AMERICAN JOURNAL OF PHARMTECH RESEARCH

Prevalence of Intensive Care Unit-Acquired Infections in different Hospitals in Khartoum State-Sudan.

Tarig Osman
National university- Sudan

ABSTRACT

Hospital-acquired infection is a serious problem in the ICU. Infection in ICU is associated with increased mortality, morbidity and carries a substantial economic burden. This study was carried out to explore the current situation regarding the prevalence of ICU acquired infections, along with the distribution of different types of infection in different governmental hospitals in Khartoum state. This is a prospective observational cross-sectional ICU-based study. The study was conducted in intensive care units of nine governmental hospitals in Khartoum state, during the period from August 2016 to March 2017. 1230 patients were enrolled in the study. Data collected using a predesigned data collection sheet. Then data were analysed using SPSS version 21. The majority (54%) of the patient population fell in age above 46 years. Males outnumbered females. 652 (53%) patients have developed an infection during ICU stay, at least two days after ICU admission. Considering the types of infection, it was found that 222 (34.04%) of them had pneumonia, 187 (28.68 %) had urinary tract infection, 121 (18.56%) of them had bloodstream infections, 101 (15.49%) had surgical site infection, 11 (1.69%) of them had gastroenteritis, 6 (0.92%) had skin, 3 (0.46%) of them had nose infections, and only 1 (0.15%) had an ear infection. More than one-half of patients were infected during their ICU stay. Pneumonia was the most common type of infection, followed by urinary tract infections. Various infection control measures should be implemented to minimize the prevalence of infections.

*Corresponding Author Email: tarigacad@gmail.com

INTRODUCTION

Hospital acquired infection is a serious problem in the intensive care unit (ICU) and is one of the leading causes of further morbidity and mortality of critically ill patients [1]. The susceptibility of patients in the ICU to infection, combined with the risk factors associated with invasive treatments is high. Furthermore the ICU environment contributes to increased risk of infection in this patient group. This can further be complicated by the fact that clinical signs may be absent or hidden by signs of underlying diseases [1].

It has been estimated that at least fifty percent of patients receive antimicrobials needlessly. Reasons include inappropriate prescribing for antimicrobial prophylaxis, the continuation of empiric therapy despite negative cultures in a stable patient, and a lack of awareness of susceptibility patterns of common pathogens [2]. Over prescribing, not only increases the costs of health care, but may also result in superinfection due to antimicrobial-resistant bacteria, as well as opportunistic fungi, and may increase the likelihood of adverse drug reactions [2].

Globally, the intensive care unit-acquired infection rate is 5-10 times higher than hospital-acquired infection rates in general ward patient. It is associated with increased mortality, morbidity and moreover, carries a substantial economic burden due to high antimicrobial use and increased the length of hospitalization [3]. Furthermore, according to world health organization, 66% of developing countries have no published data on the burden of hospital-acquired infection [3].

This study intended to explore the current situation regarding the prevalence of ICU-acquired infections and organisms involved and their sensitivity pattern, along with common risk factors and current applied practice outcomes in different governmental hospitals in Khartoum state.

Globally, intensive care unit acquired infection rate is five to ten times higher than hospital-acquired infection rates in general ward patient. It is associated with increased mortality, morbidity and moreover, carries a substantial economic burden due to high antimicrobial use and increased length of hospitalization. Furthermore, according to world health organization, 66% of developing countries have no published data on the burden of hospital-acquired infection. Therefore this study explores the current situation regarding the prevalence of ICU acquired infections, its associated organisms and their sensitivity pattern, along with common risk factors and current applied practice outcomes in different governmental hospitals in Khartoum state.

MATERIALS AND METHOD

Study Design:

A prospective observational cross sectional, case-finding follow up ICU-based study.

Study Location:

Intensive care units of nine governmental hospitals in Khartoum state, encoded with the capital letters from A to I. Hospitals were selected according to greater coverage of population.

Study Population:

Inclusion criteria:

All patients admitted to intensive care units during study period.

Exclusion criteria:

1. Post-operative patients admitted for monitoring for 24 hours.

2. Patients admitted with feature of brain death; post cardiac arrest.

Sample Size:

1230 patients were included in this study, all patients admitted to ICUs of selected hospitals during the study period.

Data Collection Instrument:

The data were collected by a predesigned pretested data collection forms prepared specifically to suit this study, filled from patient files and missed information completed from ICU doctors, co-patients and nursing staff. Data collection forms were filled by the researcher.

