

INCIDENCE AND MICROBIOLOGICAL PROFILE OF LATE ONSET NEONATAL SEPSIS IN PRETERM AND LOW BIRTH WEIGHT NEONATES, NICU, RIMS, RAICHUR

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INTRODUCTION: According to recent data from National Neonatal Perinatal Database (NNPD) 2000, the incidence of neonatal sepsis has been reported to be 38 per 1000 intramural live births in tertiary care institutions.^[1] Septicaemia was the commonest clinical category with an incidence of 24 per 1000 live births. Neonatal sepsis was one of the common causes of neonatal mortality contributing to 23% of all neonatal deaths.^[1]

Neonatal sepsis is defined as clinical syndrome of bacteraemia with systemic signs and symptoms of infection in the first four weeks of life.^[2]

Neonatal sepsis can be classified as:

- Early Onset Neonatal Sepsis (EONS) – onset of symptoms is before 72 hours of life.
- Late Onset Neonatal Sepsis (LONS) – onset of symptoms is after 72 hours of life.

EONS most often appears within 24 hours of life where the neonate gets infected by organisms present in maternal genital tract.

LONS is caused by organisms thriving in the external environment of home or hospital. The most frequent microorganisms involved in LONS are Staphylococci, Streptococci, Escherichia coli, Klebsiella, Pseudomonas species.

The common risk factors associated with the two syndromes are low birth weight (LBW) i.e. <2500gm and gestational age < 37 weeks.

Several studies have reported that infants with LBW or Intra Uterine Growth Retardation or who were Small for Gestational Age, have a lower percentage of T or B lymphocytes and lower vaccine-specific IgG responses than do new born infants with Normal Birth Weight.^[3]

Neonates, particularly those born prematurely, are exquisitely vulnerable to life-threatening infections. It is increasingly recognized that innate immune responses are key to the protection against infection early in life, and emerging data suggest that such responses are deficient in the new born and especially in preterm infants.^[4]

The present study was undertaken in Raichur Institute of Medical Sciences, Raichur to find out the incidence and microbiological profile of LONS in preterm and LBW neonates.

REVIEW OF LITERATURE:

1. In a study conducted by Isaacs D. Barfield C et al; it was concluded that Coagulase negative Staphylococci are the commonest cause of late onset sepsis of babies in neonatal units.^[6]
2. According to a study conducted by Stoll BJ, Gordon T et al; it was proved that vast majority of infections are caused by gram positive organisms with CONS accounting for

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52% of all infections and rate of infection was inversely related to birth weight and gestational age.^[7]

3. In a study conducted by Tallur SS, Kasturi AV et al; it was proved that the blood culture positivity rate was 64.87%. klebsiella species was the commonest causative pathogen found and multidrug resistance was frequent.^[8]
4. In a study conducted by I Roy, A Jain et al; it was found that CONS (16.7%) were more frequently associated than Staphylococcus aureus (14%) and resistance amikacin was less frequent than resistance to gentamycin.^[9]
5. In a study conducted by Akash Deep, R Ghildiyal et al; it was proved that the risk of nosocomial infection was directly related to the duration of stay in the Neonatal Intensive Care Unit (NICU).^[10]
6. In another study conducted by Shrestha P, Das BK et al; it was concluded that Staphylococcus aureus, CONS and klebsiella species the principle organism causing neonatal sepsis.^[11]
7. In a study by Narodi L, Johnston RB Jr. it was concluded that invasive infections with Candida species are the most common cause of Late onset blood culture proven nosocomial sepsis in Very Low Birth Weight (VLBW) neonates.^[12]
8. In a study conducted by Thaver D, Ali S et al; it was proved that among the three major pathogen study (Escherichia Coli, Staphylococcus aureus and Klebsiella species), a high proportion of Escherichia coli were ampicillin (72%) and cotrimoxazole resistant.^[13]
9. In a study by done by Dagne M, Yismow G et al; it was concluded that most of the pathogens were isolated from the blood culture showed high rate of resistance to most common antibiotics used to treat bacterial infections.^[14]
10. In a study conducted by Tsai MH, Hsu JF et al; it was concluded that late onset neonatal sepsis predisposes hospitalised neonates to increase the risk of mortality and morbidity especially caused by Candida species.^[15]

AIMS & OBJECTIVES:

- To estimate the incidence of Late Onset Neonatal Sepsis in Low Birth Weight and preterm neonates in RIMS, Raichur.
- To find out the microbiological profile of Late Onset Neonatal Sepsis in preterm and LBW neonates.

