

“Study of sources of Coagulase Negative Staphylococci infection from NICU environment.”

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Abstract:

Introduction: In recent years Coagulase negative staphylococci infections has emerged as a pathogen in growing number of serious nosocomial infections¹. The shift in NICU bed utilization toward occupancy by babies who have the highest overall risk of developing nosocomial bloodstream infections is seen. With this consideration in mind the present study was planned to study different sources of Coagulase Negative Staphylococci infection from NICU environment.

Materials & Methods: The present study was conducted in neonatal intensive care unit (NICU) of a tertiary care hospital over a period of one year. A Total of 972 neonates both preterm and fullterm, who were clinically suspected of having sepsis were included in the study. Blood, Pus, CSF and Urine specimen were collected. These samples were processed by standard bacteriological techniques. 269 samples from NICU environment were also collected during same time and period.

Observations & Results: In our study shows that, majority of 100 CoNS were isolated from blood 58, followed by exudates 28 [Umbilical swab 9, Skin infection 10, Catheter tip 8, Conjunctival swab 1], CSF12 and urine 02. There was seen correlation between onset of septicemia with early onset < 48 hrs case were 36 while with late onset >48 hrs were 64 cases out of 100.

Conclusion: There are few studies showing CoNS isolation rate more than the present study. This may consider as an interim study & hence more studies should occur in India & with more appropriate statistical analysis.

Keywords: Coagulase Negative Staphylococci , Neonatal intensive care unit

Introduction:

In recent years Coagulase negative staphylococci infections has emerged as a pathogen in growing number of serious nosocomial infections¹. They are an important cause of infection in hospitalized patients who are immunocompromised and or are suffering from chronic diseases². This is particularly true in the blood stream infections of Neonatal Intensive Care Unit [NICU] patients. The advances in neonatal intensive care units have led to improved survival of very low birth weight infants, which have led to late onset nosocomial neonatal septicemia (>72 hr post delivery) as an

important cause of morbidity and mortality among these infants³.

The shift in NICU bed utilization toward occupancy by babies who have the highest overall risk of developing nosocomial blood stream infections is seen. These high risk factors are very low birth weight, operations, prematurity, etc⁴. Although Gram negative bacilli were the principal concern in previous decades, coagulase negative Staphylococci are now the most common organisms associated with late onset septicemia. In more than 50% cases CoNS has been isolated. Skin colonization by CoNS can be demonstrated in over 90% of NICU admissions; these organisms may then gain entry

to the blood during an invasive procedure and result in sepsis⁵.

Modern treatment necessitate the use of intravenous catheters, urinary catheters, respirators, haemodialysis, complicated operations, cortisone therapy and other factors, which depress the resistance mechanisms and make patients susceptible to infections. More over in neonatal state due to weak immune barrier, CoNS can get entry during routine invasive procedures and can cause septicemia⁵. With this consideration in mind the present study was planned to study different sources of Coagulase Negative Staphylococci infection from NICU environment.

Material & Methods:

The present study was conducted in neonatal intensive care unit (NICU) of a tertiary care hospital over a period of one year. The Institutional Ethical Committee clearance was obtained for study design & work. The informed consent was obtained from regulatory authorities. A Total of 972 neonates both preterm and fullterm, who were clinically suspected of having sepsis were included in the study. Blood, Pus, CSF and Urine specimen were collected. These samples were processed by standard bacteriological techniques. 269 samples from NICU environment were also collected during same time and period.

Environmental specimens were collected from Hands of health care workers , Stethoscope , Apron , Cot of Neonates , Trolley, Suction machine & Wash basin tap. These specimen were also processed by standard bacteriological techniques.⁶

Blood culture was done in all clinically suspected neonates with septicemia while other specimens like CSF, Pus, and Urine were also collected to determine the focal infection in these neonates. Total 1411 samples from 972 neonates were collected.

All the specimens were brought to the laboratory within two hours of collection and further processing was done by direct microscopy & Blood culture. Specimens were inoculated onto nutrient agar, blood agar and Mac-Conkey agar plates. The plates were incubated aerobically, at 37⁰c for 24 hours. After 24 hours plates were observed for the growth, colony morphology. Colonies were picked up from culture and gram staining was done. Gram positive cocci., arranged in clusters, pairs were further considered for the study. Staphylococci were differentiated from Micrococci with the help of three tests, i.e. Furazolidone susceptibility. (100 µg) , Bacitracin susceptibility (0.04 µ) & Modified oxidase test – Modified oxidase reagent is prepared just before use by adding dimethyl sulfoxide(DMSO) in Teramethyl-p-phenylenediamine dihydrochloride(oxidase reagent).⁷

Observations & Results:

In our present study, there was seen correlation between onset of septicemia (Table 2) with early onset < 48 hrs case were 36 while with late onset >48 hrs were 64 cases out of 100.

