International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

IJMRP

Original Research Article.

Study of Trends of HCAI in NICU Over 5 Years and Its Association with Risk Factors

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ABSTRACT

Background: HCAI is also a common complication in intensive care of critically ill patients in neonatal intensive care units (NICUs) in not only developing but also developed countries. It is therefore essential to monitor the local epidemiology of HCAIs to detect any changes in patterns of infections and susceptibility to various antibiotics. This study was done to analyze the patterns of HCAI in the NICU over the period of five years and its association with risk factors in order to establish preventive beneficial practices to curtail this scourge.

Materials and Methods: This study an observational, retrospective cohort study was conducted in the Neonatal Intensive Care Unit, NICE Hospital, Hyderabad which is a level 111 A tertiary care referral unit. All the neonates admitted in the NICU during the five-year period i.e. 2014 to 2018 were assessed for HCAI. The risk factors were assessed based on the history in the medical records. This included obstetric history of sepsis and symptoms of sepsis such as lethargy, poor feeding was obtained. The hospital risk factors included assessment of use medical devices such as endotracheal tube, mechanical ventilation, central venous catheter, urinary catheter, peripheral arterial/venous catheter, and feeding tube.

Results: It was observed that over the 5 years when analyzed in toto, most admissions in NICU were out born babies. However, there was an increasing trend of inborn admissions in level 2 &3 NICU over the 5 years with a corresponding reduction in out born admissions. These trends reached levels of high statistical significance ($p<0.001$). HCAI occurred in 0.5 to 6.5 % of NICU admissions over the years with an average incidence of 3.4% over 5 years. The incidence of HCAI is inversely proportional to the gestational age across all the years (p value < 0.05). There were no deaths occurred with HCAI group in 2014,2015 and 2016.However in the year 2017 and 2018 there was an increase incidence of HCAI as well HCAI related mortality ($p<0.001$).

Conclusion: We concluded that lower gestational age, low birth weight, male gender were significant risk factors for HCAIs. Despite rigorous surveillance strategies, prophylactic processes and the development of new treatment options and life support techniques, HCAI remains a major problem.

Keywords: HCAIs, NICU, LBW, Risk Factors.

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Article History:

Received: 06-08-2020, **Revised:** 03-09-2020, **Accepted:** 27-09-2020

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2020.6.5.013	

INTRODUCTION

'Healthcare Associated Infections' (HCAI) appear in a patient under medical care in the hospital or other health care facility which was absent or incubating at the time of admission. These infections can occur during healthcare delivery for other diseases and even after the discharge of the patients. Additionally, they comprise occupational infections among the medical staff.[1] Invasive devices such as catheters and ventilators employed in modern health care are associated to these infections.[2]

Of every hundred hospitalized patients, seven in developed and ten in developing countries can acquire one of the healthcare associated infections.[3] Populations at stake are patients in Intensive Care Units (ICUs), Burns units, Organ transplant patients and Neonates. According to Extended Prevalence of Infection in Intensive Care (EPIC II) study, the proportions of infected patients within the ICU are often as high as 51%.[4] Based on extensive studies in USA and Europe shows that HCAI

incidence density ranged from 13.0 to 20.3 episodes per thousand patient-days.[5] With increasing infections, there is an increase in prolonged hospital stay, long-term disability, increased antimicrobial resistance, increase in socio-economic disturbance, and increased mortality rate. Spare information exists on burden of HCAI because of poorly developed surveillance systems and inexistent control methods. For instance, while getting care for other diseases many patients probably get respiratory infections and it becomes troublesome to spot the prevalence of any HCAI in continuation of a primary care facility.[Error! Bookmark not defined.] These infections get noticed only when they become epidemic, yet there is no institution or a country that may claim to have resolved this endemic problem.[6] HCAI is also a common complication in intensive care of critically ill patients in neonatal intensive care units (NICUs) in not only developing but also developed countries. It is a major cause of mortality and morbidity in NICUs.[7,8] The incidence ranges from 6-20%, with a wide range of variation according to birth weight and the presence of risk factors.[9] Multidrug-resistant organisms usually cause the infections. In the literature, the overall mortality rate is reported to vary between 20% and 80%, depending on the underlying risk factors.[Error! Bookmark not defined.]

