

Surgical Site Infection in the General Surgery Department at the Fousseyni Daou Hospital in Kayes

Sogoba Gaoussou¹, Katilé Drissa^{2*}, Soumbounou Goundo³, Goïta Lassina³, Diallo Mohamed Brehima¹, Sangaré Sidy¹, Traoré Lamine Issaga¹, Kouyaté Mamaye⁴, Diakité Adama Salifou⁵, Magassa Moulaye⁵, Traoré Hamidou¹, Traoré Drissa¹, Kané Moustapha¹

¹Department of General Surgery of the Fousseyni Daou Hospital in Kayes

²Hepato-Gastroenterology Unit of the Fousseyni Daou Hospital in Kayes

³Anesthesia and Intensive Care Unit at the Fousseyni Daou Hospital in Kayes

⁴Paediatric Surgery Unit of the Fousseyni Daou Hospital in Kayes

⁵Department of Urology at the Fousseyni Daou Hospital in Kayes

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*Corresponding author: Katilé Drissa

Hepato-Gastroenterology unit of the Fousseyni Daou hospital in Kayes

Abstract

Original Research Article

Objectives: To determine frequency, analyze risk factors, identify responsible germs and antibiotic susceptibility, and assess the cost of infection. **Patients and Method:** We conducted a prospective study (August 1, 2022 to February 2023) for a period of 6 months. During our series, we received 250 patients who had been operated on and hospitalized in the general surgery department. The diagnosis of surgical site infection was based on criteria set forth by the Atlanta CDC. Data collection was carried out by interviewing, consulting records and anaesthesia sheets. Surgical wound monitoring was done up to the 30th postoperative day. A sample was taken for each infection. The word processor and tables were made on Microsoft Word 2019. Data were captured and analyzed on SPSS software (version 25). **Results:** We collected a total of 250 patients in our study. 31 developed an infection of the surgical site, a frequency of 12.4%. There were 31 patients, including 23 men and 8 women, with a mean age of 34 years, with a standard deviation of 20.75. The most common type of infection was superficial incision infection with 70.9% followed by deep incision infection with 29.1%. **Risk factors for Surgical Site Infection Were:** haemoglobin level; the nature of the surgery; ALTEMEIR contamination class 3 and 4; NNIS index 1 and 2; the type of intervention with probability tests $P < 0.05$. The analysis of the 31 samples resulted in 31 positive cultures, i.e. a bacteriological yield of 100%. *E. coli* was the most isolated germ with 25.8%, followed by *Enterobacter cloacae* 19.3% and *Enterococcus* 19.3%. **The Treatment was:** Carrying out local care based on antiseptics (daklin; Betadine; hydrogen peroxide) and general (adapt to susceptibility testing). The consequence of surgical site infection was the prolongation of the hospital stay by an average of 19 days for infected patients; with an estimated additional cost of 294712 and 0% mortality.

Keywords: Surgical site infection, surgery department FOUSSEYNI hospital DAOU.

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INTRODUCTION

Infection is a microbial process characterized by an inflammatory response, at least local, of the host, to the presence of a germ in a tissue or in a biological fluid that is usually sterile [1].

The infection is said to be nosocomial (from the Greek *nosos*=disease and *komein*=cure) when it occurs after 72 hours of hospitalization in a patient when it was not present during the incubation period at the time of the patient's admission [2].

Surgical site infections (SSIs) are those that occur within 30 days of surgery or within one year (1 year) if an implant or prosthesis has been placed, aggravating the previous situation by their morbidity and even mortality [3]. They are caused by bacteria that enter the incisions made during the procedure [4].

Numerous studies have been carried out on surgical site infections in which the following frequencies have been noted: In Europe, 1.7% of surgeries have an ECDC SSI in 2018-2020 [5].

In the USA, 0.5 to 3% of surgical procedures will have an infection of the surgical site in 2023 [6]. In

China, the overall incidence of SSIs is 3.18% in 2023 [7]. In sub-Saharan Africa: It is a real public health problem with an incidence that varies from 6.8 to 26% in 2016 [8]. In Mali, a study done in general surgery at Gabriel Touré Hospital in 2011 found a postoperative infection rate of 7.8% [9].

A study conducted at the General Surgery Department of the Bocar Sidy Sall University Hospital in Kati found a frequency of 8.46% in 2020 [10]. A study carried out at the Fousseyni Daou hospital in Kayes reported a frequency of 4.18% in 2017 [11].

Diagnosis is generally easy in the case of wall abscesses, but difficult when the infection is deep [2]. Its treatment is sometimes difficult, requiring multiple surgeries and most often leading to dreadful sequelae [2]. SSI contributes significantly to longer hospital stays, increased costs, morbidity and sometimes even mortality of the patient [12].

The aim of this study is to reassess the frequency of SSIs and to highlight the factors that contribute to the use of SSIs in the surgical department of the Fousseyni Daou Hospital in Kayes. To achieve these goals, we have set ourselves a few goals.

PATIENTS AND METHOD

This was a cross-sectional descriptive study from August 1, 2022 to January 31, 2023, this study was conducted in the general surgery department of the Fousseyni DAOU Hospital in Kayes and focused on patients with Surgical Site Infection (SSI).

