

Studying Prevalence of Infectious Diseases (2nd And 3rd Seasons of 2015 in Hospital (Iran))

Hamedian amirabbas¹, HashemiDehaghi Zahra^{2, 3*}

¹(Department Of Environmental Health Engineering, School Of Public Health, Shahidbeheshti University, Tehran, Iran)

²(Department of Management and Accounting, Islamic Azad University, South Tehran Branch, Tehran, Iran)

³ Eye Research Center, Tehran University of Medical Sciences, Tehran, Iran)

Abstract : Hospital acquired infection is a serious health problem all around the world. The study is aimed at determining prevalence of hospital acquired infections among patients hospitalized in ShohadaiTajrish Hospital, Tehran, Iran in second and third seasons of 2015.

Methods: The study was carried out as cross sectional descriptive study on 7914 patients hospitalized Types of microbes of suspicious cases were cultured in EMB, Blood Agar. Gram staining was employed on wound, blood, and urine samples if required. Microorganisms were classified and determined through standard methods. Antibiogram disk was performed on all separated microorganism.

Results: hospital acquired infection rate reported in the period under study was 1.1% (85 out 7914 cases) and 28 patients were infected with two types of hospital acquired infections. The most common type of infection was surgical wound infection (57.64%) followed by hospital acquired pneumonia (23.52%), urinary tract infection (12.94%), and hospital acquired blood infection (5.88 %). The results showed that infection was more common in ICU ward (49%) and main infection in the ward was pneumonic infection (40%) followed by surgical wound infection (33%), urinary tract infections (21%), and blood stream infection (7%).

Conclusion: Taking into account that surgical wound infection constituted the majority of hospital acquired infection cases it is essential to observe hospital acquired infection control instructions.

Keywords: prevalence, infection, intense care ward, Hospital, Iran

I. Introduction

Hospital acquired infection (HAI) is a serious problem for health care centers so that these institutes incur considerable costs each year to deal with the problem. Prevalence of HAI is 5-15% of hospitalization cases in developed countries and this figure in developing countries is 25%(Larypoor&Frsad, 2011). More than 25-33% of HAI are in ICU ward and among the factors that increase prevalence of HAI in this ward are patients' response to physiological (damage and disease) and mental (noise, pain, anxiety, alienation) factors, age, uncontrolled use of antibiotics, stress medicine, ulcer, lack of sleep, and poor nutrition (lack of protein and calorie). These factors increase probability of HAI because of change in immunity system. The patients' horizontal posture in bed (<30°), low level of consciousness (because of painkillers and tranquillizers) are some of the risk factors of HAI in ICU ward. Prevalence of HAI in ICU ward is 5 to 10 times more than that of general wards. According to disease control center, HAI kills about 2 million soles and cause 11 billion dollar damage in USA-based hospitals. The infections are cause of several problems in the process of treatment and considerable damages in the form of increase of term of hospitalization, medicine use, and cost of medical services(Ghotbi, Raghimbolagh, &Valaie, 2005). Three main areas of HAI are urinary tract (31%), respiratory system (24%), and blood (16%). Usual ways of diagnosing in these areas are pneumonia, urinary tract system, and septicemia. Pneumonia is the most common HAI in ICU ward and the second top HAI in hospital. In addition, intubation of chip is the riskiest factor of expansion of pneumonia. Urinary tract infection is the second top HAI in ICU ward. Catheterization may results in formation of microbial, Staphylococcus, and candida fungus biofilms and constitutes 80% of HAI. Long-term use of catheter in urinary tract is the main cause of infection in the organ. In addition, this is worthy of attention as formation of biofilm is a key factor in resistance against drug and increase of drug allergy. Thereby, it is important to examine catheters used for the hospitalized patients to avoid fungus and candidiasis diseases such as candidemia, and urinary candidiasis (Berenholtz et al., 2004). Blood stream infection (BSI) is the third cause of HAI in ICU ward (2-7% more than internal and surgery ward). BSI caused by central venues catheter is more common than peripheral catheter BSI. A feature of skin (moisture and temperature) where catheter is inserted is a critical factor in severity of infection (Jafarzadeh, Hassanshahi, &Nemati, 2009).

