SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 9 | Issue: 12 | December 2024 Peer Reviewed Journal

COMPARISON OF CLINICAL CHARACTERISTICS OF STAPHYLOCOCCUS AUREUS INFECTION IN ELDERLY AND YOUNGER ADULT PATIENTS IN KURDISTAN REGION. IRAQ

Hassan Muhsen Hassan[1], Muslim Abbas Allu[2]
[1]General and Laparoscopic Surgeon, FIBMS, College of Medicine, University of Dohuk,
[2]Nursing Department, Technical Institute of Zakho/ Duhok,University of Duhok Polytechnic

Article DOI: https://doi.org/10.36713/epra19564
DOI No: 10.36713/epra19564

ABSTRACT

The study aimed to determine the clinical characteristics and outcomes of Staphylococcus aureus infections are different in elderly patients as compared with younger adults, the study started from January 2021 to December 2022, the samples were collected from male and female patient of 2 hospitals in Zakho and Duhok cities, were stratified into two groups by age, those 60 years or older were considered 'elderly' and those aged 15 to 59 years were defined as a younger '. Of 481 patients with an S. aureus infection. 249 (51.67) were classified as younger, while incidence rates of elderly patients were 232 (48.33). Pneumonia was the most common S. aureus infection in the younger group and skin and soft tissue infection, bacteremia infection, Bone and joint infection, Surgical site infection and endocarditis infection was the most common in the younger group comparative with the elderly group, Old age (60 years) was confirmed to be a strong independent risk factor for death in the entire study population after adjustment for confounding variables. And the clinical Characteristics in elderly and younger patients with Staphylococcus aureus infection. was incidence most common in the younger group comparative with the elderly group rates.

KEYWORDS: *Staphylococcus aureus Aged. Infection, outcomes, Clinical characteristics.*

INTRODUCTION

Staphylococcus aureus is both a commensal bacterium and a human pathogen. Approximately 30% of the human population is colonized with *S. aureus* (1). Simultaneously, it is a leading cause of bacteremia and infective endocarditis (IE) as well as osteoarticular, skin and soft tissue, pleuropulmonary, and device-related infections. We do not address in any significant depth issues regarding colonization or mechanisms of drug resistance and refer readers to recent reviews (1 – 6).

Elderly population is increasing in the developed world, both in terms of absolute numbers and proportion of the entire population. In the UK, from 1982 to 2002, life expectancy at the age of 80 increased from 5.8 years to 7.2 years in men and from 7.5 to 8.7 years in women. Trends are similar in other countries where elderlies represent more than 10% of ICU admissions (1-3). Infection, either as a cause of admission to intensive care units (ICU) or as complication during the ICU stay, represents a major health-care issue. It is estimated that elderly adults account for 60% of all ICU days, indicating a prolonged and frequently complicated length of stay (LOS) in an environment with increased rates of nosocomial infections owing to the severity of illness, multiplicity of invasive procedures and complexity of antibiotic and non-antibiotic treatments (3-6). Large epidemiological studies on outcomes of elderly adults after ICU admission are limited. Most data derive from small reports usually from single centers, describing a particular infection or syndrome, while few studies are available on ICU acquired infections (7-14). The most frequent infections in the ICU are respiratory infections, followed by urinary tract (UTIs) and bloodstream infections (BSIs) including catheter related infections (CRIs) (15,16). The definition of elderly patient is a matter of debate. The adult of 65 years old is considered elderly due to insurance reasons. However, aging is a continuous and host-specific process, therefore the subgroups of 65–74 (young-old elderlies), 75–84 (old elderlies) and >85 (old-old or oldest old elderlies) have been used (4,17,18) Over the past three decades, the incidence of S. aureus infections has increased and methicillin resistance among S. aureus isolates has been a growing problem. (6,7) With the continuing increase in the annual incidence of S. aureus bacteremia across all age groups and the continuing increase in the elderly population,

staphylococcus aureus infections have become significant causes of morbidity and mortality in older patients. (19,20,21) Older persons generally have greater susceptibility to infections than younger adults (.22). Urinary tract infections, pneumonia, skin and soft tissue infections, intra-abdominal infections, infective endocarditis, bacterial meningitis, tuberculosis, and herpes zoster appear to have a special predilection for elderly individuals.(22,23) Probably because of the increased prevalence of chronic diseases in older individuals, bacteremia illnesses appear to be more frequent and more often associated with death.(23,24) Despite the clinical significance and increasing frequency of S. aureus bacteremia in older adults, only few studies of S. aureus bacteremia in older adults have been published.(25) In addition, although it is well established that many infections are both more frequent and more

SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 9 | Issue: 12 | December 2024 Peer Reviewed Journal

often associated with mortality in older individuals, comprehensive studies focusing on elderly patients with S. aureus infection, not just bacteremia cases, are still limited.

staphylococcus aureus is the second most common etiological agent of nosocomial bloodstream infections after coagulase-negative *Staphylococcus. S. aureus* was responsible for 20.2% of the 24,179 cases of nosocomial bloodstream infections included in the SCOPE project, yielding an incidence rate of 10.3 cases of bacteremia per each 10,000 admissions. *S. aureus* bacteremia can become complicated and progress to metastatic infection, recurrence, severe sepsis, septic shock, and death. The mortality rate associated with *S. aureus* bacteremia (11–43%) has not varied over the last few decades. Six to 12% of cases present recurrence and up to 31% of patients may present metastatic infection(26-35).

Staphylococcus aureus is also reported to be the second most common cause of bloodstream infection after coagulase-negative *Staphylococcus* in patients with neoplastic disease(36). Among the oncological patients seen at Institute Nacional de Cancerology (INC) during 2002, 57% of the 261 episodes of bloodstream infections were Gram-positive, and *S. aureus* was the main microorganism isolated (31% of all isolates)(37)Similar data were reported by Carney et al at the beginning of the 1980s in the oncology unit of the Veterans Administration Medical Center in Washington, DC, where *S. aureus* was the main causative agent of bloodstream infection (responsible for 23% of all cases) (38).However, more recent reports in developed countries have shown a lower prevalence of *S. aureus* bacteremia: 13% in 1998 and 8% in 2004 (39-45).

The risk factors predicting complications and mortality in patients with *S. aureus* bacteremia have been extensively described over the last few decades; however, the related information regarding cancer patients is scarce (46-52). The aim of the present study was to determine the mortality-predicting risk factors of *S. aureus* bacteremia in cancer patients.

The purpose of this study was to more clearly determine whether the clinical features and outcomes of S. aureus infections are different in elderly patients as compared with younger adults.

MATERIALS AND METHOD

Study of S. aureus infections started from January 2021 to December 2022, the samples were collected from male and female patient of 2 hospitals in Zakho and Duhok, to determine clinical features and outcomes of S. aureus infection in relation age. to showed the difference between to elderly and younger adults. were stratified into two groups by age: those aged 60 years or older were considered ‘elderly’ and those aged 15 to 59 years were defined as ‘younger’. based on the time the culture samples were obtained. We compared data of the elderly group with those of the younger group. All patients were evaluated using a structured case record form. The following information was collected from cases: baseline demographic information, underlying diseases (pulmonary disease, neoplastic disease, liver disease, heart disease, neurologic disease, renal disease, and diabetes S. aureus infection was defined by the isolation of S. aureus from a normally sterile body site (e.g., blood, cerebrospinal fluid, pleural or peritoneal fluid, aseptically obtained deep-tissue aspirates, or surgical tissue samples). S. aureus pneumonia was diagnosed if patients fulfilled the clinical and radiological criteria of pneumonia. and S. aureus was isolated from adequate lower respiratory mellitus. infection was also classified as primary bacteremia. The type of infection was determined by physicians on the basis of the isolation of S. aureus from the presumed portal of entry and clinical evaluation

Statistical Analyses

The ratios and were calculated., and $p < 0.05$ was considered statistically significant. The software package was used for statistical analyses.

RESULTS

A total of 481 patients with S. aureus infection were included in the study. Of these, 249 patients (51.67%) whose age was 60 years or older were classified as the elderly group, and the remaining 232 (48.33) patients constituted the younger group. the younger group was incidences rate (percentage) of Pulmonary disease, Cardiovascular disease, Neurologic disease, Neoplastic disease, Liver and renal disease and Diabetes mellitus was higher comparative with the elderly group (Table 1).

