“Postoperative infection in pregnant women who undergo cesarean section at a tertiary hospital in Dhaka, Bangladesh: a descriptive cross sectional study ”

By

Sumaiya Zahan Dolon

ID: 18326002

Ummay Habiba

ID: 18326025

A thesis submitted to the Department of Mathematics and Natural Science in partial fulfillment of the requirements for the degree of

B.Sc. in Microbiology

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Declaration

It is hereby declared that

1. The thesis report submitted is my/our own original work while completing a degree at Brac University.
2. The thesis report does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis report does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I/We have acknowledged all main sources of help.

Student's Full Name & Signature:

_____

Sumaiya Zahan Dolon

Student ID: 18326002

_____

Ummay Habiba

Student ID: 18326025

APPROVAL

The thesis/project titled " Postoperative infection in pregnant women who undergo cesarean section a tertiary hospital in Dhaka, Bangladesh: a descriptive cross sectional study" is submitted by Sumaiya Zahan Dolon (18326002) & Ummay Habiba (18326025) of Summer 2022 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Science in Microbiology.

Examining Committee:

Supervisor:

_____

Dr. Fahim Kabir Monjurul Haque

Assistant Professor, Mathematics and Natural Sciences

BRAC University

Program Coordinator:

_____

Dr. Nadia Sultana Deen

Associate Professor, Mathematics and Natural Sciences

BRAC University

Departmental Head: ‘

_____

Professor A F M Yusuf Haider

Professor and Chairperson, Mathematics & Natural Science Department

BRAC University

Ethics Statement

This study has been conducted with swab samples of pregnant women after cesarean section from their surgical site, the Department of Obstetrics and Gynecology, The Institute of Maternal and Child Health Training Institute (MCHTI), Azimpur, Dhaka, Bangladesh and consent was taken in agreement to use the samples and working at their lab for thesis purposes.

Abstract

Objective: Infection is the most common cause of mortality and morbidity in pregnant women during cesarean section. Hence this study was undertaken to study the incidence of postoperative infection after cesarean section at first referral units and identify microorganisms as well as risk factors leading to it.

Methodology: The descriptive cross sectional study included 1117 patients undergoing cesarean section in Maternal and Child Health Training Institute (MCHTI), Azimpur, Dhaka, Bangladesh. Patients' demographics, antibiotics used with dosages were recorded. Investigations like pus culture, blood and urine culture were recorded for patients with postoperative complications. Change of antimicrobial following culture sensitivity which occurred at 3rd party laboratory outside of the hospital; report was noted.

Result: Most of the patients were upper lower class (45.33%), C the common risk factor can be Body Mass Index (BMI) and along with that anemia and hemoglobin can also be considered as risk factors for those who have undergone Cesarean Section(CS). Hence, the most common pathogen was ***Escherichia coli*** 22 (37.93%) and the second most common pathogen was ***Klebsiella*** 17(29.32%). The use of third generation cephalosporin (ceftriaxone) in the majority of the patients was observed. Two drugs combination commonly included third generation cephalosporin and metronidazole and in addition gentamicin was added when three drugs combination was used.

Conclusion: Cesarean Section (CS) women who were infected by postoperative infection bearing some risk factors shown by this investigation. Risk variables discovered were higher body weight,diabetes, anemia, hemoglobin level. Fundamentally, the data were comparable to those from other nations. Using risk-reducing strategies that are supported by research, as other people have reported, will improve results.

*Keywords: Cesarean Section (CS), wound infection, Urinary Tract Infection(UTI), antibiotics

Dedication

This Research is wholeheartedly dedicated to our beloved parents, who have been our source of inspiration and gave us strength when we thought of giving up, who continually provide their moral, spiritual, emotional, and financial support. To also our supervisor who shared his words of advice and encouragement to finish this study. And lastly, we *dedicate* this book to the Almighty Allah, thank you for the guidance, strength, power of mind, protection and skills and for giving us a healthy life.

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The oversight and encouragement of these esteemed individuals influenced this report to be completed flawlessly in every step of the thesis work. We regard this opportunity as a significant achievement in the growth of our career. We will certainly aspire to use the skills and experience learned in our near future in the best possible ways.

Sumaiya Zahan Dolon, Ummay Habiba

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List of Acronyms

CS: Cesarean Section

UTI: Urinary Tract Infection

NO: Number Of

OP: Operative

SD: Standard Deviation

BMI: Body Mass Index

SSIs: Surgical Site Infections

CDC: Centers for Disease Control & Prevention

Chapter 1

1.1 Introduction

Women in both developing and industrialized nations most typically generate a cesarean section (CS), which is a major surgical operation. Approximately 15% of people worldwide have CS [1]. In the past 30 years, severe complications from cesarean sections have massively decreased because of the improvements in anesthesia, blood transfusion, pain management, and antibiotics. Including in clinics with the most advanced infrastructure, postoperative infection remains a significant exposure [2].

A typical post-operative complication, surgical site infection enhances hospital stays, repeatedly demands readmission, and adds extra hospital expanses of 10-20% to cost, which is connected with intense morbidity and rarely inference in fatality [3]. In some research, we have observed that the best procedures for infection control have been suggested, including antibiotic prophylaxis, vaginal preparation, and spontaneous placental removal [32]. The incidence of Cesarean Section-Surgical Site Infection (CS-SSI) is unfamiliar in low and middle-income countries, despite reports ranging from 2% to 7% in high-income nations [33] [34]. Body Mass Index (BMI) more than 25, anemia, longer operating duration, premature membrane rupture, emergency operation, pre-existing medical condition, and process carried out through junior surgeons have all been assessed as risk factors for CS-SSI [35]. In the literature, the incidence of Surgical Site infection (SSI) following CS ranges from 0.3% in Turkey [5] to 24% [4] in Tanzania. However, the most frequent post-cesarean section consequence, with reported rates which is ranging from 18% to 83%, is considered as infectious morbidity [44–47]. There is a high number of many infectious difficulties in women who have cesarean deliveries including fever, bacteraemia, wound infection, endometriosis, Urinary Tract Infection (UTI) and pelvic abscess [48].

