

An Observational Prospective Study of the Management of Neonatal Sepsis in the Pediatric Wards of Korle-Bu Teaching Hospital

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Abstract

Neonatal sepsis has been identified by World Health Organisation (WHO) as one of the major causes of high morbidity and mortality in neonates [1]. It is a clinical syndrome characterised by systemic signs of circulatory compromise which is usually as a result of the invasion of the blood stream by bacteria during the first month of life [2], [3]. In Ghana where most people are in the middle or low-income range and cannot afford the cost of a blood culture investigation and considering the fact that it takes a minimum of five days for one to receive a blood culture report, there is usually the approach of empirical management of most cases of neonatal sepsis in the hospital. A request is made for blood cultures usually after treatment failure. The incidence of neonatal sepsis in the Korle-Bu Teaching Hospital is very high and this is likely due to the occurrence of predisposing factors and lack of essential facilities for optimal hygiene in most of the primary health facilities from where the patients are referred.

OBJECTIVE: *The aim of this study was to evaluate the empirical management of neonatal sepsis at the Children's Department of Korle –Bu Teaching Hospital (KBTH).*

METHODOLOGY: *A prospective cohort study method was used. Patients diagnosed with Neonatal sepsis were identified from the admissions and discharge records. All neonates admitted to the pediatric ward with sepsis during the period was selected and followed up over the study period (15th November, 2015 – 15th December, 2015). There was no intervention made to the management approach to the subjects during the study. All the necessary data was taken from the patients' folders and the care givers (Clinical staff and parents of the patient) where possible. The data was collected using a specially designed data collection tool which captured data on the following; Patient characteristics, Septic screen, Case fatality, Sensitivity patterns and Pattern of antibiotic usage . The results were analysed using SPSS for Microsoft version 20 and Excel spreadsheet and presented as bar charts, pie charts and percentages.*

FINDINGS: *A total of 271 neonates were admitted at the study site during the period. A third of all neonatal admissions during the period were diagnosed with neonatal sepsis. 55.4% of the cases were males and the rest females. More than half of the neonates diagnosed with neonatal sepsis had septic screen conducted on them. Most of the cases (58.33%) were screened for C - reactive protein whilst less than half (40.2%) of the septic screen was for organism culture. Over half of the samples sent for organism culture yielded no growth. 48.27% yielded growth out of which only 35.71% were micro - organisms. Most of the causative organisms were gram-negative micro-organisms. The case fatality rate of neonatal sepsis for the period was 4.17%. E-coli infection was confirmed as a cause of more than a third of death from Neonatal Sepsis. Almost all (95.83%) of the neonates diagnosed with neonatal sepsis were given empirical antibiotics. Only 4.17% of the cases had their antibiotics changed in accordance with their culture and sensitivity results.*

CONCLUSION: *Neonatal sepsis diagnosis at the department was usually of early onset and empirical treatment used for its management appeared effective. Most of the subjects did*

not have septic screen done making it impossible for microbial sensitivity and resistance patterns to be studied.

Keywords: Neonatal Sepsis, Septic Screen, Empirical Antibiotics, Culture and Sensitivity

1. Introduction

1.1 Background

Neonatal sepsis has been identified by World Health Organisation (WHO) as one of the major causes of high morbidity and mortality in neonates [1]. It is a clinical syndrome characterised by systemic signs of circulatory compromise (e.g. Poor peripheral perfusion, pallor, hypotonia and poor responsiveness), which is usually as a result of the invasion of the blood stream by bacteria during the first month of life [2],[3].

In Ghana where most people are in the middle or low-income range and cannot afford the cost of a blood culture investigation and considering the fact that it takes a minimum of five days for one to receive a blood culture report, there is usually the approach of empirical management of most cases of neonatal sepsis in the hospital. A request is made for blood cultures usually after treatment failure. The incidence of neonatal sepsis in the Korle-Bu Teaching Hospital is very high and this is likely due to the occurrence of predisposing factors and lack of essential facilities for optimal hygiene in most of the primary health facilities from where the patients are referred.

In the management of neonatal sepsis, the ideal approach is to have the blood samples of the affected neonates cultured and the results of antimicrobial susceptibility testing aiding in the choice of the appropriate antimicrobial therapy and providing good supportive care for the patient [4]. Alternatively, the administration of antimicrobials empirically to cover the possible organisms suspected is sometimes used. There appears to be paucity in literature on the clinical outcomes of the empirical management of neonatal sepsis in Ghanaian hospitals. Knowledge of the extent and outcomes of the empirical management of neonatal sepsis will thus contribute to policy formulation at the study setting and other similar facilities.

