To Uncover Various Factors Associated with Positive Blood Cultures amongst Neonates and Children- A Prospective Hospital based Study

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ABSTRACT

Introduction: Septicemia is a serious bloodstream infection. Neonatal sepsis is a clinical syndrome characterized by signs and symptoms of infection with or without accompanying bacteremia in the first month of life. Neonatal infections currently cause 1.6 million deaths annually in developing countries. Sepsis and meningitis are responsible for most of these deaths. The aim of the present retrospective study was to uncover various factors associated with positive blood cultures amongst neonates and children.

Material and methods: The present study was a hospital based prospective study conducted by the department of paediatric and microbiology in the institute. Only clinically suspected cases of blood stream infections amongst high risk neonates and children were in this 6 month prospective study. A detailed history including age, sex, socio- economic status, distribution of lesion and duration of illness and any associated risk factors contributing for the illness was elicited from the patients. Blood sample was collected and processed. The categorical data were analyzed by calculating proportion. The Chi Square test was used to see the association among categorical variables.

Result: Out of the 80 subjects who were enrolled in this study, there were 48 males and 32 females. out of 80 subjects, 39 subjects belonged to middle class whose score was between the range of 11-15, 33 subjects had score ≤5 belonged to lower class and only 08 subjects belonged to upper class and their score was 16-25. Febrile, per vaginal leaking more than 48 hours and total leucocytes count more than 11000/cumm factors were found to be significantly associated with culture positivity.

Conclusion: Sepsis is the leading cause of death and as we know that no single factor is responsible for neonatal sepsis. According to our present study, febrile, per vaginal leaking more than 48 hours and total leucocytes count more than 11000/cumm factors were found to be significantly associated with culture positivity.

Keywords: Blood, Culture, Prospective, Sepsis

INTRODUCTION

The word "sepsis" was first introduced by Hippocrates (460-370 BC) and was derived from the Greek word sipsi ("make rotten"). At the beginning of the 19th century, the chemist Justus von Liebig expanded the theory by claiming that the contact between wounds and oxygen was responsible for the development of sepsis. The French chemist Louis Pasteur (1822-1895) discovered that tiny single cell organisms caused putrefaction. He called them bacteria or microbes and correctly deducted that these microbes could be causing disease. Sepsis is a systemic infection that can lead to complications and death.[1] World-wide, 13 million people develop sepsis each year, and as many as 4 million people have died.[2] Septicemia is a serious bloodstream infection. Septicemia and sepsis aren't the same. Sepsis is a serious complication of septicemia. Pathophysiology of sepsis has been attributed to abnormal coagulation, endothelial cell dysfunction[3], presence of excessive tumour necrosis factor, cell apoptosis - eg, lymphocytes and endothelial cells, neutrophil hyperactivity, poor glycaemic control, lack of steroid hormones, cytokines, proteases, lipid mediators, gaseous substances, vasoactive peptides and cell stress markers play key roles in sepsis pathophysiology.[4] Neonatal sepsis is a clinical syndrome characterized by signs and symptoms of infection with or without accompanying bacteremia in the first month of life. Neonatal sepsis can be classified into two major categories depending up on the onset of symptoms: Early onset sepsis and late onset sepsis. Neonatal infections currently cause 1.6 million deaths annually in developing countries. Sepsis and meningitis are responsible for most of these deaths.[5] The aim of the present retrospective study was to uncover various factors associated with positive blood cultures amongst neonates and children.

MATERIAL AND METHODS

The present study was a hospital based prospective study conducted by the department of paediatric and microbiology in the institute. The study was approved by the Institutional Review Committee (IRC) and the Ethical Review Committee (ERC). Before enrollment in the study, written consent was taken the patient's parent/ legal guardian. The risk and benefits had been explained in the consent form. Only clinically suspected cases of blood stream infections amongst high risk neonates and children were in this 6 month prospective study. Any patient who was not giving the consent was excluded from the study. All the data was entered in a predesigned proforma.

A detailed history including age, sex, socio- economic status, distribution of lesion and duration of illness and any associated risk factors contributing for the illness was elicited from the patients. Blood sample was collected and processed. Gloves were worn in accordance with standard precautions. Appropriate verification of the patient's identity, age, sex, and address was done before the specimen collection. Skin over the vein was disinfected by 70% isopropyl alcohol for preventing contamination. Blood was withdrawn before administration of antibiotics and blood cultures were done by Bactec and traditional methods.

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STATISTICAL ANALYSIS

The categorical data were analyzed by calculating proportion. Mean and standard deviation was calculated for quantitative data. The Chi Square test was used to see the association among categorical variables. However, Fisher exact test may be used in a case of small frequency in different cells. P<0.05 was taken as significant

RESULT

Out of the 80 subjects who were enrolled in this study, there were 48 males and 32 females (Table 1). About 93.7% of the blood cultures were obtained by Bactec technique and only 6.25 were obtained by traditional technique (Table 2). In 24 patients gram positive cocci was found in blood cultures and in 9 patients gram negative bacilli was found. Out of 80 subjects 30 (37%) subjects presented with fever while 50 (63%) subjects had no fever (Table 3).