With very few exceptions, the cause of postoperative infections after cesarean sections are the same everywhere [36,37,38,39]. Age, obesity, underlying illness including hypertension, asthma, diabetes mellitus, and immunocompromised conditions like HIV infection, hypoalbuminemia, hyperlipidemia, and anemia are only a few of the intrinsic factors that are patient-related. Extrinsic factors are related to the management and care including preoperative cleaning of the patient's parts and skin asepsis, type of procedure (emergency/ elective), type of skin incision (horizontal/ vertical), method of skin closure, type of suture used (mono/ poly filament) or use of staples, length of labor prior to CS [40] [41]. Although Surgical Site Infections (SSIs) frequently exist between the fifth and eighth postoperative days, depending on the type of bacterial infection, certain SSIs may seem as early as the third postoperative day [39] [40]. An

infection at the incision or surgical site which manifest within 30 days following surgery is referred to as a SSI Centers For Disease Control & Prevention (CDC). Moreover, the infection must seem to be associated to the operation. 38% of all nosocomial infections in surgical patients according to the CDC's National Nosocomial Infection Surveillance system, are SSIs[42].

Traditionally, the presence of SSIs is visualized by seeing the common inflammatory sign, pus draining from the site, and a positive culture [42]. Whereas there are several risk factors that might contribute to SSIss, raising awareness of them will support effective preventive measures. The morbidity and mortality associated with SSI can be decreased through early identification, microorganism isolation, and the use of the proper antibiotics [42]. Even though SSI cannot be eliminated entirely, post-surgical prevention and management of associated risk factors, along with strict infection control practices in the operating room, can help to achieve minimal infection rates in patients undergoing cesarean section, which could have significant benefits in terms of both patient's comfort and the resources used for healthcare [43]. In certain studies, we have noticed that microorganisms were found in 55% of cases in a bacteriological examination. The majority of the organisms were ***Staphylococcus aureus*** (20%). Other isolates include ***Proteus spp*** (5%), ***Escherichia coli*** (11%), ***Acinetobacter spp*** (7%) and ***Pseudomonas spp*** (6%). Anguzu JR [49] conducted a study in 2007, microorganisms were found in 58% samples at a referral hospital in Uganda. Consequently, ***Staphylococcus aureus*** (45.1%), ***Escherichia coli*** (16.9%), ***Pseudomonas spp*** (9.9%), ***Klebsiella*** (7%) and ***Proteus spp*** (11.3%) were the isolates. And gentamicin, ciprofloxacin and ceftazidime were effective against the majority of the pathogens.

The objective of this study was to help understand the prognosis of postoperative infection in women who undergo Cesarean Section at the Institute of Maternal and Child Health Training Institute (MCHTI) and to identify the risk factors of postoperative infection.

Chapter 2

2.1 Materials & Methods

2.1.1 Study Design & Settings

The study was a Descriptive Cross Sectional study. Samples were collected from the surgical site (SSI) infected patients and diagnosed at the laboratory of that maternity hospital. First, the pus sample & the urine sample of the CS patients were collected and then cultured in Macconkey Agar media and Blood agar media by streaking methods and then by the bacterial growth size and color detection of the microorganisms class was done. Also, If needed the biochemical tests were also done for the finding of bacterial species selectively. Antibiotics Susceptibility test could not be done at the maternity hospital due to the lack of facilities. The sample was sent to the 3rd party diagnostics center for further investigation.

2.1.2 Sample Size

This study conducted 1117 women who scheduled C-section and among them who developed a surgical site infection (wound infection) and urinary tract infection (UTI); from January,2022 to July 2022 (7 months) had been diagnosed at the Institute of Maternal and Child Health Training Institute (MCHTI), Azimpur, Dhaka, Bangladesh, in order to assess infections type, treatment regimens and details of postoperative management were recorded

2.1.3 Statistical analysis

Descriptive data are shown as frequency (%), mean, standard deviation (SD), median and range, as appropriate. No imputation was made for missing data.

Data was collected from every patient by means of a detailed questionnaire. Cases were reviewed in detail with respect to their socio-demographic characteristics, age, weight and height, cases related to gravida. All patients suspected of having wound infection had wound swabs and the pus cell and also along with that the urine sample of patients were

cultured in accordance with local practice,where all suspected SSIs had swabs taken prior to commencement of antibiotics or as soon as the diagnosis was suspected.

Purulent discharge was accumulated from the surgical incision site with sterile cotton swabs. Complete blood count, blood sugar and urine for routine and microscopic examination were carried out. Data were recorded on a predesigned study questionnaire and managed on an excel spreadsheet. Categorical variables had been summarized by frequency (percentage).