1.2 Aim

The aim of the study was to evaluate the empirical management of neonatal sepsis at the Children's Department of Korle –Bu Teaching Hospital (KBTH).

1.3 Objectives|

- To assess the percentage of neonates with clinical diagnosis of neonatal sepsis
- To determine the number of cases that had septic screens done
- To calculate the portion of neonates with sepsis who are managed empirically
- To assess the frequencies of bacterial isolates from neonatal septic screens
- To determine the pattern of empirical antibiotic use in the management of neonatal sepsis at the Paediatric ward of KBTH

1.4 Research questions

1. What guides the diagnosis of Neonatal Sepsis at the Paediatric wards of the KBTH?
2. What antibiotics are used for the empirical management of Neonatal Sepsis at the Department of Paediatrics of the KBTH?

2.0 Literature review

The WHO estimates that more than four million neonates die each year and 98% of these death occur in developing countries and neonatal sepsis is among the main causes of neonatal mortality [5]. Neonatal sepsis is a clinical syndrome characterised by systemic signs of infection and accompanied by bacteraemia in the first month of life [6]. Neonatal sepsis can be considered in three groups and these are the ones acquired antenatally, perinatally and nosocomially [7]. It is also known that an early and accurate aetiological diagnosis of neonatal sepsis is not very easy since usually the disease may start with minimal or non-

specific symptoms [8]. The case fatality rates in antibiotic treated infants are usually low in high-income countries [9]. There is a high disparity in neonatal care between high and low-income countries [2]. In the high income countries, there is an increased number of extremely premature infants in intensive care unit with high nosocomial infection rates due to multiresistant organisms whilst in the low income countries, there is a high health-facility infection rates and a high proportion of home deliveries in unclean environment which predisposes neonates to sepsis [2].

Some possible risks factors for neonatal sepsis include poverty and poor environmental conditions, prolonged rupture of membranes, preterm labour, maternal pyrexia, unhygienic intrapartum and postnatal care, low birth weight, and prelacteal feeding of contaminated foods and fluids [2], [10], [11]. It has been proven that the acquisition of the bacteria responsible for causing neonatal sepsis happens just before or during or after delivery [2]. The bacterial are either acquired from the mothers directly, her skin, or her vaginal tract before, during delivery of the baby or from the environment after the delivery of the baby [2].

Neonatal Sepsis can either be classified as an Early onset Neonatal sepsis (EONS) which is the appearance of illness in a neonate from the first day of birth to the seventh day or Late onset Neonatal Sepsis (LONS), also the appearance of illness from the eighth day of birth to the twenty-eighth day of birth [12].

Commonly occurring organisms that are known to cause neonatal sepsis in many countries are gram negative (*Escherichia coli*, *Klebsiella spp.*, *Pseudomonas spp.*, *Acinetobacter spp.*) and gram positive cocci (such as *Staphylococcus aureus* and Coagulase negative *Staphylococci*) [13].

In 2002, Mokuolu, Jiya and Adesiyun did a study in Nigeria, Ilorin[4] – Bacterial pathogens and antibiotic sensitivity pattern. In their study, all the babies admitted and diagnosed of neonatal Sepsis to the Neonatal Intensive Care Unit of the University of Ilorin Teaching Hospital from January 1995 to December 1996 were studied. In all 198 babies were studied. The findings of their study revealed that there were 61(30.8%) positive cultures out of the 198 samples taken and the occurrence of neonatal sepsis within the study period was 7.04 per 1000 births. The findings revealed that the commonest causative organism of sepsis in the neonates was *Staphylococcus aureus* with the most cultured organism in neonates within the first 48 hours of their life were the gram-negative bacilli. Another study in 2006 by Iregbu and colleagues in Nigeria[14] was to determine the bacteriologic profile of common aetiological agents of neonatal septicaemia and their antibiotic sensitivity pattern. Their retrospective study reviewed 390 neonatal blood cultures that were conducted in the Department of Clinical Microbiology and Parasitology of the National Hospital in Abuja between January 2002 to December 2004. The findings of their study showed that only 22% of the samples cultured gave a positive yield of either gram positive or gram-negative bacteria. Also the findings of their study revealed that the most cultured gram-positive bacterial as a cause of neonatal sepsis in the cultures studied was *Staphylococcus aureus* and this was similar to the findings of the study earlier mentioned. The most cultured gram-negative organism according to the findings of this study was *Klebsiella pneumoniae* which showed a strong resistance pattern towards most of the gram negative antibiotics that was then being used.

