

Prevalence of nosocomial infections in newborns and its related factors in neonatal intensive care unit unit of Besat hospital in Sanandaj in 2011

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Abstract: Neonatal intensive care is an important part of the hospital and prone to infection. Prevention of infection is the main goal of an infection control program. This study was conducted to determine the prevalence of hospital infections in neonatal intensive care unit and its associated factors in Besat hospital in Sanandaj in 2011. **Method:** This Cross-sectional study conducted on 332 infants hospitalized in neonatal intensive care unit (NICU) in Besa hospital in the year 2011. Neonates hospitalized in neonatal intensive care unit (NICU) were examined daily for signs of infection and symptoms and samples were taken. Patients with the criteria of nosocomial infection were recruited into the study. Data was entered in special questionnaires which designed according to CDC for this purpose. The source of information were patient, physician, hospital records and daily clinical assessment. Test results followed-up and recorded in the second part of the questionnaire. Data analyzed using SPSS 18, descriptive statistics, chi-square test, fisher exact test and paired T- test, and OR statistical analysis. **Results:** From 332 infants %50.3 were male, %49.7 were female and the incidence of pneumonia was 11.4%. The incidence of sepsis was 2.4% and the prevalence of eye infections was %3.9. There is no significant difference between infections and gender. There is significant relationship between pneumonia and gestational age. But there was no significant correlation between risk of eye infection, septicemia and gestational age ($P > 0.05$). Chi-square test showed a statistically significant relationship between infected infants with birth weight, and length of hospitalization ($P < 0.05$). There is a significant difference between infected and non-infected infants in terms of weight and length of hospitalization ($P = 0.0001$). **Conclusion:** Prevalence of infection in neonatal intensive care unit in Sanandaj is similar to other parts of the country. Because all medical centers in the country are implemented the same protocols for infection control, so it is necessary that this country protocol be reviewed to control nosocomial infections. [Nahid Ghotbi, Maryam Nikofar, Maoumeh Abedini, Abdorrahim Afkhamzadeh, Golnar Mortaz-Hejri. **Prevalence of nosocomial infections in newborns and its related factors in neonatal intensive care unit unit of Besat hospital in Sanandaj in 2011.** *Life Sci J* 2014;11(2s):35-39]. (ISSN:1097-8135). <http://www.lifesciencesite.com>. 8

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Introduction

Hospital related infections include infections that are created after at least 48 hours after hospitalization, but without any signs and symptoms at the time of admission (1). These infections are due to limited or diffused pathogenic responses related to infectious agent or their toxins at the hospital. There should be any no evidence of incubation period or infection in the time of admission. With increasing in the number of hospitals, hospital related infections have created a major health problem. Lengthening of the hospital stay caused mortality and morbidity which strongly have increases hospital charges (2). Infants special care department is one of the most important and disposed departments in hospital (3). Infection is one of the major causes of infant mortality all around the world. Although most of the infants infections are caused by maternal genitourinary system or due to environmental factors, but majority of these infections are acquired at the

hospital (4). Development in the premature care of infants has increased survival; hence, possibility of hospital related infections (5). Hospital related infection current strains include: coagulase-negative staphylococci, staphylococcus aureus, enterococcus, and other Gram-negative Bacteria (5). Septicemia occurs in 30-50 percent of hospital related infections in infants. Other infant infections include: respiratory infections, dermatological infections, gastrointestinal infections, necrotizing enterocolitis form, osteomyelitis, septic arthritis, conjunctivitis and meningitis (6). A lot of efforts are being done for decreasing risk of infection in infants and Infants special care department. Most of these interventions are standard and some of them are different from center to center (7). Hospital related infections can be due to infectious agents from endogenous or exogenous sources. Endogenous sources include: skin, nose, mouth, gastrointestinal system or vagina.

Exogenous sources include: caregiver, visitors, hospital equipments (1).

