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

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 dur 24 month 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 meningit(1,03%) The isolated germs are essentially the GNB (67.11%) with Acinetobacter in the first raw (25,54%)

E. coli (15,32) K. pnemonia(14, 59%) and P. aerogénosa (8, 02%)

GPC (30.63%) essentially StaphylococcusAureus=21.89%

Polymicrobism is present in 15.88% of nosocomial infections.

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

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

Introduction

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

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

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

Materials and Methods

This is a retrospective study of 840 patients hospitalized in the intensive care unit of the Avicenna military hospital in Marrakech over a period of two years, from January 1, 2017 to January 1, 2019.

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

The diagnostic criteria were based on clinical signs (fever, cough, dyspnea, etc.), biological (elevation of white blood cells, CRP, procalcitonin), radiological and bacteriological (positive 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. a 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%).

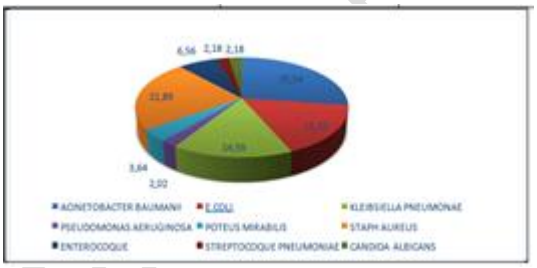

Figure 1: The main germs isolated in nosocomial infections

Germes	Nombre	Pourcentage(%)
Acinetobacter baumanii	35	25.54
Ecscherichia coli	21	15.32
Klebsiella pneumoniae	20	14.59
Pseudomanas aeruginosa	11	8.02
Proteus mirabilis	5	3.64
Staphylocoque aure ıs	30	21.89
Enterocoque	9	6.56
Streptocoque pneu ıoniae	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.

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

Discussion

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

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.

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.

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.

Prevention

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

Prevention is based on several axes:

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

- Continuous epidemiological surveillance and systematic reporting of cases.

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

- Training of healthcare personnel in the prevention of HAIs.

- Reasoned prescription of antibiotics and adaptation to the antibiogram.

The author underlines the importance of the culture of healthcare safety within medical and paramedical teams.

Conclusion

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

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

Bibliography:

1. Raisin.
a national program early warning investigation and surveillance ofhealthcare associated infection in France.
s.l. : Descenlos JC.RAISIN working group.eurosurveil, 2009 ;. 14(46)pii:19408.

2. Kaoutar B, july C,l'Herite au F,Barbut F,Robert J,Denis M,et al.
Nosocomial infections and hospital mortality:a multicenter epidemiology study. J Hosp infect. 2004 ;. 58:268-75.

3. Abesaid D, Read I,Umphrey J et al.
infusion therapy team and dressing changes of central venous catheters. s.l. : infect control Hosp Epidemiol, 1999 ;. 20:101-105.

4. William, Schaffner.
Les infections nosocomiales.
s.l. : CECIL Traité de médecine interne, 1ère édition française. ch : 267. P 1548-1555.

5. Garner JS, Jarvis WR, Emori TG, Horan TC, Hughes JM. CDC definitions for Nosocomial infections, 1988. s.l. : Am J Infect Control, 1988 ;. 16(3):128-140.

6. Guidelines for the management of adults with hospital-acquired,ventilator-associated, and healthcare-associated pneumonia. s.l. : Am J Respir Crit Care Med, 2005. 171:388-416.

7. Cohen J, Brun-Buisson C, Torres A, Jorgensen J. Diagnosis of infection in sepsis : an evidence-based review. s.l. : Crit Care Med, 2004 ;. 32: S466-S494.

8. Marcowicz P, Wolff M, Djedaini K, Cohen Y, Chastre J, Delclaux C, Merrer J,Herman b, Veber B, Fontaine A, Dreyfuss D. Multicenter prospective study of ventilator-associated pneumonia during acute respiratory distress syndrome.Incidence, prognosis, and risk factors. s.l. : ARDS Study Group. Am J Respir Crit Care Med, 2000. 161:1942-8.

9. Iregui M, Ward S, Sherman G, Fraser VJ, Kollef MH. Clinical importance of delays in the initiation of appropriate antibiotic treatment for ventilator-associated pneumonia. s.l. : Chest, 2002. 122:262-8.

