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## Original Research Article

# Risk factors for surgical site infections after caesarean section at Yaounde, Cameroon

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## ABSTRACT

**Background:** Surgical site infection is the invasion by microorganisms of the tissue layers affected by the surgical procedure. Maternal morbidity from infections has been shown to be higher after caesarean section compared to the vaginal delivery. Objective of the research was to analyze the risk factors associated with surgical site infections after caesarean section.

**Methods:** This was a cross sectional (affected/non affected) study approved by the institutional committee for ethics and research of the faculty of medicine and biomedical sciences. A total of 310 medical files were assessed, 62 files from patients with surgical site infections and 248 files from patients without any complications. The data was collected using a pretested questionnaire and analyzed using the statistical package for the social sciences (SPSS) software version 22.0. The Chi squared and the Fisher exact tests were used to assess homogeneity between the 2 groups. Odd ratio 95% confidence interval was used to assess the association between the variables.

**Results:** The proportion of surgical site infections during the study was 1.81%. Factors associated with surgical site infections were premature rupture of membranes (OR: 2.065; 95% CI 1.051-4.05; p=0.035); the vertical midline incision (OR=5.26; 95% CI; 1.41-19.57; p=0.013) and a operation by a resident physician doctor (OR=1.98; 95% CI 1.09-3.59; p=0.02).

**Conclusions:** A factors associated with surgical site infections after caesarean section are a premature rupture of membranes, vertical midline incision and the qualification of the practitioner.

**Keywords:** Risk factors, Frequency, Infection, Cesarean section

## INTRODUCTION

Caesarean section is a surgical procedure that allows delivery by incision through the abdomen and the uterus when conditions of mother or child are not favorable for natural childbirth.<sup>1</sup> Initially used to bypass an insurmountable mechanical obstacle, it has become a means to limit fetal trauma and fetal suffering in many pathological situations surgery.<sup>2</sup> Its indications are very broad and concern mother, fetus or both.

It is worth noting that, there has been a change in frequency worldwide. The caesarean section rate has been increasing rapidly for several years. In France, the caesarean section rate had increased to 20.8% in 2010 as compared to 15.5% in 1995, in the United States from 21% in 1998 to 32% in 2007 and in Cameroon, between 2004 and 2011 the percentage of births per caesarean section increase from 2% to 3.8% before dropping to 2.4% in 2014.<sup>3-5</sup> Infectious complications being a common morbidity after caesarean section. Infection is one of the

leading causes of maternal mortality.<sup>6</sup> Studies in developing countries revealed that 15% of maternal death were attributed to infections.<sup>6</sup>

### Objectives

Objectives of the study were to identify the factors associated with surgical site infections occurrence after cesarean section at Yaounde Central Hospital (CHY), Gyneco-Obstetrics and Pediatric Hospital of Yaounde (GOPHY) and Yaounde University Hospital Center (CHUY).

## METHODS

### Type-place-periode

We conducted a 5 months retrospective cross sectional (affected/non affected) study from 20 December 2017 to 20 April 2018 at the HGOPY, YUHC and the YUCH.

### Sampling

Our sampling was consecutive and exhaustive. The study population consisted of all women admitted to the HGOPY, CHUY, and HCY who were treated for surgical site infection after cesarean section and patients who delivered via cesarean without any post-partum infection. All women who did not consent to the study were excluded.

### Variables

Data was collected using a pre-tested questionnaire. Variables of interest were: age, educational level, profession, parity, gravity, premature rupture of

membranes, 3<sup>rd</sup> trimester genital tract infection, urinary tract infection in pregnancy, history of cesarean section, type of incision, type of caesarean section, type of anaesthesia, surgeon's qualification, and antibiotic prophylaxis.

### Statistical analysis

All statistical analyzes were performed using Epi-Info version 7.2.2.6. The comparison of variables was carried out using the student t test and Chi square test. To identify risk factors for surgical site infections after cesarean section, we used an unconditional logistic regression. Multivariate analysis was used in order to determine the model that was more predicting. Confounding variables used in the multivariate model were selected based on the heterogeneity observed at bivariate analysis or with  $p < 0.24$ . The level of significance was set up at  $p < 0.05$ .

## RESULTS

A total of 310 medical files were assessed, 62 files from patients with surgical site infection and 248 files from patients who had no infectious complications. The age of the study populations varied from 14 to 46 years. The mean age of infected patients was  $26.82 \pm 5.63$  years and that of uninfected patients was  $27.83 \pm 5.95$  years.

The proportion of surgical site infections during our study was 1.81%. Factors associated with surgical site infections occurrence were premature rupture of membranes (OR: 2.06; 95% CI 1.05-4.05;  $p=0.035$ ); the vertical midline an incision (OR=5.267; 95% CI; 1.41-19.57;  $p=0.013$ ) and an operation by a resident doctor (OR=1.98; 95% CI 1.09-3.59;  $p=0.024$ ) (Table 1).