Chapter 3

3.1 RESULT

3.1.1: Month wise distribution of patients and their postoperative infection who are undergoing cesarean section

The study had a population size of 1117 patients. **Table-3.1** describes month wise description of patients who were undergoing cesarean section who were enrolled from January to July, 2022 . Among 1117 patients, we have found that the wound infection number was 58 and UTI was 17.So, in total 75 infected patients were found out of 1117 patients. OUT of 1117 patients 5.19% belonged to wound infection. Wound infection out of 75 infections is 77.33% and UTI is 22.67%. The Mean (SD) average of the total patients according to month 279.25±18.72. It means per month almost 279 patients undergo cesarean section. Maximum infected patients were found in January to April. From 58 wound infection patient's average mean±SD is 14.5±5.40. And the percentage for wound infection is 25±9.48. Furthermore, from 17 UTI patients, the average Mean±SD is 4.25±5,40. And the percentage for UTI is 25±10.11.

* UTI(Urinary Tract Infection), UTI=17, Wound infection(58) and total cases=1117, %=percentage

MONTHS	NUMBER OF CASES	URINARY TRACT INFECTION (UTI)	UTI % (n=17)	UTI % (n=1117)	WOUND INFECTION	WOUND INFECTION % (n=58)	WOUND INFECTION % (n=1117)
JANUARY	182	3	17.64	0.27	14	24.14	1.25
FEBRUARY	157	5	29.42	0.45	14	24.14	1.25
MARCH	189	2	11.76	0.18	10	17.24	0.9
APRIL	147	1	5.88	0.09	12	20.69	1.07
MAY	141	0	0	0	4	6.9	0.36
JUNE	156	2	11.76	0.18	1	1.72	0.09
JULY	145	4	23.54	0.36	3	5.17	0.27
TOTAL	1117	17	100	1.53	58	100	5.19
Mean	279.25	4.25	25	0.38-	14.5	25	1.20
SD	18.72	1.72	10.11	0.15	5.40	9.48	0.49

Table 3.1.1: Monthwise distribution of patients and their postoperative infection who are undergoing cesarean section

3.1.2: Distribution of women cases who are undergoing cesarean section by age.

Table-3.2 shows the mean age of the women undergoing cesarean section was (15±6.78) who had developed postoperative infection (75). This table 2 shows the age distribution of the CS cases. The mean age was found out of 58 wound infected patients 11.6±5.03 and out of 17 UTI patients 3.4±1.95. (25-29) age group was common 18(31.03%) patients out of 58 wound infected patients and 6(35.29%) out of UTI patients. In total 24(32%) out of 75 postoperative infected patients. Along with this group the age range (30-34) age group had developed wound infection, 16(27.59%) from wound infection and 4(23.53%) from UTI infection and out of total 75 infected patients 20(26.67% woman) had developed postoperative infection within this age group. Then in the age group of >35, 7(12.07%) women who developed wound infection and 1(5.89%) out of 17 UTI infected patients and out of 75 in total 8(10.67%) women are found from this group. In the lower 20-24 age group women out of 58 patients 8(13.79%) developed wound infection and 2(11.76%) developed UTI, and out of 75 10(13.33%) developed the postoperative infection. Below 20 age, <19 aged group 9(15.52%) patients developed wound infection out of 58 patients and 4(23.53%) developed UTI out of 17. And a total of 13(17.33%) developed postoperative infection out of 75.

* OP- Operative *% shows the percentage

VARIABLES	POST OP WOUND INFECTION (n=58)		POST OP UTI (n=17)		TOTAL INFECTION (n=75)	
AGE	Number	%	Number	%	Number	%
<19	9	15.52	4	23.53	13	17.33
20-24	8	13.79	2	11.76	10	13.33
25-29	18	31.03	6	35.29	24	32
30-34	16	27.59	4	23.53	20	26.67
>35	7	12.07	1	5.89	8	10.67
TOTAL	58	100	17	100	75	100
Mean±SD	11.6±5.03	20±8.67	3.4±1.95	20±11.46	15±6.78	20±9.04

Table 3.1.2: Distribution of women cases who are undergoing cesarean section by age.

3.1.3: Demographic variable of patients undergoing cesarean section by socio-economic condition.

Table-3.1.3 shows the demographic variable of patients undergoing cesarean section according to socio-economic condition of the patient who developed postoperative infection. Out of 75 infected patients 34(45.33%) were upper lower class, among them 23(39.66%) patients developed wound infection out of 58 and 11(64.71%) developed UTI out of 17. So in total 75 postoperative infected patients 19(25.33%) were middle class, 18(24%) were lower class, 4(5.34%) were upper middle class. The mean±SD of the total who developed postoperative infection 15±13.53.

*Based on Economic Policy & Debt: National accounts: Growth rates, WORLD BANK GDP, Bangladesh, 2022 [31]

VARIABLES	POST OP WOUND INFECTION (n=58)		POST OP UTI (n=17)		TOTAL INFECTION (n=75)	
SOCIO ECONOMICS STATUS	Number	%	Number	%	Number	%
LOWER CLASS	14	24.14	4	23.53	18	24
UPPER LOWER CLASS	23	39.66	11	64.71	34	45.33
MIDDLE CLASS	17	29.31	2	11.76	19	25.33
UPPER MIDDLE CLASS	4	6.89	0	0	4	5.34
UPPER CLASS	0	0	0	0	0	0
TOTAL	58	100	17	100	75	100
MEAN±SD	11.6±9.45	20±19.20	3.4±4.56	20±26.83	15±13.53	20±18.03

Table 3.1.3: Demographic variable of patients undergoing cesarean section by socio-economic condition.

3.1.4: Distribution of the study patients undergoing cesarean section by Body Mass Index (BMI).

