

Nosocomial infections in the intensive care unit: Experience of the Avicenna Military Instruction Hospital

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Abstract

Nosocomial infections are a public health problem for patients, population, and health budgets.

This work is the result of a retrospective study of 840 patients hospitalized in the intensive care unit of the military hospital during 24 months from 01 January 2017 to 01 January 2019.

The purpose of this study is to evaluate the incidence of nosocomial infections, study its bacteriological profile and the therapeutic modalities.

The inclusion criteria were every patient hospitalized in the surgical intensive care unit for more than 48 hours and that has developed a nosocomial infection.

A total of nosocomial infected patients was found among 97 surveyed patients.

The overall prevalence of infected patients was 21, 60%. In our study the pneumonia is the first nosocomial infection (67,01%), followed by urinary tract infections (30,92%), catheter infection (20,61%), parietal infection (15,46%), bacteremia (13,40%) and meningitis (1,03%). The isolated germs are essentially the GNB (67.11%) with *Acinetobacter* in the first row (25,54%) *E. coli* (15,32%), *K. pneumoniae* (14, 59%) and *P. aeruginosa* (8, 02%).

GPC (30.63%) essentially *Staphylococcus aureus* = 21.89%

Polymicrobialism is present in 15.88% of nosocomial infections.

The particular bad prognosis of the intensive care unit patients implies an early diagnosis and good management of antibiotherapy and patient's environment.

Then, only prevention permits a significant reduction of morbidity infection and improve the prognosis.

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29 Introduction

30 Nosocomial infections, also called ⁷healthcare-associated infections (HAI), constitute a major
31 public health issue. They are ⁸contracted during or following hospitalization and were neither
32 present nor incubating at the time of admission. Their occurrence is particularly worrying in
33 ¹³intensive care units, where the severity of pathologies and the frequency of invasive procedures
34 considerably increase the risk of infection.

35 The study is part of this context and aims to evaluate the frequency, bacteriological profile,
36 antibiotic resistance, and impact of nosocomial infections within ¹the intensive care unit of the
37 Avicenna Military Hospital.

38 The objectives were to determine: (1) the frequency of nosocomial infections, (2) the germs
39 most often isolated, (3) their sensitivity profile to antibiotics, and (4) the main preventive
40 measures applicable in the Moroccan hospital ²context.
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45 Materials and Methods

46 This is a retrospective study of ²840 patients hospitalized in the intensive care unit of the
47 Avicenna military hospital in Marrakech over a period of two years, from January 1, 2017 to
48 January 1, 2019.

49 Among these patients, only those hospitalized for more than 48 hours were included (449
50 patients). Records were analyzed using SPSS 20.0 software to determine the frequency,
51 distribution and characteristics of infections.

52 The diagnostic criteria were based on clinical signs (fever, cough, dyspnea, etc.), biological
53 (elevation of white blood cells, CRP, procalcitonin), radiological and bacteriological (positive
54 culture depending on the infected site).

The main infections studied were: pneumonia, urinary infections, catheter-related infections, surgical site infections, bacteremia and meningitis.

Results

Of the 449 patients included, 97 developed a nosocomial infection, i.e. frequency of 21.6%. The prevalence was higher in men (16.03%) than in women (5.56%), and in patients aged over 40 years (15.36%).

The most affected pathologies were of neurosurgical and polytraumatic origin. The average length of stay was 10.75 days for infected patients, compared to 5.25 days for non-infected patients. The average time to onset of infection was 7.1 days.

The most frequently associated invasive devices were the gastric tube (61.8%), the urinary catheter (58.7%), and mechanical ventilation (56.7%).

Nosocomial pneumonia represented the majority of cases (67.0%), followed by urinary infections (30.9%), catheter infections (20.6%), parietal infections (15.4%), and bacteremia (13.4%).

The predominant germs were Gram-negative bacilli (67.1%), dominated by *Acinetobacter baumannii* (25.5%), *Escherichia coli* (15.3%) and *Klebsiella pneumoniae* (14.6%). Gram-positive Cocci represented 30.6%, dominated by *Staphylococcus aureus* (21.9%).

