

Factors Associated With the Nosocomial Infection of Surgical Wounds in the Maternity of Lubumbashi Public Hospitals in the Democratic Republic of the Congo

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Received: 21 October 2018; **Accepted:** 14 November 2018

Citation: Mbutshu Lukuke Hendrick, Ntambue Mukengeshayi Abel, Makoutode Michel, et al. Factors Associated With the Nosocomial Infection of Surgical Wounds in the Maternity of Lubumbashi Public Hospitals in the Democratic Republic of the Congo. *Microbiol Infect Dis.* 2018; 2(4): 1-7.

ABSTRACT

Introduction: In Africa, up to 20% of women who have had a caesarean section contract a nosocomial infection of surgical wounds, compromising their health and ability to care for their children. In the DRC the field of hospital hygiene is of little interest to researchers, so it is difficult to analyze the problem when it is a thorny public health problem.

Methods: We conducted a cross-sectional study whose study population consisted of women, whose delivery was associated with surgery, including a caesarean section or an episiotomy. The data collection was exhaustive and one nosocomial case of surgical wounds was defined according to the WHO definition. Associated factors were evaluated by the prevalence ratio at the significance level $p < 0.05$.

Results: We obtained 443 surgical cases; of which 253 were caesarean sections 57.1% and 190 or 42.9% were episiotomies and the prevalence of nosocomial surgical wound infections was 9.9%. The risk of developing a nosocomial surgical site infection was 6.8 times high at the Congo Railroad Hospital (SNCC) and 5.0 times at Jason Sendwe General Referral Hospital than at the Hospital. The General Reference Hospital (HGR) of Kenya and its association were statistically significant ($p = 0.0022$). A statistically significant difference was observed between the rate of nosocomial infections of surgical wounds and the age group of pregnancy between 32 to 34 WS, parturient who gave birth in this age group was 4 times at the risk of developing nosocomial infection surgical wounds. Long stay of more than 10 days ($p=0.0010$), delivery by caesarean section ($p=0.0481$), parturient carrying the indwelling catheter ($p = 0.0162$) and taking antibiotics were associated with the onset of nosocomial infection of surgical wounds.

Conclusion: The factors associated with nosocomial infections of surgical wounds in maternity wards of public hospitals in Lubumbashi are related to the state of the structures, to the health care administered to clients. It is necessary to improve the hygiene conditions of the maternities, to train the personnel on the measures of hygiene and to apply a good policy of use of the antibacterial ones.

Keywords

Associated Factors, Infection surgical wounds and Lubumbashi Maternity.

Introduction

The World Health Organization (WHO) said more than 1.4 million people worldwide suffer from nosocomial infections, particularly surgical site infections. Risk factors are related to patients, the

environment and medical practices [1-4].

In low- and middle-income countries, 11% of operated patients are infected during the intervention. In Africa, up to 20% of women who have had a caesarean section develop a wound infection, compromising their health and ability to care for their children. But the problem of surgical site infections is not restricted to poor countries only. It is a public health problem even in developed countries. In the United States, for example, they contribute more than 400,000 additional days of hospitalization, increasing total expenditures by \$ 900 million annually. Surgical services are the most favorable place for nosocomial infections in health care systems, especially in developing countries such as the Democratic Republic of Congo (DRC) [4-5]. Most of these infections are caused by bacteria that often have patterns of antibiotic resistance and often complicate the management of clients [6].

In the United States, it is estimated that nosocomial infections are responsible for 9000 deaths per year with a rate of minus 2% of all operated patients [7], while in France; they account for 10.2% of all nosocomial infections and rank third after urinary tract infections, skin infections and soft tissue [8-9]. In Africa, the rate of these infections is high between 19 and 38.7% [10-11].

The factors favoring the occurrence of an ISO are known for the most part in developed countries and other developing countries whose research has been conducted, including surgery in contaminated or dirty anatomical region, operating time greater than 50 minutes and a preoperative stay greater than 6 days [11].

In Tanzania, two studies were conducted, one by Eriksen et al, who conducted a prospective study of nosocomial infections of early and late surgical wounds, over a 5-month period in a general surgery department and the incidence rate of nosocomial infections surgical wounds were 19.4%, of which 36.4% were identified at follow-up after discharge from hospital. Of 77 patients with ISO, 6 were readmitted, 6 reoperated and two died due to ISO. The other by Fehr J et al, meanwhile, they found an incidence rate of 24% of ISO in a district hospital and the not insignificant diffusion of Bacteria Multi Resistant, like methicillin-resistant *S. aureus* and certain enter bacteria with broad spectrum beta lactamase [11-12].