Table-3.4 tabulates the BMI of the 75 patients who developed postoperative infection after undergoing cesarean section. The mean BMI was found out of 75 postoperative infected patients 25±9 (kg/m²). Moreover, the mean BMI was found out of 58 wound infected patients 19.33±8.50(kg/m²) and out of 17 UTI patients 6.67±3.06(kg/m²). Almost half of the women, 34(45.33%) who developed postoperative disease, belong to the BMI range 25-29 and this is the overweight range. 29(27.59%) women were from wound infection and 5(29.41%) from UTI. Then 25(33.33%) women out of 75 infected patients belonged to the 19-24 BMI range which indicated the healthy weight, 16(27.59%) women from wound infection and 9(52.94%) women from UTI had 19-24 BMI value. In the end, a total of 16(21.34) women {13(22.41%) from wounds and 3(17.65%) from UTI} had BMI range 30-40, this range indicates the obesity problem.

*The first row is based on the womens Body Mass Index(BMI).

BMI (KG/m2)	POST OP WOUND INFECTION (n=58)		POST OP UTI (n=17)		TOTAL INFECTION (n=75)	
	Number	%	Number	%	Number	%
19-24	16	27.59	9	52.94	25	33.33
25-29	29	50	5	29.41	34	45.33
30-40	13	22.41	3	17.65	16	21.34
TOTAL	58	100	17	100	75	100
Mean ± SD	19.33 ± 8.50	33.33 ± 14.67	5.67± 3.06	33.33±17.97	25±9	33.33±11.90

Table 3.1.4: Distribution of the study patients undergoing cesarean section by Body Mass Index (BMI).

3.1.5: Distribution of the study patients undergoing cesarean section by gravida.

Table-3.5 examines the patients according to gravida(the number of pregnancies). Out of 75 infected patients, most of the women were primiparous 42(56%) and 33(44%) women were multiparous. Out of 58 wound infected patients 33(56.80%) was primiparous and 25(43.10%) was multiparous. On the other hand, out of 17 UTI patients 9(52.94%) was primiparous and 8(47.06%) was multiparous.

*Primiparous means pregnant for the first time and multiparous means pregnant for the 2nd or multiple time

NO OF PREGNANCIES	POST OP WOUND INFECTION (n=58)		POST OP UTI (n=17)		TOTAL INFECTION (n=75)	
	NO	%	NO	%	NO	%
PRIMIPAROUS	33	56.897	9	52.941	42	56
MULTIPAROUS	25	43.103	8	47.059	33	44
TOTAL	58	100	17	100	75	100

Table 3.1.5: Distribution of the study patients undergoing cesarean section by gravida.

3.1.6: Distribution of the study cases undergoing cesarean section by postoperative infectious morbidity.

Postoperative infectious morbidity is shown in **Table-3.6** . The overall infectious morbidity was 75(6.71%) out of 1117 patients. Incidence of wound infection and UTI was found in 58(5.19%) and 17(1.52%) patients respectively. The total postoperative infection was 75(6.71%). The rate of wound infection out of 75 patients is 77.33% and UTI is 22.67%.

*This table is based on the outcome cases of postoperative infection after CS.

OUT COME	NUMBER OF CASES	% OUT OF 75	% OUT OF 1117
WOUND INFECTION	58	77.33	5.19
UTI	17	22.67	1.52
TOTAL	75	100	6.71

Table 3.1.6: Distribution of the study cases undergoing cesarean section by postoperative infectious morbidity.

3.1.7: Distribution of the associated risk factors among cesarean section patients.

Table-3.7 tabulates postoperative infectious outcome by the comorbidities of Anemia,Diabetes mellitus, high blood pressure and hemoglobin level. Within 58 postoperative wound infected patients 35(60.34%) patients have Anemia. And 23(39.66%) patients do not have Anemia. Therefore, 16(27.59%) patients have diabetes mellitus and 42(72.41%) patients do not have diabetes mellitus. Moreover, 28(48.28%) patients have high blood pressure and 30(51.72%) have normal blood pressure. Furthermore, 19(32.76%) patients had hemoglobin level >10, 39(67.24%) had hemoglobin level<10.

Out of 17 postoperative UTI infected patients 5(29.42%) had Anemia and 12(70.58%) did not have Anemia. Then, 2(11.76%) patients have diabetes mellitus during pregnancy and 15(88.24%) patients do not have diabetes mellitus. After that, 4(23.53%) patients have high blood pressure and 13(76.47%) have normal blood pressure. And, 6(35.29%) patient's hemoglobin level is >10, on the other hand 11(64.71%) patient's hemoglobin level is<10. In the last, out of total 75 postoperative infected patients 40(53.33%) are suffering from Anemia, 18(24%) patients who have diabetes mellitus and 57(76%) not have diabetes. Along with this, 32(42.67%) have high blood pressure but 43(57.33%) have normal pressure. Infected 25(33.33%) women's hemoglobin level is >10 but 50(66.67%) women's hemoglobin level is <10.

*Number of infected patients with others comorbidity

NAMES		POST OP WOUND INFECTION (n=58)		POST OP UTI (n=17)		TOTAL INFECTION (n=75)	
		Number	%	Number	%	Number	%
ANEMIA	YES	35	60.34	5	29.42	40	53.33
	NO	23	39.66	12	70.58	35	46.67
DIABETES MELLITUS	YES	16	27.59	2	11.76	18	24
	NO	42	72.41	15	88.24	57	76
HIGH BLOOD PRESSURE	YES	28	48.28	4	23.53	32	42.67
	NO	30	51.72	13	76.47	43	57.33
HEMOGLOBIN LEVEL	>10	19	32.76	6	35.29	25	33.33
	<10	39	67.24	11	64.71	50	66.67

Table 3.1.7: Distribution of the associated risk factors among cesarean section patients.