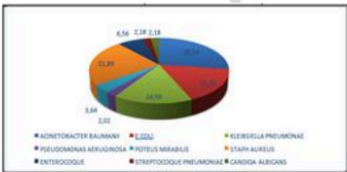


Figure 1: The main germs isolated in nosocomial infections

Germes	Nombre	Pourcentage(%)
Acinetobacter baumannii	35	25.54
Escherichia coli	21	15.32
Klebsiella pneumoniae	20	14.59
Pseudomonas aeruginosa	11	8.02
Proteus mirabilis	5	3.64
Staphylococcus aureus	30	21.89
Enterococcus	9	6.56
Streptococcus pneumoniae	3	2.18
Candida albicans	3	2.18

Figure 2: Table of the main germs isolated in nosocomial infections

Concerning bacterial resistance:

- Acinetobacter baumannii was resistant to imipenem in 100% of cases, to ciprofloxacin in 97%, and to amikacin in 83%.

- Staphylococcus aureus showed high resistance to penicillin (93%) but remained sensitive to glycopeptides (vancomycin and teicoplanin).

- Escherichia coli was resistant to amoxicillin (81%) and the amoxicillin-clavulanic acid combination (62%).

- Klebsiella pneumoniae was resistant in 75% of cases to 3rd generation cephalosporins.

These resistance profiles confirm the seriousness of the phenomenon of antibiotic resistance in Moroccan hospital environments.

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The mortality of infected patients was significantly higher than that of non-infected patients, highlighting the major clinical impact of nosocomial infections.

Discussion

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The results confirm that nosocomial infections constitute a major problem in intensive care, both in terms of their frequency and their consequences.

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Ventilator-acquired pneumonia (VAP) is the most feared infection, due to the duration of ventilation, prolonged intubation and intensive care stay. Urinary infection, often linked to bladder catheterization, and catheter infections complete this typical picture.

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The bacteriological profile observed at the Avicenna Military Hospital is similar to that described in other Moroccan and international intensive care units: predominance of multi-resistant Gram-negative bacilli, notably *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*.

The strong resistance to Imipenems and cephalosporins reflects the intensive and sometimes inappropriate use of antibiotics. The retained sensitivity to colistin underlines its role of last resort.

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The study also highlights the role of invasive devices as major risk factors. Prolonged use of probes and catheters promotes bacterial colonization and the formation of biofilms. Hygiene measures and aseptic protocols therefore appear essential. Finally, the average extension of stay of more than five days among infected patients illustrates the economic and organizational impact of these infections on hospital structures.

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129 Prevention

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131 The additional cost of nosocomial infections mainly results from prolonged stay, increased
132 consumption of antibiotics, and the need for additional care. Beyond the economic impact, they
133 represent a major cause of morbidity and avoidable mortality.

134 Prevention is based on several axes:

135 - Rigorous compliance with hand hygiene rules (hydroalcoholic solution).

136 - Continuous epidemiological surveillance and systematic reporting of cases.

137 - Rational use of invasive devices (minimum duration, strict asepsis).

138 - Training of healthcare personnel in the prevention of HAIs.

139 - Reasoned prescription of antibiotics and adaptation to the antibiogram.

140 The author underlines the importance of the culture of healthcare safety within medical and

141 paramedical teams.

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146 Conclusion

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148 This study highlights the high prevalence of nosocomial infections in the intensive care unit of
149 the Avicenna military hospital in Marrakech. The most common germs are dominated by multi-
150 resistant Gram-negative bacilli, mainly *Acinetobacter Baumannii*, *Escherichia coli* and *Klebsiella*
151 *pneumoniae*.

152 Growing resistance to antibiotics poses a serious threat to the care of critical patients.

A strict prevention policy, better hospital hygiene and rational use of antibiotics are essential to reduce this scourge.

Compliance with ethical standards:

Disclosure of conflict of interest

All the authors declare that they have no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study

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