Similarly, in Dakar, the results of the surveillance showed an ISO rate of 5.1% with a significant association between nosocomial surgical wound infection and the contamination class in contaminated surgery, in an emergency context, and with the operating time [13]. In the DRC the area of hospital hygiene is of little interest to researchers, so it is difficult to analyze the problem. A study conducted at Sendwe Hospital and University Clinics in Lubumbashi in 2010 described length of hospital stay as the risk factor associated with nosocomial infections [14]. Among these nosocomial infections, surgical site infections were the most frequent (27.1%) [6,15-16].

As a result, the hypothesis is that health care-related factors related to the client and health staffs are the risk factors for nosocomial

infections at operating sites in the maternity wards of public hospitals in Lubumbashi.

To invalidate or confirm this hypothesis, this work was carried out with the objective of determining the risk factors for nosocomial infections of operating sites in maternity wards of public hospitals in Lubumbashi

Methods

We carried out an analytical cross-sectional study; The number of women who developed nosocomial surgical wound infection on those who underwent surgery in our previous surveillance study allowed us to calculate the prevalence period of these infections.

The population of our study consisted of women who had stayed at this maternity hospital whose delivery was associated with surgery, including a caesarean section or an episiotomy. The investigation covered the period from October 1, 2014 to January 1, 2015, a four-month period in each structure.

Included in our study was any woman who came to this maternity clinic due to childbirth and underwent surgery, either a caesarean section or an episiotomy.

The data collection was performed in an exhaustive way in all the parturients who underwent surgery. The bacteriological samples concerned the operative wounds observed during the dressings the presence of a purulent discharge, abscess or extensive cellulitis.

The presence of an infection on the operative wound was a dependent variable of this study, while the socio-demographic and obstetric parameters of the parturient, the germs in question of these infections, the resistance of these germs to the antibiotics, the environmental factors were variables explanatory or independent.

Samples of the biological fluids that were collected were submitted to the laboratory laboratories of Lubumbashi University Clinics (CUL) to confirm the existence of the infection and identify the causative organisms.

A case of nosocomial infection was defined according to the WHO definition, namely: "any purulent discharge, abscess or extensive cellulitis on the operative site in the month following surgery [17-18]. However, for this study, due to the lack of financial means, we limited ourselves to the follow-up of parturient only during their hospital stays.

The sample was made by rotating 360 ° and covering a surface of 1 cm 2. We used the sterile swabs that we had wetted in a sterile isotonic liquid. These swabs were passed over zones defined in close parallel streaks by rotating them slightly, then on the same zones in perpendicular striate and at the end, they were put back in its protective cases which carried all the identities of the parturients and they were transmitted to the laboratory within a quarter of an hour.

These swabs were seeded on bromocresol purple lactose agar,

Chapman medium, blood agar and chocolate agar, and incubated at 37°C for 24-48 hours. Colony abundance was noted and Gram-negative bacilli colonies were subcultured on an API 20E or API 20 NE labeling and Gram Positive colonies were identified according to their catalase reaction, and plaque agglutination. [7,17-18]

The determination of the susceptibility of bacteria to antibiotics was carried out as in the previous study using the Kirby Bauer diffusion method which classifies the strains into three categories: Sensitive (S), Intermediate (I) and resistant (R) based on critical diameter.

The data was analyzed using the STATA 13 software and we used the usual statistics to describe our samples and calculate the frequency measurements.

The period prevalence of nosocomial surgical wound infections was calculated by reporting the number of parturients who underwent surgery such as caesarean section or episiotomy to the denominator and the number of nosocomial surgical wound cases in the numerator during the period of the study. A 95% confidence interval (95% CI) was then calculated. Bivariate analysis used the prevalence ratio as a risk indicator.

The principles of ethics were respected and the research protocol was validated by the ethics committee of the University of Lubumbashi.

The parturients who were selected to participate in the study had clear explanations for the purpose and course of the study in order to obtain their informed verbal consent. The information on the study was managed in a discreet manner anonymously. An authorization to conduct the research was issued by the health authorities of the structures concerned.