From table 1 in our study shows that, majority of 100 CoNS were isolated from blood 58, followed by exudates 28 [Umbilical swab 9, Skin infection 10, Catheter tip 8, Conjunctival swab 1], CSF12 and urine 02.

Observations & Results:

Table 1: Specimen-wise distribution of CoNS from neonates.

Specimens	Number
Blood	58
Pus (exudates)	28
a) Umbilical swab	9
b) Skin infection	10
c) Catheter tip	8
d) Conjunctival swab	1
CSF	12
Urine	02
Total	100

Table 2: Correlation of CoNS with onset of septicemia in neonates.

Total no. of CONS	Early onset <48 hr	Late onset >48 hr.
100	36	64

Discussion:

In recent years Coagulase negative staphylococci infections has emerged as a pathogen in growing number of serious nosocomial infections³. They are an important cause of infection in hospitalized patients who are immunocompromised and or are suffering from chronic diseases. This is particularly true in the blood stream infections of Neonatal Intensive Care Unit [NICU] patients. Nosocomial infections are widespread. They are important contributors to

morbidity and mortality. Neonates are particularly vulnerable to infections because of their weak immune status. In the present study 100 CoNS strains were isolated from various clinical specimens received from neonates in NICU of a tertiary care hospital. Also 39 CoNS strains were isolated from NICU environment during same period.

In our study positive growth was seen in 43.25% of specimen collected. This study correlates with the study of Roy et al (2002) who

got growth in 346 (47.5%) out of 728 specimens.⁸ Aftab I. et al and Iqbal (2005) got a slightly higher percentage when they isolated 62 (54%) out of 115 specimens, this higher percentage of isolation could be probably due to their NICU being in a developing country.⁹

Lesser percentage of growth was shown by many workers. Issacc D. et al (31%) out of 294 neonates studied, Barbara J. et al (2002) 21% out of 6215 infants.^{10,11} Villari P. et al (2002) 21% out of 1010 infants.¹² This low percentage of isolations could be due to the fact that their studies were carried out in developed countries, which have separate rooms for each neonate and one nursing staff for only two neonates. This decreases the rate of infections. Ni Chung Lee et al showed 9.31% rate of isolation in Chinese neonates is could be explained by the fact that all high risk neonates in their NICU received prophylactic antibiotics on admission.¹³

In our study, we have collected samples like blood, CSF, pus and urine from septicaemic neonates. As is clear from table 2, blood showed maximum number of growth positivity, i.e. 260 (54.3%) out of 494 positive samples. Roy I. et al (2002) 47.5% showed that 42% of blood cultures were positive out of 1828 samples⁸. There are some workers who showed less percentage of blood culture positivity. Barbar Stoll M.D et al studied 6215 infants and obtained blood culture positivity in 1313 (21%) infants.¹⁴ This could be the possible that their high level of NICU set ups prevents nosocomial infections. The high rate of blood

culture positivity in our study and other workers studies shows the importance of blood culture in diagnosis of neonatal septicemia.

In our present study, we have included the pus specimens including umbilical swab, skin swab, catheter tip, conjunctival swab. In our study we got 147 (29.7%) pus samples culture positive. These results are comparable to the finding of Villari P. et al (256) who got 25.5% pus culture positive out of 1010 samples.¹²

In this present study 40 (8.1%) CSF samples showed positive growth out of 497 samples. Our results are comparable with that of Villari P. et al who had shown growth in 6.5% CSF samples.¹² 47 urine samples out of 494 samples were culture positive (9.5%), other workers also have a comparable growth from urine. Villari P. and Sarnataro showed 8.7% growth from total of 1010 samples.¹² In the present study 100 CoNS were isolated from 494 organisms, which amount to 20.24%. Comparable studies show that, 16.5% of CoNS were isolated from neonatal septicemic cases out of 346 organisms in 728 neonates by Roy I. et al. similarly 16.4% of CoNS were isolated from neonatal septicemia out of 660 organisms by Amita Jain et al. (2004)^{3,8}. Ni-hung Lee et al (2004) have isolated 29% CoNS from 87 organisms isolated.¹³ This high rate of isolation could be explained on the basis that majority of these organisms were from neonates with very low birth weight and their sample collection was after the 3 days of admission.

There are few studies showing CoNS isolation rate more than the present study, Barbara S. et al have isolated 48% of CoNS in a study of 6215 neonates.¹⁴ They have also collected the samples from VLBW

neonates and after the 96 Hrs of admission which explains high rate of CoNS isolation.

Conclusion: There are few studies showing CoNS isolation rate more than the present study. This may consider as an interim study & hence more studies should occur in India & with more appropriate statistical analysis.

Abbreviations:

CoNS : Coagulase Negative Staphylococci

NICU : Neonatal Intensive care unit

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Manuscript submission: 20 November 2012

Peer review approval: 04 December 2012

Final Proof approval: 28 December 2012

Date of Publication: 05 January 2013

Source of support: Nil Conflict of Interest: Nil