It is therefore essential to monitor the local epidemiology of HCAIs to detect any changes in patterns of infections and susceptibility to various antibiotics. This study was done to analyze the patterns of HCAI in the NICU over the period of five years and its association with risk factors in order to establish preventive beneficial practices to curtail this scourge.

MATERIALS AND METHODS

This study an observational, retrospective cohort study was conducted in the Neonatal Intensive Care Unit, NICE Hospital, Hyderabad which is a level 111A tertiary care referral unit. All the neonates admitted in the NICU during the five-year period i.e.2014to 2018were assessed for HCAI.

Inclusion Criteria: All patients admitted to the NICU without any sign of infection and without evidence of incubation at the time of hospitalization who remained hospitalized for at least 48 hours were included in this study.

Exclusion Criteria: Neonates discharged before 48 hours or those who had perinatal and community-acquired infections and infants who were born with congenital anomalies were excluded from the study.

Methodology

For this study, HCAI was defined as an infection not present and without evidence of incubation at the time of hospitalization. The diagnosis of infection based on clinical symptoms (fever, hypothermia, apnea, bradycardia, lethargy, hypotonia, unstable vital signs, and feeding intolerance, etc.), laboratory findings (leukocytosis or leukopenia, thrombocytopenia, elevated C reactive protein and immature / total neutrophil ratio) and positive blood cultures.

Medical Records were analyzed for the five-year period. The risk factors of infection i.e. maternal, natal or postnatal factors were noted. The other parameters collected included gestational age, birth weight, and gender. The data regarding the growth of organisms in blood culture was collected and analyzed. The sensitivity pattern was also noted. Institutional Ethics Committee and Institutional Research Committees approved the study protocol.

Outcome Measures

Demographic and clinical were collected and recorded. The data consisted of patient information about antenatal history, the procedures applied such as respiratory support and catheter insertion.

The risk factors were assessed based on the history in the medical records. This included obstetric history of sepsis and symptoms of sepsis such as lethargy, poor feeding was obtained. The hospital risk factors included assessment of use medical devices such as endotracheal tube, mechanical ventilation, central venous catheter, urinary catheter, peripheral arterial/venous catheter, and feeding tube.

Statistical Analysis

The data was collected, compiled and compared statistically by frequency distribution and percentage proportion. Qualitative data variables were expressed by using frequency and Percentage (%). P-values of < 0.05 were considered significant.

