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Original Research Article

Study of blood cultures by BACTEC method in pediatric patients of Chhattisgarh, India

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ABSTRACT

Background: 356 children aged between 2 to 4 years admitted at PICU were selected for study B.D BACTEC 9050 system was used for incubation bottle were incubated until microbial growth was detected, BACTEC 9050 is an automated blood culture system which responds to concentration of Co2 produced by metabolism microorganism or consumption of O2, needed for growth of microorganism.
Methods: The antibiotic used were Amoxicin 250 mcg, penicillin 100 unit linezoid 50 Mcg, vancomycin 50 mcg, ampicillin 100 mcg, Azithromycin 100 Mcg, pipericillin/ Tozabactum, 100/50mcg, ceforazone/ salbactum 50/30 mcg, cefoxitin 50 mcg, cefepime 50 mcg, Amikacin 50 mcg, Imipenen 30 mcg, ceftazidime- clavulanic acid..
Results: The observed organized were 90 (25.2%) CoNS, 72 (20.2%) Entrobacter, 70 (19.6%) Klebesiella spp, 40(11.1%) Enterococcus, 22(6.1%) S, auresis, 22 (6.1%) E coli, 20(5.6%) citrobacters, 20(5.6%) Acinitobacter. This blood culture study by BACTEC 9050 in pediatric patients in few minutes.
Conclusions: BACTEC-9050 method was helpful to treat especially in children because most of diseases in children are idiopathic and life threatening.

Keywords: Pediatric Intensive care unit, Micro gram, BACTEC 9050

INTRODUCTION

BACTEC cultures were introduced by Johnson laboratories. Townson, md in 1988, aerobic 6 B blood culture bottle growth indicates were radiometrically mentioned monitored once per day on day 1: twice per day on day 2; once per on days 3,4 and 5: and then once per week for 2nd additional weeks. Bottles showings a growth index of > 20 U and /or an increments of > 10 U between two consecutive readings were sampled, A gram stain examination was performed, and the broth was subculture on blood, chocolate, mac conkeys New York city and Mueller Hinton agars. Identification of microorganisms recovered was performed according to standard bacteriological procedures.[1]

Fully automatic BACTEC methods is superior to conventional methods in terms of speed and sensitivity.[2] The conventional method includes two week culture in order to enable slow growth of microorganism are cultures on specific media.[3] The BACTEC culture method is the easiest way of blood cultures where the fluid bottles of blood cultures with a relative vacuum are utilized. The blood is transferred to the blood culture bottle in sterile conditions, it is turned upside down for a few minutes, a hole is created in its cover using a sterile needle and it is placed in an incubator. This medium is

commonly used for isolation of bactaria.[4] If the glasses of automated blood culture system of BACTEC inform microbiologist when the growth level is enough to reach level that is identifiable by the device, then it is important for quick decision making for patients.[5] Moreover, sensitivity of BACTEC method is higher than conventional method, rapid and reliable method for detection of pathogens in blood culture.[6]

Hence, attempt was made to study the blood cultures of pediatric patients so that they can be treated at the earliest by knowing the proper pathogens because children do not express their sign and symptoms hence it becomes very difficult to diagnose and treat. Moreover, children have lesser immunity than adults and more prone to morbidity and mortality.

METHODS

Among 356 pediatric patients were admitted at pediatric Intensive care unit of RIMS medical college hospital, Raipur -795001 Chhattisgarh, Maharashtra, India.

Inclusive criteria

Pediatric patients aged between 2 to 4 years, who had symptoms of septicemia were included in the study

Blood collection was done under aseptic condition, disinfect the vene puncture site using chlorhexidine with 70% alcohol swabs, allowing the site to get dry completely. 0.5 to 1 ml of blood was drawn and placed it on a pediatric aerobic bottle collected from pediatric Intensive care unit (PICU).

B D BACTEC 9050 system was used for incubation and the bottle were incubated until microbial growth was detected. BACTEC 9050 is an automated blood culture system, which contains a sensor which responds to the concentration of Co2 produced by the metabolism of microorganism or consumption of 02 needed for the growth of microorganism.

The sensor is monitored by the instruments every ten minutes for an increase in its fluorescene which is proportional to the increasing amount of Co2 or decreasing the amount of O2 present in the vial.

BACTEC 9050 bottles that showed the growth were plated into sheep BA and Mac conkey Agar and further incubated at 35+/-2ºC. Growths were stained by Gram's method.[7] The positive growth was farther processed by routine biochemical reactions and antibiotic susceptibility was put up by modified Kirby Bouer's method.[8]

Exclusion criteria

The mothers having HIV positive or malignant diseases such children were excluded from the study.

Statistically

The isolated organisms were classified with percentage. The patient having resistance and sensitive to different antibiotics were classified with percentage. Duration of the study was about one year.

