

Sensitivity Pattern of Micro-organisms Causing Septicemia in Neonatal Intensive Care Unit at tertiary Hospital, Bangladesh

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SPECIAL CARE NEONATAL UNIT (SCANU)

নবজাতকের নিবিড় পরিচর্যা ইউনিট



Background

- Neonatal septicemia is a clinical syndrome of systemic illness accompanied by bacteremia occurring in the first 28 days of life .
- It may occur through transplacental infection or an ascending infection from mother's genitourinary tract and from the infected caregiver or nosocomial infection.

Ref: Gotoff SP. Infection of neonatal infant, 2000.

Background

- The incidence of neonatal sepsis is 5 to 8 per 1000 birth, the highest rates occur in LBW, perinatal asphyxia, maternal infection and babies with congenital abnormalities .
- In global perspective the microorganisms most commonly associated with early onset of infection include group B Streptococci, Escherichia coli, Hemophilus influenzae, Listeria monocytogenes.

Ref: Mery TC. Neonatal sepsis. National Institute of Health, 2009

Background

- **Organisms that have been implicated in causing late onset sepsis include coagulase-negative *Staphylococci*, *Staphylococci aureus*, *E.coli*, *Klebsiella*, *Pseudomonas*, *Enterobacter*, *Candida*, *Streptococcus* anaerobes and non typable *H. influenzae*.**

Background

- Culture positive neonatal sepsis in the USA is 0.98% but in very low birth weight infants under prolonged intensive care the rate of culture proven sepsis may be high as 30%.
- Neonatal sepsis is one of the commonest cause of perinatal mortality in the developing world.

Ref: Stoll BJ, Hansen NI, Sanchjez PJ, et al: Early onset neonatal sepsis. Pediatrics, 2011.

Background

- Mortality rate of early onset neonatal sepsis is 2 to 40% and late onset neonatal sepsis is 2 to 20% (Mery 2009).
- Definitive diagnosis of neonatal sepsis is based on positive blood or cerebrospinal fluid (CSF) culture, which both take at least 24 to 48 hours and are often falsely negative.

Background

- **Due to irrational use of antibiotics sensitivity pattern of microbes are also changed. In many situations, conventional antibiotics are not sensitive to causative micro-organisms.**

Objectives of the study

- ✓ To identify the causative organisms causing neonatal septicemia.
- ✓ To detect culture-sensitivity of the microorganisms.

Inclusion Criteria

- 1) **Term & preterm babies, irrespective of sex and weight.**
- 2) **Clinically diagnosed septicemic patient were only included in this study**
- 3) **Patient under antibiotic treatment & also without prior antibiotic therapy included in this study.**

Exclusion Criteria

- 1) Severe perinatal asphyxia
- 2) Neonate with congenital anomalies
- 3) Extremely low birth weight neonates.