Results

Of the 1240 parturients selected and distributed in seven maternity wards of public hospitals in the city of Lubumbashi. We obtained 443 surgical cases; of which 253 were caesarean sections 57.1% and 190 or 42.9% were episiotomies. Among these parturients, 132 (29.8%) were recruited at the Katuba General Referral Hospital, 101 (22.8%) at the Lubumbashi University Clinics (CUL), 94 (21.2%) at the Kenya General Referral Hospital, 59 (13.3%) at the Sendwe General Referral Hospital, 31 (7.0%) at the National Railway Company Hospital (SNCC), 27 (6, 1%) at the Kisanga Reference General Hospital and 24 (5.4%) at the Kampemba Reference General Hospital.

Parturients were for the majority resident of Katuba commune (29.8%), Kampemba (22.6%), followed by Kenya (16.7%), Lubumbashi (14.2%), Annex (8.6%). %, Kamalondo (4.5%) and Rwashhi (3.6%). 15.8% of parturients were under 20 years of age, 70.7% were between the ages of 20 and 34, and 13.5% were older than or equal to 35 years old and several women were married (85, 8%).

Compared to the level of study, 6.1% had a high level, 41.8%

an average level and 48.5% a low level. The majority of house workers were household workers (59.7%), 34.3% were in the private and public sector, and private enterprises.

The median parity was two children per woman, the median gestational age was 38.5 weeks of amenorrhea, and 100% of the parturients who underwent surgery received an antibiotic, amoxicillin, ampicillin, ciprofloxacin and gentamicin associated with ampicillin. Generally, these women experienced some difficulties in delivery and to cope with these complications, they underwent an intervention including episiotomy (15.7%) and caesarean section (84.3%) and the duration of the procedure. hospitalization was half (50.4%) parturients 4 to 7 days, 24.0% between 1 to 3 days, 9.6% between 8 to 10 days, 8.6% between 11 to 14 days and 7.4 %, 15 days or more.

With regard to invasive devices, 84% of parturients had an invasive device, particularly a venous catheter (42.7%), an evacuation catheter and a venous catheter (35.4%). More than 1/3 of these parturients had an individual history, including diabetes, immunodeficiency and malaria. Long stay duration of more than 10 days ($p = 0.0010$).

The risk of developing a nosocomial surgical site infection was 6.8 times elevated at the SNCC hospital and 5.0 times at Jason Sendwe General Reference Hospital compared to HGR Kenya and this association was statistically significant ($p = 0.0022$) Table 1.

Unmarried women were twice as likely to develop hospital-acquired nosocomial infections as brides ($p = 0.0022$) Table 1.

From this table, we note that there was no statistically significant difference between the age of the parturient, its level of study and the occurrence of nosocomial infection of the operating site Table 2.

It emerged that there was a statistically significant difference in the nosocomial infection rate of pregnancy age groups between 32 and 34 SW and the occurrence of nosocomial infection of surgical sites, the parturients having delivered in this slice of infection. Age was 4 times the risk of developing a nosocomial infection Table 3.

The caesarean delivery ($p = 0.0481$), and parturient with indwelling catheter ($p = 0.0162$) were associated with onset nosocomial surgical site infection Table 3.

Discussion

We found that health facility characteristics, marital status, gestational age, length of stay, and type of intervention were associated with the prevalence of hospital-acquired nosocomial infections and thus constitute the risk factors for nosocomial surgical site infection in maternity wards of public hospitals in Lubumbashi.

Given these results, we can say that our study method allowed us to reach the goal we set for ourselves at the beginning of this study, which was to determine the risk factors for nosocomial infections

Variables		Numbers	No	Yes	Prevalence (%)	PR	IC 95%	p
Hospital	HGR Katuba	107	100	7	6.5	1.3	0.4 to 4.4	0.0022
	CUL	101	94	7	6.9	1.3	0.4 to 4.7	
	HGR Kisanga	27	24	3	11.1	2.5	0.5 to 10.9	
	SNCC	31	23	8	25.8	6.8	2.0 to 22.7	
	HGR Kampemba	24	22	2	8.3	1.7	0.3 to 9.7	
	HGR Sendwe	59	47	12	20.3	5.0	1,6 15,0	
	HGR Kenya	94	89	5	5.3	1.0		
Age of the pregnant year	≤ 20	70	62	8	11.4	1.2	0.5 to 2.9	0.7662
	20-34	313	284	29	9.3	1.0		
	≥ 35	60	53	7	11.7	1.3	0.5 3.1	
Civil status of the pregnant woman	Unmarried	63	50	13	20.6	2.3	1.4 to 5.9	0.0022
	Married	380	349	31	8.2	1.0		

Table 1: Nosocomial infection rate of operative site according to Hospital, age and marital status of the pregnant woman.