Clinical Characteristics	Younger	%.	Elderly	%.
Pulmonary disease	38	15.26	36	15.52
Cardiovascular disease	43	17.27	40	17.24
Neurologic disease	41	16.46	39	16.82
Neoplastic disease	32	12.86	29	12.50
Liver disease	23	9.24	21	9.05
Renal disease	23	9.24	22	9.48

SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 9 | Issue: 12 | December 2024 Peer Reviewed Journal

Diabetes mellitus	49	19.67	45	19.39
Total	249(51.67)	100	232(48.33)	100

The most common diseases (bacteremia, Skin and soft tissue, Bone and joint infection, Surgical site infection, Endocarditis, pneumonia, Urinary tract infection) incidence rate in younger group was high comparative with elderly group was low rate (all $p < 0.05$) (Table 2).

Table 2: Comparison of type of infection in elderly versus younger patients with *Staphylococcus aureus* infection.

Type of Infection	Younger	%.	Elderly	%.
Primary bacteremia	32	12.86	31	13.36
Skin and soft tissue infection	34	13.66	32	13.79
Bone and joint infection	31	12.45	28	12.09
Surgical site infection	11	4.42	10	4.31
Endocarditis	19	7.63	17	7.32
Pneumonia	45	18.07	43	18.53
Urinary tract infection	34	13.65	31	13.36
Concomitant bacteremia	43	17.26	40	17.24
Total	249	100	232	100

DISCUSSION

This study has provided a comprehensive evaluation of the clinical characteristics of younger patients with S. aureus infection, as well as those with S. aureus bacteremia. It appears that younger patients with S. aureus infection indeed have distinctive features when compared with elderly, and that younger patients have higher overall mortality than elderly patients. The presence of co-morbid conditions in elderly populations has been identified as a better predictor of impaired immunity than chronological age. (54,55) No statistically significant differences between the elderly and younger populations with regard to the clinical characteristics of patients with S. aureus.

However, even after adjustment for co-morbid conditions, our data showed that old age was one of the independent factors associated with increased mortality in patients with S. aureus infection. have also shown that younger patients have a greater risk of death with S. aureus bacteremia;(56). the types of infection with a poor outcome, were more common in the younger group than in the elderly group. such as lung and primary bacteremia, are associated with higher mortality in S. aureus bacteremia. (36).

The higher proportion of bacteremia and pneumonia in the elderly group could have influenced the mortality rate, because these infections have been found to be independent predictors of mortality in S. aureus infection.(36,53) Although the major focus in infectious diseases has been on young adults with infection or immunocompromised hosts, the vast majority of serious infectious diseases will be seen in the elderly population.(27) Therefore, clinicians who care for adult patients should become familiar with the clinical problems in the elderly population. We believe that providing data and information on some of the unique aspects of aging and S. aureus infection.

The presence of co-morbid conditions or severity of underlying illness is clearly a determinant of the mortality in patients with bacterial infections. Second, we were unable to obtain detailed information regarding the appropriateness of antimicrobial therapy for many cases. Consequently, we were unable to fully assess whether inappropriate antimicrobial therapy, which might be one of the risk factors for mortality, was more frequent in the elderly group. In addition, we did not study the effect of different available options for S. aureus infection on mortality. Third, we may have incorrectly identified the type of infection or have failed to identify metastatic infections in several cases, despite the prospective design of this study. However, these limitations would likely affect elderly and younger patients equally. Fourth, in our study a catheter-related bloodstream infection was classified as primary bacteremia, since the differentiation of catheter-related bloodstream infections from primary bacteremia is frequently difficult in clinical practice. However, there is a clear difference in management and outcomes for bacteremia with and without a removable focus

CONCLUSION,

our study showed that younger patients currently account for a major proportion comparative with elderly patients with S. aureus infection. and the clinical features of younger patients with S. aureus infection differed substantially from those of elderly patients in terms of underlying diseases, and type of infection. We also confirmed that S. aureus infection in the elderly population is a serious clinical condition, in which the mortality rate is more than twice that in younger patients.

SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 9 | Issue: 12 | December 2024 Peer Reviewed Journal