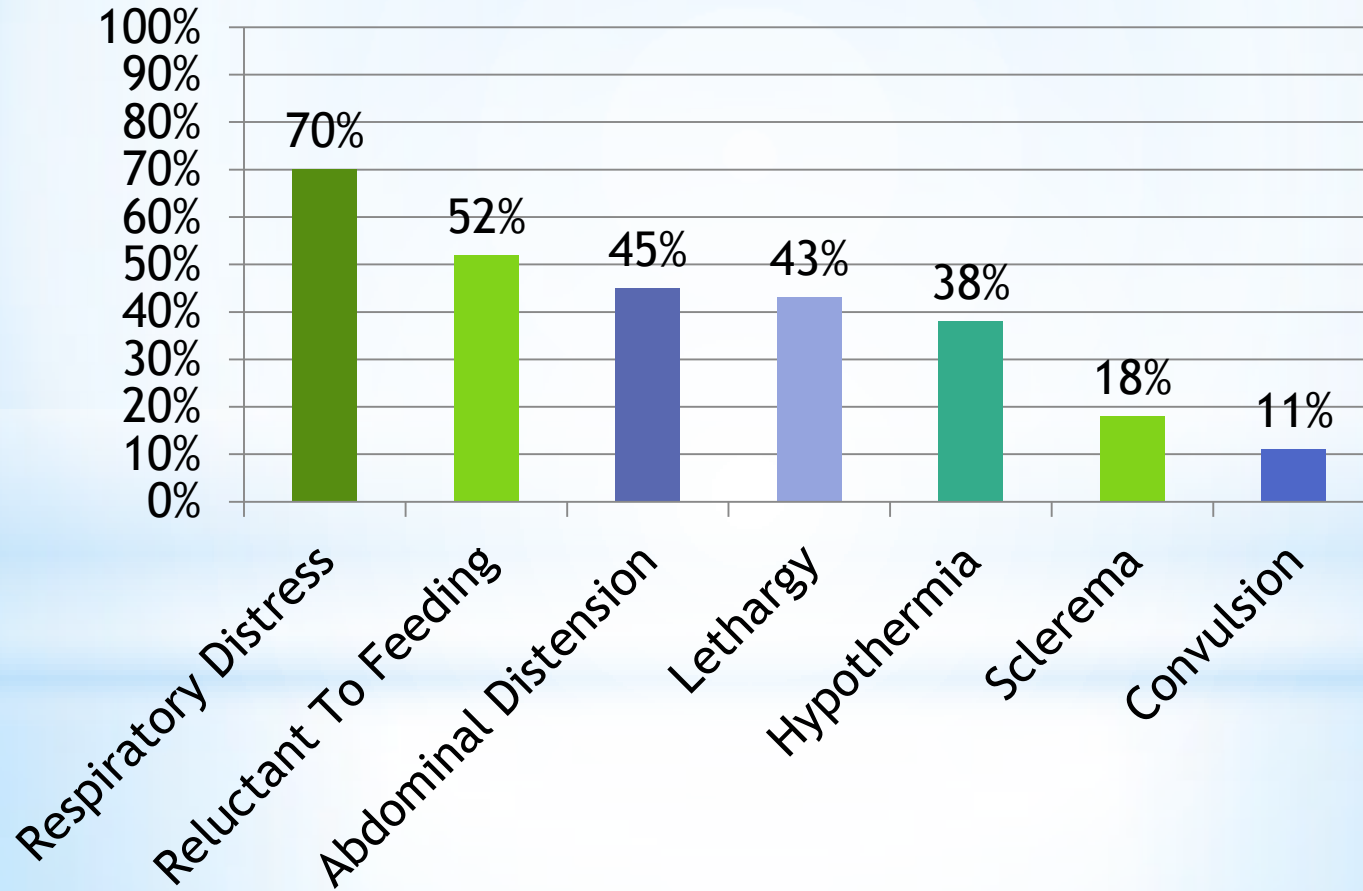
Methodology

- This is a hospital based prospective longitudinal study.
- Place of study: SCANU, Chittagong Medical college Hospital, Bangladesh.
- Duration of the study :January 2013 to July 2014.
- Sample Size :300
- Blood culture was done in Bac T/Alerd 3D system and culture incubated in FAN.

Methods

- ❖ For every case 2ml of venous blood was collected from a peripheral vein under aseptic condition and introduced into aerobic and anaerobic media. The blood culture specimens were sent and processed accordingly bac T/alert 3D system in Microbiology laboratory.
- ❖ Sensitivity of the bacterial isolates to different antibiotics was determined using Kirby Baurer disk diffusion method.

Significant characteristic finding of neonatal septicemia clinically observed



Statistical Profile Of Admitted Cases in SCANU, 2013

Indicators		2013											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1. Availability&Utilisation													
1.1	Total # of SCANU beds available	32	32	32	32	32	56	56	56	56	56	56	56
1.2	Total # of admission to SCANU	500	518	590	644	671	600	605	635	670	673	563	509
1.3	Total number of newborn admission(male)	315	255	389	347	354	350	310	335	365	370	363	290
1.4	Total number of newborn admission(female)	185	263	201	297	317	250	295	300	305	303	200	219
1.5	Number of newborn admission (in-born)	150	160	177	200	215	104	103	203	205	202	104	105
1.6	Number of newborn admission (referred from outside)	350	358	413	444	456	496	502	432	465	471	459	404
1.7	Average length of Stay (Days)	6	7	5	6	5	5	6	8	4	6	7	6
1.8	Bed Occupancy Rate (%) as per hospital record	184.6%	162.5%	171.9%	186.4%	190.0%	192.8%	181.3%	171.9%	186.7%	203.9%	195.0%	175.9%

Statistical Profile Of Admitted Cases in SCANU, 2013

3. Cause of hospitalisation		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.1	Neonatal Sepsis	210	213	245	225	263	247	223	223	266	320	247	212
3.2	Birth Asphixia	193	198	233	253	273	238	227	248	267	210	191	195
3.3	Low birth Weight/Prematurity (1.5-2.5kg)	56	50	46	46	49	100	110	117	100	100	84	80
3.4	Low birth Weight/Prematurity (<1.5kg)	63	79	77	75	65	55	53	60	65	44	41	45
3.5	Neonatal Jaundice	60	63	71	77	81	73	68	67	76	67	52	56
3.6	Birth Defect	2	2	2	4	3	2	3	12	7	7	9	8
3.7	Other infection	10	13	13	22	15	15	10	12	10	7	10	10
3.8	Others	25	29	26	65	39	15	8	10	10	9	10	9

Statistical Profile Of Admitted Cases in SCANU, 2014

Indicators		2014							
<i>1. Availability&Utilisation</i>		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1.1	Total # of SCANU beds available	56	56	56	56	56	56	56	56
1.2	Total # of admission to SCANU	663	502	592	553	579	561	667	753
1.3	Total number of newborn admission(male)	365	295	322	303	310	305	352	395
1.4	Total number of newborn admission(female)	298	207	270	250	269	256	315	358
1.5	Number of newborn admission (in-born)	202	203	203	202	204	103	102	103
1.6	Number of newborn admission (referred from outside)	461	299	389	351	375	458	565	650
1.7	Average length of Stay (Days)	7	9	8	10	6	7	6	8
1.8	Bed Occupancy Rate (%) as per hospital record	149.8%	181.6%	206.1%	208.7%	172.0%	212.5%	195.1%	187.5%

Statistical Profile Of Admitted Cases In SCANU, 2014

3. Cause of hospitalisation		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
3	Neonatal Sepsis	230	173	220	190	180	177	225	245
3	Birth Asphixia	143	111	120	130	136	113	135	160
3	Low birth Weight/Prematurity (1.5-2.5kg)	100	80	90	113	123	140	155	165
3	Low birth Weight/Prematurity (<1.5kg)	143	100	125	81	89	88	90	130
4	Neonatal Jaundice	20	16	15	13	15	23	39	31
4	Birth Defect	2	1	3	3	2	1	1	2
4	Other infection	11	9	11	11	13	10	12	9
4	Others	14	12	8	12	11	9	10	11