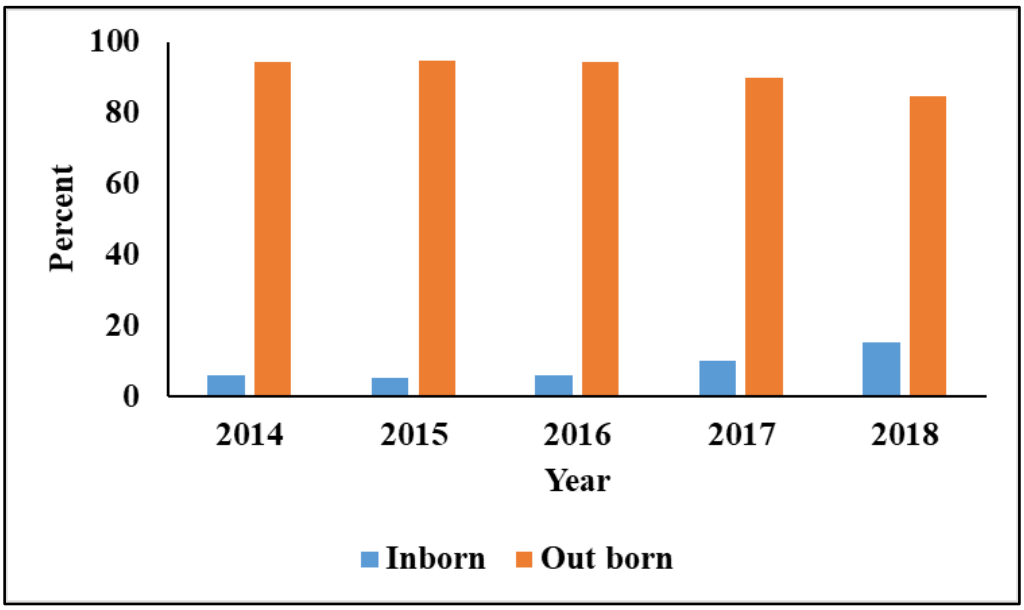

Figure 1: Incidence Inborn Vs Out Born Babies 2014-2018

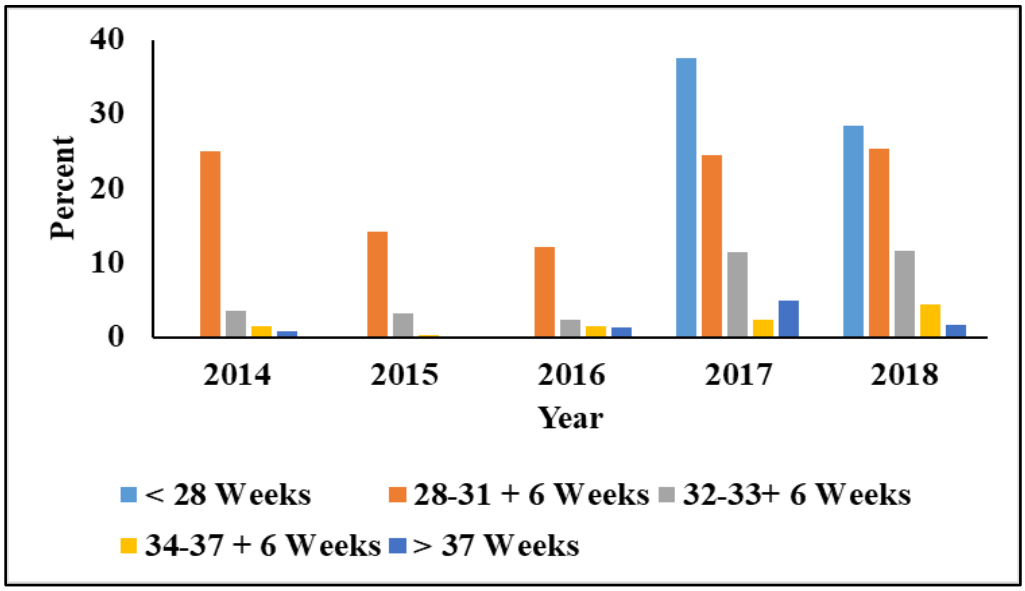

Figure 2: Bar diagram showing distribution of HCAI according to Gestational age over last Five Years:

Table 1: Incidence HCAI vs Place of Delivery

	2014		2015		2016		2017		2018		Total (%)	p value	95 % CI
	TA	HCAI (%)	TA	HCAI (%)	TA	HCAI (%)	TA	HCAI (%)	TA	HCAI (%)	TA/HCAI		
Inborn	50	1 (2)	58	0 (0)	56	2 (3.57)	78	8 (10.2)	85	4 (4.7)	327/15 (4.5%)	NA	NA
Outborn	201	14 (6.96)	1057	6 (0.56)	890	16 (1.79)	699	43 (6.1)	479	33 (6.8)	3326/112 (3.3%)	NS	-2.07 to 3.54
Total	251	15 (5.9)	1115	6 (0.5%)	945	18 (1.9%)	777	51 (6.5%)	564	37 (6.5%)	3653/127 (3.4%)		

Table 2: HCAI Categories from 2014-2018

HCAI	2014	2015	2016	2017	2018	Total
BSI	10	6	16	49	12	93
CLABSI	4	4	13	34	2	57
UTI	5	0	0	4	23	32
VAP	2	0	0	1	1	4
TOTAL	21	10	29	88	38	186

Table 3: Deaths in HCAI and Non HCAI from 2014-2018

Deaths	2014	2015	2016	2017	2018	x^2	P Value
HCAI	0	0	0	6	4	20.335	<0.001
Non HCAI	25	21	27	16	14		SIG

RESULTS

It was observed that over the 5 years when analyzed in toto, most admissions in NICU were out born babies. However, there was an increasing trend of inborn admissions in level 2 &3 NICU over the 5 years with a corresponding reduction in out born admissions. These trends reached levels of high statistical significance (p<0.001) (figure 1).