In 2012 in Yamen, Al-Shamahy, Sabrah, Al-Robasi and Naser under took a study with the objective of investigating the organisms that cause sepsis in the Neonatal Unit at the Al-Thawra Hospital[15] and determined their resistance to antibiotics to enable the investigators come up with recommended Policy for empirical treatment of Neonatal Sepsis. The findings of this study revealed that, out of the total of 158 cases studied, 90% of the cultured cases gave a positive yield of bacteria with cases described as Early –onset Septic cases giving a higher positive culture result of 61.7%. The findings of their study also showed that most of the positive isolates (97.8%) were gram-negative organisms with *Klebsiella pneumoniae* being the major pathogen (36.7%) then followed by the *Pseudomonas* species (30.0%).

Though the diagnosis of Neonatal sepsis can be a bit challenging, there are certain biological parameters that are used as diagnostic markers for Neonatal sepsis. Examples of such parameters are the Serum Prolactin level, serum C-reactive protein and Serum Amyloid [16]. Most studies have confirmed that among these three markers, the Serum Prolactin (PT) levels are more sensitive and so better indicators of Neonatal Sepsis [17] but in the absence of that, the Serum C-reactive Protein (CRP) level can be used since it has similar in specificity with Serum Prolactin level in the diagnosis of Neonatal Sepsis.

Ideally, the treatment of neonatal sepsis is based on culture and sensitivity results. However, clinical neonatal sepsis are frequently managed empirically with antibiotics before pathogens are isolated [18]

In 2014 in the Paediatric department of the Korle-bu Teaching Hospital, there were 396(21.6%) and 229 (9.3%) admissions to its Emergency room and the Neonatal Intensive Care Unit respectively on account of neonatal sepsis. Diagnosis of Neonatal sepsis in Korle-bu Teaching Hospital is usually based on the clinical symptoms of the neonate, maternal risk factors, Septic screen results and C - reactive protein results.

3.0 Method

3.1 Ethical considerations

Written Informed consent was obtained from mothers and care givers of all the subjects. The study was for academic purposes and no clinical intervention or invasive intervention was employed to the subjects at any point of the study. Anonymity of the data was ensured by not associating information taken from subjects' folder with their names and other characteristics which personally identify them. Administrative approval was obtained from the Nurses Superintending the wards and the Resident doctors before the data was taken.

3.2 Study site

The study was conducted at the Children's department of the Korle-Bu Teaching Hospital. The Korle-Bu Teaching Hospital is the Premier tertiary hospital in Ghana located in the Greater Accra region of Ghana. It is located in the Southern part of Ghana and it receives referrals from all the other hospitals in the country. The hospital has 68 bed, 108 cots for babies and 64 cots for toddlers in its Children's Department which consist of the Paediatric surgery and the Paediatric unit. The hospital has very good expert Paediatricians and Neonatologists but is under equipped and so not able to deliver the level of service expected of it.

The paediatric ward has a Neonatal Intensive Care Unit with 25 incubators for management of preterm and other babies (whether born in the hospital or other referral sites from the country) with some complications for their care, the department also have a babies unit on its third floor where babies born and discharged home but fall ill are admitted to for clinical care. The paediatric surgical wards of the department also have a nursery where neonates with condition requiring surgical interventions are admitted to. At the department, all referred babies except the preterm are initially admitted to the emergency room and then transferred to the appropriate ward for care to be given.

3.3 Study design

A prospective cohort study method was used. Patients diagnosed with Neonatal sepsis were identified from the admissions and discharge records. All neonates admitted to the paediatric ward with sepsis during the period was selected and followed up over the study period (15th November, 2015 – 15th December, 2015).

Written informed consent was taken from all the mothers of the subjects who were enrolled into the study. There was no intervention made to the management approach to the subjects during the study. All the necessary data was taken from the patients' folders and the care givers (Clinical staff and parents of the patient) where possible.

3.3.1 Inclusion criteria: All neonates (babies within the first one month of life) who were admitted on the paediatric wards and diagnosed with neonatal sepsis were included.