Ethical Consideration:

1) Previous permission was taken from ministry of health and then from administration of studied hospitals.

2) No any harmful interventions were carried out for participants.

3) Any information requested from the medical staff were at their free time only.

 Study Period:

This study was carried out during the period of August 2016 to March 2017.

Statistical Analysis:

The data were collected using a predesigned pretested data collection forms. The collected data were organized, tabulated, classified, and analyzed using a statistical software program. Data entry and analyses took place once, each data collection forms were reviewed for clarity and completeness using Statistical Package for Social Science (SPSS) version 21.0 (IBM SPSS INC., Chicago, IL). All data gathered via data collection forms were coded into variables. Both descriptive and inferential statistics, including Chi square, were performed to present results. The results were further tabulated, interpreted and discussed, figures were plotted using Microsoft Office computer software (2010).

Infections occurred >/= 48 hours after ICU admission were only considered as ICU acquired infections.

RESULTS AND DISCUSSION

When patients were classified according to their ages, it was noticed that 367 (29.8%) of them were falling in the age group (46-60) years, whereas 314 (25.5%) of them were falling in the average age of 47.6 years and 19-30 constitutes the minority, as shown in Figure 1).
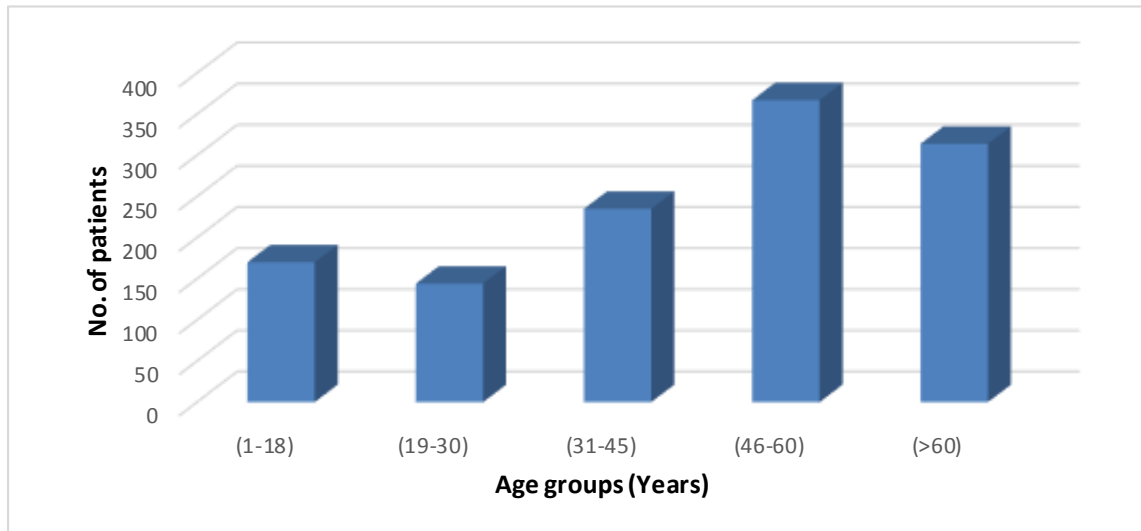

Figure 1: Classification of patients according to the age group.

Classification of the patients' genders showed that the majority (61.9%) were males, as shown in Figure 2).
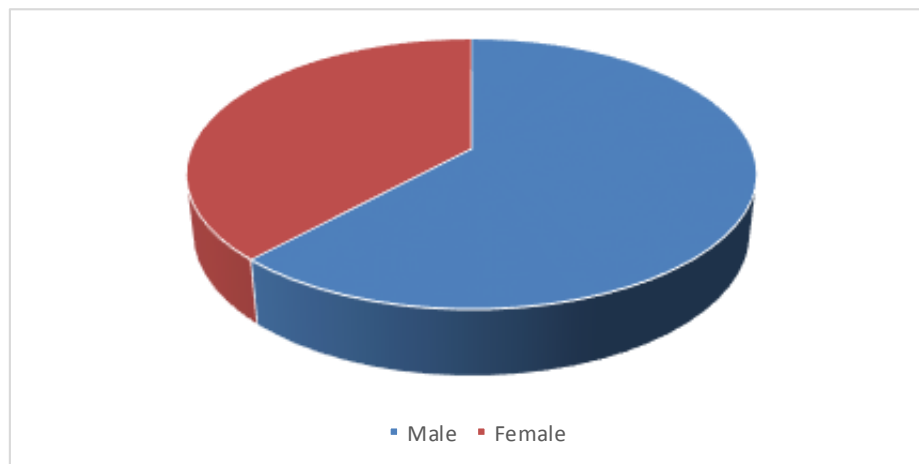

Figure 2: Classification of patients according to their gender.

