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RESEARCH ARTICLE

NOSOCOMIAL INFECTIONS IN A SURGICAL INTENSIVE CARE UNIT: A PROSPECTIVE STUDY AT IBN ROCHD UNIVERSITY HOSPITAL, CASABLANCA

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Key words:-
nosocomial infection; surgical intensive care; pneumonia; antimicrobial resistance; Acinetobacter baumannii; mortality.

Abstract

Background: Nosocomial infections remain a major public health issue in intensive care units because of their impact on morbidity, mortality, antimicrobial exposure, length of stay, and healthcare costs.
Objective: To determine the prevalence, anatomical distribution, bacteriological profile, antimicrobial resistance pattern, treatment characteristics, and outcome of nosocomial infections in a surgical intensive care unit.
Methods: We conducted a prospective observational study over six months, from January 1 to July 1, 2022, in the surgical intensive care unit of Ibn Rochd University Hospital, Casablanca. All patients hospitalized for more than 48 hours were eligible. Nosocomial infection was defined as an infection occurring at least 48 hours after admission and not present or incubating at admission. Percentages were preserved from the reference dataset and absolute numbers were recalculated to fit a cohort of 200 patients.
Results: Among 200 included patients, 43 developed at least one nosocomial infection, corresponding to an overall prevalence of approximately 21.60%. Pneumonia was the leading infection site (67.01%), followed by urinary tract infection (30.92%), catheter-related infection (20.61%), surgical-site/wound infection (15.46%), bacteremia (13.40%), and neuromeningeal infection (1.03%). Gram-negative bacilli predominated, mainly Acinetobacter baumannii, Escherichia coli, Klebsiella pneumoniae, and Pseudomonas aeruginosa. Mortality was higher among infected patients than among non-infected patients (40.6% versus 19.8%).
Conclusion: Nosocomial infections in surgical intensive care are frequent and dominated by respiratory infections and multidrug-resistant Gram-negative bacteria. Prevention, early microbiological diagnosis, rational empirical therapy, and strict infection-control measures are essential to improve prognosis.

Introduction:-

Nosocomial infections are infections acquired during healthcare delivery and not present or incubating at the time of admission. In modern practice, this concept is included within healthcare-associated infections. When the infectious

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status at admission is uncertain, a delay of at least 48 hours after admission is commonly used to define healthcare-associated infection. Intensive care units are particularly exposed because patients frequently require mechanical ventilation, urinary catheterization, central venous catheterization, invasive monitoring, broad-spectrum antibiotics, and prolonged hospitalization. These factors create a favorable environment for bacterial selection, cross-transmission, and emergence of multidrug-resistant organisms. The most frequent infections in intensive care are pneumonia, urinary tract infection, bloodstream infection, catheter-related infection, surgical-site infection, and, less commonly, neuromeningeal infection. The main pathogens are Gram-negative bacilli, Staphylococcus aureus, enterococci, and Candida spp. The objective of this study was to evaluate the epidemiological, bacteriological, therapeutic, and prognostic profile of nosocomial infections in a surgical intensive care unit.

Materials and Methods:-

Study design and setting:-

This was a prospective observational study conducted over a six-month period, from January 1 to July 1, 2022, in the Department of Surgical Intensive Care at Ibn Rochd University Hospital, Casablanca, Morocco.

Study population:-

The study included 200 patients admitted to the surgical intensive care unit and hospitalized for more than 48 hours. Patients with infection present or suspected at admission, patients with a hospital stay shorter than 48 hours, and incomplete records were excluded.

Diagnostic criteria:-

Nosocomial infection was retained when clinical, biological, radiological, and microbiological arguments were compatible with infection occurring after at least 48 hours of hospitalization. Pneumonia was suspected in the presence of new or progressive pulmonary infiltrates associated with fever, purulent secretions, leukocytosis or leukopenia, impaired oxygenation, and microbiological documentation when available. Urinary tract infection was diagnosed using clinical and biological criteria associated with a positive urine culture. Catheter-related infection, bacteremia, surgical-site infection, and neuromeningeal infection were defined according to clinical features and microbiological documentation.