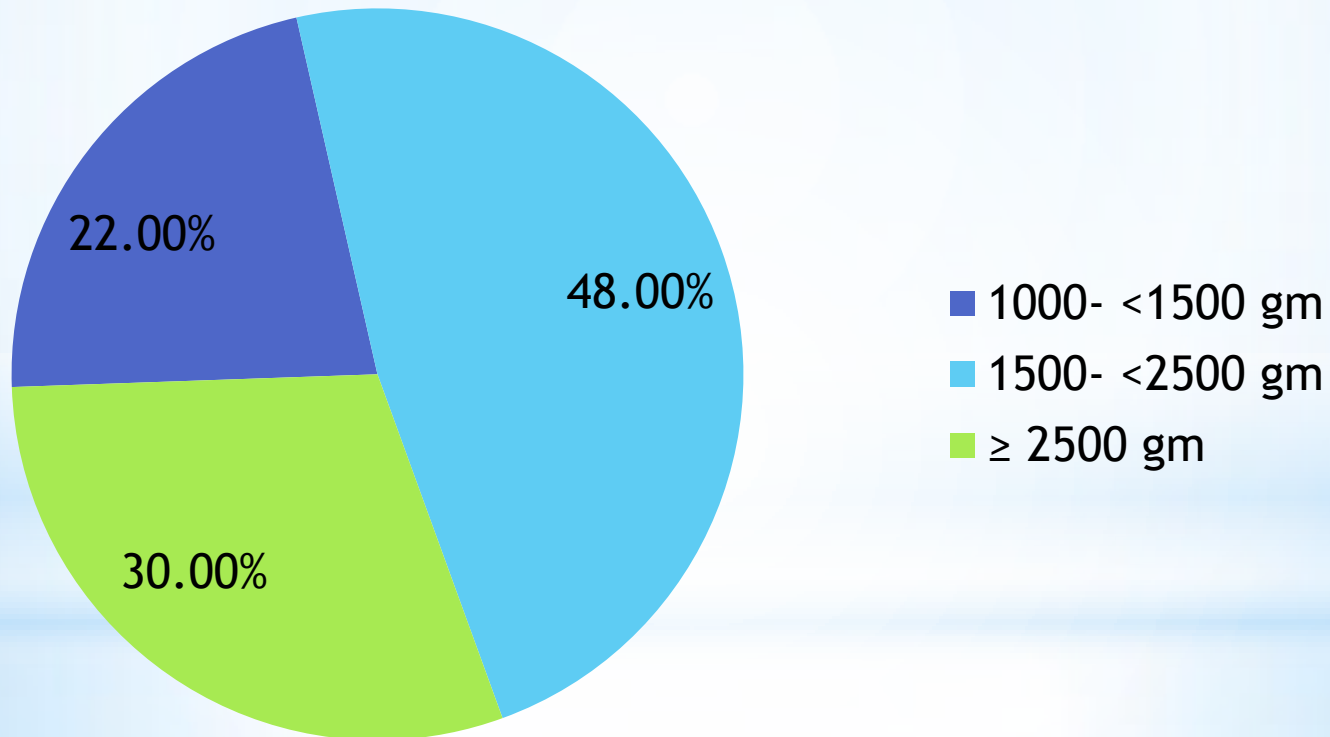
NICU In CMCH



Results



Distribution of birth weight in study cases



Association between sex and sepsis in relation to birth weight

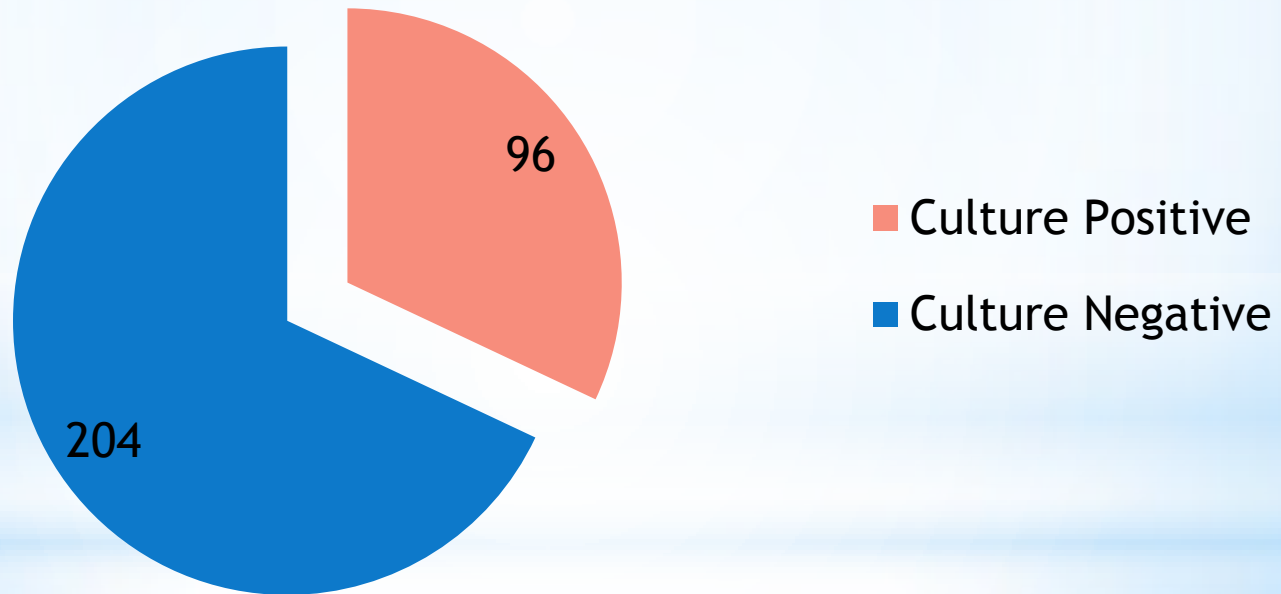
	>2500g	<2500g	<1500g	
Male	52 (57.8%)	35 (53.0%)	76 (52.8%)	P = 0.735 NS*
Female	38 (42.2%)	31 (47.0%)	68 (47.2%)	
Early onset sepsis (EONS)	38 (42.2%)	45 (68.2%)	124 (86.1%)	P = 0.000 HS*
Late onset sepsis (LONS)	52 (57.8%)	21 (31.8%)	20 (13.9%)	

* Chi-square test significance

Distribution of causative organisms according to onset of sepsis

	Klebsiella (54.17%)	Pseudomonas (16.67%)	Acinetobacter (14.58%)	S.Aureus (6.25%)	E.Coli (6.25%)	E. Coli with coliform (2.05%)
Early onset sepsis	39.07%	13.27%	5.08%	2.00%	5.10%	0.00%
Late onset sepsis	15.10%	3.40%	9.50%	4.25%	1.15%	2.08%