When patients were categorized according to their past medical history, it was found that most (55%) of ICU patients had past medical history, as presented in Figure 3).
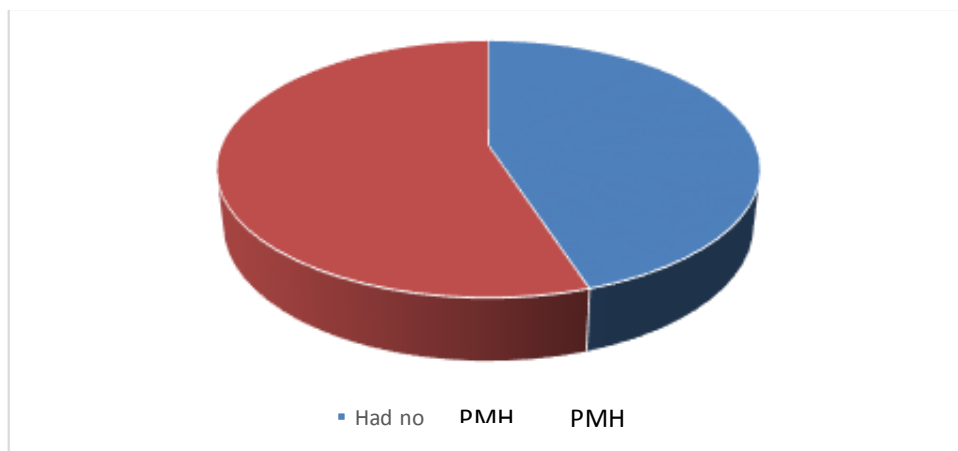
Figure 3: Classification of patients according to their past medical history.

When patients were classified according to their past medical history, it was found that: 341 (27.7%) of ICU patients had diabetes mellitus, 266 (21.6%) of ICU patients had hypertension, 96 (7.8%) of sample population had ischemic heart disease, 68 (5.5 %) of participants had asthma, 47 (3.8%) of participants had CKD. 23 (1.9%) of participants underwent a surgical procedure, and 77 (6.3%) of participants had past medical history of other conditions, as shown in Figure 4).
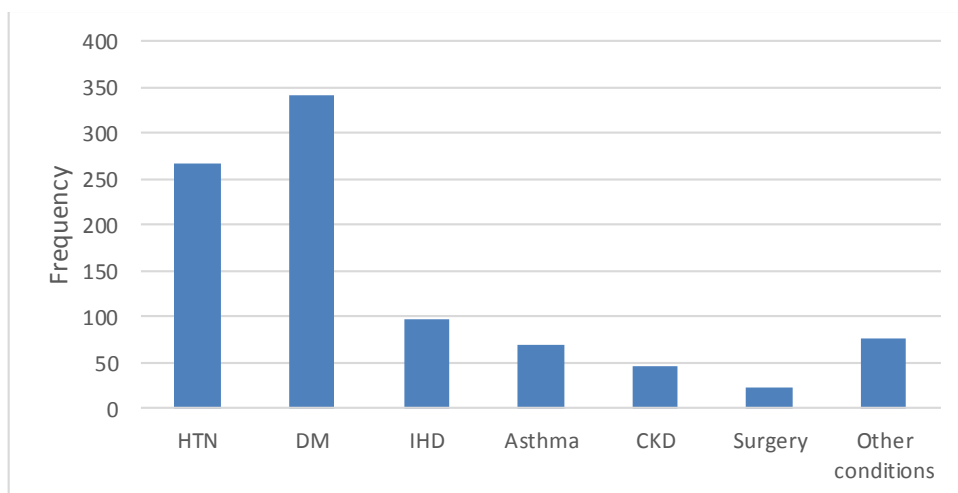

Figure 4: Distribution of past medical history among patients with past medical history.