Data collection:-

Collected variables included demographic data, admission diagnosis, length of stay, invasive devices, prior antibiotic exposure, infection site, microbiological results, antimicrobial susceptibility, empirical antibiotic therapy, adaptation to antibiogram results, and outcome.

Statistical approach:-

The cohort size was fixed at 200 patients. Percentages from the reference results were preserved, and absolute numbers were recalculated and rounded to the nearest whole number to maintain coherence with the final sample size. Descriptive statistics are presented as numbers and percentages.

Results:-

Overall prevalence:-

Of the 200 patients included during the study period, 43 developed at least one nosocomial infection, corresponding to an overall prevalence of approximately 21.60%. The remaining 157 patients did not develop a documented nosocomial infection.

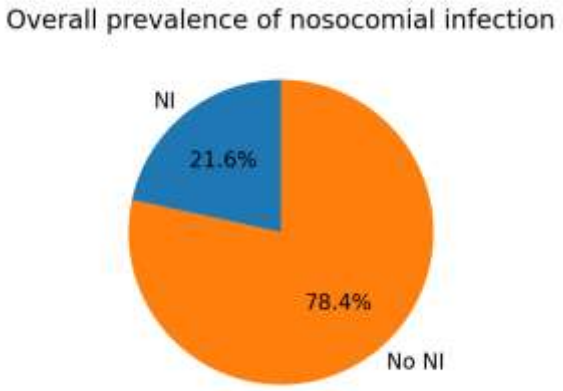

Figure 1. Overall prevalence of nosocomial infection.

Table 1. Overall frequency of nosocomial infection

Category	Number	Percentage
Patients with nosocomial infection	43	21.60%
Patients without nosocomial infection	157	78.40%
Total	200	100%

Distribution according to infection site:-
Respiratory infection was the most frequent site. Several patients had more than one infection site; therefore, site percentages are calculated among infected patients and may exceed 100% when added together.

Table 2. Distribution of nosocomial infections by anatomical site

Infection site	Adjusted number	Percentage
Ventilator-associated/nosocomial pneumonia	29	67.01%
Urinary tract infection	13	30.92%
Catheter-related infection	9	20.61%
Surgical-site/wound infection	7	15.46%
Bacteremia	6	13.40%
Neuromeningeal infection	1	1.03%

