Original Research Article

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

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Received: 30 April 2019
Revised: 16 July 2019
Accepted: 29 July 2019

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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. Bottles were incubated until microbial growth was detected. BACTEC 9050 is an automated blood culture system which responds to concentration of CO2 produced by metabolism microorganisms or consumption of O2, needed for growth of microorganism.

Methods: The antibiotic used were Amoxicin 250 mcg, penicillin 100 unit linezolid 50 Mcg, vancomycin 50 mcg, ampicillin 100 mg, Azithromycin 100 Mcg, pipericilline/ Tozabactum, 100/50mcg, ceforazone/ salbactum 50/30 mcg, cefoxitin 50 mcg, cefepime 50 mcg, Amikacin 50 mcg, Imipenem 30 mcg, ceftazidime- clavulanic acid.

Results: The observed organisms were 90 (25.2%) CoNS, 72 (20.2%) Entrobacter, 70 (19.6%) Klebsiella 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. 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 bacteria. 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. Moreover, sensitivity of BACTEC method is higher than conventional method, rapid and reliable method for detection of pathogens in blood culture.

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 ven 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 O2 needed for the growth of microorganism.

The sensor is monitored by the instruments every ten minutes for an increase in its fluorescense 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+-2°C. Growths were stained by Gram’s method. The positive growth was farther processed by routine biochemical reactions and antibiotic susceptibility was put up by modified Kirby Bouver’s method.

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- Amoxicilav 2500 mcg, penicillin 100 units, linezoid LZ 500 mcg, vancomycin 50 mcg Ampicillin 100 mcg, Azithromycin 100 mcg, piperclillin/ Tazabactum 100/50 mcg, cefoperazone/salbactum 50/30 mcg, cefoxitin 50 mcg, ceftriaxone 50 mcg, ofloxacin 25mcg, cefepime 50 mcg, amikacin 50 mcg, Imipenem 50 mcg, ceftazidine- clavulanic acid 50 mcg.

| Antibiotics | Abbreviation | Potency |
|-------------|--------------|---------|
| Amoxicilav  | AMC          | 2500 mcg|
| Pencillin   | P            | 100 unit |
| Linezoid    | Lz           | 50 mcg  |
| Vancomycin  | VA           | 50 mcg  |
| Ampicillin  | Amp          | 100 mcg |
| Azithromycin | AZM         | 100 mcg |
| Piperclillin/Tozabactum | PIT | 100/50 mcg |
| Cefoperazone/Salbactum | CFS | 50/30 mcg |
| Cefoxitin   | CTN          | 50 mcg  |
| Ceftriaxone | CTR          | 50 mcg  |
| Ofloxacin   | OF           | 25 mcg  |
| Cefepime    | CPM          | 50 mcg  |
| Amikacin    | AK           | 50 mcg  |
| Imipenem    | IPM          | 30 mcg  |
| Ceftazidine-clavulanic | CAC | 50 mcg |

Mcgs 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%), Klebsiella spp 40 (11.2%), Enterococcus 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 Ampicillin 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, cerfiriaxazone had 0% sensitivity and 6 (1.68%) resistance, ciprofloxacin 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/sulfamethoxazole had same sensitivity and resistance-4 (1.2%).

| Antibiotics                      | Sensitivity | Percentage | Resistance | Percentage |
|----------------------------------|-------------|------------|------------|------------|
| Amikacin                         | 06          | 1.68       | 00         | -          |
| Amoxicillin/ clavulance Acid     | 04          | 1.12       | 02         | 0.56       |
| Ampicillin                       | 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       |
| Nitrofuantoin                    | 04          | 1.12       | 02         | 0.56       |
| Piperacillin/tazobactam          | 06          | 1.68       | 00         | -          |
| Tigecycline                      | 06          | 1.68       | 00         | -          |
| Trimethoprim/sulfamethoxazole    | 04          | 1.12       | 04         | 1.12       |

Table 4: Gram negative bacilli number of patients -356 N 280-(Sphingomonas paucimobilis).

| Antibiotics                        | Sensitivity | Percentage | Resistance | Percentage |
|------------------------------------|-------------|------------|------------|------------|
| Amikacin                           | 16          | 4.49       | 16         | 4.49       |
| Amoxicillin/ clavulance acid       | 06          | 1.68       | 26         | 7.30       |
| Ampicillin                         | 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       |
| Nitrofuantoin                      | 10          | 2.80       | 22         | 6.17       |
| Piperacillin/tazobactam            | 12          | 3.37       | 20         | 5.61       |
| Tigecycline                        | 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-
(Sphigomonas paucimobilis) – Amikacin had same
sensitivity and resistance rate- 16 (4.49%) Amoxycillin/
clavulanic Acid had 6 (1.68%) sensitive and 26 (7.30%)
resistance. Both cefepime and pipercillin/ 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%) cerfizone had 0% sensivity
and 32 (8.98%) resistance rate. Ciprafloxicillin
and Imipenem had same rate of sensitivity 4 (1.12%) and
same rate 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.

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.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the
Institutional Ethics Committee

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Cite this article as: Morey SM, Channe N. Study of blood cultures by BACTEC method in pediatric patients of Chhattisgarh, India. Int J Contemp Pediatr 2019;6:2022-6.