When patients were categorized according to their drug allergy, it was noticed that only 28 (2.3 %) of participants had known drug allergy, as presented in Figure 5).
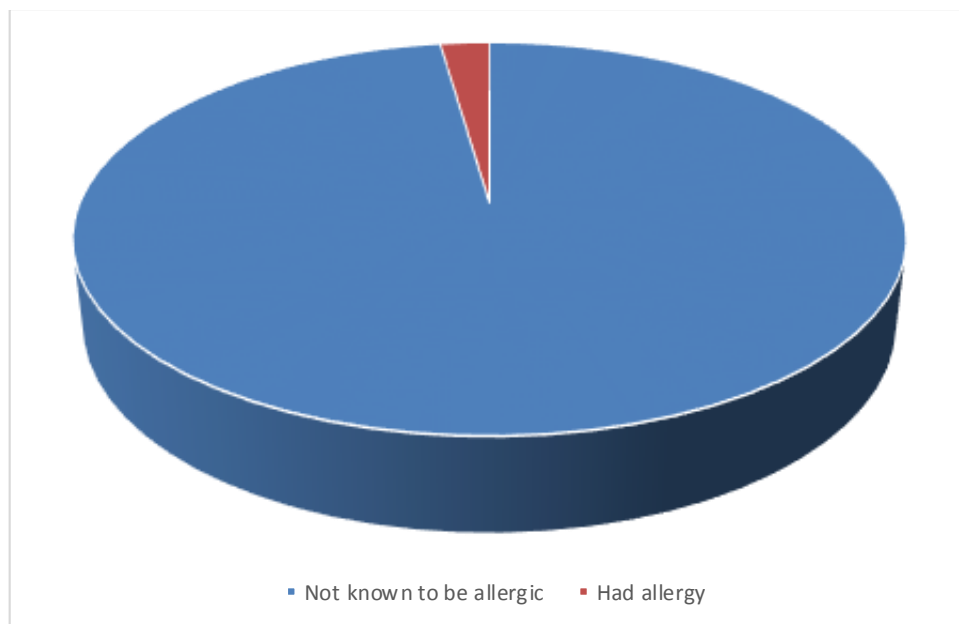
Figure 5: Classification of patients according to drug allergy.

When patients were classified according to particular drug allergy, it was found that most (67%) of participants who had a drug allergy, were allergic to penicillin, whereas aspirin and sulpha (14.29 % and 17.85 %, respectively) constituted the minority, as shown in Figure 6).
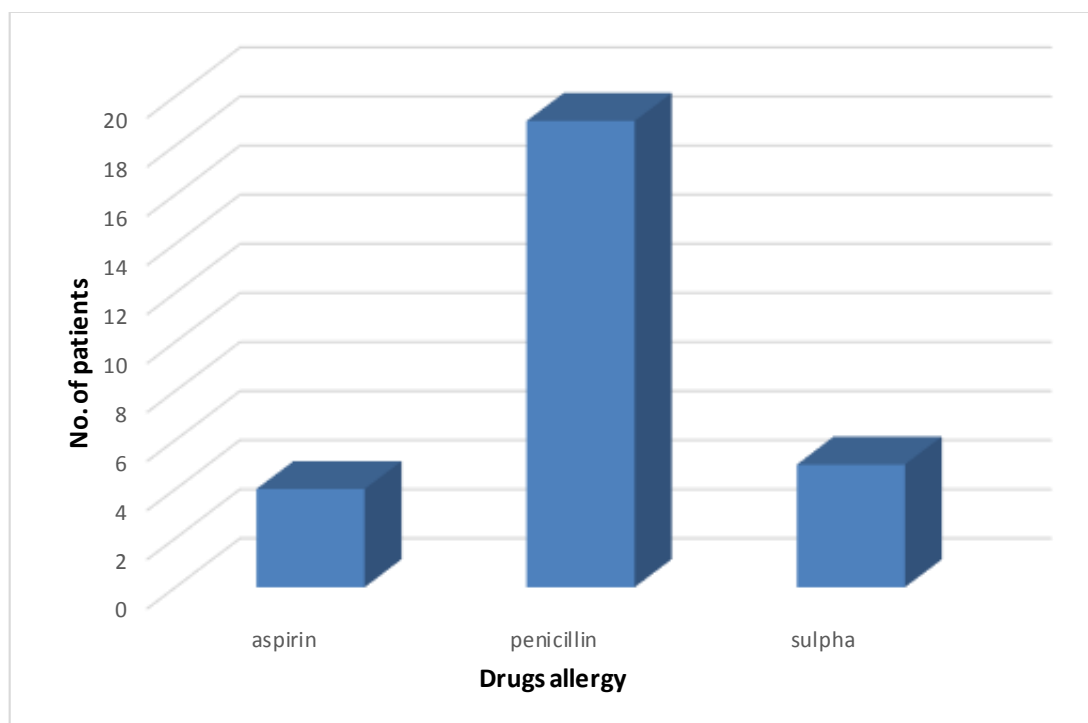

Figure 6: Distribution of drug allergies.