Included were: all patients who had an SSI and met the Atlanta CDC criteria (table below);

To conduct this study, we developed a file taking into account administrative, anatomical, clinical

and paraclinical data, the evolution during hospitalization and even after the patient's discharge from the hospital.

The diagnosis was based on the Atlanta CDC criteria. The equipment used for the collection was a SARSTED laboratory swab

The samples were taken by the nursing team and then sent directly to the LABIOKA analysis laboratory for bacteriological examination and susceptibility testing.

Media: A survey form in the form of a questionnaire was drawn up for each patient (see annex).

Ethical Aspects

Informed consent from patients was requested and respect for data confidentiality. This work is intended to be operational research. In this way, the results obtained will be made available to all stakeholders in the field of surgical health in the interest of patients.

Data Entry

Data were entered on Word software and data analysis on SPSS and Epi info software. Statistical tests: The statistical tests were that of Chi2. The significance threshold was set at $p < 0.05$.

RESULTS

During our study, we recorded 31 cases of SSI out of 250 surgical procedures, or 12.4%. From August 1, 2022 to January 31, 2023, we performed 250 surgeries, including 86 cold-scheduled surgeries and 164 emergency surgeries.

Table I: Method of recruitment

How to Recruit	Actual	Percentage
Cold-programmed	86	34,4
Emergency room	164	65,6
Total	250	100

Table II: Pathologies

Pathologies	Actual	Percentage
Digestive Surgery	152	60,8
Trauma Surgery	67	26,8
Urological Surgery	31	12,4
Total	250	100

Table III: Risk Factors

Associated pathologies	Staff	Percentage
Diabetes	8	3.2
HTA	9	3.6
Total	17	6,8

Table IV: Altemeier Classification

Classification of altemeier	Actual	Percentage
Clean Surgery	72	28,8
Clean-contaminated surgery	47	18,8
Contaminated surgery	80	32
Dirty Surgery	51	20,4
Total	250	100

Table V: ASA Classification

ASA Classification	Actual	Percentage
ASA 1	223	89,2
ASA 2	26	10,4
ASA 3	1	0,4
Total	250	100

Table VI: Response Time in Hours

Duration of intervention	Actual	Percentage
1 hour	104	41,6
2 Hours	83	33,2
3 hours and more	63	25,2
Total	250	100

Table VII: Presence of ISO

Presence of ISO	Actual	Percentage
Yes	31	12,4
No	219	87,6
Total	250	100

Table VIII: Mode of Diagnosis

Diagnostic Mode	Actual	percentage
pus discharge	18	58,1
fever + discharge of pus	7	22,6
pus in a subfascial drain	6	19,3
Total	31	100

Table IX: Time to on set

Onset Delay	Actual	Percentage
D1-D5	19	61,3
D6-D10	11	39,7
Total	31	100

Table X: Type of Infection

Infection Type	Actual	Percentage
Deep	9	29,1
Superficial	22	70,9
Total	31	100

Table XI: Isolated Germ

Isolated Germ	Staff	Percentage
Esherichia coli	8	25,8
Enterobacter cloacae	6	19,4
Enterococcus	6	19,4
Staphylococcus aureus	5	16,1
Klebsiella ornithinolytica	3	9,7
Aeromonas hydrophila	2	6,4
Serratia fonticola	1	3,2
Total	31	100

Table XII: Duration of intervention and occurrence of SSI

Duration of Surgery		Postoperative infection		Total	
		No	Yes		
1 hour	Number	96	8	104	
	%	38.4	3.2	41.6	
2 hours	Number	75	8	83	
	%	30.0	3.2	33.2	
3 Hours and more	Number	48	15	63	
	%	19.2	6.0	25.2	
Total		219	31	250	
		%	87.6	12.4	100.0

Table XIII: Sensitivities to imipenem, chloramphenicol, ciprofloxacin

Germs	Staff	Imipenem		Chloramphenicol		clavulanic amoxi-accide		Ciprofloxacin	
		S	R	S	R	S	R	S	R
Escherichia coli	8	5	3	5	3	4	4	1	5
Enterococcus	6	2	4	5	1	1	5	4	6
Enterobacter cloacae	6	4	2	3	3	2	4	0	6
Staphylococcus aureus	5	4	1	1	3	3	2	1	5
Klebsiella ornithinolytica	3	3	0	2	1	1	2	0	3
Aeromonas hydrophila	2	1	1	1	1	0	2	0	2
Serratia fonticola	1	1	0	0	1	0	1	0	1
Total	31	20	11	17	14	11	20	6	28

Table XIV: Length of hospitalization

Length of hospital stay	Staff	Percentage
1-10 days	2	6,4
11-20 days	15	48,5
21-35 days	14	45,2
Total	31	100

The Overall Cost of Care In the Course of Our Study

- Preoperatively, the average amount spent was 199844±67419 with extremes of 59250 and 350000 FCFA including additional examinations, surgery and anesthesia prescriptions.
- Postoperatively, the amount spent was on average 294,712±88,993 with extremes of 111,260 and 460,000 which corresponds to the additional cost related to the infection.