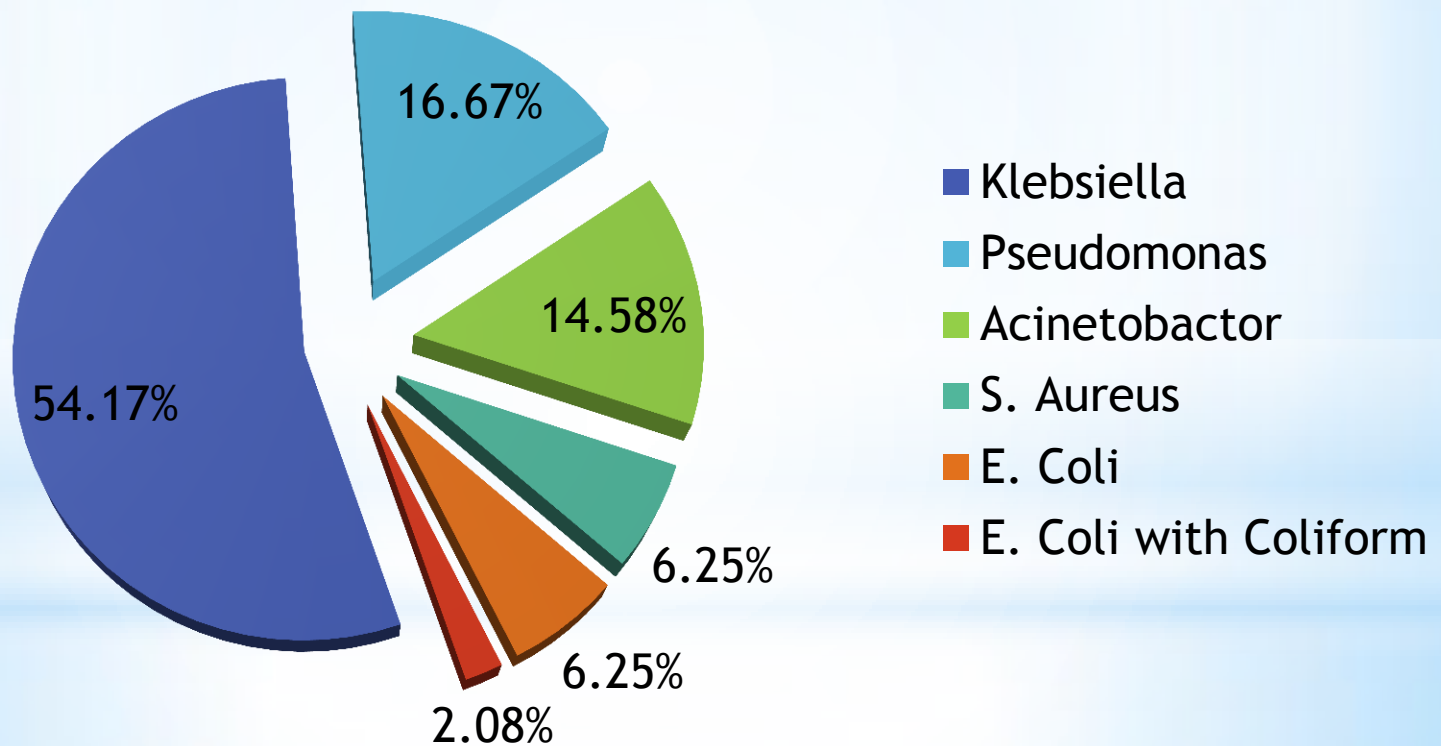
Culture Pattern Of Study Cases



32% cases were culture positive.

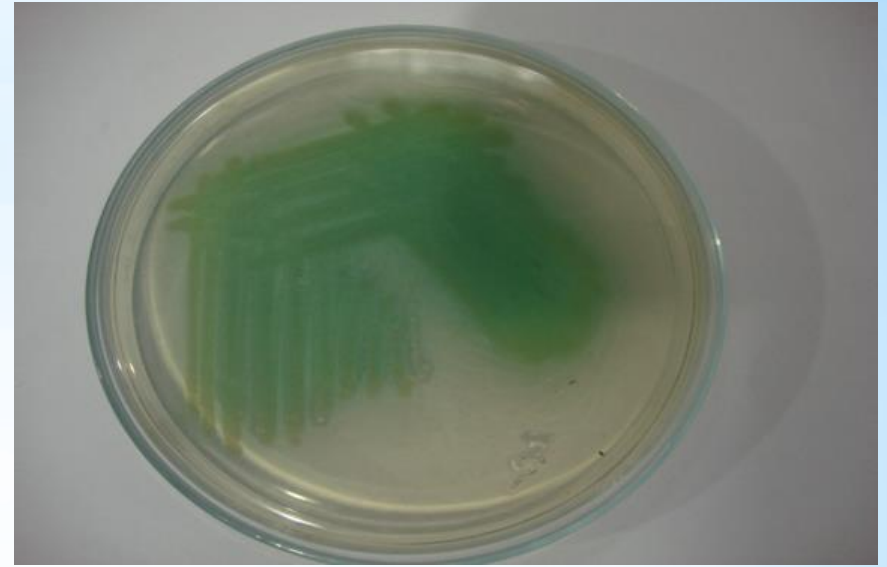
68% cases were culture negative, which were clinically sepsis.