MATERIALS & METHODS:

Study setting: The study was undertaken in Neonatal Intensive Care Unit (NICU), Raichur Institute of Medical Sciences, Raichur.

Study design: Prospective cohort study.

Sample size: All the preterm and LBW neonates admitted to the Neonatal Intensive Care Unit (NICU), RIMS Raichur in a period of 2 months.

Materials: Digital weighing machine, Sysmex KX-21 Automated Haematology Analyser, gestational age is assessed using Modified Ballard's score.

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Methodology: All the LBW neonates i.e. preterm and small for gestational age, admitted to NICU were examined.

➤ **INCLUSION CRITERIA:**

- All the preterm neonates of gestational age <37 weeks
- Age of the neonate should be >72 hours
- LBW Neonates i.e. those weighing <2500gm admitted in NICU. RIMS.
- Neonates for whom informed consent has been granted by the parent/guardian.

➤ **EXCLUSION CRITERIA:**

- All the preterm and LBW neonates for whom informed consent has not been granted.
- Neonates <72 hours old.

PROCEDURE:

Blood Sample collection: The sterile procedure for collecting blood sample should be strictly followed to avoid contamination.

- The staff involved should wear sterile gloves.
- The proposed venous-puncture site should be cleansed thoroughly with alcohol then by povidone-iodine followed again by alcohol.
- Application of povidone-iodine should be done in concentric circles moving outward from the centre. The skin should be allowed to dry for at least 1 minute before the blood sample is collected.
- 2ml of blood sample will be collected.

BLOOD CULTURE AND SENSITIVITY: This is the golden standard for diagnosis of septicaemia and will be done in all above mentioned sepsis. A positive blood culture and sensitivity of the isolate is the best guide to antimicrobial therapy.

A one-ml sample of blood is adequate for a blood culture bottle containing 5-10 ml of culture media. All blood cultures should be observed for at least 72 hours before they are reported as sterile.

The Kirby-Bauer disc-diffusion method was used for antimicrobial susceptibility testing. The guidelines of the Clinical and Laboratory Standards Institute were used for interpretation as resistant, intermediate sensitive, and sensitive.^[5]

To corroborate the diagnosis, C-Reactive Protein (CRP) and percentage of neutrophils and random blood glucose level was also calculated.

Statistical analysis: The collected data was analyzed using SPSS 20 software.

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RESULTS & OBSERVATIONS:

FIGURE SHOWING NUMBER OF MALES AND FEMALES IN THE STUDY:

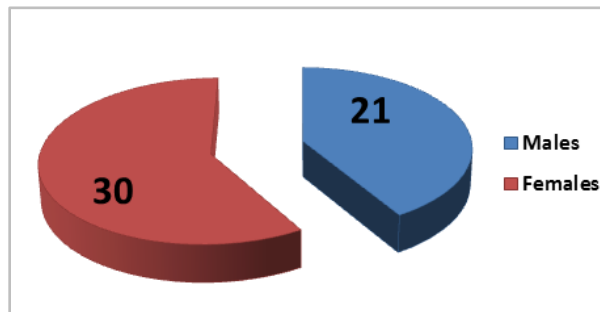


Figure 1

FIGURE SHOWING THE INCIDENCE OF LATE ONSET NEONATAL SEPSIS IN THE STUDY:

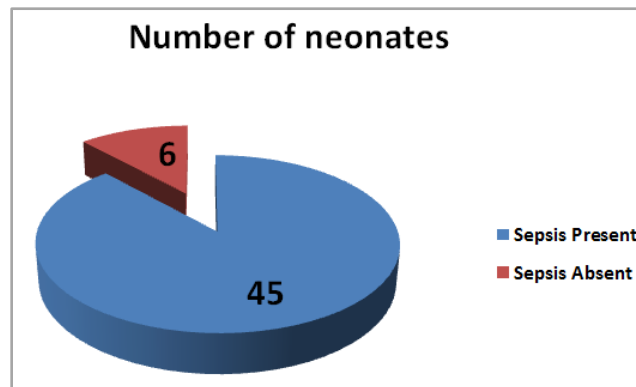


Figure 2

FIGURE SHOWING CULTURE POSITIVITY IN THE STUDY:

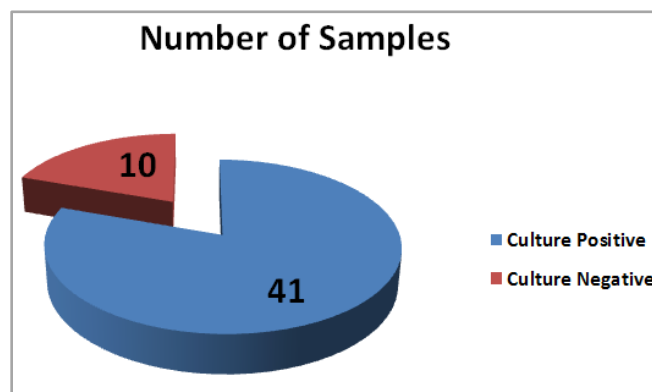


Figure 3

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FIGURE SHOWING CRP POSITIVITY IN THE STUDY:

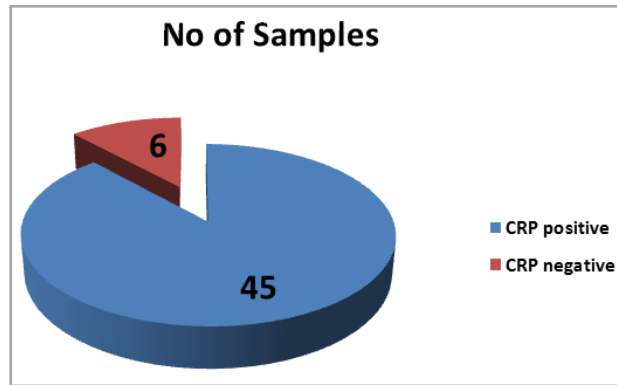


Figure 4

FIGURE SHOWING DIFFERENT ORGANISMS ISOLATED IN THE STUDY:

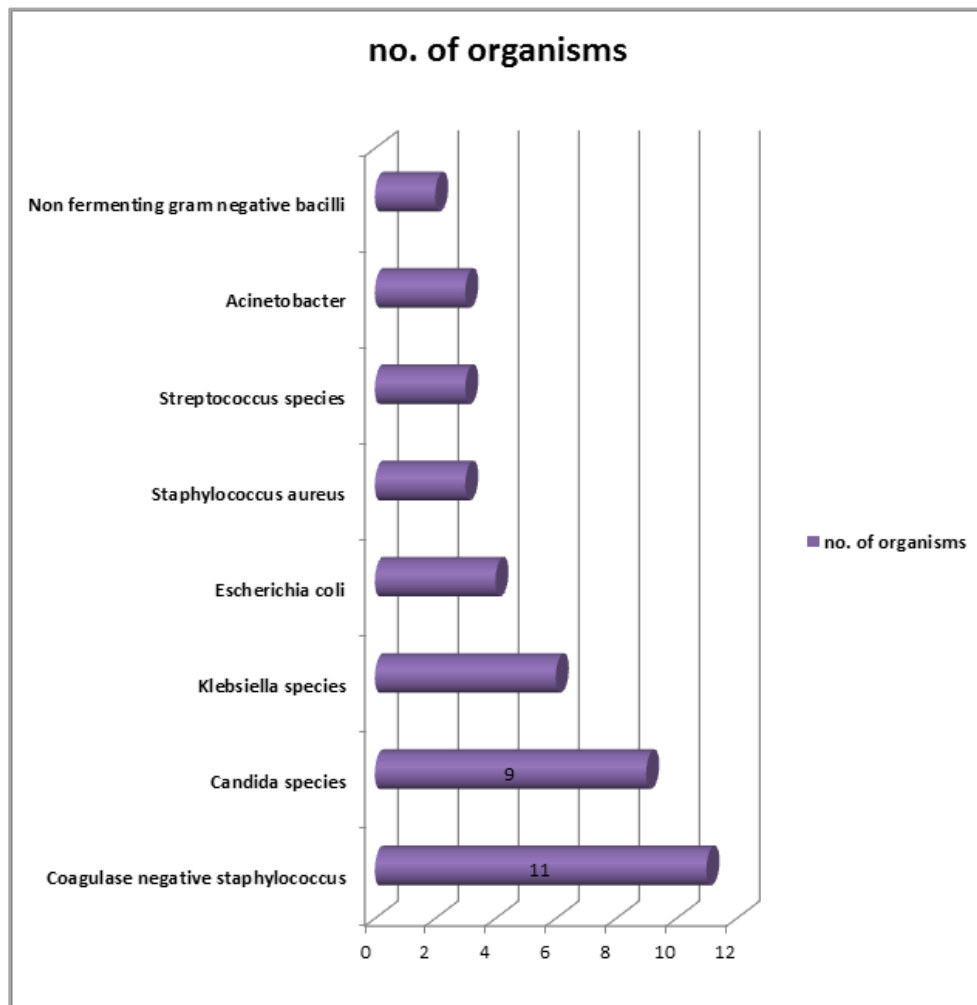


Figure 5

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FIGURE SHOWING THE NUMBER OF GRAM POSITIVE, GRAM NEGATIVE ORGANISMS AND FUNGAL ISOLATES ISOLATED IN THE STUDY:

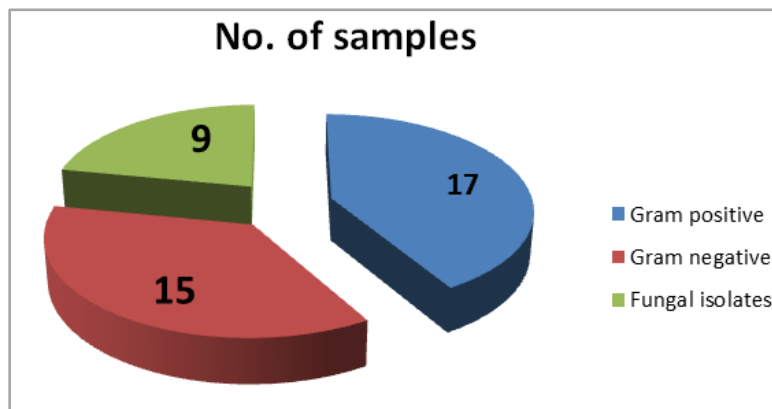


Figure 6

GRAPH SHOWING RELATION BETWEEN DURATION OF HOSPITAL AND INCIDENCE OF SEPSIS:

