



Factors Associated with Acquired Infections Caesarian Wounds in Maternity Mbuji-Mayi/DR Congo

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Abstract

Introduction: The purpose of this study is to analyze the factors associated with nosocomial infections of caesarean section wounds in the maternity hospitals of the city of Mbuji-Mayi. **Methods:** This study was conducted in 25 maternities of general referral hospitals, clinics and hospitals in the city of Mbuji-Mayi during the period from 1 February to 1 June 2017, out of 171 parturients cesarized that were followed during a period of 4 months. A survey questionnaire was used to collect the data. **Results:** Out of 171 parturients monitored, surgical site infection developed 52 (SSI), an incidence of 30.4%. After analysis, nine factors were identified as associated post-caesarean SSI in Mbuji-Mayi city ($p \leq 0.05$): age ($p = 0.000$), anemia ($p = 0.000$), prolonged duration of labor delivery ($p = 0.001$), premature rupture of the membranes before caesarean section ($p = 0.044$), prolonged duration after-rupture of the membranes ($p = 0.000$), preparation of the operative site by shaving ($p = 0.029$), surgery by general practitioner ($p = 0.023$), duration of operation greater than 60 minutes ($p = 0.040$), non-compliance with asepsis during dressing ($p = 0.000$). **Conclusion:** The fight against nosocomial infections must be a permanent concern: the prevention and regular monitoring of these infections must be the control strategies of each hospital structure, under the watchful eye of a coordination center for the fight nosocomial infections.

Subject Areas

Epidemiology

Keywords

Factors, Nosocomial Infections, Caesarean Section Wounds

1. Introduction

Despite the enormous progress made in obstetric technique and anesthesia to provide better maternal-fetal safety during cesarean section, the rates of maternal complications and surgical site infections remain high, putting some time in life-threatening and obstetric outcome of patients [1]. The operating site nosocomial infections are the second cause of premature death and the third leading cause of neo-maternal mortality [2].

It is estimated that 18.5 millions sections are made in the world each year and that the incidence of surgical site infections after surgery is 5% to 11.2%. In developed countries the total SSI after cesarean ranges from 1.5% to 7%; the incidence of superficial infections is estimated at approximately 0.18%, endometritis 3% - 6%; by cons in developing countries the impact of SSI varies from approximately 6% to 15% [3].

In Asia, specifically in New Delhi (India), the coincidence of surgical site infections after cesarean is higher because a study in the Obstetrics and Gynecology Department of Lady Hardinge Medical College. And the Suchete Kriplani Hospital reports a rate of 24.2% or 121 women out of 500 [4] [5] [6]. In some European countries it is reported a rate of 8.3% in Norway in 2009 and 8.9% in England in 2008 [7]. In Africa the incidence of nosocomial infections caesarean wounds ranges from 9, 1% to 22.3% [8] [9], with a lethality of 2.9% [10] [11].

In most cases, these infections affect women of low socioeconomic class [12] and women of young age (21 - 25 years) [5]; and they are more common in maternity hospitals in rural and urban [3].

The surgical site infections in post cesarean are serious complications that can lead to further surgery, increased medical costs and long hospital stay, re-hospitalization, prolongation of maternal functioning back and mortality [10] [13].

To reduce these infections, it is necessary to install surveillance programs for nosocomial infections, [14]. In addition antibiotic prophylaxis reduces the incidence of wound infections after cesarean section, endometritis and other serious complications in 60% - 70% of cases [15] [16] [17].

The objective of this study was to analyze factors associated with nosocomial infections caesarean wounds in maternity structures of the city of Mbuji-Mayi.

2. Methods

It is a study conducted in 25 maternity wards of general hospitals references,

clinics and hospitals of the city of Mbuji-Mayi, during the period from 1 February to 1 June 2017. In total, the sample consisted of 171 women in labor caesareans who were followed over a 4 month period. It is the sample exhaustive obtained on the basis of the following selection criteria for inclusion:

- Having had a caesarean section in one of the structures concerned;
- To be hospitalized during the period of our investigation;
- Agree to participate voluntarily in the study.