The occurrence of HCAI in NICU admissions from 2014 to 2018 as per place of delivery viz inborn/out born is depicted in Table 1. It was observed that HCAI occurred in 0.5 to 6.5 % of NICU admissions over the years with an average incidence of 3.4% over 5 years. The average incidence over 5 years of HCAI in inborn was 4.5% & 3.3 % in outborns. We observed that there is increase in incidence of HCAI in moderate preterm group over the years reaching levels of statistical significance (p<0.05). It was observed that incidence of HCAI is inversely proportional to the gestational age across all the years (p value < 0.05). Babies less than 28 weeks in 2017 and 2018 were affected the most with HCAI compared to other years (figure 2).

We observed that of HCAI's, the incidence of BSI was commonest followed by CLABSI, UTI and VAP in decreasing order. This trend was uniform in all years except 2018 where UTI was predominant (table 2).

We observed that there were no deaths occurred with HCAI group in 2014,2015 and 2016.However in the year 2017 and 2018 there was an increase incidence of HCAI as well HCAI related mortality (p<0.001) (table 3).

DISCUSSION

HCAI are one of the major causes of morbidity in the Newborn Intensive Care Unit (NICU). Known risk factors include birth weight, gestational age, severity of illness and its related length of stay, and instrumentation. Over the 5 years when analyzed in, most admissions in NICU were out born babies. However, there was an increasing trend of inborn admissions in level 2 &3 NICU over the 5 years. It was observed that the HCAI occurred more in out born babies except in 2017 where inborn babies were affected more due to the outbreak of infection. However, as the numbers were low, it could not be effectively statistically analyzed.

In this study It was observed that the incidence of HCAI in range from 0.91-8.3/1000 patient days with the average of 4.3 per 1000 patient days. There was outbreak of HCAI in 2017 and it corresponded to an increase in incidence of HCAI. This is related to a major change in paramedical staff. This finding shows the decrease incidence of HCAI in our unit when compared with the study conducted by S. Srivastava et al[10] where the HCAI rate was 19.9/1000 patient days.

In our study number males were affected more with HCAI, the difference between the proportions was statistically not significant. The findings were consistent with the Tavora et al.[11] showed gender as insignificant risk factor (p value 0.65). Babanzono et al.[12] studied risk factors in neonatal intensive care unit using NICU surveillance data and showed that the incidence of infection was significantly higher in the boys (OR 1.28; 95% CI 0.43–3.75).

In this study there was increase in incidence of HCAI in moderate preterm group (p value < 0.05). In general it was seen that the incidence of HCAI was inversely proportional to the gestational age (p value < 0.05) and birth weight (p value < 0.05) across all the years. It has been shown that as the gestational age decreases, the risk of infection increases as a result of the neonate being either of a low birth weight or extremely low birth weight. This finding was supported by a study done in Italy by Auriti et al.[13] in which it was documented that shorter gestational age rendered neonates more susceptible to HCAI.

Over the 5-year period of study, when compared with different types of HCAI. It was observed that BSI was commonest form of HCAI followed by CLABSI, UTI and VAP. In the study of Ihn Sook Jeong et al[14] commonest HCAI was VAP followed by BSI. In our center the incidence of VAP was low with an increasing trend towards noninvasive ventilation.

The death caused by the HCAI was 8% which was more when compared to the study done by Fatih Bolat et al[15] were it was 17.3%. There were no deaths occurred with HCAI group in 2014, 2015, 2016 and it incidence increased in the year 2017 and 2018 with the statistical significance (p<0.001).