3.1.8: Isolated bacteria among cesarean section patients.

The microorganisms isolated from wound infection and UTI both are described in Table-8. The isolated microorganisms from wound infection were gram negative and ***Escherichia coli*** 22(37.93%), was the common. Others were ***Klebsiella*** 17(29.32%), ***Pseudomonas*** 12(20.69%), non fermenting gram negative bacteria 4 (6.89%), ***Enterobacter*** 2(3.45%) and ***Strepto facalis*** 1(1.72%). On the other hand, the isolated microorganisms from UTI were gram negative and ***Escherichia coli,*** 9(52.94%), was the common. For UTI also others were ***Klebsiella*** 3(17.65%), ***Pseudomonas*** *2(11.76%), non fermenting gram-negative bacteria 1(5.88%),* ***Enterobacter*** 2(11.77%). In total infected patients (75). The isolated microorganisms were gram negative and ***Escherichia coli***, 31(41.33%) was the common which was resistant to third generation cephalosporin and sensitive to amikacin. The second most common organism were ***Klebsiella*** 20(26.67%), ***Pseudomonas*** 14(18.67%), non fermenting gram negative bacteria 5(6.67%), ***Enterobactor*** 4(5.33%), ***Strepto faecalis*** 1(1.33%)

*(NO= Number)

NAME OF ORGANISMS	POST OP WOUND INFECTION (n=58)		UTI (n=17)		TOTAL INFECTION (n=75)	
	NO	%	NO	%	NO	%
Eshcerichia coli	22	37.93	9	52.94	31	41.33
Klebsiella	17	29.32	3	17.65	20	26.67
Pseudomonas	12	20.69	2	11.76	14	18.67
Non fermenting Gram-negative bacteria	4	6.89	1	5.88	5	6.67
Enterobactor	2	3.45	2	11.77	4	5.33
Strepto faecalis	1	1.72	0	0	1	1.33
TOTAL	58	100	17	100	75	100

Table 3.1.8: Isolated bacterias among cesarean section patients.

3.1.9: Prescribed antibiotics for post cesarean infected patients

Usage of antibiotics is shown in **Table 3.9.** Most of the patients received Ceftriaxone, 36(48%) and Cefotaxime, 14(18.67%), the following two antibiotic combinations were administered; Ceftriaxone+Metronidazole, 12(16%); Amoxicillin+Clavulanic acid, 6(8%) and Cefotaxime+Metronidazole, 3(4%). The following three antibiotics combinations were administered; Cefotaxime+Metronidazole+Gentamicin, 3(4%) both were same in number and Amoxicillin+Clavulanic acid + Metronidazole, 1(1.33%)

NAME OF ANTIBIOTICS	NUMBER OF CASES	% OUT OF 75
Ceftriaxone	36	48
Ceftriaxone+Metronidazole	12	16
Cefotaxime+Metronidazole	3	4
Cefotaxime	14	18.67
Cefotaxime+Metronidazole+Gentamicin	3	4
Amoxicillin+Clavulanicacid	6	8
Amoxicillin+Clavulanic Acid+Metronidazole	1	1.33
TOTAL	75	**100**

Table 3.1.9: Prescribed antibiotics for post cesarean infected Patients

Chapter 4

4.1 DISCUSSION

This has been turned into finished with an intention to assess the submit cesarean segment wound contamination additionally Urinary Tract Infection (UTI) concerning the underlying elements and the causative organisms dosages. In this observation fifty eight sufferers of wound contamination and 17 sufferers of UTI following cesarean phase have been evaluated. This prevalence of CS has dramatically expanded in Bangladesh [6] with this increase, accelerated danger of infections and long term morbidity and mortality have turned out to be concerns.

There had been only a few posted information in this subject matter in Bangladesh. A examine from Bangabandhu Sheikh Mujib Medical University (BSMMU) in Dhaka, a massive submit graduate health facility stated on SSIs following popular surgical cases[7]. There changed into a 20% wound contamination fee amongst 496 optional well known surgical procedures. The not unusual place hazard elements have been Anemia(52%),malnutrition (44%), Diabetes (38%), Obesity and smoking. In every other tertiary care clinic in Bangladesh, normal occurrence price of SSI changed to 14%; Escherichia coli 30.8%; and Enterococcus spp. (12%) [8]. There aren't any posted reviews from Bangladesh which have in particular tested CS-SSI rates. One file of 124 eclamptic sufferers with CS confirmed a morbidity price, which protected contamination of 53% [9], which accorded with the existing prevalence of 50%. Another go sectional cohort observe turned into carried out withinside the branch of obstetrics and gynecology of Sir Salimullah Medical university and MItford Hospital, in Dhaka, Bangladesh from January to June 2014 to assess the danger elements of postoperative surgical web website online contamination following CS. One hundred sufferers had been decided on as cases/ Body mass index>25(kg/m²), Anemia(p=0,001), Prolonged rupture of membrane (p=0.005), Prolonged operation time (p=0.019), and junior surgeons acting the operation (p=0.011) have been the threat elements for CS-SSI.[10]