REFERENCES

1. *Wertheim HF, Melles DC, Vos MC, van Leeuwen W, van Belkum A, Verbrugh HA, Nouwen JL. 2005. The role of nasal carriage in Staphylococcus aureus infections. Lancet Infect Dis 5:751–762.*
2. *Coates R, Moran J, Horsburgh MJ. 2014. Staphylococci: colonizers and pathogens of human skin. Future Microbiol 9:75–91.*
3. *Verhoeven PO, Gagnaire J, Botelho-Nevers E, Grattard F, Carricajo A, Lucht F, Pozzetto B, Berthelot P. 2014. Detection and clinical relevance of Staphylococcus aureus nasal carriage: an update. Expert Rev Anti Infect Ther 12:75–89.*
4. *Stryjewski ME, Corey GR. 2014. Methicillin-resistant Staphylococcus aureus: an evolving pathogen. Clin Infect Dis 58(Suppl 1): S10–S19.*
5. *Malachowa N, DeLeo FR. 2010. Mobile genetic elements of Staphylococcus aureus. Cell Mol Life Sci 67:3057–3071.*
6. *Howden BP, Davies JK, Johnson PD, Stinear TP, Grayson ML. 2010. Reduced vancomycin susceptibility in Staphylococcus aureus, including vancomycin-intermediate and heterogeneous vancomycin-intermediate strains: resistance mechanisms, laboratory detection, and clinical implications. Clin Microbiol Rev 23:99–139.*
7. *Gastrell J. Annual update: Mortality statistics 2001: General. Health Stat Q 2004.67-9de Rooij SE., Abu-Hanna A, Levi M, et al. Factors that predict outcome of intensive care treatment in very elderly patients: A review. Crit Care 2005;9: R307-14.*
8. *Garrouste-Orgeas M, Timsit JF, Montuclard L, et al. Decision-making process, outcome, and 1-year quality of life of patients over 80 years referred for intensive care unit admission. Intensive Care Med 2006;32: e1045-51*
9. *Castillo-Lorente E, Rivera-Fernandez R, Vazquez-Mata G. Limitation of therapeutic activity in elderly critically ill patients. Project for the Epidemiological Analysis of Critical Care Patients. Crit Care Med 1997; 25:1643-8.*
10. *Groeger JS, Guntupalli KK, Strosberg M, et al. Descriptive analysis of critical care units in the United States: Patient characteristics and intensive care unit utilization. Crit Care Med 1993; 21:279-91*
11. *Marik PE. Management of the critically ill geriatric patient. Crit Care Med 2006;34: S176-82. Gavazzi G, Krause KH. Ageing and infection. Lancet Infect Dis 2002; 2:659-66. Smith PW. Nosocomial infections in the elderly. Infect Dis Clin North Am 1989; 3:763-77.*
12. *Saviteer SM, Samsa GP, Rutala WA. Nosocomial infections in the elderly. Increased risk per hospital day. Am J Med 1988; 84:661-6.*
13. *Sligl WI, Eurich DT, Marrie TJ, et al. Age still matters: Prognosticating short- and long-term mortality for critically ill patients with pneumonia. Crit Care Med 2010; 38:2126-32.*
14. *Rello J, Rodriguez R, Jubert P, et al. Severe community-acquired pneumonia in the elderly: Epidemiology and prognosis. Study Group for Severe Community-Acquired Pneumonia. Clin Infect Dis 1996; 23:723-8.*
15. *Blot S, Cankurtaran M, Petrovic M, et al. Epidemiology and outcome of nosocomial bloodstream infection in elderly critically ill patients: A comparison between middle-aged, old, and very old patients. Crit Care Med 2009; 37:1634-41.*
