

Incidences and Risk Factors for Surgical Site Infections in Koutiala, Mali

Mahamadou Coulibaly^{1,2}*, Moussa Diassana^{1,3}, Issiaka Diarra^{1,4}, Bréhima Bengaly^{1,5}, Birama Togola^{1,5}, Drissa Ouattara^{1,5}, Souleymane Sanogo^{1,5}, Samuel Kletigui Dembélé^{1,6}, Cheick Aka Waigalo^{1,2}, Brehima Ballo^{1,2}, Drissa Traoré^{1,2}, Nouhoum Ongoiba^{1,5}

¹Faculty of Medicine, University of Science, Technique and Technologies of Bamako, Bamako, Mali

²Department of Surgery, Koutiala Hospital, Koutiala, Mali

³Department of Surgery, Sikasso Hospital, Sikasso, Mali

⁴Département de Chirurgie, Hôpital Commune I, Bamako, Mali

⁵Department of Surgery, University Hospital Center Point G, Bamako, Mali

⁶Department of Surgery, Tominian Hospital, Tominian, Mali

Email: *cmahamadou38@yahoo.fr

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Abstract

Purpose: This paper aims to assess the incidences and risk factors for surgical site (ISO) infections in the general surgery department of the Koutiala District Hospital. Patients and Methods: This was a prospective and descriptive study from August 1, 2017 to October 31, 2020 involving all patients who underwent laparotomy in the general surgery department of the Koutiala District Hospital. Patients who were not operated on and who did not have a laparotomy were not included. Age, sex, frequency, patient history, National Nosocomial Infections Surveillance (NNIS) index, time to occur, bacteriological test results and course of infection were analyzed. Results: Fifty patients were registered. The average age was 34.2 ± 21.2 years old. Eleven patients were 60 years old or older. The hospital incidence rate was 4.3% and the community incidence rate was 6.1 cases per 100,000 population. The concept of smoking was noted in 15 patients. Patients were operated on in emergency 84% of cases. Peritonitis was the most common initial lesion with 32% of cases. Our patients had an NNIS index greater than 0 in 84% of cases. The time to develop infection from the surgical site was less than 3 days in 8 patients (16% of cases). Depending on the depth of the infection, it was superficial (cutaneous) in 39 patients (78%) and deep (subcutaneous and organic) in 11 patients (22%). Escherichia coli was the most common germ with 72% followed by staphylococcus aureus at 24%. We noted 22% morbidity. The median length of hospitalization was 9 ± 2.2 days. Conclusion: ISO is common in our service. Prevention and mastery require knowledge of risk factors.

Keywords

Surgical Site Infection, Incidence, Risk Factors, Surgery

1. Introduction

Surgical site infections (SSIs) are nosocomial infections that occur following surgery. The main risk factors involved are the pre, per and postoperative environment of the patient as well as the care team, the immune defenses of the host and especially the level of the proprété of the surgical act [1]. In France, ISO is the third leading cause of nosocomial infection with an annual incidence of 6 cases per 100,000 inhabitants [2]. They are a real public health problem in Africa with an incidence that varies from 6.8% to 26% [3] [4]. Contamination of the surgical site occurs mainly perioperatively, and it is favored by certain factors that may be related to the patient's terrain and/or the surgical procedure [5]. Given the increase in the number of surgical site infections in the department, we wanted to carry out this first study in the region, the aim of which was to determine the incidences and identify the risk factors for SSI in the general surgery department of Koutiala district hospital.

2. Patients and Methods

This was a prospective and descriptive study from 1 August 2017 to 31 October 2020 involving all patients who underwent laparotomy in the general surgery department of the Koutiala District Hospital. Patients who did not undergo surgery and those who did not undergo laparotomy were not included. The realization of this work required a detailed database that was validated by our scientific committee, we used the medical file of the patients, the register of consultation and the notebooks of the operative report. This information allowed us to identify impacts and risk factor groups. For risk factors related to the patient's terrain, we assessed age, sex, patient history, the notion of smoking and the American Society of Anesthesiologists (ASA) score. This score is composed of 4 stages. Stage 1: Healthy, healthy patient, i.e. without organic, physiological, biochemical or psychological involvement; Stage 2: Mild systemic disease, patient with moderate impairment of high function; Stage 3: Severe or disabling systemic disease, patient with severe impairment of major function that does not result in disability, for example: moderate angina, diabetes, severe hypertension, beginning cardiac decompensation. Stage 4: Patient with severe impairment of great function, disabling, and life-threatening, for example: angina pectoris at rest, pronounced systemic insufficiency (pulmonary, renal, hepatic, cardiac ...); Stage 5: Moribund patient with a life expectancy not exceeding 24 hours, with or without surgery. And for factors related to operative procedures: the type and urgency of the initial lesions, Altemeier's classification, the duration of the intervention, the quality of the operator, the time to onset of infection, the result of the bacteriological

examination and the evolution of the infection were evaluated. Thus, according to Altemeier's classification, surgical procedures can be divided into 4 stages: 1) Clean surgery: without opening a hollow organ, without trauma and without aseptic fault. 2) Contaminated clean surgery: hollow organ opening, trauma and lack of minimal asepsis. 3) Contaminated surgery: Wound less than 4 hours, frank rupture of asepsis, infected genitourinary or biliary surgery. 4) Dirty surgery: Fecal contamination, visceral opening, infection surgery with pus, traumatic wound greater than 4 hours. After analysis of these parameters, the risk of surgical site infection was assessed by the National Nosocomial Infections Surveillance (NNIS) index. The NNIS index was rated from 0 to 3 and is based on Altemeier's classification, ASA score and duration of surgery. The comparison test was the Khi2 test and the p < 0.05 probability was considered significant.