Variety of factors such as age, surgery, immunity system problems, Chronic disease (e.g. diabetes, Cirrhosis, renal failure, cancer, retrogression of ICU patients' condition, high rate of using invasive treatments,

an increase of physical contact with patients all increase probability of exposure to or transfer of pathogens (Challacombe, 1994).

There is no guaranteed way for 100% removal of the infections; however, the key to successful prevention of infections is to pay attention to causes of infection and effective and comprehensive use of infection control methods. Staff by washing their hands and patients by observing personal hygiene and avoiding taking too much antibiotics can reduce rate infection. In addition, increasing knowledge about measures to avoid infection and contamination is another critical step (Katz, 2004).

HAI is an index of quality of health services provided by a clinic or health center. As suggested by WHO, accurate planning regarding hygiene issues is considerably effective in controlling diseases and cutting medical costs so that such measures are paid off in short-term. In addition, this results in improvement of health culture, increase of life expectancy, life standards, and qualitative development. Given that hospitals are the main providers of health and treatment services and that they host variety of patients who are usually accompanied with family members, they are considered as the places with high probability of infection. Technological development, increase of people's resistance to treatment, introduction of new medicines, an increase of resistance to medicine all increase prevalence of HAI (Movahedi et al., 2013).

Taking into account clinical importance of HAI and the above introduction, the present study was carried out in ShohadaiTajrish Hospital in 2015. The results could be helpful in determining probable problems in health service system and improving specific regulations to control HAI.

II. Materials and Methods

The study focused on HAIs sustained by the patients hospitalized in ShohadaiTajrish Hospitals through 2nd and 3rd seasons of 2015.

Study population was comprised of UTI, pneumonia, and sepsis patients. Throughout the six months period under study, 7914 patients were hospitalized and 85 cases developed HAI. To determine type of microbes and suspicious cases, wound sample, urine sample and so on were cultured on EMB, Blood Agar. Urine samples were examined regarding macroscopic and microscopic specifications. In addition, wounds suspect to Staphylococcus were tested by mannitol salt agar. Gram staining was employed for wound, blood, and urine samples; so that the case would be considered negative if no bacterium was extracted within 24hrs for urine and wound samples and 5 days for blood samples. Disaggregation and microorganism detection were carried out through standard methods. Antibigram disc was examined for all disaggregated microorganism after incubation at 35°C for 24hrs. The collected data was analyzed in SPSS16.

III. Results

HAI within 2nd and 3rd seasons of 2015 in the hospital under study was 1.1% (85 out of 7914) and among these patients, 28 were diagnosed with two types of HAI.

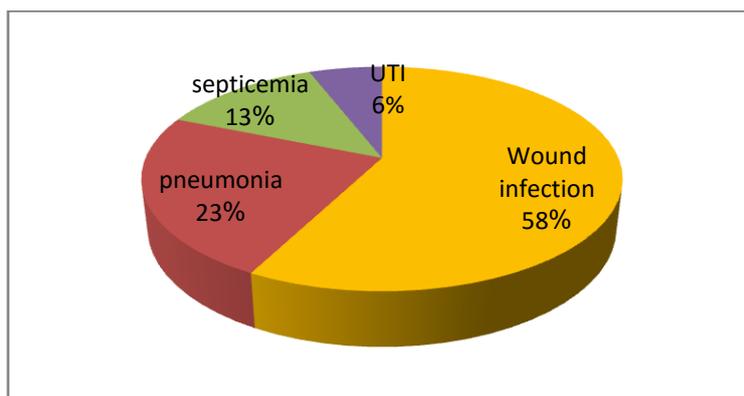


Diagram 1.HAI rate based on type of infection during 2nd and 3rd seasons of 2015

SSI was the top of HAI (57.46%) followed by pneumonic HAI (23.52%) and UTI (12.94%) and BSI (5.88%).

Among different wards, HAI was more common in ICU ward (49%) so that 42 cases were observed in ICU, 14 in neurosurgery ward (16%), 8 in general surgery (9%), 4 in urology (5%), 5 in Stereotaxy (6%), 4 in gynecology and NICU each (5%), and 2 in neurology and nephrology (2%).

