly affects the developing of SSI. We need to identify all preoperative and intraoperative risk factors that affect the quality of C-section. The aim should be focussed towards a better maternal and fetal outcome to allow patients to avail optimal health care.

References

1. Betran A.P. et al. What is the optimal rate of cesarean section at population level? A systematic of ecologic studies. *Reprod. Health* 12,57-62[2015].
2. Gossman GL, Joesch JM, Tanfer K. Trends in maternal request cesarean delivery from 1991 to 2004. *Obstet Gynecol* 2006;108:1506-16.
3. National Institutes of Health state-of-the-science conference statement: Cesarean delivery on maternal request March 27-29, 2006; *Obstet Gynecol* 2006;107:1386-97.
4. Joseph KS, Young DC, Dodds L, et al. Changes in maternal characteristics and obstetric practice and recent increases in primary cesarean delivery. *Obstet Gynecol* 2003;102:791-800.
5. Murthy K, Grobman WA, Lee TA, et al. Association between rising professional liability, insurance premiums and primary cesarean delivery rates. *Obstet Gynecol* 2007;110:1264-9.
6. World Health statistics 2015. Geneva: Health care associated infections: Fact Sheet [cited 05 may 2015].
7. Watts DH, Krohn MA, Hillier SL, Eschenbach DA. The association of occult amniotic fluid infection with gestational age and neonatal outcome among women in preterm labor. *Obstet Gynecol.* 1992;79[3]:351-7.
8. Nabhan, AF, Allam N.E. Hamed A, and Salama M. Routes of administration of antibiotic prophylaxis for preventing infection after cesarean section. *Cochrane Database Syst Rev.* <https://doi.org/10.1002/1465185.CD011876.pub2>[2016].
9. Assawaolanggool, S, Kasatpibal N, Sirichotyakul S, Arora R. Risk factors for cesarean surgical site infections at a Thai-Myanmar border hospital. *Am J Infect control.* 44,990-996[2016].
10. Moulton L, Erick Jelovsek, Chagin K, Gojie, O, A. Model to predict risk of postpartum infection after cesarean delivery. *Am. J. Infect. Control.* 31[18], 2409-2417. <https://doi.org/10.108014767058.20171344632>[2018]
11. Zaki M N, Troung M, Pyra M, and Irwin T. Wound complications in obese women after cesarean : A comparison of staples versus subcuticular suture. *Am J Perinatol.* 36[10], 819-822. <https://doi.org/10.1038/jp.2016.89>[2016].
12. Gasim T, Al Jama, F.E. Rahman, M, S, Rahman J. Multiple repeat cesarean sections: operative difficulties, maternal complications and outcome. *J Reprod Med.* 58[7-8], 312-318[2013].
13. Shilpa Gupta, Nishu Priya, Harish Gupta. Surgical Site infections after cesarean delivery: Incidence and assessment of associated risk factors. *International journal of Research and Review.* 2022;9[6]11-17.
14. Shrestha S, Shrestha R, Shrestha B, Dongol A. Incidence and Risk factors of Surgical Site Infection following Cesarean section at Dhulikel Hospital. *kathmandu univ Med J* 2014;46[2]:113-6.
15. Onuzo, C.N, Sefogah, P.E, Nuamah, M.A, Ntummy M and Nkyekyer, K. [2022]. Surgical site infections following cesarean sections in the largest teaching hospital in Ghana. *Infection prevention in practice*, 4[2]. 100203. <http://doi.org/10.1016/j.infpip.2022.100203>.
16. Johnson MP, Kim SJ, Langstraat CL, et al. Using bundled interventions to reduce Surgical site infections after major gynecologic cancer surgery. *Obstet*

- Gynecol.*2016;127[6]:1135[pubmed]
[crossRef][Google Scholar].
17. Alnajjar,M,S,Alashker,D,A.Surgical site infections following cesarean sections at Emirati Teaching Hospital :Incidence and implicated factors.Sci Rep 10,18702[2020].<https://doi.org/10.1038/s41598-020-75582-9>.
 18. Gomaa,K,Abdeil rahiem,A R El Gelany,S et al.Incidence,risk factors and management of post cesarean section surgical site infection[SSI] in a tertiary care hospital in Egypt:A five year retrospective study.BMC Pregnancy Childbirth 21,634[2021].<https://doi.org/10.1186/s12884-021-04054-3>.
 19. Zejnullahu,V,A, Isjanovska,R,Sejfija Z, and Zejnullah V,A.[2019].Surgical site infections after cesarean sections at the university Clinical Centre of Kosovo:rates,microbiological profile and risk factors.BMC infectious diseases,19[1],752.<http://doi.org/10.1186/s12879-0194383-7>.