For exclusion criteria, all caesareanized parturients who did not meet the inclusion criteria were excluded from the study.

Data collected by questionnaire were encoded using the EXCEL 2007 and analyzed by the EPI-INFO Version 3.5.3 software, using the chi-square test to analyze the association relationships between variables independent and dependent variable. The following variables were considered in this study:

- a) Dependent variable: nosocomial infection of caesarean section wounds.
- b) Independent variables
 - 1) Sociodemographic characteristics:
 - Age
 - Parity
 - Marital status
 - Level of study
 - Previous pathologies: anemia, diabetes, HIV, obesity, high blood pressure, nutritional status
 - 2) Factors related to child labor:
 - Duration of labor
 - Membrane status
 - Number of vaginal touch intra uterine monitoring
 - 3) Factors related to the intervention:
 - Type of Anesthesia
 - Caesarean section
 - Number of cesarean section
 - Nature of the intervention room
 - Type of incision
 - Number of people in the operating room
 - Qualification of the surgeon
 - Duration of the operation
 - Nature of the preparation of the operation site (shaving or removal) antibiotic
 - 4) Environmental factors:
 - Preoperative hospitalization
 - Respect for the hygiene of the sick ward
 - Length of hospital stay in post operation
 - Hand hygiene
 - Hygiene of the hospital room

5) Factors related to postoperative care

Type of dressing; respect of asepsis during the dressing; quality of the equipment used.

3. Ethical Considerations

This study had been approved by the Interuniversity Ethics Committee of the city of Mbuji-Mayi. Then free and informed consent was obtained in writing for any caesarianized woman who participated in the study.

4. Results

4.1. Results Descriptive Analyses

Figure 1 shows that the incidence of cesarean wounds infection is 30.6%.

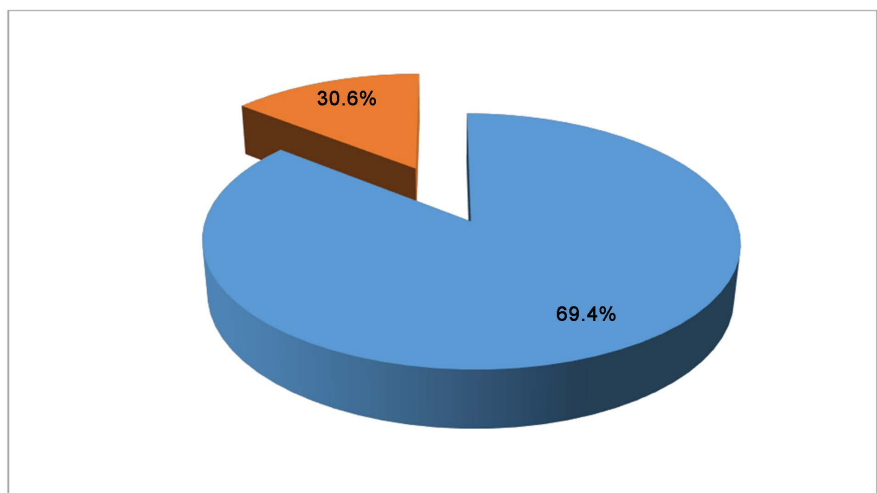


Figure 1. Show that the incidence of cesarean wounds infection is 30.6%.

Figure 2 shows that deep infection of cesarean wounds is 5.2%.