When patients were classified according to development of ICU infection, it was found that 652 (53%) of patients were developed an infection during ICU stay, as presented in (8).
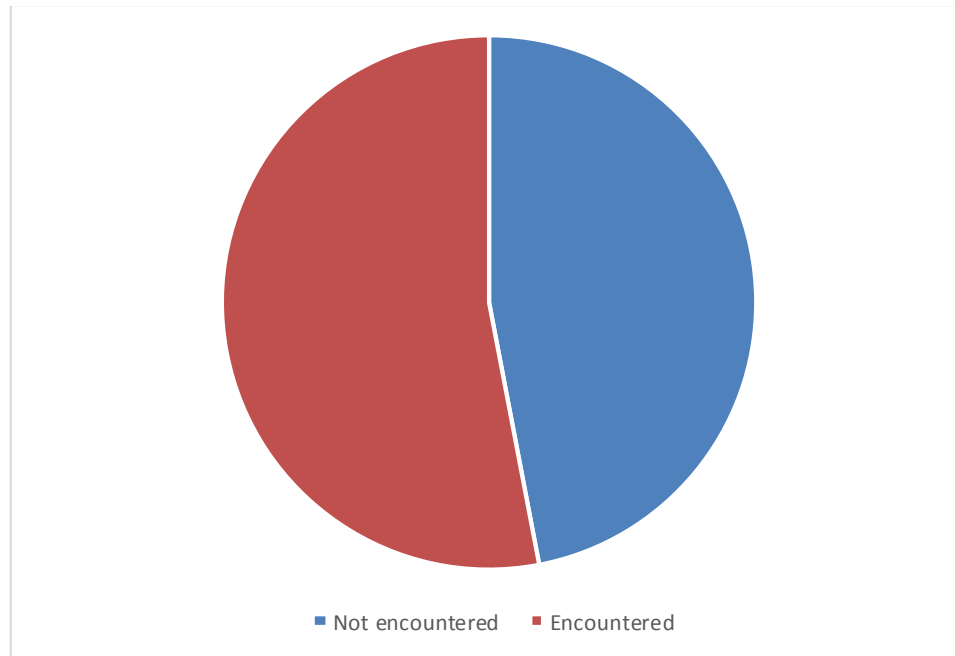
■ Not encountered   ■ Encountered

Figure 7: Distribution of patients according to whether/not get infected during ICU

ICU.

When patients (who developed an ICU infection) were classified according to the type of infection during ICU, it was found that 222 (34.04%) of them had pneumonia, 187 (28.68 %) had urinary tract infection, 121 (18.56 %) of them had blood stream infections, 101(15.49%) had surgical site infection, 11 (1.69%) of them had gastroenteritis, 6 (0.92%) had skin, 3 (0.46%) of them had nose infections and only 1 (0.15%) had ear infection, as shown in Figure **8: Distribution of patients according to whether/not get infected during**
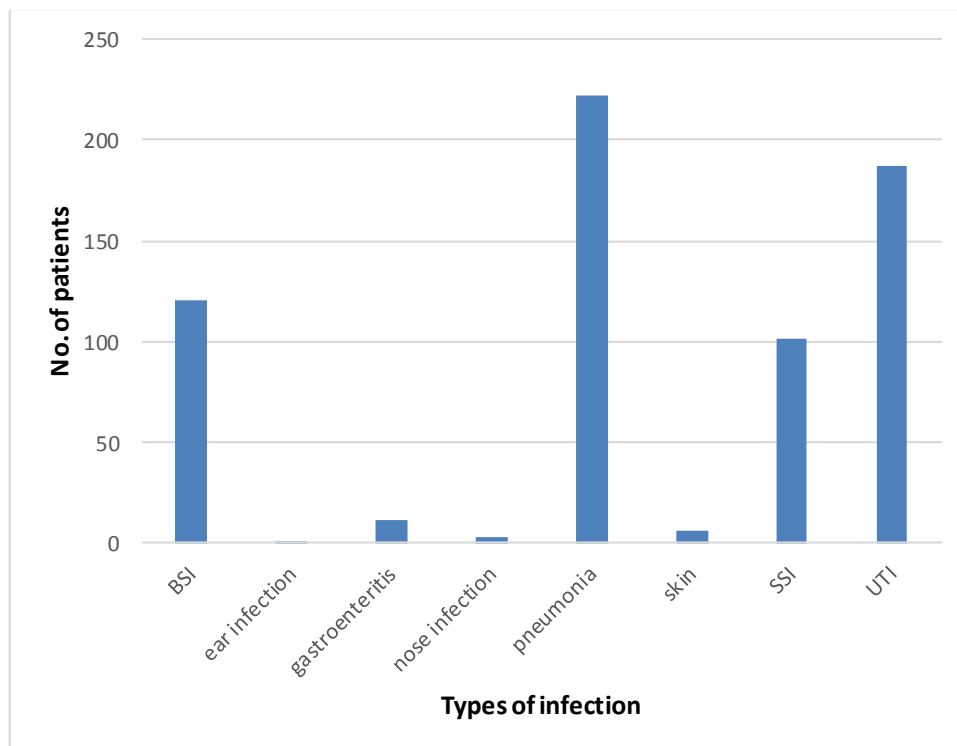
9).