CONCLUSION

We concluded that lower gestational age, low birth weight, male gender were significant risk factors for HCAIs. Despite rigorous surveillance strategies, prophylactic processes and the development of new treatment options and life support techniques, HCAI remains a major problem.

REFERENCES

1. WHO. The burden of health care-associated infection worldwide. 2016 [Online] Available from: http://www.who.int/gpsc/country_work/burden_hcai/en/

2. CDC. Types of healthcare-associated infections. Health care associated infections (HAIs). 2016 [Online] Available from: https://www.cdc.gov/HAI/infectionTypes.html

3. Raja Danasekaran GM, Annadurai K. Prevention of health care associated infections: protecting patients, saving lives. Int J Community Med Public Health 2014;1(1): 67-8.

4. Vincent JL, Marshall J, Silva E, Anzueto A, Martin CD, Moreno R, et al. International study of the prevalence and outcomes of infection in intensive care units. JAMA 2009; 302;(21): 2323-29.

5. Allegranzi B. Report on the burden of endemic health care associated infection worldwide. Geneva: WHO; 2011.

6. Gupta A, Singh DK, Krutarth B, Maria N, Srinivas R. Prevalence of health care associated infections in a tertiary are hospital in Dakshina Kannada, Karnataka: a hospital based cross sectional study. Int J Med Res Health Sci 2015; 4(2): 317-21.

7. Stoll BJ, Hansen N, Fanaroff AA, Wright LL, Carlo WA, Ehrenkranz RA, et al. Late-onset sepsis in very low birth weight neonates: the experience of the NICHD Neonatal Research Network. Pediatrics. 2002;110:285-91.

8. Zaidi AK, Huskins WC, Thaver D, Bhutta ZA, Abbas Z, Goldmann DA. Hospital-acquired neonatal infections in developing countries. Lancet. 2005;365:1175-88.

9. Adams-Chapman I, Stoll BJ. Prevention of nosocomial infections in the neonatal intensive care unit. Curr Opin Pediatr. 2002;14:157-64.

10. S. Srivastava, N. Shetty. Healthcare-associated infections in neonatal units: lessons from contrasting worlds J Hosp Infect, 2007; 65(4):292-306.

11. A.C. Tavora, A.B. Castro, M.A. Militao, J.E. Girao, C. RibeiroKde, L.G. Tavora Risk factors for nosocomial infection in a Brazilian neonatal intensive care unit Braz J Infect Dis,2008;12 (1):75-9.

12. Babazono A, Kitajima H, Nishimaki S, Nakamura T, Shiga S, Hayakawa M, et al. Risk factors for nosocomial infection in the neonatal intensive care unit by the Japanese Nosocomial Infection Surveillance (JANIS). Acta Med Okayama. 2008;62:261-8.

13. Auriti C, Ronchetti MP, Pezzotti P et al. Determinants of nosocomial infection in 6 neonatal intensive care units: an Italian multicenter prospective cohort study. Infect Control Hosp Epidemiol. 2010;31(09):926–33.

14. Jeong IS, Ree YH, Oh HS, Choe KW: Outbreak Investigation of Epidemic Keratoconjunctivitis in a neonatal intensive care unit. Korean J Nosocomial Infect Control 2000;5(2):99-111.

15. Fatih Bolat, Sinan Uslu, Guher Bolat, Serdar Comert, Emrah Can, Ali Bulbul and Asiye Nuhoglu. Healthcare-associated Infections in a Neonatal Intensive Care Unit in Turkey. Indian Pediatrics, December 2012;49:951-7.

Source of Support: Nil.

Conflict of Interest: None Declared.

Cite this article as: Khurshida Khan, Navneeth Reddy, N. Saravanan, Uma Raju, Padmanabh Reddy. Study of Trends of HCAI in NICU Over 5 Years and Its Association with Risk Factors. Int J Med Res Prof. 2020 Sept; 6(5): 61-64. DOI:10.21276/ijmrp.2020.6.5.013