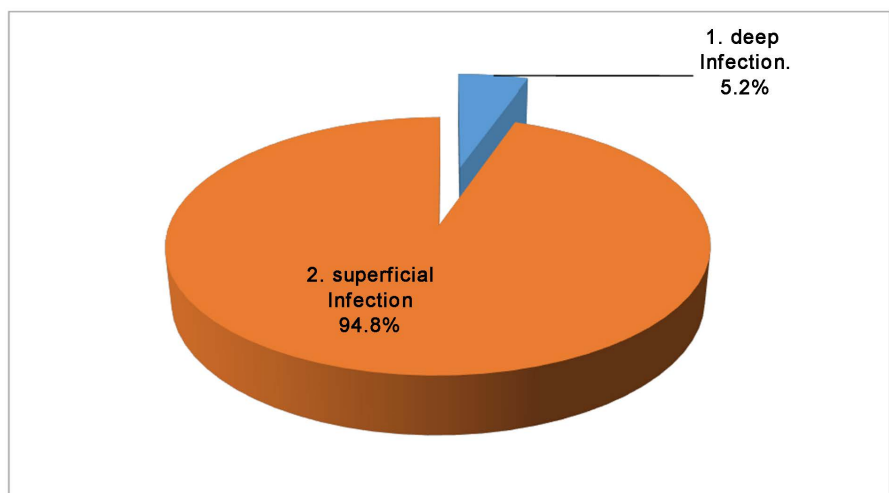


Figure 2. Show that deep infection of cesarean wounds is 5.2%.

Table 1 shows that the age of parturients aged 20 and over is represented, or 87.1%, against that of ≤ 19 years with 12.9% and overall average age was 29.9 ± 40 years. Parturient with ≤ 5 parity represent 66.7% and those with parity of 6 or more 33.3%. Generally, women in labor did not present obesity, that in view of the BMI shows that 83.0% have a clue ≤ 29 . The majority of women in labor are married 91.8%, most of them have not finished the study of junior high, 66.7% against 33.3% of those graduates and more.

Table 1. Distribution of caesareans according sociodemographic characteristics.

Feature	Category	Effective n = 171	%
Age (year)	≤ 19	22	12.9
	20 and more	149	87.1
Average age	29.9 ± 40		
Parity	≤ 5	114	66.7
	6 and more	57	33.3
Body mass index (BMI)	≤ 29	142	83.0
	≥ 30	29	17.0
marital status	married	157	91.8
	single	14	8.2
Study level	not graduate D6	114	66.7
	Graduate or more	57	33.3

Table 2 shows that surveyed caesarean parturient are less affected by hypertension and/or preeclampsia (20.5%), diabetes (2.9%), the HIV infection (0.6%), or malnutrition (2.9%); except 69.0% against 31.0% who presented anemia.

Table 2. Distribution of caesareans as underlying diseases.

Pathology	Category	Effective n = 171	%
Anemia	Yes	53	31.0
	No	118	69.0
Hypertension/preeclampsia	Yes	35	20.5
	No	136	79.5
Diabetes	Yes	5	2.9
	No	166	97.1
HIV	Yes	1	0.6
	No	170	99.4
Malnutrition	Yes	1	0.6
	No	170	99.4

Table 3 shows that general anesthesia is used in many cases caesarean section is 84.8% of cases, the incision types commonly used are vertical incision (70.8%) and the transverse incision (29.2%). Many cases are brought in emer-

gency cesarean is 90.1%, and most of the caesarean or 81.9% were operated for the first time; surgery was done in an operating room for 170 cases or 99.4%. The preparation of the operative site was made 98.8%. The number of people who attended the operation in the majority of interventions did not exceed 5 people (64.3%), and 35.7% for 6 or more. More C-sections were performed by general practitioners (61.4%). The duration of the operation has not exceeded 60 minutes in 35.1% of cases and more than 60 minutes in 64.9%. Antibiotic prophylaxis was made in 92.4%.

Table 3. Distribution of surgical characteristics according cesarized.

Feature	Category	Effective n = 171	%
Type of anesthesia	regional	26	15.2
	general	145	84.8
Type of incision	Vertical	121	70.8
	transversal	50	29.2
Fashion caesarean	programmed	17	9.9
	Emergency	154	90.1
Number of caesarean	1 time	140	81.9
	2 and more	31	18.1
Operation middle	operating room	170	99.4
	Delivery room	1	0.6
Preparation of the operation site	by depilation	2	1.2
	by shaving	169	98.8
Number of people in the operating room	≤5	110	64.3
	6 and more	61	35.7
Surgeon Qualifications	general practitioner	105	61.4
	Specialist	66	38.6
Duration of the operation	≤60 minutes	60	35.1
	61 minutes and more	111	64.9
Antibiotic	Yes	158	92.4
	no	13	7.6

In **Table 4**, the majority of women in labor caesareans have been hospitalized prior to the cesarean is 93.0%, against a 7.0% of cases were hospitalized before undergoing the operation. During the post-operation hospital, there are many cesarized spent a stay of 15 days or more (81.9%). 63.2% of caesareans perform regular washing of hands, against 36.8% of cases that are not running the practice. By cons, only 24.0% of patients guards perform this practice, against 76.0% who did not run. The hospital room caesarean was cleaned regularly every day in 98.9%.