Figure 8: Distribution of patients according to whether/not get infected during

DISCUSSION

The principal purpose of the current work was to explore the current situation regarding the prevalence of ICU acquired infections, along with the distribution of different types of infection in different governmental hospitals in Khartoum state. 1230 ICU patients admitted to intensive care departments in 9 randomly selected hospitals in Khartoum state were enrolled.

Male gender was predominant over females, which coincides with (4-6). This may be due to males exposed to more risk factors. 54% of patients were in age ranges of older than 46 years, hence expected to have age-related physiological deterioration [7].

Risk factors that may lead to ICU admissions can be identified through correlating the identified factors from the published literature to the patients' findings in this study.

Smoking is another risk factor, which may cause preventable morbidity and mortality and consequently may result in ICU admissions [8], about quarter of studied patients were smokers.

Alcohol was known to increase risks that cause admissions to the ICU at 40% [9], although in the current study, patients who were admitted as alcohol consumers were only 5%. This difference may be due to Islamic regulations and social stigma.

Drug allergy is an important patient information that may affect the patient therapy but is usually overlooked, due to improper medication reconciliation or unawareness about the allergic profile.

Only 2.3% of the patients had allergic histories to drugs, mainly to penicillin, less than the proportion of drug allergies in literature which is about 10% [10].

The prevalence of ICU infections was 53%, which is much greater than what was found in other published studies [11-15], that may reflect poor infection control practice in the selected hospitals. Additionally, the risk of acquiring a nosocomial infection is especially high in the ICU, as compared with the general hospital ward [16].

The most frequently acquired ICU infection was pneumonia. This was consistent with many published literature [17-20] and disagrees with others, in which blood stream was the most common ICU acquired infection [21-23]. Pneumonia followed by urinary tract infection, blood stream infections and surgical site infection. Whereas gastrointestinal, skin and ENT had the little contribution.

CONCLUSION:

More than one-half of patients were infected during their ICU stay. Pneumonia was the most common type of infection, followed by urinary tract infections. Various infection control measures should be implemented to minimize the prevalence of infections

REFERENCES:

1. Singer M, Webb A. Oxford Handbook of Critical Care: OUP Oxford; 2009.

2. Leekha S, Terrell CL, Edson RS, editors. General principles of antimicrobial therapy. Mayo Clinic Proceedings; 2011: Elsevier.

3. Rejeb MB, Jihene Sahli M, Dhekra Chebil M, Balsam Kacem M, Houssem Hmouda M, Lamine Dhidah M, et al. Mortality among Patients with Nosocomial Infections in Tertiary Intensive Care Units of Sahloul Hospital, Sousse, Tunisia. Archives of Iranian medicine. 2016;19(3):179.

4. Martin GS, Mannino DM, Eaton S, Moss M. The epidemiology of sepsis in the United States from 1979 through 2000. New England Journal of Medicine. 2003;348(16):1546-54.