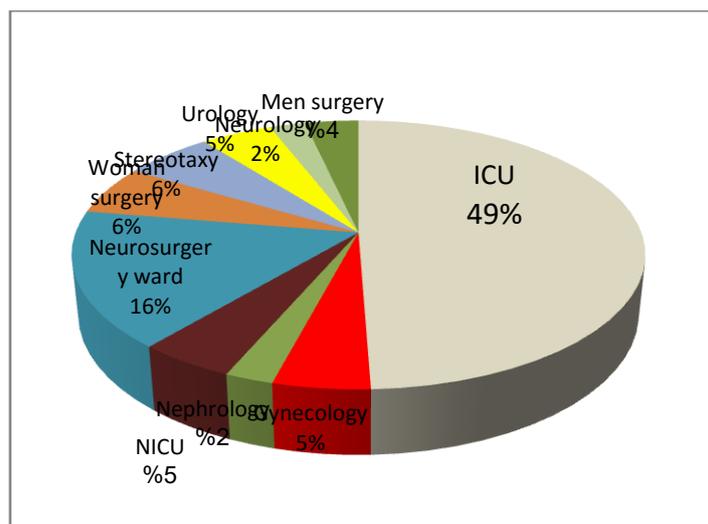


Diagram2. HAI based on wards during 2nd and 3rd seasons of 2015

Table 1. Prevalence of HAI based on wards and type of infection

Ward	UIT	PNEU	SSI	BSI
ICU	9	17	13	3
NICU	1	2	-	1
Neurosurgery	-	-	14	-
Urology	-	-	4	-
Gynecology	-	-	4	-
Women surgery	-	-	5	-
Men surgery	-	-	3	-
Nephrology	-	-	1	1
Neurology	1	1	-	-
Stereotaxy	-	-	5	-
Total	11	20	49	5

As listed in table able, highest rate of HAI in ICU belongs to PNEU (40%), followed by SSI (33%), UIT (21%), and BSI (7%). As to PNEU, 85% of the cases were observed in ICU, 10% in NICU, 5% in neurology; as to UTI, 82% of the cases were observed in ICU, and 9% in NICU and neurology each. Regarding SSI, 29% of the cases were observed in neurosurgery, 27% in ICU, 10% in stereotaxy and women surgery each, 8% in genealogy urology, 6% in men surgery, and 2% in nephrology. With respect to BSI, 60% of the cases were observed in ICU and 20% in NICU and nephrology wards each. There was significant relationship between frequencies of HAI cases based on different wards. (P<0.05; Table 1)

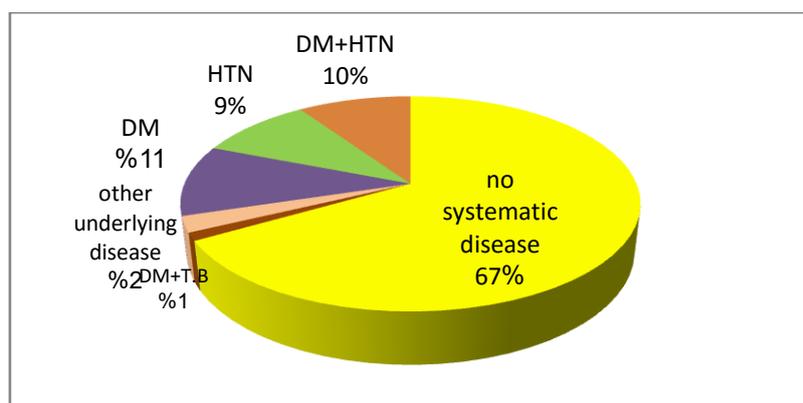


Diagram3. Rate of background diseases of HAI during 2nd and 3rd seasons of 2015

In 57% (56) of the cases, no background disease were observed and background diseases of the rests included HTN + DM (11%), DM + T.B (1%), HTN (9%), and other diseases (2%).

The main cause of HAI (as showed by the cultures) were Acinetobacter (18%), candida (13%), Klebsiella (11%), Staphylococcus aureus (6%), enterococcus and antrobactra (4% each), and E.coli,

Staphylococcus coagulase negative and coaceae gram positive (as to 36 unreported cases, HAI diagnosis was carried out based on symptoms and examination by physician).