Table 4. Distribution of caesareans in connection with the living and hygiene of the hospital environment.

Stay and hyg. of approx. Hosp	Category	Effective	%
		n = 171	
Hospitalization prior cesarean	Yes	12	7.0
	No	159	93.0
Number of days post operation hospitalization	≤14 days	31	18.1
	15 days and more	140	81.9
Regular hand washing by cesarized	Yes	108	63.2
	No	63	36.8
Regular hand washing in the custody of the cesarized	Yes	41	24.0
	No	130	76.0
Cleaning the hospital room	Yes	152	88.9
	No	19	11.1

In **Table 5**, the dressing benefited by caesarean postoperative antiseptic is dry type in 73.1% of cases and 26.9% for the other types (antiseptic to dry or wet daikin). The aseptic dressing was observed during 33.3%, against 66.7% of non-compliance. The quality of material used for the dressing was generally sterile in 83.6% of cases.

Table 5. Distribution of caesareans as postoperative care received.

Post-operative care	Category	Effective n = 171	%
Type dressing	antiseptic Dry iodinated alcohol/polividone	152	88.9
	other types	19	11.1
Respect for the aseptic dressing	Yes	57	33.3
	No	114	66.7
Quality of the material used for the dressing	Steril unsterile	143	83.6
	unsterile	28	16.4

4.2. Results of the Bi-Varied Analysis

In this **Table 6**, the difference between the sociodemographic characteristics and the occurrence of cesarean wound infection is significant only for age ($p = 0.000$).

In **Table 7**, among the underlying pathologies observed in caesarean, anemia showed a significant difference ($p = 0.000$).

In **Table 8**, the duration of the delivery work, the rupture of membranes before cesarean section and length after rupture of the membranes showed a sig-

nificant difference, because the value of the p value is less than 0.05 (respectively p value of 0.001; 0.0443 and 0.000).

Table 6. Association between socio-demographic characteristics and the occurrence of infection of cesarean wound.

Sociodemographic characteristic	Infection		X ²	p	Meaning
	Yes	No			
	n = 52	n = 119			
Age					
≤19 years	14	8	13.172	0	S
20 years and over	38	111			
Parity					
≤5 childbirth	32	82	0.884	0.347	NS
≥6 childbirth	20	37			
BMI					
≤29	47	95	0.568	0.478	NS
≥30	5	24			
Marital status					
Not married	50	107	1.8732	0.171	NS
Married	2	12			
Study level					
not graduated	37	77	0.6770	0.41	NS

Table 7. Association between the underlying pathologies in caesarean and the occurrence of wound infection.

underlying diseases	Infection		X ²	p	meaning
	Yes n = 52	No n = 119			
Anemia					
Yes	28	25	18.2446	0	S
no	24	94			
Hypertension/preeclampsia					
Yes	6	29	3.6600	0.055	NS
no	46	90			
Malnutrition					
Yes	1	4	0.263	0.607	NS
no	51	115			
HIV					
Yes	1	2	0.345	0.712	NS
No	49	119			

Table 8. Association characteristics of childbirth labor and infection of cesarean wound.

Features into labor	Infection		X2	p	Meaning
	Yes n = 52	No n = 119			
Labor before cesarean Presence					
Yes					
No	50	103	0.3109	0.577	NS
	2	16			
Working hours before caesarean					
≤10 hours					
10 hours and more	15	49	9.8575	0.001	S
	35	70			
Number of vaginal affected before caesarean					
≤3 times					
4 times more	20	50	0.009	0.924	NS
	32	69			
Status of the membrane before caesarean					
intact					
broken	33	64	4.041	0.0443	S
	19	55			
Number of hours of breaking the caesarean					
≤10 Hours					
10 hours and more	5	0	22.510	0	S
	14	55			

In **Table 9**, there is a significant difference between the way of preparing the surgical site ($p = 0.029$), the qualification of the surgeon ($p = 0.023$), the duration of the operation ($p = 0.040$) and the occurrence of wound infection because the p value is less than 0.05.