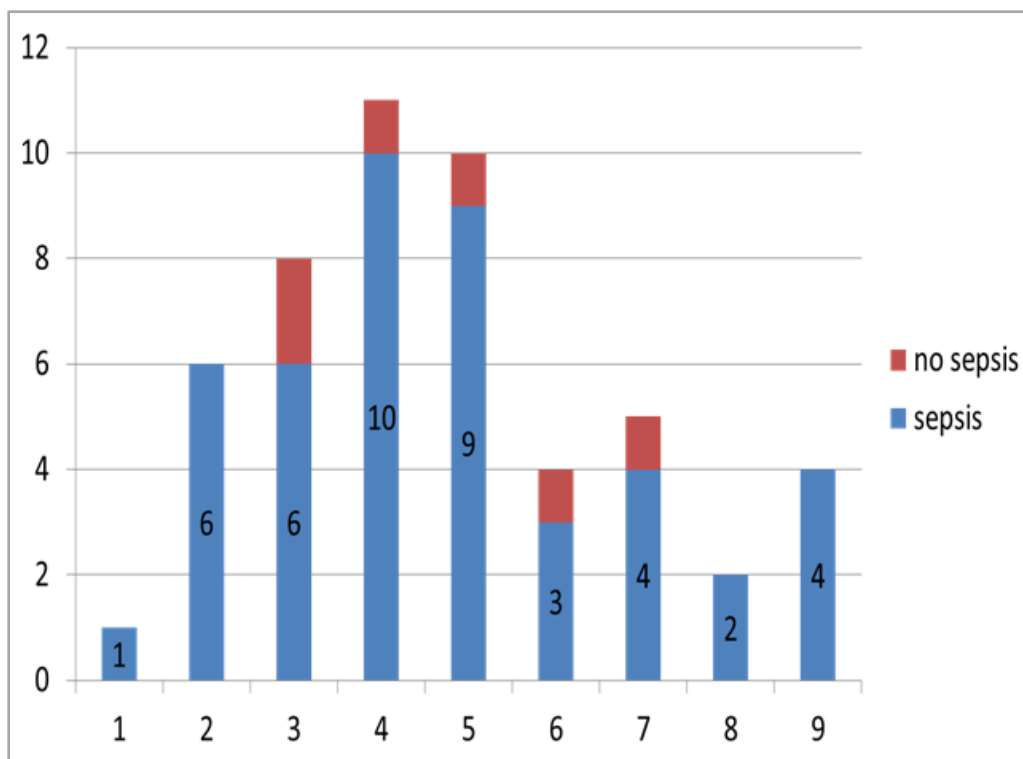


Figure 7

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FIGURE SHOWING RELATION BETWEEN BIRTH WEIGHT AND INCIDENCE OF NEONATAL SEPSIS:

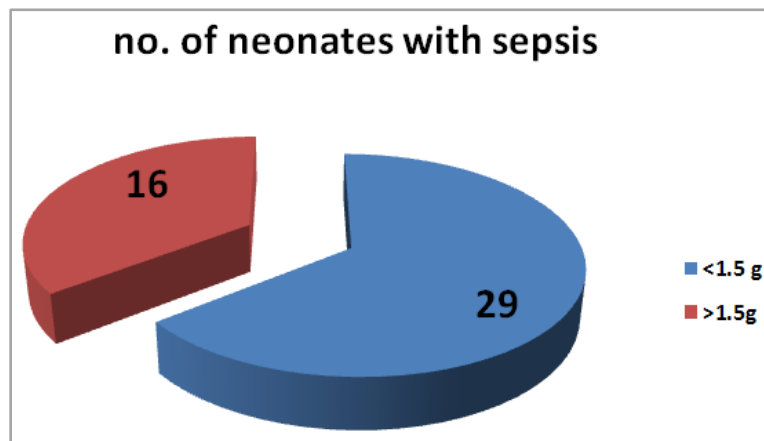


Figure 8

GRAPH SHOWING OVERALL ANTIBIOTIC SENSITIVITY OF THE ORGANISMS ISOLATED IN THE STUDY:

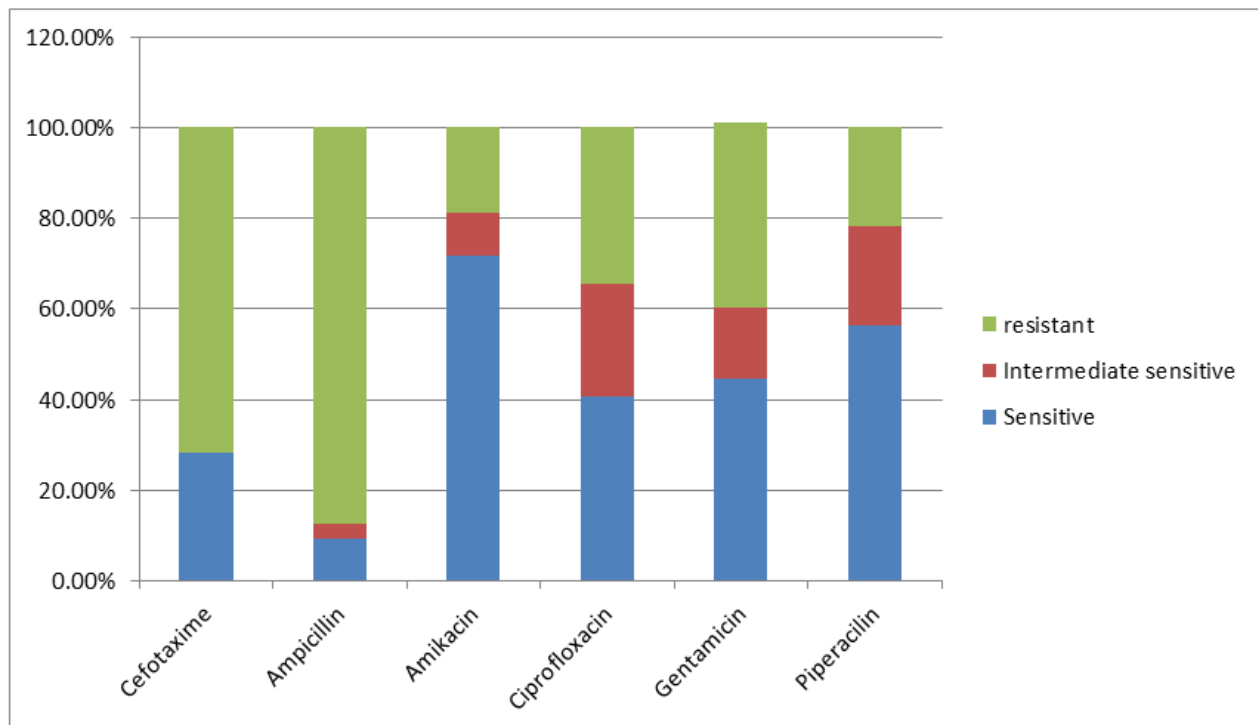


Figure 9

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TABLE SHOWING THE ANTIBIOTIC SENSITIVITY PATTERN OF COAGULASE NEGATIVE STAPHYLOCOCCI:

Antibiotic	Sensitive	Intermediate sensitivity	Resistant
Cefotaxime	0	0	11
Ampicillin	0	0	11
Amikacin	10	1	0
Ciprofloxacin	7	3	1
Gentamicin	6	2	3
Piperacillin	9	2	0

Table 1

As the table shows CONS is markedly resistant to Cefotaxime and Ampicillin.

TABLE SHOWING THE ANTIBIOTIC SENSITIVITY PATTERN OF STREPTOCOCCUS SPECIES:

Antibiotic	Sensitive	Intermediate sensitivity	Resistant
Cefotaxime	3	0	0
Ampicillin	0	0	3
Amikacin	3	0	0
Ciprofloxacin	0	2	1
Gentamicin	3	0	0
Piperacillin	2	1	0

Table 2

As the table shows Streptococcus species are markedly resistant to Ampicillin.

TABLE SHOWING ANTIBIOTIC SENSITIVITY PATTERN OF STAPHYLOCOCCUS AUREUS:

Antibiotic	Sensitive	Intermediate sensitivity	Resistant
Cefotaxime	0	0	3
Ampicillin	1	0	2
Amikacin	3	0	0
Ciprofloxacin	2	0	1
Gentamicin	2	1	0
Piperacillin	3	0	0

Table 3

As the table shows Staphylococcus aureus is resistant to cefotaxime and Ampicillin.

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TABLE SHOWING ANTIBIOTIC SENSITIVITY PATTERN OF ESCHERICHIA COLI.

Antibiotic	Sensitive	Intermediate sensitivity	Resistant
Cefotaxime	0	0	4
Ampicillin	0	0	4
Amikacin	0	2	2
Ciprofloxacin	0	1	3
Gentamicin	0	0	4
Piperacillin	0	2	2

Table 4

As the table shows Esch.coli is markedly resistant to the above mentioned antibiotics.

TABLE SHOWING ANTIBIOTIC SENSITIVITY PATTERN OF KLEBSIELLA SPECIES.

Antibiotic	Sensitive	Intermediate sensitivity	Resistant
Cefotaxime	2	0	4
Ampicillin	0	1	5
Amikacin	3	0	3
Ciprofloxacin	2	1	3
Gentamicin	0	1	5
Piperacillin	0	2	4

Table 5

As the table shows most of the Klebsiella species are resistant to the above mentioned antibiotics.

TABLE SHOWING ANTIBIOTIC SENSITIVITY PATTERN OF ACINETOBACTER.

Antibiotic	Sensitive	Intermediate sensitivity	Resistant
Cefotaxime	3	0	0
Ampicillin	0	0	3
Amikacin	3	0	0
Ciprofloxacin	2	1	0
Gentamicin	2	1	0
Piperacillin	3	0	0

Table 6

As the table shows Acinetobacter is markedly resistant to Ampicillin.

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TABLE SHOWING ANTIBIOTIC SENSITIVITY PATTERN OF NON FERMENTING GRAM NEGATIVE BACILLI.