Regarding the pathogens that caused UTI, candida and Klebsiella were causes of 82% and 8% of the cases. As to pathogens of PNEU, 65% of the cases were caused by Acinetobacter, 10% by Klebsiella and Antrococcoc each, and 5% by candida, antrobacter, staphylococcus aureus each. With respect to the SSI pathogens, 10% were caused by Klebsiella, 6% by Staphylococcus aureus, staphylococcus coagulase negative, and candida, 20% by antrococcuc, and coaceae gram positive each.

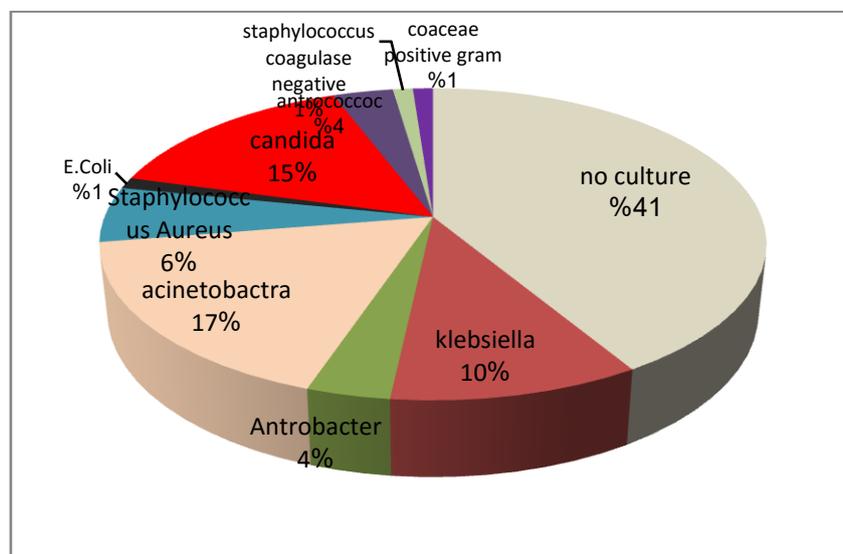


Diagram 4. Rate of HAI pathogens during 2nd and 3rd seasons of 2015

Regarding gender, out of 85 HAI patients, 40 were women (47%) and 45 were men (63%). In addition, 36% of HAI female patients were at age range 20-40 and 40% of HAI male patients were older than 60 years old. Average age of HAI men and women was 51 and regarding HAI infants, 2 were girls and 2 were boys.

As to mortality data (281 cases), 1 case (0.35% - man) was due to HAI in sterotaxy. The cause of death in that case was B.T and the pathogen of HAI was Staphylococcus eurous.

IV. Conclusion

HAI is a critical health problem in hospitals and (5-10%) of hospitalized patients suffer HAI. Frequent use of invasive interventions and physical contacts with the patient, place them in a risky situation and increase probability of HAI. Prevalence of HAI in Iran health system depends on variety of causes such medical interventions and individuals' characteristics. Studies in Iran have reported that HAI rate varies from 8.5% to 39%. Comparison of different statistics with the results of this work shows that prevalence of HAI during 2nd and 3rd seasons of 2015 was better than the standards (1.1%); which indicate effectiveness of the measures taken by the hospital authorities such as infection control, better use of invasion interventions, training and supervising observance of health codes in the hospitals and proper use of disposable tools (McBryde, Bradley, Whitby, & McElwain, 2004).

The majority of HAI cases were observed in ICU ward and the main infection was SSI (57.64% of total cases). In most of the cases, diabetes and high blood pressure were the main background disease. HIA rate of men (63%) was higher than that of women and average age HAI patients was equal for men and women. These show that the first step of the measures to control the problem is to determine current situation and then find the cases and risk factors. It is notable that majority of similar studies have mentioned respiratory infections as the most common form of HAI in ICU (Richards, Edwards, Culver, & Gaynes, 2000; Sampson et al., 2006)(Kaul et al., 2007).