16. *Stéphan F, Cheffi A, Bonnet F. Nosocomial infections and outcome of critically ill elderly patients after surgery. Anesthesiology 2001; 94:407-14.*
17. *Avci M, Ozgenc O, Coskuner SA, et al. Hospital acquired infections (HAI) in the elderly:Comparison with the younger patients. Arch Gerontol Geriatr 2012; 54:247-50.*
18. *Martin GS, Mannino DM, Moss M. The effect of age on the development and outcome of adult sepsis. Crit Care Med 2006; 34:15-21.*
19. *Rowe T, Araujo KL, Van Ness PH, et al. Outcomes of older adults with sepsis at admission to an intensive care unit. Open Forum Infect Dis 2016;3: ofw010.*
20. *McLean RF, McIntosh JD, Kung GY, et al. Outcome of respiratory intensive care for the elderly. Crit Care Med 1985; 13:625-9.*
21. *Angus DC, Linde-Zwirble WT, Lidicker J, et al. Epidemiology of severe sepsis in the United States: analysis of incidence, outcome, and associated costs of care. Crit Care Med 2001; 29:1303-10.*
22. *Klevens RM, Morrison MA, Nadle J, Petit S, Gershman K, Ray S, et al. Invasive methicillin-resistant Staphylococcus aureus infections in the United States. JAMA 2007; 298:1763–71.*
23. *Wang JL, Chen SY, Wang JT, Wu GH, Chiang WC, Hsueh PR, et al. Comparison of both clinical features and mortality risk associated with bacteremia due to community-acquired methicillin-resistant Staphylococcus aureus and methicillin-susceptible S. aureus. Clin Infect Dis 2008; 46:799–806.*
24. *Bader MS. Staphylococcus aureus bacteremia in older adults: predictors of 7-day mortality and infection with a methicillin-resistant strain. Infect Control Hosp Epidemiol 2006; 27:1219–25.*
25. *Gavazzi G, Mallaret MR, Couturier P, Iffenecker A, Franco A. Bloodstream infection: differences between young-old, old, and old-old patients. J Am Geriatr Soc 2002; 50:1667–73.*
26. *Lyytikainen O, Ruotsalainen E, Jarvinen A, Valtonen V, Ruutu P. Trends and outcome of nosocomial and community-acquired bloodstream infections due to Staphylococcus aureus in Finland, 1995–2001. Eur J Clin Microbiol Infect Dis 2005; 24:399–404*
27. *Yoshikawa TT. Epidemiology and unique aspects of aging and infectious diseases. Clin Infect Dis 2000; 30:931–3.*
28. *Crossley KB, Peterson PK. Infections in the elderly. In: Mandell GL, Bennett JE, Dolin R, editors. Principles and practice of infectious diseases. 6th ed., Philadelphia, PA: Elsevier Inc; 2005. p. 3517–24.*
29. *McBean M, Rajamani S. Increasing rates of hospitalization due to septicemia in the US elderly population, 1986–1997. J Infect Dis 2001; 183:596–603.*
30. *Big C, Malani PN. Staphylococcus aureus bloodstream infections in older adults: clinical outcomes and risk factors for in-hospital mortality. J Am Geriatr Soc 2010; 58:300–5. 15. Song JH, Hsueh PR, Ko KS, Kang C.*
31. *H. Wisplinghoff, T. Bischoff, S.M. Tallent, H. Seifert, R.P. Wenzel, M.B. Edmond. Nosocomial bloodstream infections in US hospitals: analysis of 24179 cases from a prospective nationwide surveillance study. Clin Infect Dis, 39 (2004), pp. 309-317*
32. *F.D. Lowy. Staphylococcus aureus infections. N Eng J Med, 339 (1998), pp. 520-532*

SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 9 | Issue: 12 | December 2024 Peer Reviewed Journal

33. A.G. Jensen, C.H. Wachmann, F. Espersen, J. Scheibel, P. Skinhoj, N. Frimodt-Moller. Treatment and outcome of Staphylococcus aureus bacteremia. A prospective study of 278 cases. Arch Intern Med, 162 (2002), pp. 25-32
34. A.K. Gopal, V.G. Fowler, M. Shah, D. Gesty-Palmer, K.A. Marr, R.S. MacClelland, et al. Prospective analysis of Staphylococcus aureus in non-neutropenic adults with malignancy J Clin Oncol, 18 (2000), pp. 1110-1115.
35. P.C. Hill, M. Birch, S. Chambers, D. Drinkovic, R.B. Ellis-Pegler, R. Everts, et al. Prospective study of 424 cases of Staphylococcus aureus bacteremia: determination of factors affecting incidence and mortality. Intern Med J, 31 (2001), pp. 97-103
36. R.S. MacClelland, V.G. Fowler, L.L. Sanders, G. Gottlieb, L.K. Kong, D.J. Sexton, et al. Staphylococcus aureus bacteremia among elderly vs younger adult patients. Comparison of clinical features and morality. Arch Intern Med, 159 (1999), pp. 1244-1247
37. O. Lesens, C. Methlin, Y. Hansmann, V. Remy, M. Martinot, C. Bergin, et al. Role of comorbidity in mortality related to Staphylococcus aureus bacteriemia: a prospective study using the Charlson weighted index of comorbidity. Infect Control Hosp Epidemiol, 24 (2003), pp. 890-896
38. M. Rubio, J. Romero, O. Corral, V. Roca, J. Picazo. Bacteriemia por Staphylococcus aureus: análisis de 311 episodios. Enferm Infect Microbiol Clin, 17 (1999), pp. 56-64
39. S.E. Cosgrove, Y. Qi, K.S. Kaye, S. Harbarth, A.W. Karchmer, Y. Carmeli. The impact of methicillin resistance in Staphyloccocus aureus bacteremia on patient outcomes: mortality, length of stay and hospital charges. Infect Control Hosp Epidemiol, 26 (2005), pp. 166-174
40. Osmon, S. Ward, V. Fraser, M. Kollef. Hospital mortality for patients with bacteremia due to Staphylococcus aureus or Pseudomonas aeruginosa. Chest, 125 (2004), pp. 607-616
41. A.I. Hartstein, M.E. Mulligan, V.H. Morthland, R.Y. Kwok. Recurrent Staphylococcus aureus bacteremia. J Clin Microbiol, 30 (1992), pp. 670-674
42. F.Y. Chang, J.E. Peacock, D.M. Musher, P. Triplett, B.B. MacDonald, J.M. Mylotte, et al. Staphylococcus aureus bacteremia. Recurrence and the impact of antibiotic treatment in a prospective multicenter study. Medicine, 82 (2003), pp. 333-339
43. C.C. Blyth, H. Darragh, A. Whelan, J.P. O'Shea, M.H. Beaman, J.S. McCarthy. Evaluation of clinical guidelines for management of Staphylococcus aureus Bactereaemia. Intern Med J, 32 (2002), pp. 224-232
44. G. Fatkenheuer, O. Cornely, H. Seifert. Clinical management of catheter-related infections. Clin Microbiol Infect, 8 (2002), pp. 545-550
45. H. Wisplinghoff, H. Seifert, R.P. Wenzel, M.B. Edmond. Current trend in the epidemiology of nosocomial bloodstream infections in patients with hematological malignancies and solid neoplasms in a hospital in the United States. Clin Infect Dis, 36 (2003), pp. 1103-1110
46. Botero CP. Mortalidad y factores asociados en los pacientes con cáncer y bacteriemia del Instituto Nacional de Cancerologia, Bogota Colombia, durante el año 2002. Thesis. Universidad Nacional de Colombia, Bogota, 2005.
47. D.N. Carney, B.E. Fossieck, R.H. Parker, J.D. Minna. Bacteremia due to Staphylococcus aureus in patients with cancer: report on 45 cases in adults and review of the literature. Rev Infect Dis, 4 (1982), pp. 1-12
48. A. Safdar, G.H. Rodriguez, M. Balakrishnan, J.J. Tarrand, K.V. Rolston Changing trends in etiology of bacteremia in patients with cancerEur J Clin Microbiol Infect Dis, 25 (2006), pp. 522-526
49. E. González-Barca, A. Fernández-Sevilla, J. Carratalá, A. Salar, J. Peris, A. Grañeda, et al. Prognostic factors influencing mortality in cancer patients with neutropenia and bacteremia. Eur J Clin Microbiol Infect Dis, 18 (1999), pp. 539-544
50. E. González-Barca, J. Carratalà, A. Mykietiuk, A. Fernández-Sevilla, F. Gudiol. Predisposing factors and outcome of Staphylococcus aureus bacteremia in neutropenic patients with cancer. Eur J Clin Microbiol Infect Dis, 20 (2001), pp. 117-119
51. H. Wisplinghoff, O.A. Cornely, S. Moser, U. Bethe, H. Stützer, B. Salzberger, et al. Outcomes of nosocomial bloodstream infections in adult neutropenic patients: a prospective cohort and matched case–control study. Infect Control Hosp Epidemiol, 24 (2003), pp. 905-911
52. M. Venditti, M. Falcone, A. Micozzi, P. Carfagna, F. Taglietti, P.F. Serra, et al. Staphylococcus aureus bacteremia in patients with hematological malignancies: a retrospective case–control study. Haematol/J Hematol, 88 (2003), pp. 923-930
53. Kim SH, Park WB, Lee KD, Kang CI, Kim HB, Oh MD, et al. Outcome of Staphylococcus aureus bacteremia in patients with eradicable foci versus noneradicable foci. Clin Infect Dis 2003; 37:794–9.
54. Laupland KB, Church DL, Mucenski M, Sutherland LR, Davies HD. Populationbased study of the epidemiology of and the risk factors for invasive Staphylococcus aureus infections. J Infect Dis 2003; 187:1452–9.
55. Blair JE, Mayer AP, Currier J, Files JA, Wu Q. Coccidioidomycosis in elderly persons. Clin Infect Dis 2008; 47:1513–8.
Castle SC, Uyemura K, Rafi A, Akande O, Makinodan T. Comorbidity is a better predictor of impaired immunity than chronological age in older adults. J Am Geriatr Soc 2005; 53:1565–9.