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Research article

RISK FACTORS OF SURGICAL SITE INFECTION AT THE REGIONAL AND TEACHING HOSPITAL CENTER OF BORGOU (BENIN)

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ABSTRACT

Introduction: The reduction of the SSI rate requires knowledge of its risk factors. **Objective: To** analyze the risk factors of SSI occurrence at CHD-B **Methods:** Prospective, descriptive and analytical study involving 603 patients undergoing general surgery (218) and obstetrics and gynecology (385) from 1st January to 31st July 2013. **Results:** 44 patients have developed SSI (7.3%). The SSI frequency was 12.8% in general surgery and 4.2% in gynecology-obstetrics (p significant). The mean age of patients developing SSI was 30.7 ± 15.8 years with a minimum and maximum 5 months and 70 years, respectively; and for general surgery patients, there were 23 men and 5 women (p not significant). The presence of preoperative infectious spot at admission (P = 0.003), the preoperative shaving of the site to be incised (p = 0.000), the ASA score (p = 0.000), the surgery contamination class (p = 0.000), and the NNIS score (p = 0.000) were all significantly related to SSI occurrence. Considering all these factors, the NNIS score ≥2 remained the predictive tool by multiplying by 3.4 the risk of SSI occurrence. **Conclusion:** NNIS score is the best SSI prediction tool at CHD-B.

KEYWORDS: Surgical site infection; Risk factor; NNIS score.

INTRODUCTION

Despite advances in surgical technique, antibiotics and recent therapeutic measures, infection is still a major problem in surgery [1]. Surgical site infections (SSI) are associated with high mortality and morbidity rates with an increase in the care cost; becoming a public health problem worldwide [2, 3]. In developing countries, SSI is one of the frequent infections associated with care [4]. According to a recent prevalence study in the United States of America (USA), SSI was the most common of all infections associated with hospitalized patients [5]. Nowadays, nosocomial infections, particularly the SSI, are considered as a reflection of the care quality in hospitals [6, 7]. The reduction of the SSI rate requires knowledge of its risk factors. It is within this framework that the authors propose to analyze the risk factors of the SSI at the Regional and Teaching Hospital Center of Borgou.

MATERIALS & METHODS

Study design: This was a descriptive and analytical study

Ethics approval: the agreement of the authorities of the hospital was acquired. The patient gave their consent. The anonymity was respected. The data collected were used only for this study. Since the study was observational, it was not necessary to obtain the agreement of an ethical committee.

Sampling method and sample size: Sampling was consecutive and exhaustive. This allowed us to retain 603 patients.

Locus of study and time frame: The prospective data collection performed in two surgical services (General surgery and Gynecology & Obstetrics) of the Regional Hospital of Borgou February 1st to August 31st 2013. The Department of General Surgery has 33 hospital beds and accommodated all patients operated in the central operating room of the hospital by all specialized surgical services. The Department of Gynecology and Obstetrics (maternity) has 53 beds and accommodated only the female patients operated in the maternity unit.

The cloths and the surgical material were treated and sterilized in the same way. The anesthesis specialists worked in both two surgical departments. Patients received were exhaustive and lasted 6 months from February 2013 to July 2013, but patient monitoring continued for 1 month or one year depending on whether the patients operated had benefited from implants or not. Thus, the last patients

operated in July 2013 without prosthetic equipment had been followed till 31 August 2013 while those with implant had been followed till 31st August 2014.

Inclusion criteria: all the patients operated in both services during the recruitment period were exhaustively included.

Exclusion criteria: when a patient's consent was not given, he was excluded. Those lost during the follow-up were excluded. And the patients who died in the follow-up period without SSI were also excluded.

Methodology: For each patient, as soon as an operative indication was given, we explained to him the purpose of the current study and asked for his willingness to participate. In the case of positive answer, we went further in the process. When the patient was actually operated, we included him in the study by recording him in a database built for all patients operated during the study period. The surgical wound was followed for all patients operated during the monitoring period. When an SSI was declared, specific data about the patient with SSI was then collected. The diagnostic criteria were those of « Centers for Disease Control and Prevention/National Healthcare Safety Network (CDC/NHSN) » of March 2009 [8].

Statistical analysis: Sample description was made possible by calculating the proportions and averages. Chi-square and Fisher tests (where Chi square was inappropriate) were used to determine the significance level studied variables. Factors associated with SSI occurrence were analyzed by performing logistic regression. The Odds Ratio (OR) was calculated and the risk of error was set at 5%.

RESULTS

From February 1st to July 31st 2013, 603 patients (218 in general surgery and 385 in gynecology and obstetrics) underwent surgery and 44 (7.3%) have developed SSI depending on the defined case; 559 (92.7%) did not develop SSI. Considering each service, the SSI frequency was 12.8% in general surgery and 4.2% in gynecology-obstetrics, respectively (Table 1) with a p = 0.000 (significant). The mean age of patients with SSI was 30.7 ± 15.8 years with a minimum and maximum of 5 months and 70 years; and for general surgery patients, there were 23 men and 5 women (p = 0.17, not significant).