Our study which was done from January 2022 to July 2022 CS cases; 58 patients were infected by wound infection and 17 patients were infected by UTI. The wound infection percentage is 5.19% and UTI rate is 1.53%. The percentage of total postoperative infection out of total enrolled patients is 6.71%. In this study, the maximum infected patient's age was between 25 to 29 years. Most of the patients were of upper lower class socioeconomic status, the reason being that the study was conducted in the facilities situated at a public maternity hospital, which provides treatment at low cost. The studies have shown that patients undergoing cesarean section have a 10% to 85% risk of getting infected with

postoperative infection depending on their socioeconomic status. [11] Increase in postoperative complications. Also reconfirmed the risk of CS infection; most of the women were primiparous which means women who are pregnant for the first time. Almost half of the women who developed postoperative infection belonged to the overweight BMI range(25-29) and 33% of women belonged to the obesity BMI range(30-40). So, we can say that patients who developed postoperative infection after undergoing cesarean section BMI for being overweight can be a common risk factor for developing infection. Among infected patients almost 50% women were with Anemia; which diminished resistance to infection. [12,13] Patients with pre existing illnesses like diabetes mellitus or malnutrition were more prone to infection. Hypertension, preexisting or pregnancy induced and other comorbid status has been associated with SSI. [14]. But we did not find a significant difference in SSIs between our patients with or without diabetes mellitus and high blood pressure level. But the hemoglobin level can be a risk factor as 67% of patients among the infected patients had the hemoglobin level deficiency. As having Anemia also referred to as low hemoglobin. So, we can say that the hemoglobin level and Anemia are correlated with each other and act as a risk factor for postoperative infection in women who have undergone cesarean section.

Escherichia coli is a commensal of the normal vaginal flora. It was the most common organism isolated in wound infection and UTI in this study. After ***E.coli, Klebsiella*** was the second most common organism isolated in wound infection and UTI. Isolation of bacteria usually not present in the genital tract such as ***Pseudomonas*** found in the hospital environment and ***Acinetobactor*** found in the skin shows the iatrogenic etiology of wound infection, [15]. These can be reduced by decreasing the duration of hospital stay and practicing more strict aseptic measures. Most of the gram negative organisms isolated in wound infection and UTI were resistant to ceftriaxone and sensitive to amikacin. Gram positive organisms were sensitive to ciprofloxacin. [15]

In this study, the used antibiotics were of broad-spectrum and most used one was ceftriaxone, a 3rd generation cephalosporins and others were combinations of antibiotics.Where antibiotics are used rationally, the Cochrane Database of Systematic Reviews,the American College of Obstetrics and Gynecologists and the Centre for Disease Control and Prevention recommend narrow-range first generation cephalosporins, like cefazolin, to be administered after umbilical cord-clamping for prophylaxis against post cesarean delivery infections[16,17]In that situation, this may be considered equally effective and less costly than broad-spectrum antibiotics.[18,19] However, due to antibiotic resistance concern, the broad-spectrum antibiotics have been evaluated in this study are mainly single agent extendedspectrum peniçillins, or 2nd or 3rd generation cephalosporins,22 Clinical trials suggest that such extended-spectrum regimens (i.e., regimen

involving the use of both the stan-dard narrow-spectrum antibiotic in addition to a second antibiotic of a different class e.g. azithromycin, gentamicin or metronidazole)are significantly more effective in reducing of post cesarean infections (by 30-60%), hospital stay and costs than the use of narrow-spectrum agents alone. [20,21] In developed countries,prophylactic antibiotics are not used for more than 24 hours because studies have proved that prophylaxis is more efficacious when given in preoperative period and is maintained during surgery and there is no added benefit from multiple dose prophylaxis given after wound closure.[22,23] In developing countries like Bangladesh, prolonged antibiotic therapy is still used considering that facilities for operation theater sterilization are not ideal. [24] It is expected that prolonged antibiotic therapy will be more effective to control infectious morbidity, although this results in economic burden on the health system as well as emergence of resistant organisms. [25,26] Short term administration of antimicrobials i.e. three perioperative doses is as effective as long term administration in surgical prophylaxis. [27] In a report describing emergence of resistance to antimicrobials, it was found that resistance developed in patients who were continued with antimicrobials for 4 days postoperatively as compared to patients who received only three perioperative doses. [27] This showed that shorter courses of prophylactic antimicrobials decreased the emergence of antimicrobial resistance. When patients are administered antimicrobials for a long time postoperatively, there may increase cost, which includes acquisition cost and costs for treating postoperative infections related to prophylactic failures due to development of resistance.

Chapter 5

5.1 Limitations:

1. Anaerobic culture could not be done due to lack of hospital facilities.
2. Post-discharge surveillance could not be done as most patients could not be followed for 30 days.
3. Antibiotics Susceptibility test could not be done at the hospital lab due to lack of lab facilities. Patients were sent to a 3rd party diagnostic center for further test and investigation.

Thus, severity of disease could not be assessed enough. Further studies are needed to provide more CS patient's postoperative infection related information for Bangladesh.

5.2 Conclusion:

Cesarean delivery is one of the most frequent surgical interventions performed worldwide and accounts for up to 60% of deliveries in a number of countries.[50,51] It carries risk for various short-term postoperative morbidities including SSI. This study demonstrated CS-SSI risk factors in Bangladesh. Identified risk factors included increased body weight, anemia, low hemoglobin and socioeconomic status. As documented by others, using actions that reduce risk based on evidence can improve results. The incidence of post-cesarean wound infection and its complications is bound to decline with only minimal use of antibiotics if we had a well-equipped obstetric ward with a clean environment and adequate facilities, a planned operating room, and general awareness of the patient and their family about the health of a pregnant woman. When treating infected wounds after surgery, choosing the right antibiotics is crucial for minimizing morbidity and complications.