Detected culture positive organisms in study cases





Growth of *Klebsiella* spp. on Macconkey agar media



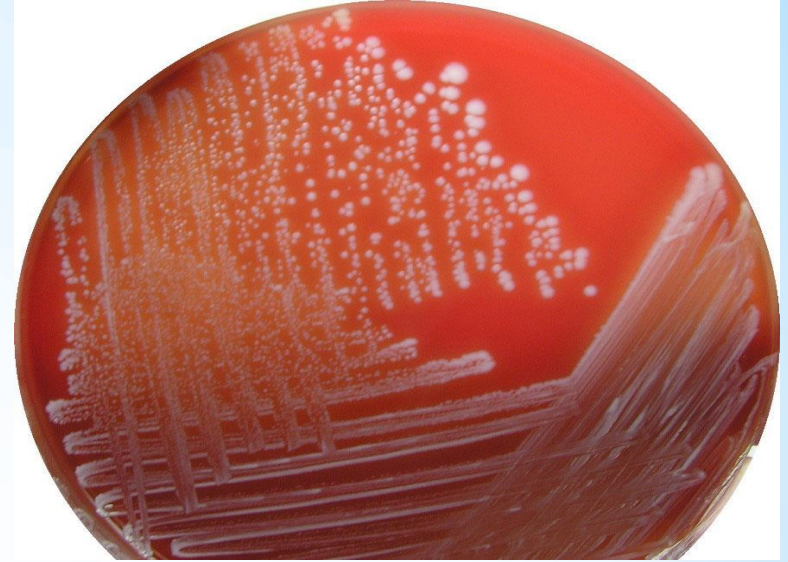
Growth of *Pseudomonas* spp. on Muller Hinton agar media