**Table 1: Multi-varied regression of factors associated with surgical site infections.**

Characteristics	Post-caesarean section infection					°OR (CI 95%)	P value	°aOR (CI 95%)	P value
	Total	Yes		No					
	N=310	N=62	N=248	n	%				
<b>PRM<sup>b</sup></b>									
No	251	42	16.7	209	83.3	1 <sup>r</sup>		1 <sup>r</sup>	
Yes	59	20	33.9	39	66.1	2.17 (1.02-4.63)	0.043	2.06 (1.05-4.05)	0.035
<b>Type of incision</b>									
Pfannenstiel	281	52	18.5	229	81.5	1 <sup>r</sup>		1 <sup>r</sup>	
Median	11	6	54.5	5	45.5	4.24 (1.01-17.75)	0.047	5.26 (1.41-19.575)	0.013
Joël-Cohen	13	4	30.8	9	69.2	1.12 (0.25-5.02)	0.877	1.63 (0.45-5.90)	0.455
Others	5	0	0	5	100			-	-
<b>Type of caesarean section</b>									
Elective	44	5	11.4	39	88.6	1 <sup>r</sup>		1 <sup>r</sup>	
Emergency	266	57	21.4	209	78.6	2.127 (0.80-5.64)	0.130	1.60 (0.54-4.75)	0.394
<b>Surgeon<sup>a</sup></b>									
Gynecologist	184	28	15.2	156	84.8	1 <sup>r</sup>		1 <sup>r</sup>	
Resident	126	34	27	92	73	2.73 (1.42-5.27)	0.003	1.98 (1.09-3.59)	0.024
<b>Type of anaesthesia</b>									
Rachidian	200	33	16.5	167	83.5	1 <sup>r</sup>		1 <sup>r</sup>	

Continued.

Characteristics	Post-caesarean section infection					<sup>c</sup> OR (CI 95%)	P value	<sup>a</sup> OR (CI 95%)	P value
	Total	Yes		No					
	N=310	N=62	N=248	n	%				
General	110	29	26.4	81	73.6	1.81 (1.03-3.19)	0.039	1.61 (0.87-2.96)	0.125
<b>Antibioprophylaxis<sup>d</sup></b>									
No	300	57	19	243	81	1 <sup>r</sup>		1 <sup>r</sup>	
Yes	10	5	50	5	50	4.26 (1.19-15.22)	0.026	2.28 (0.56-9.25)	0.245

<sup>a</sup>Surgeon's qualification; <sup>d</sup>induction antibiotic prophylaxis; <sup>c</sup>OR: odds ratio crude; <sup>r</sup>reference; <sup>b</sup>premature rupture of membranes; AOR: adjusted odds ratio

## DISCUSSION

We found the prevalence of surgical site infection of 1.81%. Our result is similar to that from Norway who had a prevalence of 1.2%.<sup>7</sup> A lower prevalence than our was reported in China in 2012 had a prevalence of 0.7%.<sup>8</sup> Other authors have shown higher prevalence than our ranging from 2.6% to 9.1%.<sup>9-14</sup> The mild prevalence ranging from 2.6% to 4.1% were reported in the United States, in Paris and India.<sup>12,13,15</sup> The highest prevalence ranging, from 5% to 9.04% were reported in United States, Estonia, Cameroon, Nigeria.<sup>9-11,14</sup> The lower prevalence of surgical infection observed in this study could be the result of the quality of care in the three study setting that are university teaching hospitals. More over our study took place in central level hospitals of the health pyramid with better post-operative follow-up.

The mean age of our study population was 27.63±5.89 years, ranging from 14 to 46 years almost similar in both groups. This result is similar to the one found in Tanzania where the participants' age varied from 14 to 44 years, with the mean of 26.8±5.8 years. A study in France found an average age of 31±6 years with extremes of 19 and 45 years.<sup>13</sup> The mean age higher than ours is in light with the early initiation of pregnancies and deliveries in our environment.

We found that patients with premature rupture of membranes had a double risk of developing surgical site infection. This result is similar from China, which showed a triple risk of developing surgical site infection after premature rupture of membrane.<sup>8</sup> This result could be explained by the fact that the PROM itself is already an infectious risk and the infection could spread contiguously during the Caesarean section, thus reaffirms the importance of proper management of premature rupture of membranes.

The risk of developing surgical site infection after caesarean section was associated with the practitioner's qualification. Caesarean sections performed by residents had a double risk of infectious complications. This result is similar to that from Ethiopia where a triple risk for infection was reported when caesarean section was performed by a resident physician.<sup>16</sup> Similar report with double risk was found in the United Kingdom.<sup>17</sup> In Tanzania a fourfold risk of infection was reported while

comparing resident doctor to the gynecologists.<sup>18</sup> In India a five-fold risk was reported.<sup>12</sup> This could be explained by the fact that residents are the ones available along even during the night and therefore perform more emergency caesarean sections than consultant gynecologists. Additionally, this result could be due to the fact that gynecologists have more skills than residents in preventing and supervising the prevention of infection during caesarean section. These observations underscore the necessity, the competence of resident doctors on the measures for preventing infections.

The median incision was found as associated with the risk of surgical site infections. This result is similar to the one found by Thornburg et al in the United States in 2012 (vertical 45.7% versus 11.6% transverse;  $p < 0.01$ ).<sup>19</sup> This could be explained by the fact that this incisions, is mainly used during emergency caesarean section, condition that could be associated with less infection prevention measure due to the stressful condition. We can justify this by the fact that this type of incision is most often used in cases of maternal obesity, which is usually associated with comorbidities such as diabetes.<sup>19</sup> Similarly, this type of incision is most often used by inexperienced personnel.

## Limitations

The data collection being retrospective, we could have recall bias.

## CONCLUSION

Factors associated with surgical site infections after caesarean section are premature rupture of membranes, vertical midline incision and the qualification of the practitioner. Our findings highlight the need of discouraging the midline incision for caesarean section, proper management premature rupture of membranes, to reinforce the competency of resident doctors on infection prevention measures.

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