Antibiotic	Sensitive	Intermediate sensitivity	Resistant
Cefotaxime	1	0	1
Ampicillin	2	0	0
Amikacin	1	0	1
Ciprofloxacin	0	0	2
Gentamicin	1	0	1
Piperacillin	1	0	1

Table 7

As the table shows NFGNB are markedly resistant to Ciprofloxacin

DISCUSSION: The current study was carried out in the period of two months from 1st June-30th July 2013. The total number of subjects was 51 out of which 21 were male babies and 30 were female babies. All the neonates were selected as per the inclusion and the exclusion criteria. The study was started with the aim of highlighting the burden of neonatal sepsis in preterm and LBW neonates admitted in NICU, RIMS and to find out the commonest causative organism for LONS so that specific antimicrobial therapy can be prescribed.

From the present study the incidence of late onset neonatal sepsis in preterm and low birth weight neonates is found to be 88.23%. The culture positivity rate was 80% and C-RP positivity rate was 88%.

In the study it was also found that as the duration of hospital stay of the neonates increased, the incidence of sepsis in neonates also increased.

It was found that birth weight is inversely proportional to incidence of late onset neonatal sepsis.

In the study gram positive organisms constituted 53% and gram negative constituted 47%.

In the study the following organisms were isolated,

1. Coagulase negative staphylococcus-21.57%
2. Candida species-17.64%
3. Klebsiella species-11.76%
4. Escherichia coli-7.84%
5. Staphylococcus aureus-5.88%
6. Streptococcus species-5.88%
7. Acinetobacter species-5.88%
8. Non fermenting gram negative bacilli-3.92%

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Out of all the organisms isolated, 71.87% were resistant to Cefotaxime, 87.5% were resistant to Ampicillin, 18.5% were resistant to Amikacin, 34.38% were resistant to Ciprofloxacin, 40.62% were resistant to Gentamicin and 21.87% were resistant to piperacillin.

CONCLUSION: From the current study the following were concluded,

1. The incidence of late onset neonatal sepsis in Low Birth Weight and Preterm neonates in RIMS hospital is 88.23%.
2. The incidence of sepsis was more in those neonates who had a longer hospital stay pointing towards hospital acquired infections.
3. Birth weight is inversely proportional to incidence of late onset neonatal sepsis.
4. Gram positive organisms were more common than gram negative.
5. The most common organisms in their decreasing order of isolation are CONS, Candida species, Klebsiella species, Escherichia coli, Staphylococcus aureus, Streptococcus species, Acinetobacter and non-fermenting gram negative bacilli.
6. The organisms which are sensitive to the commonly used antibiotics in the decreasing order of their frequency are Amikacin, Piperacilin, Ciprofloxacin,

SUMMARY: The present study was started with the objective of estimating the incidence of Late Onset Neonatal Sepsis in Low Birth Weight and preterm neonates in RIMS, Raichur and to find out the microbiological profile of Late Onset Neonatal Sepsis in preterm and LBW neonates.

This study was carried out in district govt. hospital RIMS Raichur where in the blood samples of neonates satisfying the inclusion and exclusion criteria were collected under aseptic conditions and were investigated for culture and sensitivity, C-RP, DLC for percentage of neutrophil and Random blood sugar and results were obtained and analyzed.

The study revealed high incidence of 88.23% of late onset neonatal sepsis in low birth weight and preterm neonates. The duration of hospital stay is directly related to incidence of late onset neonatal sepsis and the birth weight is inversely related. Among the organisms isolated gram positive were more (53%) when compared to gram negative ones (47%). Among the organisms CONS are the commonest i.e. 21.57%, followed by Candida species 17.64%, Klebsiella 11.76%, Escherichia coli 7.84%, Staphylococcus aureus, Streptococcus species, acinetobacter each accounting to 5.88%, Non fermenting gram negative bacilli 3.99%. It was found that the organisms isolated were resistant to most of the commonly used antibiotics. 71.87% of the organisms were resistant to Cefotaxime, 87.5% were resistant Ampicillin, 34.38 are resistant to ciprofloxacin, 40.62% were resistant to gentamicin, 21.87% are resistant to piperacilin and 18.85% are resistant to Amikacin.

From the present study it is concluded that there is high incidence of hospital acquired neonatal infection in low birth weight and preterm neonates. The duration of hospital stay of the neonate and the birth weight are identified as risk factors the former being directly and the later, inversely related. The organisms isolated were resistant to the most commonly used antibiotics in our hospital setup.

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