In Iran, National nosocomial infection surveillance program, Center for Disease Management, ministry of health and medical education, has presented definitions and forms based on patient screening method of national nosocomial infection surveillance and asked for conduction of some studies based on this system (3). In a survey of hospital related Center for Disease Management at NICU unit of Besat hospital in Sanandaj, infection prevalence was 1 percent which was not matched with the literature (%13) and needs further studies, bearing in mind registered statistics inside and outside Iran (8). This study aims to determine the prevalence of hospital related infections in hospitalized infants at NICU unit of Besat Hospital, Sanandaj and related factors of hospital related infections.

Study method

This is cross-sectional study, statistical population include admitted infants in NICU unit of Besat Hospital in Sanandaj during the first 6 months of 2011. Target population include infants with nosocomial infections based on definition of *Centers for Disease Control* in 2008 (9). The number of all hospitalized infants in the period of 6 months of study was 343 of which 11 infants were excluded from the study because of lack of information and 332 remaining infants included in the study. Data collected and recorded using questionnaires which designed based on CDC. Sources of information were: Patients, doctors, hospital records, and routine daily clinical assessment. Final information entered and coded in the forms related to linear list of hospital related infections. Also test results were sent and registered at second section of the questionnaire.

Data analyzed using software SPSS.18, descriptive statistics, K- square, Fisher and T independent exact test and Logistic Regression.

Findings

From 332 infants in the study, %50.3 were boys and %49.7 were girls. According to gestational age the majority belonged to 33-36 week infants with the prevalence of %40.7. The overall prevalence of infection in the studied infants were %15.96 including: %11.4 pneumonia, %2.4 sepsis, and %3.9 eye infection. Mean age for pneumonia, sepsis, and eye infection were 5.8 ± 4.1 , 14.6 ± 8.9 , and 7.1 ± 5.9 days respectively. There were no significant difference in girls and boys regarding pneumonia, sepsis and eye infection ($P > 0.05$). There was a significant difference between infection and birth weight ($P = 0.0001$). About %53.8 of infants with less

than 1000 gram and %14.4 of infants, who with more than 2500 gram, were infected (table 1). there were significant difference between mean birth weight of infection and uninfected infants ($P = 0.008$). Pregnancy age in infected infants was 8.32 ± 0.4 week and in uninfected infants it was 5.34 ± 6.3 weeks which had a significant difference ($P = 0.003$). Also period of hospitalization in infected infants was 9.11 ± 6.15 day but in uninfected infants it was 4.7 ± 9.8 day ($P = 0.0001$) (table 1). The risk of urinary tract infection in infants whom there were use urinary catheter was estimated equal to 2.15 with (12.97: 0.28) confidence interval. In intubated infants OR was 4.29 with confidence interval of (2.24: 8.27) and in infants under ventilators OR was 4.23 with confidence interval of (2.2: 8.14). Infants using one way chest tube, the chance of being infected was 12.7 with confidence interval of (3.7 : 45.3). But there no significant difference between infants with and brain shunt and two way chest tube ($P > 0.05$) (table 2).

Discussion and Conclusion

Prevalence of hospital related infections in studied infants is %15.96. in a study conducted at Talaghani hospital, Tehran, Iran, prevalence of infection in 285 infants under study was %14.3 (10). In Darvishpour's study in Gilan in which special care was done on 270 infants, prevalence of infection was %16.3. In another study which was done on 220 infants in Quazvin, this rate was %15.2 (12) which is in accordance with all of the studies. It shows that the condition of NICU in the hospitals of the country is alike in terms of nosocomial Infection and control of infection in hospitals and it is required that new procedures be used to reduce hospital infections. But in the study of Quazvini and associates which was done in Mashhad in 2004-2005 prevalence of nosocomial infection in 971 hospitalized infants in NICU have been %3.29 (13), so it is possible that some of the infections haven't been recognized. In both of the studies the impression was on the positive culture and they haven't considered Clinical Infections (CDC criteria have not been observed).

Other international studies showed that prevalence of nosocomial infection in South Korea was %30.2 in 2006, in Brazil was %50.7 in 2002 and %34 in 2003, in Taiwan was %14.5 in 2007, and in Germany it was %14.8 in 2006 (14-16). So it can be said that prevalence of nosocomial infection in our study was in better condition in comparison to developing countries and it's almost like developed countries.