Herbart et al. indicated in their study that SSI (35%) is the most common form of HAI followed by UTI, and BSI(St Harbartha, Ruefb, Widmerd, & Pitteta, 1999). Wounds are good place for bacterial growth so that stability of bacteria in wound infection is too high. Studies in other parts of the world have also reported high rates of wound infection as HAI. Consistently, our study confirmed higher rate of SSI.(BOUBACAR, 2006)As the results showed, SSI constituted the main form of HAI and this indicates necessity of controlling HAI through limiting invasive interventions to the occasions that there is no other choice and the staff who have properly trained for such measures. In addition, HAI is inevitable and health center can only make their best to control and reduce prevalence of the infection. Recent studies on controlling HAI have emphasized on timely

and proper medical intervention. Catheter and similar interventions must be used as a measure of last resort. Taking into account high sensitivity of intensive care wards (e.g. ICU and CCU) necessity of observing health and hygiene codes must be trained to the staff and physicians. Washing hands, using antibacterial gels, using disposable gloves and mask all are essential and needed. In addition, antibiotic usage must be under control, the staff should be vaccinated and their health and wellbeing at work must be guaranteed (Costantini, Donisi, Turrin, & Diana, 1987)(Shahsavari, Beigi Marvast, Behinaaine, & Ayatollahi, 2004).

Results of this work were reported to infection committee and some solutions to control infections in ICU and other wards were proposed based on priority of the wards and rate of HAI in each one. To this end, direct observation of the wards and examining practical problems are part of the measures taken by the committee. In addition, physical separation of patients and emphasis on hand hygiene of all personnel (nurses, service staff, and physicians) and training proper way of performing suction and changing bandage are some of other measures taken. Results of these measures will be evaluated afterward.

Acknowledgements

The authors express their gratitude toward all authorities and personnel of ShohadaiTajrish Hospital and all others who helped to carry out this study.

References

- [1]. BOUBACAR, GUINDO. (2006). Analyse des données du système local D'information sanitaire sur le paludisme, les ira basses et les diarrhées Dans le cercle de Niono. Thèse de Médecine, Université de Bamako.
- [2]. Costantini, M, Donisi, PM, Turrin, MG, & Diana, L. (1987). Hospital acquired infections surveillance and control in intensive care services. Results of an incidence study. *European journal of epidemiology*, 3(4), 347-355.
- [3]. Kaul, S, Brahmadathan, KN, Jagannati, M, Sudarsanam, TD, Pitchamuthu, K, Abraham, OC, & John, G. (2007). One year trends in the gram-negative bacterial antibiotic susceptibility patterns in a medical intensive care unit in South India. *Indian journal of medical microbiology*, 25(3), 230.
- [4]. McBryde, ES, Bradley, LC, Whitby, M, & McElwain, DLS. (2004). An investigation of contact transmission of methicillin-resistant *Staphylococcus aureus*. *Journal of Hospital Infection*, 58(2), 104-108.
- [5]. Richards, Michael J, Edwards, Jonathan R, Culver, David H, & Gaynes, Robert P. (2000). Nosocomial infections in combined medical-surgical intensive care units in the United States. *Infection Control & Hospital Epidemiology*, 21(08), 510-515.
- [6]. Sampson, Hugh A, Muñoz-Furlong, Anne, Campbell, Ronna L, Adkinson, N Franklin, Bock, S Allan, Branum, Amy, . . . Galli, Stephen J. (2006). Second symposium on the definition and management of anaphylaxis: summary report—Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network symposium. *Annals of emergency medicine*, 47(4), 373-380.
- [7]. Shahsavari, Sekineh, Beigi Marvast, Parvin, Behinaaine, Nouredin, & Ayatollahi, Sayyed Alireza. (2004). Teaching Nursing Students about the Basic Principles of Infection Control: Programmed Instruction or Lecture Method. *Iranian Journal of Medical Education*, 4(1), 23-30.
- [8]. St Harbartha, Ch, Ruefb, P Franciolic, Widmerd, A, & Pitteta, D. (1999). Nosocomial infections in Swiss university hospitals: a multi-centre survey and review of the published experience. *Schweiz Med Wochenschr*, 129(42), 1521-1528.