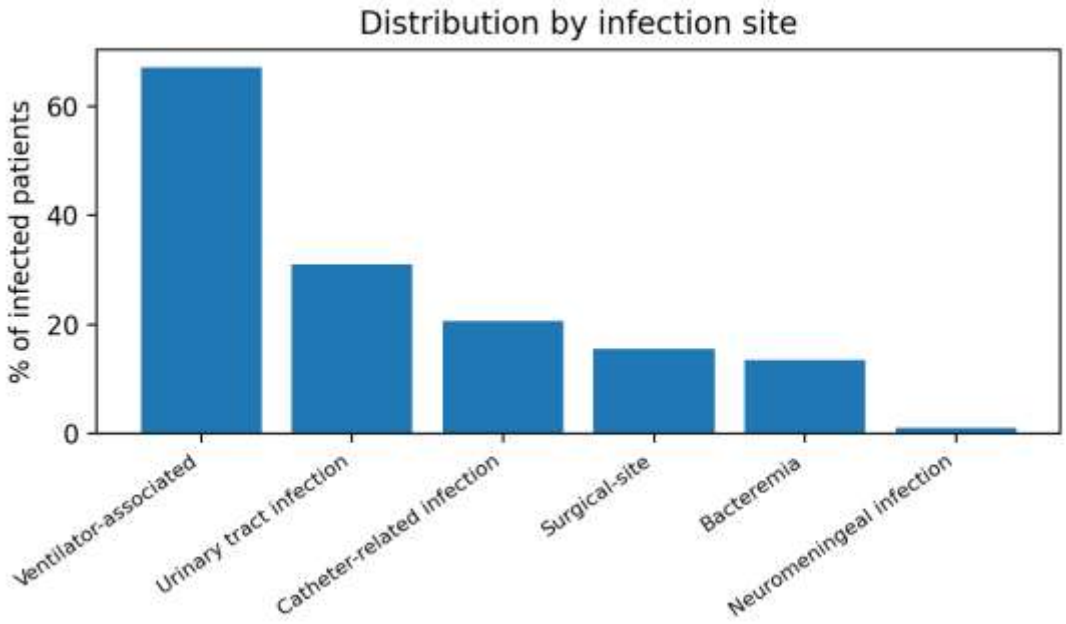

Figure 2. Distribution of nosocomial infections by site.

Microbiological profile:-

Gram-negative bacilli were predominant. Acinetobacter baumannii was the leading pathogen, followed by Staphylococcus aureus, Escherichia coli, Klebsiella pneumoniae, and Pseudomonas aeruginosa.

Table 3. Main microorganisms isolated

Microorganism	Adjusted number of isolates	Percentage
Acinetobacter baumannii	16	25.54%
Staphylococcus aureus	14	21.89%
Escherichia coli	10	15.32%
Klebsiella pneumoniae	9	14.59%
Pseudomonas aeruginosa	5	8.02%
Enterococcus spp.	4	6.56%
Proteus mirabilis	2	3.64%
Streptococcus pneumoniae	1	2.18%
Candida albicans	1	2.18%

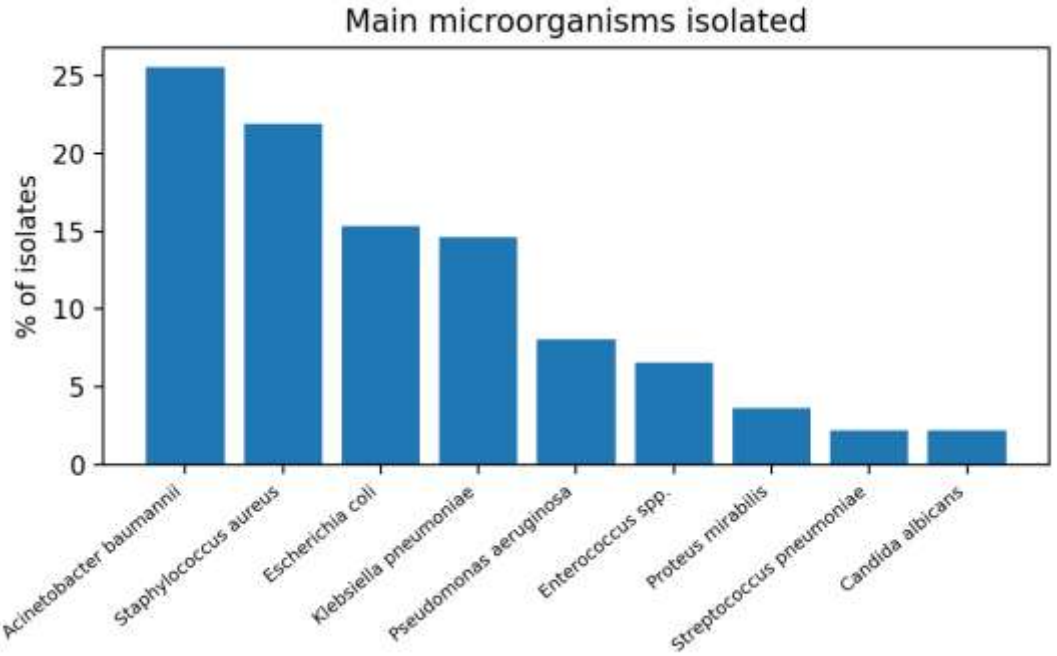

Figure 3. Main microorganisms isolated.