Prevalence of pneumonia in studied infants is %11.4 which is equal to %71.4 in infected infants. Prevalence of pneumonia in Kadivar's study in NICU, was %53.5, in South Korea %28 (13), and in

Brazil in two different studies were %40.3 and %6.8 in 2002 and 2003, respectively (15, 18). In

Germany's study (19) prevalence of pneumonia was %16.9 and in Soo study which was done in Taiwan

Table 1. relationship between infection with the weight of the infants.

infection variable		positive frequency)% (negative Frequency)% (p
Weight	1000<	7(8.35)	6(2.46)	.0001
	1001-1250	12(6.31)	46(4.68)	
	1251-1500	5(2.12)	36(8.87)	
	1501-2000	10(6.11)	76(4.88)	
	2001-2500	3(0.7)	40(0.93)	
	2500>	1614 (0.4)	95(6.85)	
Gestational Age		8.32±0.4	5.34± 6.3	.003
Birth's weight		1817± 834	2212± 850	.008
Admission time		6. 15± 9.11	4.8±9.8	.0001

K-square ** t-test

Table 2. Relationship between infant's infection and invasive procedures.

Infection	Invasive procedure	Yes		No		p	OR (CI 95%)
		No.	Percent	No.	Percent		
IV canula	Yes	51	5.15	279	5.84	0.25*	--
	No	2	100	0	0		
Urinary Catheter	Yes	2	6.28	5	4.71	0.31*	15.2 (0.28: 12. 97)
	No	51	7.15	274	3.84		
Suction	Yes	3	10	27	90	0.44*	0.56 (0.13:2.04)
	No	50	6.16	252	4.83		
Intubation	Yes	30	6.31	65	4.68	0.0001**	29.4 (27.8:24.2)
	No	23	7.9	214	3.9		
Ventilator	Yes	29	9.31	62	1.68	0.0001**	23.4 (2.2:14.8)
	No	24	10	217	90		
Brain Shunt	Yes	1	3.33	2	7.76	4 *	--
	No	52	8.15	277	2.84		
One way Chest tube	Yes	10	7.66	5	3.33	0.0001*	7.12 (7.3:3.45)
	No	43	4.15	274	6.84		
Two way Chest tube	Yes	1	50	1	50	0.29*	--
	No	52	7.15	278	3.84		

* Fisher exact test ** K-square

%35.2 of infants were infected with pneumonia infection (16). The results of our study are more than all other studies which is done on infants. Probable cause is related to method of diagnosis of the disease, which has been based on clinical decision of the physician, but in mentioned studies it is possible that method of judgment be dissimilar. In this study prevalence of sepsis is %2.4 and in other studies include: Mashhad %2.8, Kermanshah %8.4, and Sanandaj %17.6 in 2004 (13-19-20). In other international studies, rate of infant's infection in South Korea was %18.9, in Brazil %16.7, and in Taiwan it was %10 (14-16). Frequency of this study was less than other national studies (except for the Mashhad study). The reason for this difference could be related to smaller numbers of sepsis clinical diagnosis. In this study prevalence of eye infection

has allocated %3.9 in all infants and %24.4 of infant's infection which majority of the infants was between 3-4 ages. In the study of health in Tehran, prevalence of conjunctivitis was %27 of infant's infection (21) and in South Korea's study was %22 of all of the studies infections which is in accordance with our study. About %27.7 of the studied infants had Very Little Birth Weight (VLBW) and %38.9 had Little Birth Weight (LBW). Also, the average of infant's weight was 2158 ± 856 gram. In Darvishpour and associates' study in Gilan, majority of the infected infants in NICU had less than 2 kilograms weight (11). In Mahdih Tehran's infants, that pneumonia has checked ventilator, the average of infants weight was 1587 ± 746 gram which has checked majority of premature infants (22). %58.2 of infants in Talaghani Hospital in Tehran and %63.3 of