Growth of *Acinetobacter* spp. on MacConkey agar media

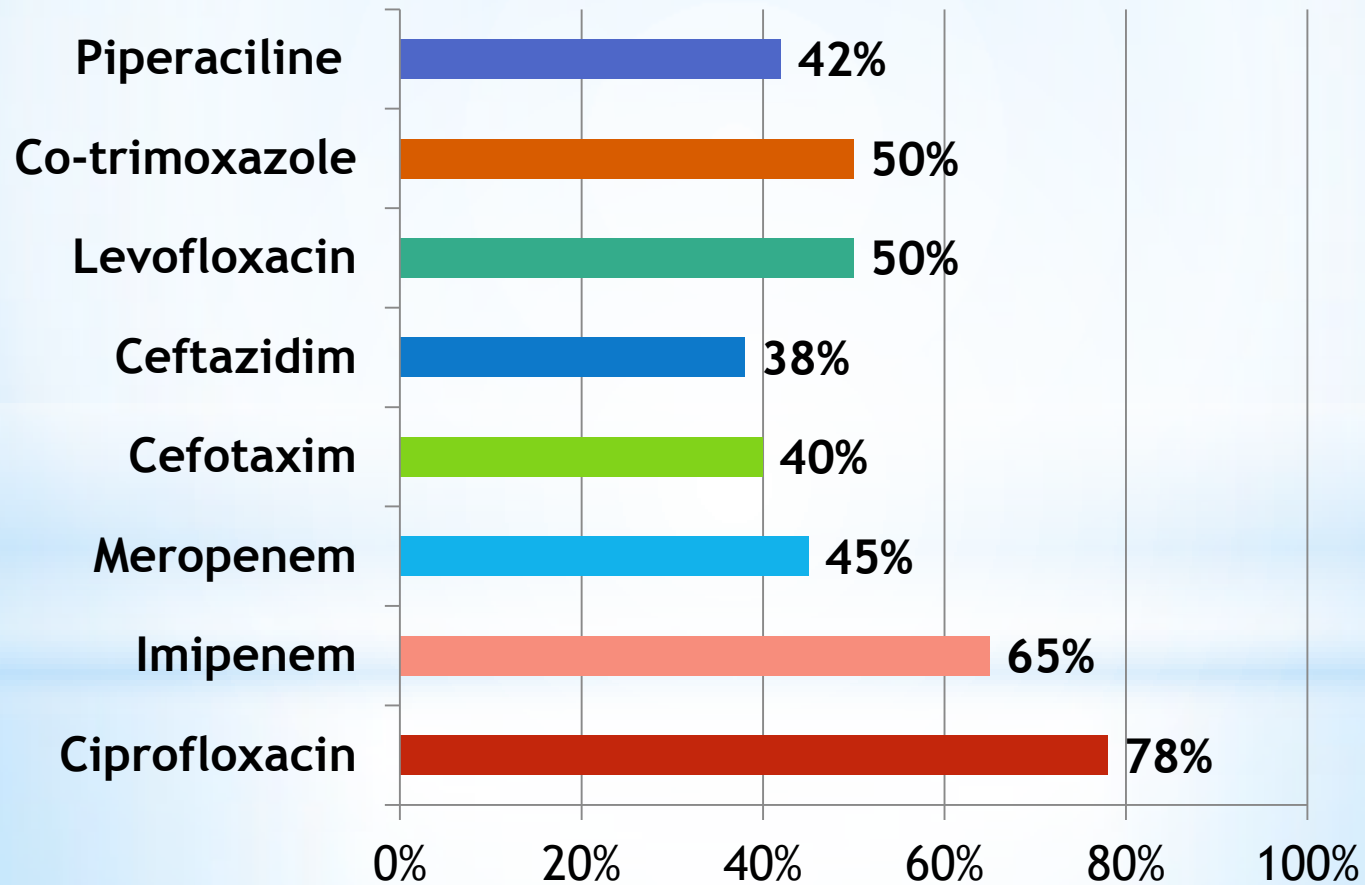


Growth of *E. coli* on
Macconkey agar media

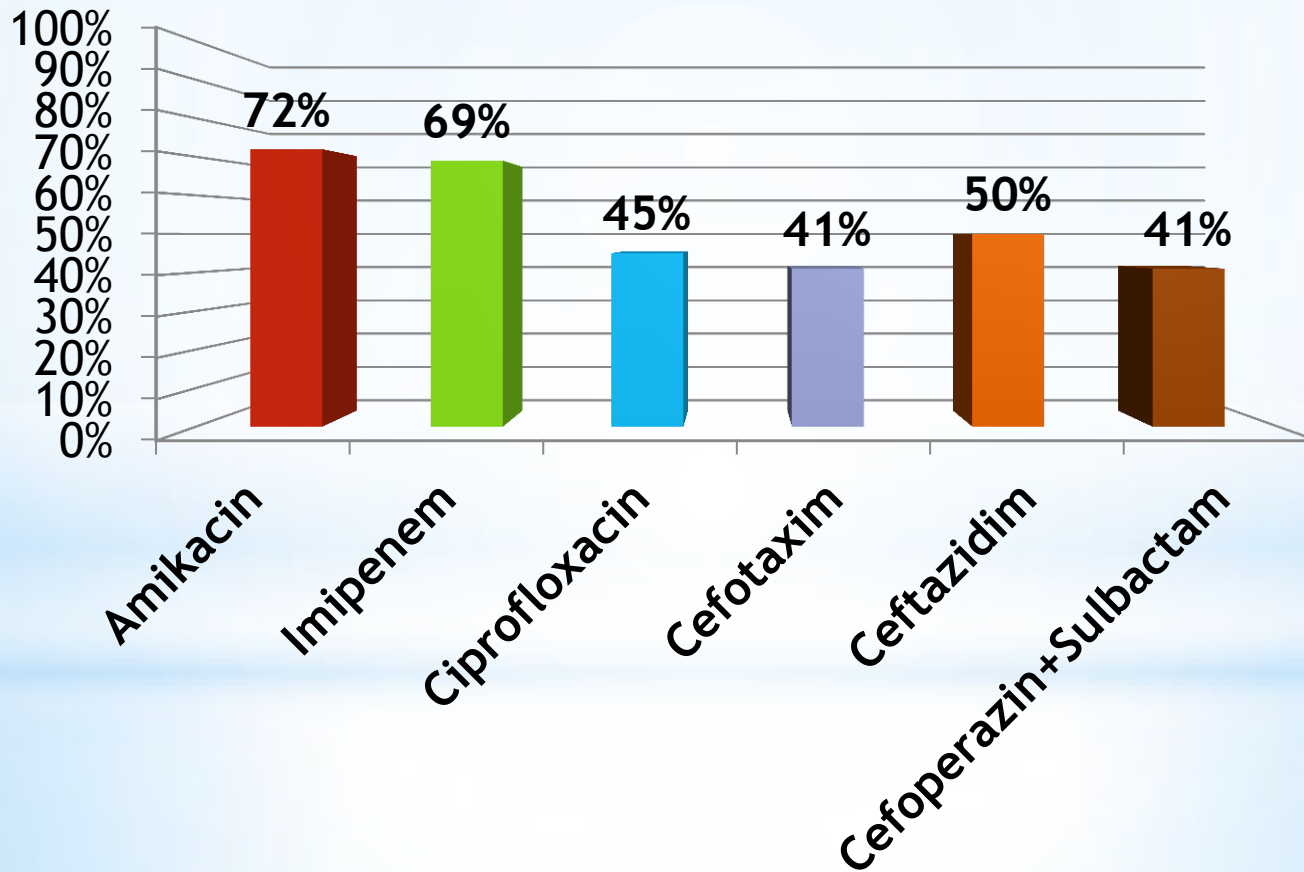


Growth of *Staph. aureus* on
blood agar media

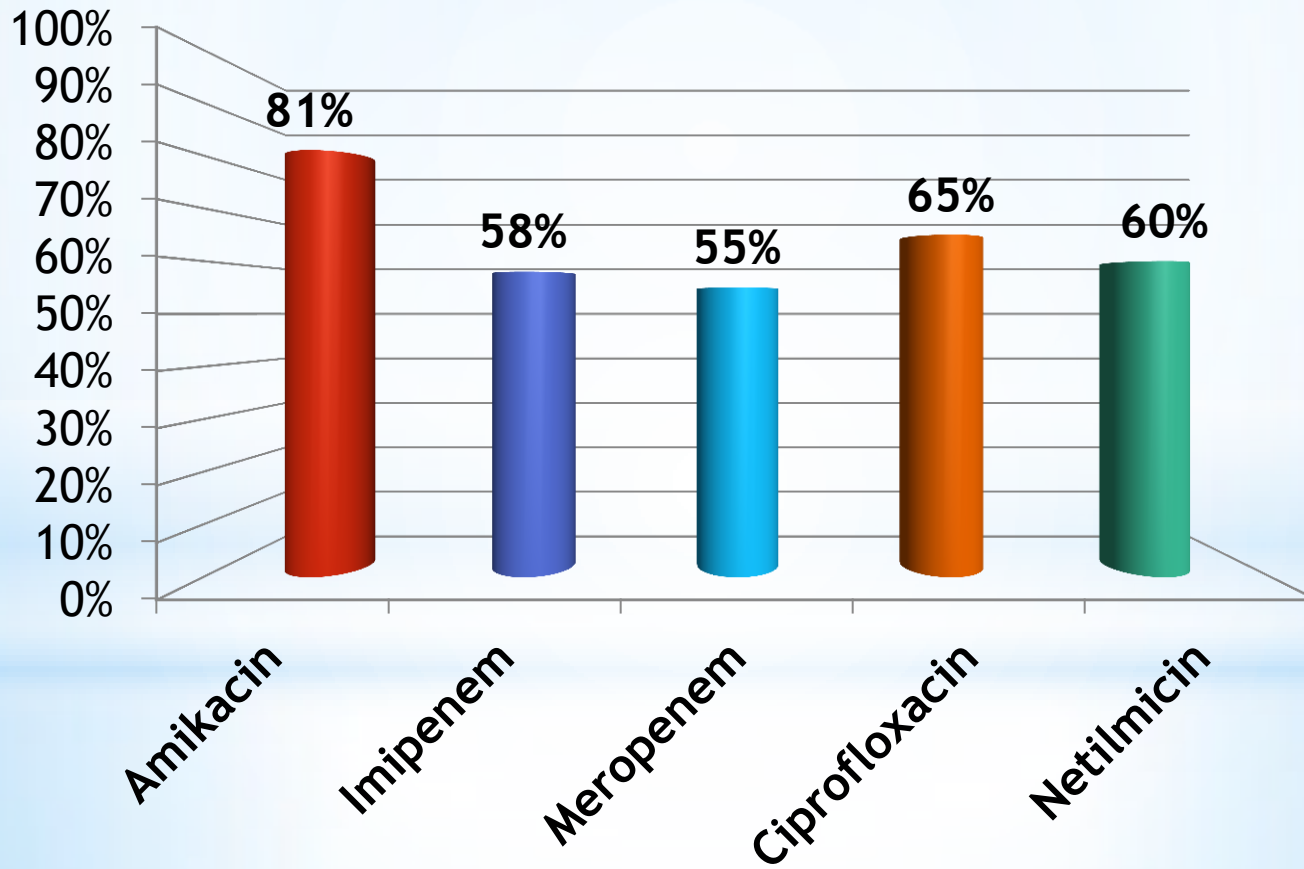
Culture sensitivity of Klebsiella



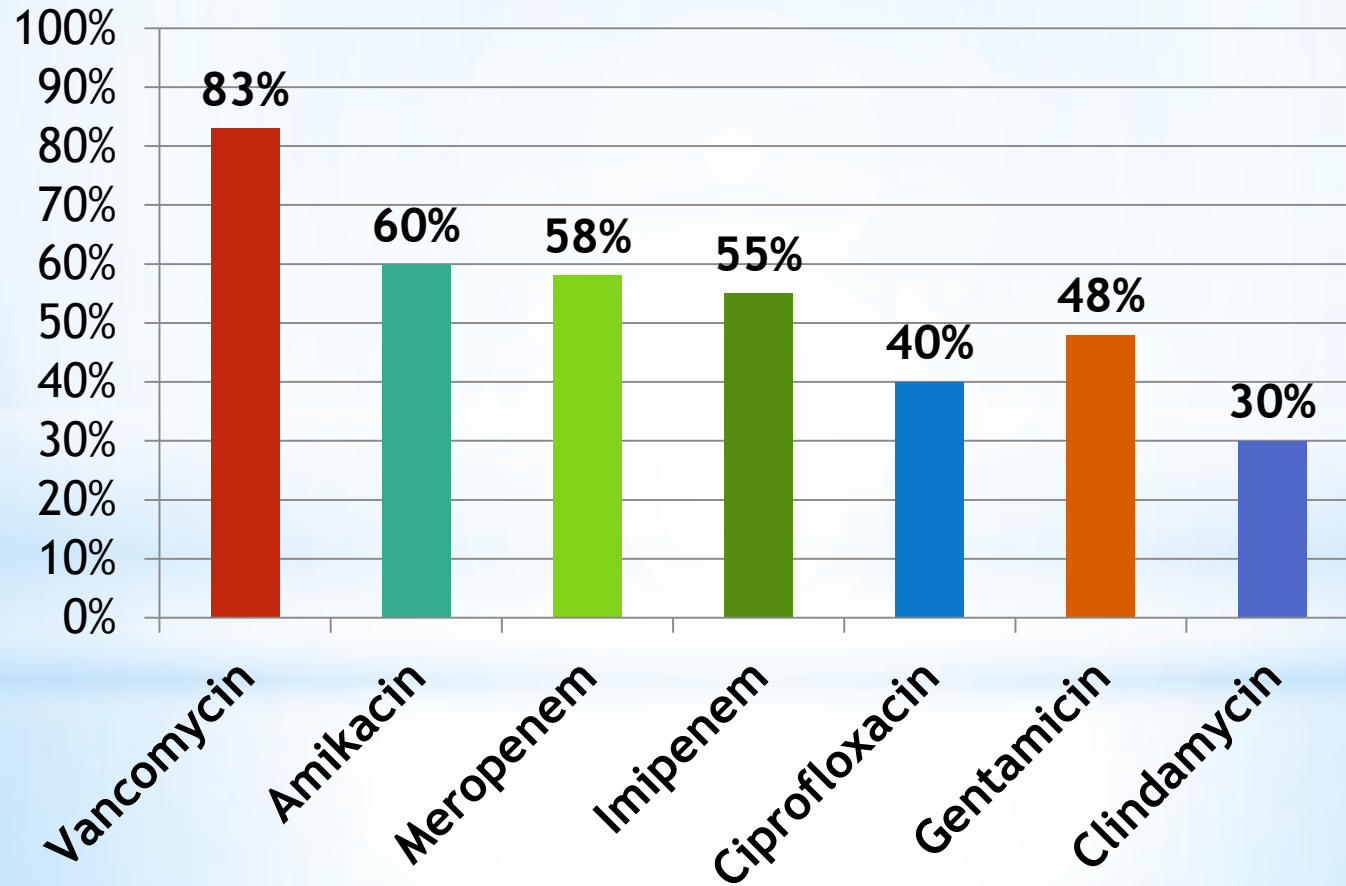
Culture Sensitivity to Pseudomonas



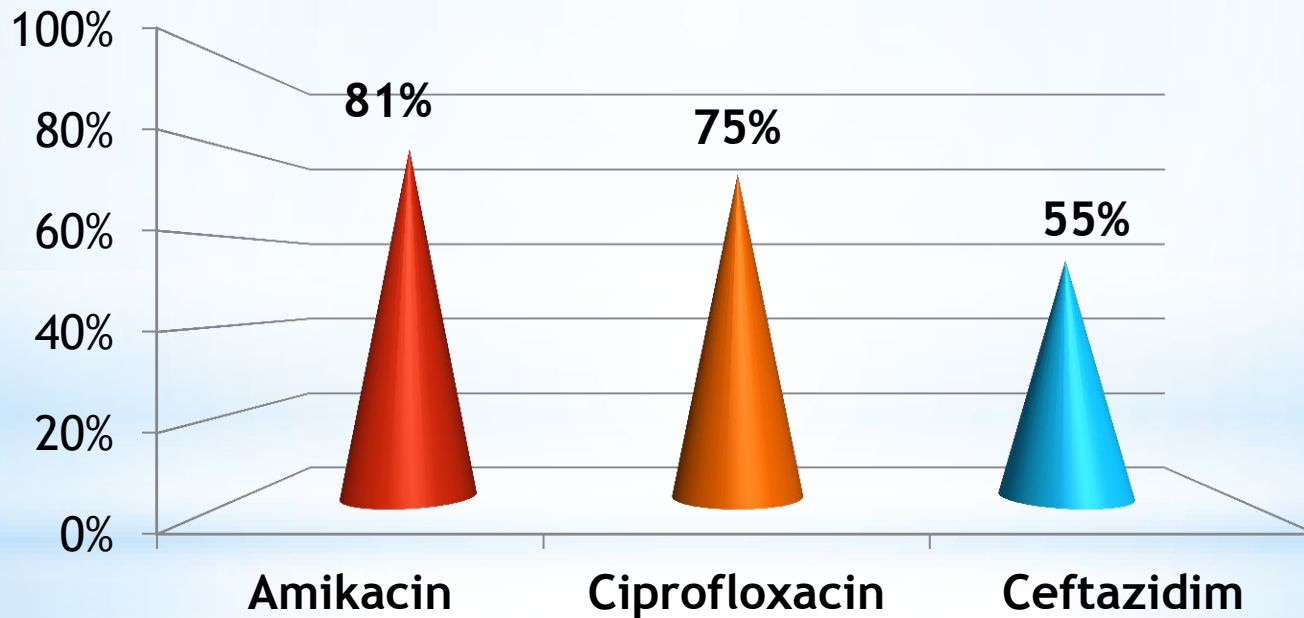
Culture sensitivity of Acinebactor



Culture sensitivity of Staph. Aureus



Culture sensitivity of E. Coli



Detected antibiotics sensitive to isolated micro-organisms

Amikacin	Imipenem	Tazobactam
Cefotaxim	Meropenem	Piperacilin
Ciprofloxacin	Vancomycin	Ceftadizim
Levofloxacin	Netilmicin	Cefoperazone
Cotrimoxazole	Azithromycin	Sulbactam

DISCUSSION

- Klebsiella pneumonia(50%),Staphylococcus Aureus (21%) were predominant microbes.
- Antibiotics sensitive to Klebsiella pneumoniae were Ciprofloxacin(88.8%), pefloxacin (97.7%), Staphylococcus Aureus most sensitive to Ciprofloxacin(99.9), Pefloxacin(80.0%) and Cloxacillin (15.8%).
- Found low incidence Group B Streptococcus.

Ref. West B A,Peterside O.Sensitivity pattern among bacteria isolates in neonatal sepicemia in port Hurcourt,Nigeria,2012.

Discussion

- * Staphylococcus(44.3%), Klebsiella(10.5%), Enterobactor(8.2%), Fungal infection(19.2%) were common organisms of neonatal sepsis.
- * Staphylococcus sensitive to Vancomycin, Klebsiella pneumoniae sensitive to Carbapenem, Quinolones.