DISCUSSION

We conducted this prospective study from August 1, 2022 to January 31, 2023 to determine the frequency of SSIs at the HFDK.

The Advantage of the Study

This study will make it possible to reassess the overall frequency of SSI after a first study conducted in 2016 by S. Magassouba in the general surgery department of the HFDK.

However, We Also Had Difficulties in Knowing

The absence of compulsory health insurance for all the frequent breakdown of sterilization equipment, namely the poupinel and the autoclave.

Our frequency of 12.6% differs from that of the Zhang *et al.*, literature, and from S. Magassouba with a statistical difference of $P < 0.05$ [32-11]. On the other hand, it is comparable to those of C. F. P. Roantsoa, E. L Niangaly, by B. Diarra with $P\text{-value} > 0.05$ [33-9].

This difference could be related to the different diagnoses of patients operated on in an emergency, the condition of the equipment in the operating room, the condition of the equipment used for postoperative care.

Men were the most numerous in our series with a ratio of 2.71 our study reports an average age of 34 years, which differs from those found by D. Pivot and A Ousmane *et al.*, [35-38].

The average age found in our study is comparable to those of B. Diarra and S. Magassouba [9-11]. This difference could be explained by the fact that the majority of the Malian population is young.

In our study, patients who underwent emergency surgery had the highest rate of infection. This result does not differ from those of Flouchi *et al.*, B. Diarra and S. Magassouba [39-11].

But differs from that of Zhang *et al.*, and Dégbey *et al.*, [32-40]. This difference may be due to

patient diagnoses and the contamination class of patients who have undergone emergency surgery.

The Atlanta CDC defines ISO rate ranges as: <5% for Class I, <10% for Class II, <20% Class III, <30% for Class IV [3]. A gradual increase was seen in our study ranging from dirty surgery with a rate that ranges from 1.6 to 7.6%. On the other hand, no infection of the surgical site was found in the surgery of our patients.

In our study, the longer the duration of the procedure, the higher the rate of occurrence of SSI. An increase in the risk of SSI beyond 120 minutes of intervention time was noted by Mr. K Mutemi in Kenya in 2004 and by Kientega in Burkina Faso in 2012 [45-43].

In our series, patients who had an ASA=1 score were the most numerous, at 80%, which is comparable to the results of Kientega in Burkina Faso 70% and D. Mukamuhirwa in Rwanda 91.8% [43-46].

In our study, the SSI rate of digestive surgery ranges from 0 to 70%. These rates are similar to those found in the series by S. Magassouba and B. Diarra [11-9].

The mean time to onset of SSI was 4 days in our study. This delay is comparable to those found in the 2012 Kientega series in Burkina Faso by EH. L. Niangaly in 2022, S. Magassouba in 2016 days with $P>0.05$ [43-9]. But differs from that of the French author P. astagneau in 2018 [44].

This difference could be explained by a predominance of contaminated surgery, hence the source of early contamination. In our study, E.coli (25.8%), Enterobacter cloacae and Enterococcus were the most isolated germs at the site of infection.

S. Magassouba had found a predominance of Escherichia coli (; 33.3%) and K. pneumoniae (8.3%) [11]. T. Escutnaire-Marrant and Col in France had found a predominance of Escherichia coli (23%) [42]. In most studies, E. coli was the most dominant germ.

In our study, the majority of germs were sensitive to imipenem (64.51%), chloramphenicol (53.83%). A. Ousmane has regained sensitivity to E. coli strains. 100% e. coli to imipenem and resistance to amoxicillin-clavulanic acid [38]. S. Magassouba in Mali found 100% resistance of E. coli to the amoxicillin-clavulanic acid combination [9].

The mean length of hospital stay was 19.68 days with a standard deviation of 7.44 days for patients with infected patients. This result does not differ from B. Diarra who found a length of hospitalization of 21 ± 8 days [9], S. Traoré who found an average length of

hospitalization of 17.25 ± 13.82 days [35], and S. Magassouba found an average length of hospitalization of 15.91 ± 3.96 days [10]

The amount spent averaged $294,712\pm 88,993$ with extremes of 111,260 and 460,000. S. Magassouba found an average cost of 187,916 FCFA with extremes of 140,000 and 330,000 FCFA [9].

These additional expenses are related to additional examinations, antibiotic therapy and dressing materials during our study, we recorded a total of 3 deaths, or 1%. No deaths were related to surgical site infection. The patients died as a result of complications related to the conditions for which they were operated on.

CONCLUSION

Surgical site infection is a major complication in a surgical setting, compromising the surgical procedure. The overall SSI rate after analysis was 12.6%. Escherichia coli was the most isolated germ, which corroborates the data in the literature. Digestive surgery is the specialty most affected by SSI, favored by the risk of intraoperative bacterial contamination, the patient's terrain and the quality of the operative act. The ISO increased the cost of care and the hospital stay without being a real cause of death. At the end of the study, we believe that the overall ISO rate is largely high, hence the need to focus on preventive measures.

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