Chapter 6

6.1 REFERENCES

1. Betrán AP, Merialdi M, Lauer JA, Bing–Shun W, Thomas J, Van Look P et al. Rates of cesarean section: analysis of global, regional and national estimates. Paediatr Perinat Epidemiol 2007; 21(2): 98–113.
2. Owens C, Stoessel K. Surgical site infections: epidemiology, microbiology and prevention. J Hosp Infect 2008; 70: 3–10.
3. Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ. The impact of surgical-site infections in the 1990s: attributable mortality, excess length of hospitalization, and extra costs. Infect Control Hosp Epidemiol 1999; 20(11): 725–730.
4. De Lissovoy G, Fraeman K, Hutchins V, Murphy D, Song D, Vaughn BB. Surgical site infection: incidence and impact on hospital utilization and treatment costs. Am J Infect Control 2009; 37(5): 387–397.
5. Tran TS, Jamulitrat S, Chongsuvivatwong V, Geater A. Risk factors for postcesarean surgical site infection. Obstet Gynecol 2000; 95(3): 367–371.
6. Rahman, M.M., Haider, M.R., Moinuddin, M.,Rahman, A.E.,Ahmed, S. and Khan, M.M. (2018) Determinants of Caesarean Section in Bangladesh: Cross-Sectional Analysis of Bangladesh Demographic and Health Survey 2014 Data. PLoS ONE, 13,e0202879. https://doi.org/10.1371/journal.pone.0202879
7. Nur-e-elahi, M., Jahan, I., Siddiqui, O., Ahmed, S., Joarder, A., Faruque, S., Imdad, S., Ahmed, H., Islam, M.,Siddiqui, M. and Sardar, K. (2014) Wound Infection in Surgery Department in BSMMU: A Study of 100 Cases. Journal of the Bangladesh Society of Anaesthesiologists, 24, 65-69. https://doi.org/10.3329/jbsa.v24i2.19804
8. Sickder, H.K., Lertwathanawilat, W., Sethabouppha, H. and Viseskul, N. (2017) Prevalence of Surgical Site Infection in a Tertiary-Level Hospital in Bangladesh. In-ternational Journal of Natural and Social Sciences, 4, 63-68.
9. Parna, F.H., Latif, T., Sultana, N., et al. (2013) Maternal & Fetal Outcome of Ec-lamptic Patients Admitted in Obstetrics & Gynaecology Department of Secondary Care Hospital in Bangladesh. Mymensingh Medical Journal, 22, 522-526.

10. Jahan, F.I., Begum, F., Islam, F., Pervin, S. and Goodman, A. (2019) Risk Factors for Wound Infection Following Caesarean Section: A Cross Sectional Cohort Study from Sir Salimullah Medical College & Mitford Hospital in Dhaka, Bangladesh. Open Journal of Ob-stetrics and Gynecology, 9, 904-913. https://doi.org/10.4236/ojog.2019.96088
11. Rothbard MJ. Mayer W, Wystepek A.Gordan M. Prophylactic antibiotics in cesarean section. Obstet Gynecol1975:45:421-4
12. Waisbern, E., Rosen, H., Badar, A.M., Lipsitz, S.R., Rogers, S.O. and Eriksson, E. (2010) Percent of Body Fat and Prediction of Surgical Site Infection. Journal of American College of Surgeons, 210, 381-389. https://doi.org/10.1016/j.jamcollsurg.2010.01.004
13. Walter, P., Zwahlen, M., Reck, S., Misteli, H., Rosenthal, R., Buser, A.S., Kaufmann,M., Oertli, D., Widmer, A.F. and Marti, W.R. (2009) The Association of Preoperative Anemia and Perioperative Allogeneic Blood Transfusion with the Risk of Sur-gical Site Infection. Transfusion, 49, 1964-1970. https://doi.org/10.1111/j.1537-2995.2009.02204.x
14. Pierson, R.C., Scott, N.P., Briscoe, K.E. and Haas, D.M. (2018) A Review of Post-Caesarean Infectious Morbidity: How to Prevent and Treat. Journal of Obstetrics & Gynaecology, 38, 591-597. https://doi.org/10.1080/01443615.2017.1394281
15. NazrinaS,Chisty S,Maruf AA. Antibiotic prescribing pattern in cesarean section. Mediscope2016;3(1):8-15.
16. Gibbs RS Decherney AH, Schwarz RH.Prophylactic antibiotics in cesareansection: a double-blind study. Am JObstet Gynecol 1972;114:1048-53.
17. SmaillF. Hofmeyr GJ. Antibiotic prophylaxis for cesarean section. Cochrane Database of Syst Rev2002:(3):CD000933.
18. ACOG practice bulletin number 47,October 2003:Prophylactic antibiotics in labor and delivery. Obstet Gynecol 2003;102(4):875-82.
19. Births: Preliminary Data for 2006.National Vital Statistics Reports 2008;56(7):18.3
20. Pitt C, Sanchez-Ramos L,Kaunitz AM.Adjunctive intravaginal metronidazole for the prevention of postcesarean endometritis: a randomized controlledtrial.Obstet Gynecol 2001;98:745-50.
21. Meyer NL, Hosier KV, Scott K,LipscombGH. Cefazolin versus cefazolin plus metronidazole for antibiotic prophylaxisat cesarean section. South Med J2003;96(10):992-5.