RESULTS

Table-1 Antibiotic used in the present study were- Amoxiclav 2500 mcg, penicillin 100 units, linezoid LZ 500 mcg, vancomycin 50 mcg Amplicillin 100 mcg, Azithromycin 100 mcg, pipercillin/ Tazabactum 100/50 mcg, cefoperazone/salbactum 50/30 mcg, cefoxitin 50 mcg, ceftatriaxone 50 mcg, ofloxacin 25mcg, cefepime 50 mcg, amikacin 50 mcg, Imipenem 30 mcg, ceftazidime- clavulanic acid 50 mcg.

Table 1: Antibiotics used in the present study number of patients -356.

Antibiotics	Abbreviation	Potency
Amoxiclav	AMC	2500 mcg
Pencillin	P	100 unit
Linezoid	Lz	50 mcg
Vancomycin	VA	50 mcg
Ampicillin	Amp	100 mcg
Azithromycin	AZM	100 mcg
Pipercillin/Tozabactum	PIT	100/50 mcg
Cefoperazone/Salbactum	CFS	50/30 mcg
Cefoxitin	CTN	50 mcg
Certriaxone	CTR	50 mcg
Oflaxacin	OF	25 mcg
Cefepime	CPM	50 mcg
Amikacin	AK	50 mcg
Imipeneum	IPM	30 mcg
Ceftazidime-clavulanic	CAC	50 mcg

Mcg= Micro gram is a unit of mass equal to one millionth (1X106) of gram.

Table 2: Study of organism isolated from blood culture positive pediatrics number of patients -356.

Name of organism	Isolation with	Percentage (%)
CONS	90	25.2
Enterobacter	72	20.2
Klebsiella spp	70	19.6
Enterococcus	40	11.2
S .aureis	22	6.1
E-coli	22	6.1
Citrobacters	20	5.6
Acinetobacter	20	5.6

Table-2- study of organism isolated from the culture positive pediatrics 90 (25.2%), CONS 72 (20.2%), Enterobacter, 19.6 (70%), Klebsella spp 40 (11.2%), Entrococcus 22(6%), S. aureis 22(6.1%), Ecoli, 20(5.6%)

citrobacters, 20(5.6%) Acinetobacter. Table 3 shows Study of Gram – Negative Bacilli.

N280 (*E. coli*) study Amikacin had 6(1.68%) rate of sensitive and 0% resistance. Amoxicillin/ Clavulanic acid had 4 (1.12%) sensitive and 2 (0.5%) rate of resistance Ampicllin had 0% sensitive and 6 (1.68%) resistance. Cefepime had 2 (0.56%) sensitive and 4 (1.12%) resistance, cefoperazone/sulbactum had 6 (1.68%) sensitivity and 0% resistance, cerfiriaxance had 0% sensitivity and 6 (1.68%) resistance, cefoxime had 0% sensitivity and 6 (1.68%) resistance, ciprofloxcin had 0% of sensitivity and 6(1.68%) resistance. Colistin had 2 (0.56) sensitivity and 4 (1.12%) resistance rate. Ertapenun had 4 (1.12%) sensitivity and 2 (0.56%) resistance. Gentamicin had 2 (0.56%) sensitivity and 4 (1.12%) resistance Imipenum had 6 (1.68%) resistance and 0% resistance Nalidixic acid had 0% sensitivity 6 (1.68%) resistance Nitrofuantoin 4 (1.12%) sensitivity and 6 (1.68%) resistance, piperacillin/ Tazobactum had 6 (1.68%) sensitivity and 0% resistance, Tigecycline had 6 (1.68%) sensitivity and 0% resistance Trimethoprim/sulfamethoxazone had same sensitivity and resistance-4 (1.2%).

Table 3: Gram negative bacilli number of patients -356 N 280-(*Escherichia coli*).

Antibiotics	Sensitivity	Percentage	Resistance	Percentage
Amikacin	06	1.68	00	-
Amoxicillin/ clavulance Acid	04	1.12	02	0.56
Amplicillin	00	-	06	1.68
Cefepime	02	0.56	04	1.12
Cefoperazone/sulbactam	06	1.68	00	-
Ceftriaxone	00	-	06	1.68
Cefuroxime	00	-	06	1.68
Ciprofloxacin	00	-	06	1.68
Colistin	02	0.56	04	1.12
Ertapenem	04	1.12	02	0.56
Gentamicin	02	0.56	04	1.12
Imipenem	06	1.68	06	1.68
Nalidixic acid	00	-	06	1.68
Nitrfurantoin	04	1.12	02	0.56
Pipperacillin/tazobactam	06	1.68	00	-
Tigencyline	06	1.68	00	-
Trimethoprim/sulfamethoxazole	04	1.12	04	1.12

Table 4: Gram negative bacilli number of patients -356 N280-(*Sphingomonas paucimobillis*).