Mehmet Y et al. Neonatal nosocomial sepsis in a level III NICU: evaluation of the causative agents and antimicrobial susceptibilities. The Turkish Journal of pediatrics,2006;48:13-18.

Discussion

- E.Coli & Klebsiella pneumoniae were predominant isolates caused neonatal sepsis.
- E. Coli showed susceptibility to clindamycin(98.88%), Meropenem (90.78%)
- Most of all gm negative isolates show susceptibility to amikacin, Imipenem and combined drugs piperacillin/Tazobactam.
- Staphylococcus aureus sensitive to Vancomycin.

Ref: Shah M, Desai p. Current scenario of antimicrobial resistance in NICUS: An emerging therapeutic confront. International J. Analytical, phar. & biomedical sciences ,2013

Discussion

- * Blood culture yielded bacterial growth 28.8% cases
- * Common organisms were isolated were Klebsiella followed by Pseudomonas .
- * Higher resistance to the commonly used 1st line antibiotics Ampicillin and Gentamycin.

Ref: Ramesh B Y, Lincy P B (India). Journal of clinical and Diagnostic Research, 2011, vol. 5

Discussion

- * In neonatal sepsis gram negative organisms were the most common pathogens identified(80%), Klebsiella(35%), Pseudomonas(20%), and Enterobactor(10%).
- * Gram positive organisms were Staphylococcus 10% and GBS 10%.

Ref: Samia B,Iman S,Gams LS et al. Journal of American Science, 2011,7(7).

Discussion

- ❖ In neonatal septicemia 32.72% were culture positive. Common bacteria isolated were Klebsiella spp., E. Coli and Staph. Aureus.