5. Vincent J-L, Rello J, Marshall J, Silva E, Anzueto A, Martin CD, et al. International study of the prevalence and outcomes of infection in intensive care units. Jama. 2009;302(21):2323-9.

6. Vincent J-L, Sakr Y, Sprung CL, Ranieri VM, Reinhart K, Gerlach H, et al. Sepsis in European intensive care units: results of the SOAP study. Critical care medicine. 2006;34(2):344-53.

7. Vellas BJ, Albarede J-L, Garry PJ. Diseases and aging: patterns of morbidity with age; relationship between aging and age-associated diseases. The American journal of clinical nutrition. 1992;55(6):1225S-30S.

8. Clark BJ, Moss M. Secondary prevention in the intensive care unit: does ICU admission represent a "teachable moment?". Critical care medicine. 2011;39(6):1500.

9. Marik P, Mohedin B. Alcohol-related admissions to an inner city hospital intensive care unit. Alcohol and Alcoholism. 1996;31(4):393-6.

10. Statistics A. American Academy of Allergy, Asthma & Immunology Web site. 1996.

11. Kanamori H, Weber DJ, DiBiase LM, Sickbert-Bennett EE, Brooks R, Teal L, et al. Longitudinal Trends in All Healthcare-Associated Infections through Comprehensive Hospital-wide Surveillance and Infection Control Measures over the Past 12 Years: Substantial Burden of Healthcare-Associated Infections Outside of Intensive Care Units and "Other" Types of Infection. Infection Control & Hospital Epidemiology. 2015;36(10):1139-47.

12. Alberti C, Brun-Buisson C, Burchardi H, Martin C, Goodman S, Artigas A, et al. Epidemiology of sepsis and infection in ICU patients from an international multicentre cohort study. Intensive care medicine. 2002;28(2):108-21.

13. Cairns S, Reilly J, Booth M. Prevalence of healthcare-associated infection in Scottish intensive care units. Journal of Hospital Infection. 2010;76(4):308-10.

14. Weinstein RA. Epidemiology and control of nosocomial infections in adult intensive care units. The American journal of medicine. 1991;91(3):S179-S84.

15. Beyersmann J, Gastmeier P, Grundmann H, Bärwolff S, Geffers C, Behnke M, et al. Transmission-associated nosocomial infections: prolongation of intensive care unit stay and risk factor analysis using multistate models. American journal of infection control. 2008;36(2):98-103.

16. Magnason S, Kristinsson K, Stefansson T, Erlendsdottir H, Jonsdottir K, Kristjansson M, et al. Risk factors and outcome in ICU-acquired infections. Acta Anaesthesiologica Scandinavica. 2008;52(9):1238-45.

17. Richards MJ, Edwards JR, Culver DH, Gaynes RP. Nosocomial infections in combined medical-surgical intensive care units in the United States. Infection Control & Hospital Epidemiology. 2000;21(08):510-5.

18. Madani N, Rosenthal VD, Dendane T, Abidi K, Zeggwagh AA, Abouqal R. Health-care associated infections rates, length of stay, and bacterial resistance in an intensive care unit

of Morocco: findings of the International Nosocomial Infection Control Consortium (INICC). International archives of medicine. 2009;2(1):29.

19. Mertens K, Morales I, Catry B. Infections acquired in intensive care units: results of national surveillance in Belgium, 1997–2010. Journal of Hospital Infection. 2013;84(2):120-5.

20. Chincha O, Cornelio E, Valverde V, Acevedo M. Infecciones intrahospitalarias asociadas a dispositivos invasivos en unidades de cuidados intensivos de un hospital nacional de Lima, Perú. Revista Peruana de Medicina Experimental y Salud Pública. 2013;30(4):616-20.

21. Becerra MR, Tantaleán JA, Suárez VJ, Alvarado MC, Candela JL, Urcia FC. Epidemiologic surveillance of nosocomial infections in a Pediatric Intensive Care Unit of a developing country. BMC pediatrics. 2010;10(1):66.

22. Dereli N, Ozayar E, Degerli S, Sahin S, Koç F. Three-year evaluation of nosocomial infection rates of the ICU. Revista Brasileira de Anestesiologia. 2013;63(1):79-84.

23. Bouafia N, Mahjoub M, Chouchéne I, Bencheikh A, Ezzi O, Bouchoucha S, et al. Device-associated infection and mortality in a Tunisian intensive care unit. Antimicrobial Resistance and Infection Control. 2015;4(Suppl 1):P208.