Table 9. Association surgical characteristics and the occurrence of wound infection.

Surgical Features	Infection		X2	p	Meaning
	Yes n = 52	No n = 119			
Type of anesthesia					
Regional	8	18	0.102	0.748	NS
General	44	101			
Type of incision					
Vertical	34	87	0.722	0.395	NS

Continued

Transverse	18	32			
Fashion caesarean					
Program	4	13	0.411	0.521	NS
Emergency	48	106			
Number of previous cesareans					
1 time	6	25	2.186	0.139	NS
2fois more	46	94			
Place of intervention					
operating room	49	119	2.347	0.125	NS
Delivery room	1	2			
Preparation of the operation site					
by depilation	2	1	4.722	0.029	S
by shaving	48	119			
Number of people in the operating room					
≤5					
6 and more	37	73	2.327	0.312	NS
	15	46			
Surgeon qualifications					
general practitioner	28	77	5.151	0.023	S
Specialist	24	42			
Duration of the operation					

5. Discussion

5.1. Results of the Descriptive Analysis

5.1.1. In Relation to Sociodemographic Characteristics

The age group of 20 and older was most represented with 87.1%. The mean age was 29.9 ± 40 years. Women with parity ≤ 5 deliveries accounted for 66.7%. The majority of women were married (91.8%); and most of them were less educated (66.7%), which may not justify the mastery of hospital hygiene measures and increasing the frequency of nosocomial infections. In the study conducted in Nairobi by Kabua M. (2013), on a sample of 184 women, average age was very close to that of our study, 27.4 ± 5.62 years with a range of 16 - 46 years [9].

5.1.2. In Connection with Existing Pathologies in Caesareans

Caesarean women surveyed are less affected by hypertension and/or preeclampsia (20.5%), diabetes (2.9%), the HIV infection (0.6%), or malnutrition (2, 9%); except that 69.0% presented anemia. As against Oman in a study conducted at the HANSA reference regional hospital D. *et al.* [18], the results found show that diabetes, anemia, hypertension and eclampsia, obesity were frequently found

among cesarized [13].

5.1.3. In Connection with Childbirth Labor Characteristics

Ninety-nine point four percent of women were into labor before cesarean section; 58.2% of cesarized had a prolonged labor (10 hours or more) before cesarean section, 59.1%, are the number of vaginal examinations performed prior cesarean section at a frequency of 4 times or more. Most women made cesarean section with membranes ruptured for 10 hours or more (93.2%). Or, the longer the delivery time is prolonged, the number of vaginal examinations increase and in addition there is premature rupture of membranes, the easier the penetration of germs into the uterine cavity. This met the study in India by GONG SP *et al.* where the premature rupture of membranes was common in 83.7% of cases, prolonged duration of the operation, the excessive number of vaginal examination during hospitalization was 75.2% of the cases [19].

5.1.4. In Connection with Surgical Characteristics

General anesthesia was used in 84.8% of cases; the type most commonly made of incision is the vertical incision (70.8%); many of cesarean cases are brought in emergency in 90.1% of cases, and most cesarean (81.9%) were operated for the first time; the preparation of the surgical site was made in 98.8% of cases. Caesarean sections performed by GPs totaled 61.4% of cases; the duration of the operation exceeded more than 60 minutes in 64.9%. This appears to be hampered by the fact in China where prolonged operation time is 81.7% of cases), and the non-antibiotic in 75.2% of cases [19].

5.1.5. The Characteristics of the Hospital Environment and Hospital Hygiene

During the post-operation room, many of caesarean section (81.9%) spent a long stay (15 days or more), this is explained by the presence of wound infection which delays healing and prolongs hospital stay; but also justified by the lack of financial resources to meet the requirements of the exit to the hospital.

