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PREVALENCE OF SURGICAL SITE INFECTIONS: BACTERIOLOGICAL PROFILE AND ANTIBIOTIC RESISTANCE (HCZ EXPERIENCE IN RABAT)

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ABSTRACT

Introduction: Surgical site infections (SSIs) represent a common and serious complication in surgery, which are responsible for significant morbidity and mortality. They represent a true public health concern due to both their frequency and substantial socioeconomic impact (1). This article aims to evaluate the prevalence of SSIs and to determine the bacteriological profile and antibiotic resistance of the bacteria responsible for these infections. **Materials and Methods:** This is a retrospective descriptive epidemiological study conducted on patients who underwent surgery at the HUICZ in Rabat between January 1, 2021, and April 1, 2024, and who developed a postoperative infection confirmed bacteriologically. Demographic, clinical, and microbiological data were collected and analyzed to identify the main risk factors and bacterial resistance patterns. **Results:** Out of the 2,735 patients who underwent surgery during the study period, 47 developed a postoperative infection, corresponding to an overall prevalence of 1.7%. The distribution by department revealed varying prevalence rates: 3.38% in neurosurgery, 2.14% in visceral surgery, 1.7% in traumatology, and 0.75% in urology. The most frequently isolated pathogen was *Staphylococcus aureus*, accounting for 25.5% of cases, followed by *Escherichia coli* (19%), KES group bacteria (17%), and *Pseudomonas* (12%). **Conclusion:** Surgical site infections represent a complication with a low frequency rate in the surgical departments of HUICZ. The implementation of targeted preventive measures, based on identified microbiological profiles and risk factors, is essential to reduce the incidence of these infections.

KEYWORDS: Surgical site infections, prevalence, bacteriological profile, bacterial resistance.

INTRODUCTION

Every year, hundreds of millions of patients worldwide develop surgical site infections, which are responsible for high morbidity and mortality. They constitute a real public health problem, not only because of their frequency, but also because of their significant socio-economic impact.[1] The aim of this article is to evaluate the prevalence of surgical site infections and to determine the bacteriological profile and antibiotic resistance of the bacteria responsible for these infections.

MATERIALS AND METHODS

In order to assess the prevalence of surgical site infections in the surgical departments of the HUICZ in Rabat, a retrospective descriptive epidemiological study was carried out on patients operated on in these departments between January 1, 2021, and April 1, 2024. Patients with a bacteriologically proven surgical site infection were included in the study. Demographic, clinical and microbiological data were collected from medical and laboratory records. Antibiogram data were extracted from the “WONET” computer system.

Qualitative variables were expressed as headcount and relative frequencies in percentage. Quantitative variables with a symmetrical distribution were expressed as average and standard deviation (average + standard deviation). Quantitative variables with an asymmetric distribution were expressed as median and quartiles (median [Q25-Q75]). Finally, the prevalence of postoperative infections in all departments combined, by department and by period, was calculated.

RESULTS

During the study period, the median age of our population was 65. In fact, over 75% of the population was aged 72, and 25% were under 45. Men outnumbered women, with a ratio of 1.5 M/F.

47 cases of surgical site infections were identified out of a total of 2,735 surgical patients, representing a prevalence of 1.7%. In neurosurgery, visceral surgery,

traumatology and urology, the prevalence rates were 3.38%, 2.14%, 1.7% and 0.75% respectively. The distribution of prevalence by year was as follows: In 2021, 2022, 2023, the prevalence rate was 1.96%, 1.86%, 0.96% respectively. Finally, in the first 3 months of 2024, the prevalence rate was 4.3%.

The most frequently germ isolated was Staphylococcus aureus with a predominance of 25.5%, followed by E. coli 19%, KES 17% and Pseudomonas aerugenosa 12%. Enterobacteriaceae accounted for 77.75% of postoperative infections in visceral surgery, including 58.3% of E. coli. S.aureus predominated in neurosurgery at 42%, followed by enterobacteria at 31%. In Urology, Enterobacteriaceae and S. aureus are the main micro-organisms found, with an equal rate of 33.3%. In trauma surgery, P. aerugenosa is the most common organism, accounting for 42%, followed by Enterobacteriaceae at 28%.

A study of resistance profiles revealed that 88.9% of E.coli strains (n=9) were resistant to combined amoxicillin, 35% to third generation cephalosporin, and 77.8% to ciprofloxacin. As for aminoglycosides, 14.3% of the strains identified were resistant to Gentamicin and Amikacin. As for S. aureus (n=12), 75% were resistant to meticillin, and 60% to ciprofloxacin and erythromycin. Finally, for P. aeruginosa (n=6), moderate resistance of 25% to ceftazidime, 33% to imipenem, 50% to ciprofloxacin and 17% to gentamicin was noted.

DISCUSSION

In this study, the prevalence rate of postoperative infection was 1.7% in the four surgical departments during the study period.

At national level, studies have found higher results, such as in the department of visceral surgery of the Mohamed-V military training hospital in Rabat in 2005[2] and in the provincial hospital of Taza in 2019[3], which found a prevalence rate of 5% and 6.3% respectively.