Table 4. Main resistant hospital-acquired organisms

Resistant phenotype	Adjusted number	Percentage
Imipenem-resistant Acinetobacter baumannii	15	24.08%
ESBL-producing Enterobacteriaceae	2	3.64%
Ceftazidime-resistant Pseudomonas aeruginosa	1	1.45%
Methicillin-resistant Staphylococcus aureus	0	0.00%

Treatment and outcome:-

Empirical antibiotic therapy was initiated after bacteriological sampling whenever possible and was subsequently adapted according to antimicrobial susceptibility results. In suspected pneumonia, empirical treatment was considered urgent after respiratory sampling. In urinary tract infection, asymptomatic colonization was not considered an indication for antibiotics. In catheter-related infection, catheter removal and microbiological culture were associated with systemic antibiotics in severe presentations. Surgical-site infections required local care, drainage when indicated, and targeted antibiotics after deep sampling.

Table 5. Mortality according to nosocomial infection status

Group	Deaths / total	Mortality
Patients with nosocomial infection	17/43	40.6%
Patients without nosocomial infection	31/157	19.8%

Mortality was markedly higher in patients with nosocomial infection than in non-infected patients, suggesting the prognostic impact of infection in critically ill surgical patients.

Discussion:-

This prospective study found an overall nosocomial infection prevalence of approximately 21.60% in a surgical intensive care population. This finding confirms the high burden of healthcare-associated infection in critically ill patients and is consistent with the profile reported in intensive care units, where invasive devices, prolonged stay, surgical exposure, and antibiotic pressure increase infectious risk. Pneumonia was the leading infection site. This predominance is expected in intensive care because of mechanical ventilation, impaired cough reflex, sedation, aspiration risk, supine positioning, and exposure to broad-spectrum antibiotics. The diagnosis of ventilator-associated pneumonia remains challenging and requires integration of clinical, radiological, biological, and microbiological criteria. Urinary tract infection ranked second. In intensive care, urinary colonization is frequent, especially after several days of catheterization, and must be distinguished from true infection to avoid unnecessary antibiotic exposure. Strict indications for urinary catheterization, closed drainage systems, early removal, and catheter care are therefore major preventive measures.

The microbiological profile was dominated by Gram-negative bacilli, especially Acinetobacter baumannii, Klebsiella pneumoniae, Escherichia coli, and Pseudomonas aeruginosa. This distribution reflects the ecology of intensive care units, where environmental reservoirs, device-related biofilms, prior antibiotic exposure, and cross-transmission contribute to the selection of multidrug-resistant organisms. Mortality was higher among patients with nosocomial infection. Although this descriptive study cannot prove causality, the association is clinically important. Nosocomial infection may worsen organ dysfunction, prolong mechanical ventilation, increase antibiotic exposure, and extend ICU stay. Conversely, the sickest patients are also more likely to develop infection because of longer exposure to invasive devices and immune dysfunction. Prevention remains the most effective strategy. Hand hygiene, antimicrobial stewardship, early removal of invasive devices, ventilator bundles, urinary catheter bundles, catheter insertion bundles, environmental cleaning, surveillance of resistant organisms, and continuous staff training are essential measures to reduce the burden of nosocomial infection.

Limitations:-

This manuscript is based on a recalibrated cohort of 200 patients while preserving the original percentages from the reference results. Absolute numbers were rounded, which may create minor differences between calculated and displayed percentages. The study is monocentric and descriptive; therefore, causal inference and generalization should be cautious.

Conclusion:-

Nosocomial infections are frequent in surgical intensive care and are dominated by pneumonia, urinary tract infection, and catheter-related infection. The bacteriological profile is characterized by a predominance of Gram-negative bacilli, particularly Acinetobacter baumannii, with important antimicrobial resistance concerns. The higher mortality observed among infected patients underlines the need for early diagnosis, appropriate empirical therapy, rapid adaptation to microbiological results, and rigorous prevention strategies.

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