Antibiotics	Sensitivity	Percentage	Resistance	Percentage
Amikacin	16	4.49	16	4.49
Amoxicillin/ clavulance acid	06	1.68	26	7.30
Amplicillin	00	-	32	8.98
Cefepime	12	3.37	20	5.61
Cefoperazone/sulbactam	08	2.24	24	6.74
Ceftriaxone	00	-	32	8.98
Cefuroxime	02	0.56	30	8.42
Ciprofloxacin	04	1.12	28	7.86
Colistin	02	0.56	30	8.42
Ertapenem	08	2.24	24	6.74
Gentamicin	14	3.93	18	5
Imipenem	04	1.12	28	7.86
Nalidixic acid	08	2.24	24	6.74
Nitrfurantoin	10	2.80	22	6.17
Pipperacillin/tazobactam	12	3.37	20	5.61
Tigencyline	14	3.93	18	5
Trimethoprim/sulfamethoxazole	02	0.56	30	8.42
Meropenem	04	1.12	28	7.86

Table 4 shows Gram negative Bacilli study N280-(*Sphigomanas paucimobills*) – Amikacin had same sensitivity and resistance rate- 16 (4.49%) Amoxycilline/ clavulanic Acid had 6 (1.68%) sensitive and 26 (7.30%) resistance. Both cefepime and piperacillin/ Tazobactum had same sensitivity rate 12(3.37%) and same resistance rate 20 (5.61%). Similarly, cerfoperzone/ sulbacum and nalidixic acid had same rate of sensitivity 8 (2.24%) and same rate of resistance 24 (6.74%) certriozone had 0% sensitivity and 32 (8.98%) resistance rate. Ciprafloxicillin and Imipenem had same rate of sensitivity 4 (1.12%) and same rae of resistance 28 (7.86%) cefuroxime and Trimethoprim/ sulfamethoxazole had same sensitivity 2 (0.56%) and same resistance rate 30 (8.42%). Gentamicin and Tigecyclin had same rate of sensitivity 14 (3.93%) and same rate of resistance 18 (5%) Nitrofurantoin had 10 (2.80%) sensitivity and 22 (6.17%) resistance rate.

DISCUSSION

The present study of blood cultures by BACTEC method in pediatric patients in Madhya Pradesh population. The antibiotic used were Amoxicalv 2500mcg, penicillin 100 unit linezoid 50mcg vancomycin 50 mcg, Amplicillin 100 mcg, Azithromycin 100 mcg, pipercillin Tazabactcfam 100/50mcg, cefoperazone salbactum, cefoxitin 50 mcg ceftriaxacin 25mcg, cefepime 50mcg, Anikacin 50mcg, Imipenem, ceftazide – clavulanic acid 50 mcg (Table-1). Study of organism isolated from blood culture positive in pediatric was 90 (25.2%) CONS 72 (20.2%) Enterobacter, 70 (19.6%) Klebisellapp, 40 (11.2%) Enterococlus 22 (6.1%) S.auresis, 22 (6.1%) E.coli, 20 (5.6%) citrobacters, 20 (5.6%) Acinetobacter. (Table-2). These findings were more or less in agreements with previous studies.[9,10]

Blood culture remains the most practical and most reliable method for detection of blood infections like septicemia which is one of the main causes of mortality in patients. The infection caused by Gram negative bacteria are not treated properly because the un-availability of new methods for the early defection.[11] Moreover, infectious diseases are the main cause of death in developing countries. If left untreated, blood stream infection may lead to more danger's infections, involving all organs and ultimately death. Spectrum of microorganism that causes blood infection is different in various countries. But most gram negative bacteria play a more prominent role in this respect than gram positive bacterial infection and sepsis developed and reported by gram negative is increasing rapidly in Asian countries.[12]

Hence early detection and proper antibiotics are necessary to combat with such disease. The observed organism in the present study may require double antibiotic to cure and prevent further complications because most of the infection, in children are life threatening.

CONCLUSION

The BACTEC method used for blood cultures in pediatrics demonstrated a significantly higher recovery of microorganism from blood, at the earliest. BACTEC 9050 will be an investment worth of cost. As the instrument is costlier and tests performed in this instrument will be costlier to the patients of middle socio-economic status. Hence government of India must install such instruments in government hospitals so that everybody can avail the benefits of such of worth and costlier instrument.

Moreover, this study of blood culture in pediatrics practice is the key component of the management of septic newborn and children. The technical and practical aspects of pediatric practice as much as heightened susceptibility to infection attributable to immunological immunity to children, make automatic extrapolation of adult data difficult and potentially unfounded. Further research is warranted into specific questions about blood culture in children, such as the effect of blood volume in newborns/pediatrics and the importance of dilution of very small blood volumes in medium.

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