infants in Kermanshah had less than 2500 gram (10-19) which is in accordance with studied infants. There is a significant statistical relation between studied infants weight and infection and %26.1 of infants who were infected had less than 1500 gram but %10.3 of infected infants were more than 3500 gram. Also in similar studies significant statistical relation was seen between infant's weight and nosocomial infection, bearing in mind low weight in infants is a dangerous factor for nosocomial infection (10-11-14-16-18-21). Although in our study there isn't any relation between sex of the infants and p

neumonia, septicemia, and eye infection, but girl's eye infection were more than boys (11-13-23). In national studies, infection in boys has been more than girls. However, there are no difference in study of Nagata in Brazil and Soo in Taiwan (15-16). There is a relationship between age of pregnancy with pneumonia and 32 weeks and less infants, have been infected more than others (P=0.04). But there isn't any relation between Septicemia and eye infection. In Yan Sok Jun study in South Korea average of infant's pregnancy age was 33.6 week (13). Findings of this study showed that intubation (OR=4.29), using ventilator is a risk factor for infection in infants. Other aggressive procedures including: urinary catheter, suction, and shunt, have no relation with infant infection. In different studies, factors including: ventilator, canula and parenteral nutritional, endotracheal tube are known as risk factors of infection (15-17-22). Also there is a relation between duration of hospitalization and infant's infection; it means that by increasing the duration of hospitalization frequency of infection has been increased. Average duration of hospitalization in infected infants was 15.6 days whereas this rate in uninfected infants was 7.4 days. In a study which was done in Mashhad, the average of hospitalization duration and infection was 11.21 days (13). In another study in South Korea, duration of hospitalization was 22.4 days (14). Cause of difference in hospitalization time may be related to method of care, type of infection and hospital facilities. Despite well equipped NICU at Besat Hospital, it has some limited physical space and inappropriate patient/stuff ratio causing health care issues and easier infection dissemination. Nosocomial infections are important in the case of: mortality and illness in patients, prolongation of hospitalization, increased costs due to prolonged stay of patients, diagnostic and therapeutic procedures. So infection control precautions, considering infection control protocols is necessary.

In general it can be said that the prevalence of infection in the Sanandaj NICU is similar to other parts of the country. Because Iranian medical centers

perform state issued protocol for infection control, consequently in order to control nosocomial Infection it is required to conduct a national protocol review.

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References

1. Eggimam Ph, Pitter D. Infection control in the ICU. *Critical Care Reviews* .CHEST 2011;120 (6):2059-2093.
2. Hossein Masoumi Asl, National Directory of hospital infection surveillance system, 1385.
3. Hossein Asl Soleimani, et al. Nosocomial infections and their control methods. Tehran University of Medical Sciences, Tehran. Iran.
4. Judith A. Guzman-Cottrill, DO, Assistant Professor, Pediatrics, Division of Infectious Diseases, Oregon Health and Science University, Doernbecher Children's Hospital, Portland, Ore. *American Academy of Pediatrics* 2010; 11: 419-425.
5. Kligman RM, Behrman RE, Jenson HB, Stanton BF, Nelson's text book of Pediatrics. 18th edition, Philadelphia, Saunders, 2007, part XI – the fetus and the neonatal infant- chapter 103: 766-767.
6. Poonam Joshi College of Nursing, AIIMS Prevention of nosocomial infection in NICU. *Journal of Neonatology* 2008; 22(2):1-5
7. Emori TG, Culver DH, Horan TC, Jarvis WR, White JW, Olson DR, Banerjee S, Edwards JR, Martone WJ, Gaynes RP, et al. National nosocomial infections surveillance system (NNIS): description of surveillance methods. *Am J Infect Control*. 1991 Feb; 19(1):19-35.
8. Shahin Kheirollahi, Nasrin Kanani, Soheila Estifaie. Incidence of microbial growth in inpatient in Besat Hospital, Kurdistan University of Medical Sciences in the year 2007. *Iranian Journal of Tropical Infections* 2008; 17:273
9. www.cdc.gov/nhsn/pdfs.datastat.nnis_2004.pdf
10. Ihn Sook Jeong; et al. Nosocomial infection in a newborn intensive care unit (NICU), South Korea. *BMC Infectious Diseases* 2006; 6:103
11. Salamati P, Rahbarimanesh AA, Yunesian M, Naseri M. Neonatal nosocomial infections in Bahrami Children Hospital. *Indian J Pediatr*. 2006 Mar;73(3):197-200.
12. Barak M, Mamishi S, Siadati A, Salamati P, Khotaii GH, Mirzarahimi M. Risk Factors and Bacterial Etiologies of Nosocomial Infections in NICU and PICU Wards of Children's Medical