Variables		Numbers	No	Yes	Prevalence (%)	RP	95%	p
Educational level	Nothingness	16	13	3	18.8	2.3	0.6 to 8.6	0.2559
	Primary	185	169	16	8.6	0.8	0.4 to 1.6	
	Secondary	215	195	20	9.3	1.0		
	University	27	22	5	18.5	2.2	0.8 to 6.5	
Address of the given birth woman	Katuba	132	121	11	8.3	0.8	0.3 to 2.8	0.2479
	Kenya	74	70	4	5.4	1.0		
	Kampemba	100	86	14	14.0	2.8	0.9 to 9.0	
	Lubumbashi	63	53	10	15.9	3.0	0.9 to 11.1	
	Kamalondo	20	18	2	10.0	1.9	0.3 to 11.5	
	Annex	38	36	2	5.3	0.9	0.2 to 5.6	
Parity	1	200	180	20	10.0	1.0		0.8964
	2 to4	172	156	16	9.3	0.9	0.4 to 1.8	
	≥ 5	71	63	8	11.3	1.1	0.4 to 2.7	

Table 2: Nosocomial infection rate of operating site according to level of study, parity and address of the parturient.

Variables		Numbers	No	Yes	Prevalence (%)	PR	95%	p
Intervention	Episiotomy	190	177	13	6.7	1.0		0.0481
	Caesarean section	253	219	34	12.4	2.0	1.2 to 3.8	
Age pregnancy in week of amenorrhea (WA)	≥ 38	70	66	4	5.7	1.0		0.0010
	<38	190	181	9	4.7	0.8	0.3 to 2.6	
	35 at 37	125	107	18	14.4	2.8	0.9 to 9.8	
	32-34	58	46	12	20.7	4.3	1.3 to 14.1	
Wearing an invasive device	No device	71	64	7	9.2	1.0		0.0162
	Indwelling catheter + catheter	26	20	6	23.1	4.0	1.9 to 14.4	
	Discharge catheter + probe	157	132	25	15.8	2.5	1.0 to 6.8	
	Venous catheter	189	181	8	4.4	0.5	0.2 to 1.8	
Hospital type room	Individual room	35	32	3	8.6	1.0		0.7791
	Common room	408	367	41	10.0	1.2	0.3 to 4.0	
Antibiotic prescription after childbirth	Yes	395	356	39	9.9	0.9	0.4 to 2.5	0.9054
	No	48	43	5	10.4	1.0		

Table 3: Nosocomial surgical site infection rate according to the age of the pregnancy, the types of procedures, the wearing of an invasive device, the type of hospitalization rooms and the prescription of antibiotics after childbirth.

of surgical wounds in patients 'maternities of Lubumbashi public hospitals.

Since nosocomial surgical wound infection was well defined according to the WHO definition and swabbing was the method used to collect these samples for this laboratory. Since the collection techniques and tools used to collect data from all our targets are in line with the collection and analysis techniques, we certify that the results of our study are valid and can be extrapolated for public hospitals. Lubumbashi. From the above, we want to point out that the surgical intervention time was not counted for this work and home monitoring of parturients had not been done for lack of means, we think that other cases of ISOs may be dropped from our study, which are the limits of this study. Since we are not the first to speak about this topic around the world, there is the need to compare our results with those of other authors in this field.

There was no statistically significant difference between the age of the parturient, her level of study and the occurrence of nosocomial infection of the operative site. While a statistically significant difference was obtained between the rate of nosocomial infections of surgical wounds and the age groups of pregnancy between 32 to 34 weeks of amenorrhea (WS) and the occurrence of nosocomial infection of surgical sites, Parturients who delivered by caesarean section in this age group had 4 times the risk of developing a nosocomial surgical site infection than those who delivered after an episiotomy. Since the term pregnancy is the one whose delivery occurs between 37 weeks + 41 weeks and 41 weeks +5, we therefore say that early deliveries (small prematurity) are a risk factor for nosocomial infections of surgical wounds, taking into account our results.