5.1.6. In Connection with the Post-Operative Care Received

The dressing benefited by caesarean postoperative antiseptic is dry type for 73.1% and 26.9% for the other types (antiseptic to dry or wet dakin) but asepsis during dressing is respected that 33.3%. This weakness typically falls under the negligence of health workers during the implementation of care and also by the lack of sufficient material to administer the required quality care.

5.1.7. In Connection with the Categories of Infected Wounds Cesarean

Ninety four point two percent of infected Caesarean section wounds are superficial, while only 5.8% are profound. These results confirm those found in the study conducted in India in New Delhi, where 96.2% of the infections were superficial and deep infections 3.7% [12]. By cons a study in Thailand proves otherwise, where about 293 who developed ISO, 10.9% of infections were superficial, 6.2% and 82.9% deep infections organ infections [1].

5.2. Results of the Bi-Variegated Analysis

In this study, wanting to verify the association of sociodemographic characteristics and the occurrence of wound infection, age showed a significant association ($p < 0.005$). For the association between existing pathologies in cesarized and the occurrence of wound infection, anemia showed a significant association ($p < 0.000$).

In the association of the characteristics of childbirth labor and infection of the cesarean wound, the duration of delivery of the work and the time after rupture of the membranes shows a statistically significant difference ($p < 0.05$). So more working time is extended, the more the time of rupture of membranes is long, the greater the risk of rise of the vagina to the uterus germs, the more cesarized is likely to develop an infection of the wound. In addition there is a significant difference between the way of preparing the surgical site ($p = 0.029$), the qualification of the surgeon ($p = 0.023$), the duration of the operation ($p = 0.040$) and the occurrence of infection the wound. Over the surgical site is prepared by shaving, the longer the duration of the intervention is long (over 60 minutes) and more surgery is made by a non-specialist, the higher the risk of infection is high. In England, a study done at the hospital, fourteen of the frequency and the ISO risk factors, shows a contradiction in relation to age, but confirmed the qualification of doctor as associated factor [20]. Thus the major factors associated with surgical site infection are obesity (BMI greater than 35; OR 3.7, 95% CI 2.6 to 5.2); the young age of women (under 20 years. OR 1.9; 95% CI 1.1 to 3.4), so that the intervention by a young GP (OR 1.6; 95% CI 1.0 to 2.4) also act as factors influencing [20].

But this study supports the results of several studies conducted around the world, for illustrative purposes we include the study conducted in Tanzania which falls six preachers factors of infection: high blood pressure during pregnancy (OR 2.5, 95 1.1% to 5.6%; $p = 0.021$), severe anemia (OR 3.8; 95% CI 1.2 to 12.24; $p = 0.028$), repeated vaginal examination (OR 2.5, 95% 1, 5 to 5.1; $p = 0.011$), prolonged operation time (OR 2.6; 95% CI 1.2 to 5.5; $p = 0.015$) and the operation performed by a young non-specialist physician (OR 4 , 0, 95% CI 1.7 to 9.2; $p = 0.001$) [10].

In addition, there is a significant difference between respect for the aseptic dressing and infection of cesarean wound ($p < 0.05$). So when we do not respect the aseptic dressing for a wound, you run a high risk of infection from it. This is an unprivileged appearance in several studies on the factors associated with infection post cesarean section surgical site.

6. Conclusions

The incidence of nosocomial infections of caesarean wounds in 25 hospitals that have covered our study in the city of Mbuji-Mayi amounts to 30.4% for a period of 4 months.

The fight against nosocomial infections must be a permanent concern; pre-

vention and regular monitoring of these infections should be the fight of every hospital structure strategies. In addition, the staff must ensure that aseptic procedures are performed in all surgical procedures, specifically cesareans, bath chlorhexidine gluconate the night before surgery, if necessary mow the pubic hair rather than shave, avoid unnecessary iterative vaginal examinations during labor, avoid necessarily using the instruments vaginally during labor, administration of antibiotic prophylaxis 60 minutes before the incision, prepare the skin with an antiseptic immediately before the operation, avoid manual separation of the placenta and fetal membranes [21].

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