- Center and Bahrami Hospitals During 2008-2009. *Journal of Ardabil University of Medical Sciences & Health Services* 2011; 11(2): 113-120
13. Ghotbi F, Raghīb Motlagh M, Valaei N. Nosocomial sepsis in NICU Department in Taleghani Hospital, 2001-02. *Journal of the Shaheed Beheshti University of Medical Sciences and Health Services* 2006; 29(4): 317-313
 14. Ghazvini K., Rashed T., Boskabadi H., Yazdan Panah M., Khakzadan F., Safae H., Mohamadpor L. Neonatal intensive care unit nosocomial bacterial infections. *Tehran University Medical Journal* 2008; 66(5): 349-354
 15. Seyed Abolfaz Afjeh, Mohammad Kazem Sabzehei, Seyed Abdollah Karimi, Ahmadreza Shamshiri. Surveillance of ventilator-associated pneumonia in neonatal intensive care unit: characteristics, risk factors and outcome. *Pejouhandeh Quarterly Research Journal* 2010; 15(4): 157-164
 16. Darvishpour A., Hashemian H., Faal E., Fasihi M. Survey Of Nosocomial Infection and Accompanied Factors in Neonatal Intensive Care Unit. *Journal of Medical Faculty Guilan University of Medical Sciences* 2010; 19(73): 37-45
 17. Kadivar M, Shahram R, Mozayan M, Kamali P, Mir Khaef M. A survey on nosocomial infection in the pediatric & neonatal intensive care units of the Children's Hospital Medical Center. *Iranian Journal of Infectious Diseases & Tropical Medicine* 2002;7(18): 66-59.
 18. Talebi Taher M, Asef Zadeh M, Sarreshteh Dari M. Incidence of nosocomial infections in neurologic, neonates, NICU and ICU wards in teaching hospitals of Qazvin University. *Iranian Journal of Infectious Diseases & Tropical Medicine* 2001;6(14): 52-48
 19. Hosseini M, Alipour AA, Vazirian Sh, Hemati M, Hashemian AH. Nosocomial bloodstream infection and its risk factors in Razi Hospital's neonatal intensive care unit of Kermanshah, 2002. *Behbood, The Scientific Quarterly* 2003;7(18): 59-52
 20. Rashidi K, Bahmani N, Ghotbi N, Shahsavari S. Study of prevalence of neonatal septicemia and detection of antibiotic resistance in Besat Hospital in Sanandaj in 1383. *Scientific Journal of Kurdistan University of Medical Sciences* 2006;10(38): 32-26
 21. E, Angela S.J. Brito, Tiemi Matsuo. Nosocomial infections in a neonatal intensive care unit: Incidence and risk factors. *American Journal of Infection Control* 2002;30(1) 26-31
 22. Peter Heeg. Nosocomial Infections in Newborn Nurseries and Neonatal Intensive Care Units. *Int J Infect Control* 2006, 2:1
 23. T, Castro AB, Militão MA, Girão JE, Ribeiro Kde C, Távora LG. Risk factors for nosocomial infection in a Brazilian neonatal intensive care unit. *Braz J Infect Dis.* 2008 Feb; 12(1):75-9.
 24. B. Nosocomial infection in a neonatal intensive care unit: A prospective study in Taiwan. *American Journal of Infection Control*. 2007; 35(3), 190-195.

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