The explanation is easy when it comes to newborns compared to the immaturity of the immune system, but for mothers, they become a little complex. However, early deliveries are due to the health status of the parturient. This may be the woman's personal history that can influence the occurrence of nosocomial infections of surgical wounds, among which, immune deficiency, malnutrition, diabetes...

The long stay duration of more than 10 days ($p = 0.0010$), caesarean delivery ($p = 0.0481$) and the female patient with the indwelling catheter ($p = 0.0162$) were associated with onset of nosocomial surgical site infection. The prolongation of the hospital stay exposes the parturient who is not only destined to be in permanent contact with the hospital environment and the other patients accommodated within the hospital, but also, that she will be subjected to the therapeutic pressure, particularly antibiotics that expose them to the risk of contamination of nosocomial infections of surgical wounds.

Several researchers have identified as risk factors nosocomial infections of surgical wounds, the immunodeficiency state of the parturient, the duration of intervention and hospital stay, the obese condition of the parturient and the pressure of treatment of antibiotic, like in our study. In the Chemsu et al study, the

comparison between the group of infected and non-infected children had shown that the gestational age was less than 33, this can be implied also in the mother because of this early delivery which could be related to certain pathologies that have also weakened their immune system [19-23].

In general, the populations most exposed to the risk of infection are therefore those whose defenses are reduced because of an underlying pathology or interventions. Surgical patients are exposed to additional risk, and intensive care or hematology patients are at a very high risk of up to 40% to 50%.

There are therefore two main categories of risk factors: the first are intrinsic to the patients, and reflect the existence of a relative immune-depression, or a pathology responsible for a particular sensitivity to certain infections (extreme age, chronic pathology, cardiovascular, renal, respiratory or hepatic, malnutrition, diabetes, cancerous disease, homeopathy, immunoglobulin deficiency) and the latter are extrinsic factors to the patients, directly or indirectly related to medical interventions and the environment in which those These are done [20-27].

The reason why researchers are protesting about the architecture, the structure of the services and the quality of the maintenance of the environment, which can play a role in the infectious risk, from where they suggest a particular attention in hygiene hospital, with the involvement of the competent departments of the hospital administration, the specifications of agencies responsible for bio cleaning, and the assumption of responsibility for daily maintenance of equipment by the staff of the service [25-28]. Bartbut meanwhile, has found that obesity, unplanned cesarean section, premature rupture of membranes (more than 6 hours) were the factors that influence the occurrence of nosocomial infections of surgical wounds in their study [16] same as in Nigeria where obesity, diabetes, anemia, staffing in the operating room, length of surgery, and position on the operation list were significantly associated with occurrence of these IN [29-30].

In a systematic review and meta-analysis of sub-Saharan Africa, the main risk factors for nosocomial infections of surgical wounds found involved both caregivers and patients, including the long duration of surgery (6 times), the high level of contamination in the patient or Altemeir Class 3 and 4 (4 times); anemia (3 times); the presence of drain (2 times), lack of preparation of patients (4 times) and a long preoperative stay [24].

In some studies, there is also a delay in the use of modern medicine after a state of bedridden health by some patients as a factor increasing the incidence of nosocomial infections of surgical wounds by complication or evolutionary contamination. The length of stay extended to the hospital, but this time it is rather before surgery.

Risk factors of nosocomial surgical wound infections found in a hospital were among others the urgency of the intervention, the age of the customer, the class d'Altemeir contamination, the pace

of the dressing, antibiotic prophylaxis, type of intervention, long anesthetic duration and operative duration in visceral surgery and preoperative duration [5,31-36].

In Lubumbashi, in a study conducted in 2010 in two health facilities included in this study, the authors found, as we did, that the length of stay was a risk factor for the occurrence of IN, as was the Odimba study [5,14].

Conclusion

Finally, in this work on the factors associated with nosocomial infections of surgical wounds in maternity wards of public hospitals in Lubumbashi, the characteristics of health structures, marital status, gestational age, length of stay and type of intervention are associated with the prevalence of nosocomial infections of surgical wounds and thus constitute the risk factors for nosocomial infections of surgical wounds in maternity wards of public hospitals in Lubumbashi.

The correct use of antibiotics, hand hygiene, prevention of obstetric complications and reduction of hospital stay are necessary interventions for the prevention of these nosocomial infections.

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