3. Results

We collected records from fifty patients who had surgical site infection in the ward during the study period. They accounted for 0.8% of laparotomy consultations (n = 6648) and 6.1% (n = 818). The mean age was 34.2 ± 21.2 years (2 -75). Eleven patients were 60 years of age or older (22%). There were 39 men (78%) and 11 women (22%). The hospital incidence rate was 4.3% and the community incidence rate was 6.1 cases per 100,000 population. In the population aged 0 to 15 years, 13.0 cases per 100,000 population were recorded. According to origin, patients came from within the circle (rural area) in 82% of cases (n = 41) and from the city of Koutiala in 18% (n = 9). The notion of smoking was noted in 15 patients. According to the ASA score the patients were: stage 1 in 6% of cases (3 patients), stage 2 in 24% of cases (12 patients), stage 3 in 68% (34 patients) and stage 4 in 2% (1 patient). Patients underwent emergency surgery in 84% of cases during initial treatment. Peritonitis was the most common initial lesion with 32% (n = 16) followed by acute bowel obstructions (22%; n = 11), acute appendicitis (22%; n = 11) and digestive tumor (10%; n = 5). There were also 5 cases of strangulated hernia (10%), 1 case of splenomegaly (2%) and 1 case of vesicular lithiasis (2%). Patients were classified as Altemeier I (10%; n = 5), Altemeier II (50%, n = 25), Altemeier III (10%; n = 5) and Altemeier IV (30%; n = 15). All patients received dermal preparation with betadine and antibiotic prophylaxis with ceftriaxone. The duration of the initial intervention ranged from 45 minutes to 90 minutes in 27 patients (54%) and greater than 90 minutes in 9 patients or 18%. Our patients had an NNIS index 0 in 16% of cases (n = 8), an NNIS index 1 in 18% of cases (n = 9), an NNIS index 2 in 30% of cases (n = 15) and an NNIS index 3 in 36% of cases (n = 18). 5 patients were operated by interns, i.e. 10% of cases. The time to onset of surgical site infection was greater than 3 days in 42 patients or 84% of cases and less than 3 days in 8 patients (16% of cases). The median time was 4 days \pm 0.97 days with extremes of 2 and 5 days. Depending on the depth of the infection, it was superficial (cutaneous) in 39 patients (78%) and deep (subcutaneous and organic) in 11 patients (22%). On bacteriological examination, Escherichia coli was the most

common germ with 72% (n = 36) followed by *Staphylococcus aureus* at 24% (n = 12) and *salmonella* at 4% (n = 2). Under medical treatment consisting of local care and antibiotic therapy, the course was simple in 39 patients with superficial skin infections, i.e. 78% of cases. For the 11 cases of deep subcutaneous and organic infections, we noted 9 cases of uncovered evisceration (18%) and 2 cases of covered evisceration (4%) which required surgical revision. The median duration of hospitalization was 9 days \pm 2.2 with extremes of 6 - 15 days. No cases of death have been recorded.

4. Discussion

Among nosocomial infections, surgical site infection is the most common. This frequency varies from one continent to another. In Africa, the annual incidence ranges from 6.8% to 26% [3] [4]. The hospital incidence of 4.3% of our study certainly does not reflect the actual incidence of surgical site infections in our hospital and no less in the circle. Indeed, the Koutiala District Hospital has other surgical services such as urology and gynecological-obstetrics and also in the city there are many private structures that do surgical interventions (these centers do not have data on surgical site infections). In 8 patients the time to onset of ISO was less than 3 days. The contamination of these patients would be linked either to the insufficient preparation of the operated patients or the precarious state of the technical installations and instruments in the block or to the quality of sterilization. Of the risk factors related to the patient's terrain, only the notion of smoking and advanced age were noted in this study. Other contamination factors were mainly related to the type of surgery, since most of the initial interventions focused on the digestive type and among these acute peritonitis was the most common; the urgency of the initial intervention which was 84% and the NNIS index which was greater than 0 in most patients. The sum of all these risk factors would explain the high rate of ISO in developing countries [6]-[8]. Unlike Ousmane's study in Dakar (71% positive culture) [6], all our cultures were positive. And on the bacteriological level, our study brings the same result as those of the literature [9]-[11] because the most frequent germs were Escherichia coli and Staphylococcus aureus. The 22% morbidity recorded was mostly secondary to deep infections. This result is confirmed by the Troillet study, which attests that the evolution is especially fatal in patients with deep ISO [12]. These cases of morbidity would also explain the extension of the duration of hospitalization of up to 15 days. Like most retrospective studies, our results were limited by the loss of certain data or even the entire file; And the limitation of our work was mainly linked to the insufficiency of the technical platform and the low income of the patients.

5. Conclusion

ISO is common in our service. The notion of smoking, the poor general condition, the urgency of the interventions, the type of surgery and the long duration of the surgeries were the most common risk factors. The prevention and control of ISO requires knowledge of these risk factors.

Authors' Contributions

All authors have read and approved the final version of the manuscript.

Conflicts of Interest

The authors do not declare any conflict of interest.

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