- ❖ Group B streptococcus not isolated.
- ❖ Antibiotics effective gm negative bacilli were cefoperazone/sulbactam and piperacillin/tazobactam.
- ❖ Methicillin resistant Staph. Aureus isolated were 57%.

Ref: Agarwal A, Bhat S. Clinicobiological study of neonatal sepsis. Journal of International Medicine and Dentistry, 2015, 2(1):22-29

Discussion

- *WHO and also in text book recommendation of empirical treatment of neonatal sepsis is Ampicillin & Gentamycin.
- *In rural India, where Gm. negative organisms were the main causes of neonatal sepsis & almost 100% resistance to conventional Ampicillin and Gentamycin.

Ref: Viswanathan R, Singh AK, Gosh C et al. Profile of Neonatal septicemia at a district level sick newborn care unit. Journal Health popul. Nutri, 2012

Conclusion

- In this study, common organism causing neonatal septicemia in our region are Klebsiella, Pseudomonas, Acinetobacter, S.Aureus, E. Coli and coliform organisms.
- Group B Streptococcus not isolated in any culture
- Most of the culture positive organisms resistant to conventional Ampicillin, Gentamycin.

Mostly Common antibiotics sensitive to isolated micro-organisms

Ciprofloxacin

Imipenem

Levofloxacin

Amikacin

Meropenem

Ceftazidim

Vancomycin

Recommendation

- *Multi-centre broad-based study for blood culture sensitivity are essential to guide antibiotic regime for neonatal septicemia in developing and developed countries.*

Bay of Bengal



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Thank You