10. Fagon JY, Chastre J, Wolff M, Gervais C, Parer-Aubas S, Stephan F, Simi-lowski T, Mercat A, Diehl JL, Sollet JP, Tenaillon A. Invasive and noninvasive strategies for management of suspected ventilator-associated pneumonia. Arandomized trial. s.l. : Ann Intern Med, 2000. 132:621-30

11. Torres A, el -Ebiary M, Padro L, Gonzalez J, de la Bellacasa JP, Ramirez J, Xaubet A, Ferrer M, Rodriguez-Roisin R. validation of different techniques for the diagnosis of ventilator-associated pneumonia. Comparison with immediate post mortem pulmonary biopsy. s.l. : Am J RespirCrit Care Med, 1994 ;. 149:324-31.

12. RG, Wunderink. Radiologic diagnosis of ventilator-associated pneumonia. s.l. : Chest, 2000. 117:188 S-190 S-136.

13. Fabregas N, Ewig S, Torres A, El Ebiary M, Ramirez J, de La Bellacasa JP, Bauer T,Cabello H. Clinical diagnosis of ventilator associated pneumonia revi-

sited:comparative validation using immediate post mortem lung biopsies. s.l. : Thorax, 1999;. 54:867-73.

14. Timsit JF, Cheval C, Gachot B, Bruneel F, Wolff M, Carlet J, Regnier B. Usefulness of a strategy base don bronchoscopy with direct examination of bronchoalveolar lavage fluid in the initial antibiotic therapy of suspected ventilator – associated pneumonia. . s.l. : Intensive Care Med, 2001;. 27:640-7.

15. Wermert D, Marquette CH, Copin MC, Wallet F, Fraticelli A, Ramon P, Tonnel AB. Influence of pulmonary bacteriology and histology on the yield of diagnostic procedures in ventilator- acquired pneumonia. s.l. : Am J Respir Crit Care Med, 1998;. 158:139-47.

16. Baker AM, Bowton DL, Haponik EF. Decision making in nosocomial pneumonia.An analytic approach to the interpretation of quantitative bronchoscopic cultures. s.l. : Chest, 1995;. 107: 85-95.

17. Souweine B, Veber B, Bedos JP, Gachot B, Dombret MC, Regnier B, Wolff M. diagnoctic accuracy of protected specimen brush and bronchoalveolar lavage in nosocomial pneumonia: impact of previous antimicrobial treatments. s.l. : Crit Care Med, 1988. 26:236-44.

18. Bouchon A, Facchetti F, Weigand MA, Colonna M. TREM-1 amplifies inflammation and is a crucial mediator of septic shock. s.l. : Nature, 2001;. 410:1103-7.

19. Gibot S, Cravoisy A, Levy B, Bene MC, Faure G, Bollaert PE. Soluble triggering receptor expressed on myeloid cells and the diagnosis of pneumonia. s.l. : N Engl J Med, 2004;. 350:451-8.

20. Luyt CE, Guérin V, Combes A, Trouillet JL, Ayed SB, Bernard M,Gibert C, Chastre J. Procalcitonin Kinetics as a prognostic marker of ventilated associated pneumonia . s.l. : Am J Respir Crit Care Med, 2005;. 171:48-53.

21. Gauzit R, Lepape A, Moine P.

Infections urinaires nosocomiales en réanimation: A propos de la Conférence de consensus du 27 Novembre 2002.
s.l. : Annales Françaises d'Anesthésie et de Réanimation, 2004 ;. 23 : 3-5.

22. Crowe MJ, Cooke EM.
Review of case definitions for nosocomial infection towards a consensus.
s.l. : Presentation by the Nosocomial infection Surveillance Unit (NISU) to the hospital infection liaison group, subcommittee of the federation of infection societies (FIS).J Hosp infect, 1998. 39: 3-11.

23. Garner JS, JaRVIS WR, Emori TG, Horan TC, Hughes JM. CDC definitions for nosocomial infections.
s.l. : Am J Infect Control, 1988. 16 : 128-40.

24. Définitions Standardisées des infections nosocomiales.
s.l. : C-CLIN Paris-Nord, 1999.

25. Edmond MB, Wallance SE, McClish DK, Pfaller MA, Jones RN, Wenzel RP.
Nosocomial bloodstream infections in US hospitals : A 3 year analysis. s.l. : Clin Infect Dis, 1999. 29: 239-44.