Our result is close to those of Western countries; studies conducted in different countries—Italy in 2020[4], Poland in 2018[5], Germany in 2019[6], and France in 2014[7]—found prevalence rates of 1.42%, 1.8%, 1.73%, and 1%, respectively.

In some Asian countries, relatively old studies found lower rates: in China in 2006[8], Thailand in 2007[9], and Hong Kong in 2007[10], with rates of 0.2%, 0.7%, and 1.1%, respectively. In contrast, higher rates were found in some African countries, such as Nigeria in 2009[11], the Central African Republic in 2007[12], and Tanzania in 2011[13], with prevalence rates of 23.6%, 18%, and 26%, respectively.

This difference in prevalence between countries could be explained by the levels of hygiene applied in each hospital, as well as healthcare-associated disease surveillance programs.

The most frequently isolated germs include Staphylococcus aureus, with a predominance of 25.5%, followed by E. coli at 19%, KES at 17%, and Pseudomonas at 12%. These results are comparable to those found in the previously cited studies.[2,14,15] However, enterococci were present at a low percentage in our results, at 4.3%, which does not align with the literature data where the percentage varied between 10% and 14%.[15–17] Other nosocomial microorganisms, such as Acinetobacter, represent only 4.3%.

Enterobacteriaceae represented 77.75% of postoperative infections in visceral surgery, including 58.3% of E.coli. This was the case in a study in Turkey between 2003 and 2009 reported by Isik et al[18], but also in the visceral surgery department of the Military and Training Hospital in Rabat.[2]

Staphylococci predominate in Neurosurgery 42% followed by Enterobacteriaceae 31%, in agreement with The National Healthcare Safety Network report between 2015 -2017.[15]

In Urology, Enterobacteriaceae and Staphylococcus were the main micro-organisms found, with an equal rate of 33.3%. This result can be explained by the type of surgery performed, since Enterobacteriaceae were more frequently found in endoscopic surgery. Pseudomonas Aeroguinosa came out on top in trauma surgery, with a percentage of 42%, followed by Enterobacteriaceae at 28%. This result varies in the literature according to the patient's mode of presentation (emergency or consultation), wound exposure time and type of surgery.[15,19]

Bacterial pathogens, once sensitive to antimicrobial agents, are becoming increasingly resistant. This represents a major risk to human health.[20] Moreover, the susceptibility of germs to antibiotics is highly dependent on the epidemiological situation of each country, structure or even department, where resistance can vary from one department to another.[21]

In our study, E. coli was one of the most frequent germs in postoperative infection. Resistance to protected amoxicillin in our study was 88.9%. This was also found in a meta-analysis of several African countries[22], which concluded that resistance was 92%. However, a study by Abosse et al[23] in Ethiopia reported a lower resistance rate than our own, at 58.3%.

For 3rd generation cephalosporinase (C3G), 35.4% of bacteria were resistant to` this antibiotic. Other studies found higher percentages, such as in Ethiopia[23] at 75%, or in Eritrea[24] at 90%. With regard to fluoroquinolones, 77.8% were resistant to ciprofloxacin.

This rate is almost the same in the above-mentioned study[22], where it was 91%. However, the rates were much lower in the studies.[22,24] at 41.7% and 60% respectively. As for aminoglycosides, the strains identified were resistant to Gentamicin and amikacin a` 14.3%. Other studies found rates well over 73% for aminoglycosides.[22] No resistance was found for the carbapenem family, specifically imipenem. This is in line with the literature.[25]

Pseudomonas is a difficult bacteria to treat, due to its high level of natural resistance. This is because it produces a broad-spectrum β-lactamase (AmpC) capable of rapidly hydrolyzing C1Gs and C2Gs, and amino penicillins, but has little effect on C3Gs and carbapenems.[26]

In our study, moderate resistance to ceftazidime (25%), imipenem (33%), gentamicin (16.7%) and ciprofloxacin (50%) was noted. According to The National Healthcare Safety Network (15), 6% resistance to aminoglycosides was found in the United States between 2009-2010, 10.2% to ciprofloxacin and 11% to imipenem. In Eritrea[24], an East African country, 16% resistance to aminoglycosides, 25% to ciprofloxacin.

Staphylococcus aureus, the most isolated germ in our study, generally plays an important role in nosocomial pathology, mainly in postoperative infections.[27] 75% resistance to meticillin. This rate is very high compared with the average in literature. However, given the small sample size (n=12), it is not statistically significant. Resistance to ciprofloxacin and erythromycin was found to be 60% in our study, and 33% to ceftriaxone. There was no resistance to vancomycin, gentamicin or trimethoprim + sulfonamides. These results are not in line with the literature, since The National Healthcare Safety Network[15] found 48% resistance to meticillin, and a study cited above[22] found 48% resistance. Resistance to ciprofloxacin and erythromycin was found to be 19% and 44% respectively.[22]

CONCLUSION

Surgical site infections are one of the main complications of modern medicine. They are a major issue in surgery, and their occurrence remains a cause for concern, due to the complications they engender. Many of these infections are caused by multi-resistant micro-organisms, increasing both the human (morbidity and mortality) and economic cost. Setting up an effective infection surveillance and control system, in order to identify the germs most frequently involved and their resistance profiles, is therefore an essential approach to reducing their impact and improving the safety of surgical care.

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