22. Andrews WW,Hauth JC, Cliver SP.Savage K, Goldenberg RL.Randomized clinical trial of extended spectrum antibiotic prophylaxis with coverage for Ureaplasma urealyticum to reduce post-cesarean delivery endometritis. Obstet Gynecol 2003;101(6):1183-9.
23. Lotfi CJ.Coralcanti RC, Costa SA.Risk Factors for surgical site infection in head and neck cancer surgery. Otolaryngol Head Neck Surg 2008;138(1):74-80.
24. Puchades MS.Havraez-Vilas JM,AytesLB,Gay-Ecoda C. Antibiotic prophylaxisto prevent local intection in oral surgery.use or abuse? Med Oral Patol Oral Cir Bucal 2009:14(1):28-33.
25. Gibbs R.Clinical risk factors for puerperal infection. Am JObstetGynecol1980;5:178-84.
26. Rosenberg AD, Wamhold D, Kraemer L,et al. Ensuring appropriate timing of antimicrobial prophylaxis. J Bone JointSurg Am 2008;90:226-32.
27. Regehr G, Espin S, Bohness J, et al.Timing of surgical antibiotic prophylaxis administration: complexities of analysis.BMC Med Res Methodol 2009;9:42.
28. Keighley MRB. Perioperative antibiotics. Br Med J 1983;286:1844-46.
29. MacLean AB. Puerperal pyrexia. In:MacLean AB (Eds.). Clinical infection inObstetrics·and Gynaecology. Oxford:BlackwellScientificPublications.1990:195-209.
30. Yip SK. Lau TK. Rogers MS. A study on prophylactic antibiotics in cesarean sections- is it Worthwhile? Acta ObstetGynecol Scand 1997 76:547-9.-*
31. World Bank national accounts data, and OECD National Accounts data files. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=BD
32. Martin, E.K., Beckmann, M.M., Barnsbee, L.N., Halton, K.A., Merollini, K. and Graves, N. (2018) Best Practice Perioperative Strategies and Surgical Techniques for Preventing Cesarean Section Surgical Site Infections: A Systematic Review of Reviews and Meta-Analyses. BJOG, 125, 956-964.
33. 33.Blumenfeld, Y.J., El-Sayed, Y.Y., Lyell, D.J., Nelson, L.M. and Butwick, A.J. (2015) Risk Factors for Prolonged Postpartum Length of Stay Following Cesarean Delivery. American Journal of Perinatology, 32, 825-832.
34. Shahida, S.M., Islam, M.A., Dey, B.R., Islam, F., Venkatesh, K. and Goodman, A. (2016) Hospital Acquired Infections in Low and Middle Income Countries: Root Cause Analysis and the Development of Infection Control Practices in Bangladesh. Open Journal of Obstetrics and Gynecology, 6, 28-39.
35. Poggi, S.B.H. (2013) Postpartum Hemorrhage & the Abnormal Puerperium. Chapter 21.

36. Ogunsola FT, Oduyebo O, Iregbu KC, Coker AO, Adetunji A. A review of nosocomial infection at the Lagos university teaching hospital: problems and strategies for improvement. J Nig Infect Contr Assoc 1998; 1: 14–20.
37. Barbot F, Carbonne B, Truchot F, Spielvogel C, Jannet D, Goderel I et al. Surgical site infections after caesarean section: results of a five-year prospective surveillance. J Gynecol Obstet Biol Reprod (Paris) 2004; 33: 487–496.
38. Ward VP, Charlett A, Fagan J, Crawshaw SC. Enhanced surgical site infection surveillance following caesarean section: experience of a multicenter collaborative post discharge system. J Hosp Infect 2008; 70: 166–173.
39. Graffiths J, Demianczuk N, Cordoviz M, Joffe AM. Surgical site infection following elective caesarian section: a case–control study of postdischarge surveillance. J Obstet Gynaecol Can 2005; 27: 340– 344.
40. Surgical site infection: treatment and prevention. National Institute of Health and Clinical Excellence (NICE), London. 2008; CG74: 1–21.
41. Olsen MA, Butler AM, Willers DM, Devkota P, Gross GA, Fraser VJ. Risk factors for surgical site infection after low transverse caesarean section. Infect Control Hosp Epidemiol 2008; 29: 477–484.
42. Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG. CDC definitions of nosocomial surgical site infections: a modification of CDC definition of surgical wound infections. Infect Control Hosp Epidemol 1992; 13: 606–608.
43. Nandi PL, Rajan SS, Mak KC, Chan SC, So YP. Surgical wound infection. HKMJ 1999; 5(1): 82.
44. Ruby N. Maternal complications associated with caesarean section.JPostgrad Med Inst 2000;14:83-9.
45. Najma SR, Bano FA. Complication between emergency and elective caesarean section.pecialist1995:11:1-6.
46. Aleem M.Bashir A, Zia F. Iqbal N.Maternal deaths with caesarean section:a three years study. Specialist1994;11:1-7.
47. Bagratee JS,Moodley J,Kleinschmidt I,Zawilski WA.Randomized controlled trailof antibiotic prophylaxis in electivecaosarean delivery. Br J ObstetGynaecol 2001;108:143-8.
48. Heethal J, Sarala N. Kumar TN,Hemalatha M.Pattern of antimicrobialuse in cesarean section in a tertiary carehospital in rural South India.Int J PharmBlomed Res 2010;1(2):57-61.
49. Anguzu JR, Olila D. Drug sensitivity patterns of bacterial isolates from septic post-operative wounds in a

regional referral hospital in Uganda, African HealthSciences 2007; 7(3): 148–154.

50. Gibbons L, Belizán JM, Lauer JA, Betrán AP, Merialdi M, Althabe F. The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: overuse as a barrier to universal coverage. World Health Rep. 2010;30:1–31.

51. Belizan JM, Althabe F, Barros FC, Alexander S. Rates and implications of caesarean sections in Latin America: ecological study. BMJ. 1999;319(7222):1397–1400.