According to Kuppu swami, out of 80 subjects, 39 subjects belonged to middle class whose score was between the range of 11-15, 33 subjects had score ≤5 belonged to lower class and only 08 subjects belonged to upper class and their score was 16-25 (Table 4).

Table 5 shows that out of 44 neonates, 26 neonates had low birth weight in between the range of 1kg to 2.5 kg, 15 neonates had birth weight between the ranges of >2.5kg to 3 kg while only one subject had < 1kg birth weight.

Table 6 shows the various factors associated with culture positivity and their significance. There were only 25 males and 15 females who were culture positive and rest 23 males and 18 females were culture negative. There was no significant difference between the males and females who were culture positive and negative. There were 4patients of upper class, 18 of middle class and 21 of upper class who were culture positive. The relationship of socioeconomic status and apgar score with culture positivity also came out to be insignificant. Febrile, per vaginal leaking more than 48 hours and total leucocytes count more than 11000/cumm factors were found to be significantly associated with culture positivity (p<0.05).

DISCUSSION

One of the prime causes of death amongst children is sepsis. It is not very easily identifiable through its signs and symptoms but bacteriologic culture is a necessity in establishing its diagnosis. There is no single feature that is pathognmonic of neonatal sepsis[6]; clinical presentation of neonatal sepsis varies widely; in most of the studies symptoms include fever, difficult in breathing, tachycardia, malaise, difficult in feeding and lethargy.[7] Neonatal mortality from sepsis is high, approximately 68% in Brazil from 2000 to 2008,[8] indicating the necessity of various preventive actions by the healthcare-associations in this age range. The number of neonatal patients at risk of acquiring nosocomial infections is increasing because of the improved survival of very low birth weight infants and their need for invasive monitoring and supportive care. The World Health organisation(WHO) reported in 2005 that over 70% of deaths in children under age five occur within the first year of life and 40% occur within the first month.[9] In many hospitals gram positive organisms cause upto 70% of nosocomial infections in neonates[10], with coagulase negative Staphylococci accounting

Total	Male	Female
80	48	32

Table-1: Distribution of study subjects according to gender.

Bactec	Traditional Blood Culture
75(93.7%)	5(6.25%)

Table-2: Types of sample collection in study subjects

Febrile	Afebrile
30	50

Table-3: Presence of pyrexia in study subjects

Upper	Middle	Low
8	39	33

Table-4: Socio-economic status of the study population

<1Kg	1Kg-2.5Kg	>2.5kg-3kg
1	28	15

Table-5: Birth weight of neonates

Factors	Culture positive (41)	Culture negative (32)	p value
Male	25	23	0.711
Female	15	18	0.401
Febrile	9	20	0.0284
Afebrile	30	16	0.344
Socioeconom IC Status			
Upper	4	4	1.00
Middle	18	17	0.68
Lower	21	20	0.69
APGAR score			
1 Minute (<7)	28	12	0.163
5 Minutes (<8)	26	14	0.425
Birth weight(<2.5Kg)	20	9	0.269
Maternal History			
PV*>24 hrs	12	10	1.00
PV>48 hrs	13	2	0.0397
TLC@/cumm			
</=4000	2	4	0.403
>11000	37	12	0.0315

Table-6: Factors associated with culture positivity

for more than half of these.[11] According to our study, 24 cultures showed gram positive cocci and 9 cultures showed gram negative bacilli. They reported from Rohtak in 2002 reported the incidence of bacteraemia to be 33.9% in neonates. Gram negative organisms (88.8%) like Klebsiella, Salmonella and Pseudomonas were most common followed by Staphylococcus aureus among the gram positives (Sharma et al., 1998).[12]

According to Bonadio et al.[13] in his study, he concluded that the rate of serious bacterial infection was in direct relation to the degree of fever, being 3.2%, 5.2% and 26% at temperatures of 38.1 - 38.9°C, 39.0 - 39.9°C and >40.0°C, respectively. This was in accordance with our study, the children having pyrexia had a significantly higher proportion of culture positivity. This was also confirmed by a study conducted by Lee et al during 1998. They concluded that Hyperpyrexia amongst young infants is a well known risk factor for bacterial infection when

assessing febrile children.[14] In a study conducted by Moro ML et al, infant's weight less than 2500 grams was regarded as a risk factor for developing blood stream infections but according to our present study weight was not significantly associated with culture positivity.[15]

At present there are not established guidelines amongst various hospitals in developing countries to treat neonatal sepsis. Proper examination and control of spread of infections in neonatal units is the most cost effective technique that can be adopted by hospitals to prevent sepsis.[16-19]

CONCLUSION

Sepsis is the leading cause of death and as we know that no single factor is responsible for neonatal sepsis. According to our present study, febrile, per vaginal leaking more than 48 hours and total leucocytes count more than 11000/cumm factors were found to be significantly associated with culture positivity.

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