Of the 57 patients with infectious spot at admission and operated, 11 (16.2%) have developed later SSI (Table I) with p = 0.003 (significant). The absence of pre-operative shaving of the incising site (p = 0.000), the American Society of Anesthesiologists (ASA) score [9] (p = 0.000), the surgical contamination class according to [10] (p = 0.000) and the score of «National Nosocomial Infections Surveillance (NNIS)» according to «CDC/NHSN surveillance definition of health care–associated infection and criteria for specific types of infections in the acute care setting»[8] (P = 0.000) were significantly associated with the occurrence of the SSI in general surgery and gynecology-obstetrics at the Regional Health Center of Borgou (Table 1).

Table 1. Patients Distribution by Variables and Occurrence of SSI

Variables	With SSI n (%)	Without SSI n (%)	P value
Support service			
General surgery	28 (12.8%)		**0.000*** **
Gynaecology-obstetrics	16 (4.2%)		
Infectious spot at admission			
Yes	11 (16.2%)	57 (83.8)	**0.003*** **
No	33 (6.2%)	502 (93.8%)	
Preoperative shaving of site to be incised			
Yes	28 (5.6%)	472 (94.4%)	**0.000*** **
No	16 (15.5%)	87 (84.5%)	
Score ASA			
ASA1	17 (4.2%)	388 (95.8%)	
ASA2	12 (12.4%)	85 (87.6%)	**0.000*** **
ASA3	11 (12.4%)	78 (87.6%)	
ASA4	4 (33.3%)	8 (66.6%)	
Surgery contamination class			
Clean	6 (7.6%)	73 (92.4%)	
Clean contaminated	20 (4.9%)	408 (95.1%)	**0.000*** **
Contaminated	7 (13.0%)	47 (87.0%)	
Durty infected	11 (26.2%)	31 (75.8%)	
Score NNIS			
NNIS0	16 (4.1%)	375 (95.9%)	
NNIS1	12 (7.1%)	157 (92.9%)	**0.000*** **
NNIS2	15 (37.5%)	25 (62.5%)	
NNIS3	1 (33.3%)	2 (66.7%)	

*** = significant (p<0.05).

Risk factors determining SSI occurrence in general surgery and in Gynecology-Obstetrics at CHD-B was identified by performing logistic regression (Table 2).

Table 2. Identification of factors determining SSI occurrence with logistic regression

Associated factors	Coefficients	P value	Odds Ratio	95% Confident Interval
Surgery care	0.1369435	0.783 ns	1.146763	[0.433; 3.0383]
No shaving	0.7239679	0.072 ns	2.062601	[0.937; 4.541]
NNIS score	1.219072	0.005***	3.384046	[1.458; 7.852]
Constant	-3.216274	0.000***	-	-

ns = not significant; *** = significant (p<0.05).

DISCUSSION

This study reports that the overall frequency of SSI at Regional and Teaching Hospital of Borgou, which was 7.3%, was similar to that reported (7.3%) by Bibi et al. [11] on the one hand and

Giri et al. [12] on the other hand. This frequency is higher than the 2.0% reported by Oni et al. [13]**;** to 0.9% in France [14]. However, it was much lower than the 10.1% obtained by Mankoutodé et al. [15]; to 30.7% reported by Umesh et al. [16]. There was significantly more SSI in general surgery (28/218, 12.8% of the operated patients) than in gynecology-obstetrics (16/385, 4.2% of operated patient). This same observation was made in the 2009-2010 SSI monitoring report in France [17]. The difference in rates between these two services could be attributed to several factors, three of which are important:- the ASA score: the majority of patients with a poor ASA score (ASA3, ASA4 or ASA5) were in general surgery; -the surgery contamination class: the operations of contaminated surgery were less practiced in gynecology-obstetrics compared to the general surgery service; Also, all the operations with dirty infected surgery have been carried out in the latter service.

The ASA score between 3 and 5 predisposed the patient to an SSI [17, 18]. In our study, the higher the ASA score was, the higher the SSI rate was. Thus, the SSI rate rose from 4.2% for patients with an ASA score of 1 to 33.3% for those with an ASA score equal to 4. The risk of SSI occurrence was significantly related to the degree of surgical dirt ($p<0.05$) as the SSI rate increased by 7.6% for clean surgery and by 26.2% for infected dirty surgery. Similar results were reported by several authors [7, 11]. However, most of the procedures performed in general surgery in our study were done for infectious diseases. For the CDC Expert Committee [19], it is necessary to know the patient's surgery class in order to give a suitable prophylactic antibiotic therapy.

The SSI rate in our study increased significantly with the NNIS score from 4.1% for an NNIS equal to 0 to 33.3% for an NNIS of 3 ($p<0.05$). Indeed, the calculation of the NNIS score took into account the ASA score, the surgical class according to Altemeier and the duration of surgical intervention. The NNIS score could then predict the occurrence of SSI. Indeed, in our study, this score of 2 or 3 multiplies by 3.4 the risk of SSI occurrence. The same observation was done by several authors [18]; Atif et al. [20]; Hernandez et al. [21]; Alberto et al. [22]. All these authors confirmed the suitability of the NNIS score for assessing the SSI risk.

CONCLUSION

The NNIS score is a sound tool for predicting SSI and its actual use as well as the rigorous practice of aseptic rules could contribute to a reduction of the SSI rate in general surgery and gynaecology-obstetrics at the Health Center of Borgou.

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