3.3.2 Exclusion criteria: All babies on the paediatric ward who are more than one month of age and diagnosed of sepsis.

3.4 Data collection

The data was collected using a specially designed data collection tool. The tool was pretested on five patients with suspected neonatal sepsis within the period of 1st November 2015 to 5th November 2015 and it was validated by a Principal and Senior Pharmacist on a daily basis. The data collection for the study was done by Principal and Senior Pharmacists of the Paediatric pharmacy unit with the assistance of Intern pharmacists who had been trained on the use of the data collection tool throughout the study period. The researcher used the subjects' folder and investigations report to fill the required variables in the data collection tool

3.5 Data analysis

The results were analysed using the SPSS for Microsoft version 20 and presented as bar charts, pie charts and percentages.

4. 0 Results

4.1 Patient characteristics

In all there were 271 neonates admitted on the paediatric wards during the study period. Out of that 82 (30.26%) of the neonates were diagnosed with neonatal sepsis. Three (3) of the subjects had their diagnosis changed to Neonatal Jaundice and seven subjects data was incomplete. In all seventy-two (72) subjects' data were analysed. A detail of patient characteristics are presented in Table 1.

Table 1. Patient characteristics

Characteristic	Frequency	(%)
Gender		
Male	40	55.6
Female	32	44.4
Age		
0-7	61	84.72
8-14	8	11.11
15-21	2	2.78
22-28	1	1.39
TYPE OF NEONATAL SEPSIS		
Early Onset Neonatal Sepsis	61	84
Late Onset Neonatal Sepsis	11	15

4.2 Septic screening

A total of 271 neonates were admitted on the paediatric wards of KBTH during the study period. About a third (30.26%) of this total number was diagnosed with neonatal sepsis and more than half (n=43, 59.72%) of the neonatal sepsis cases diagnosed had their samples taken for septic screens. Out of the 72 cases analysed, 43(58.33%) had C-Reactive screen done (Fig. 1). Less than half (n= 29, 40.2%) of the subjects diagnosed with neonatal sepsis and analysed had their septic screen done. Over half (n= 15, 51.72%) of these had their culture yielding no growth and 48.27% of the cultured samples had 64.29% growing contaminants and 35.71% grew micro-organisms. The profile of septic screen, C - reactive protein (CRP) screen and cultured micro – organisms profile is shown in Table 2 and Figure 2.

Table 2. Septic Screen Profile

Septic Screen (N=43)	Frequency	(%)
Septic Sample		
Blood	35	81.39
Cerebral spinal fluid	3	6.98
Eye swab	1	2.33
Cord Swab	2	4.65
Urine	2	4.65
C/S and CRP Activity		
No Growth but CRP Reactive	3	27.27
Contaminant cultured but CRP Reactive	3	27.27
No Septic screen done but CRP Reactive	4	36.36
Growth and CRP Reactive	1	9.10

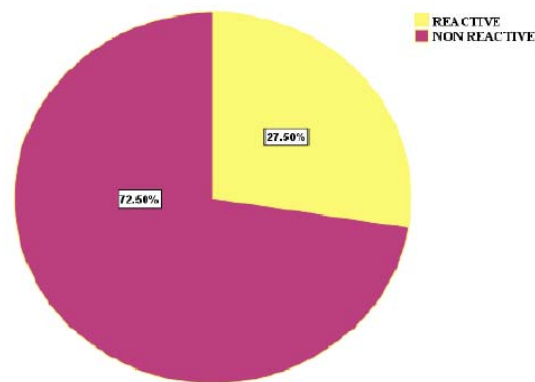


Fig 1. C-Reactive Protein Screens

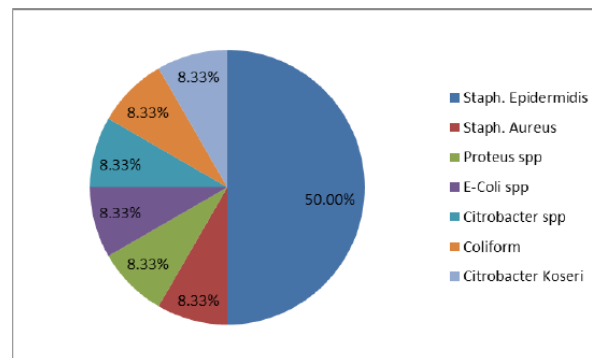


Fig 2. Details of Treatment Outcome

4.3. Case fatality of neonatal sepsis

Out of the 72 cases analysed, 3(4.17%) had died as an outcome of Neonatal Sepsis. This gave a case fatality rate for the period as 4.17%. Out of the three cases that died, E-coli infection was confirmed as a cause of more than a third of death from Neonatal Sepsis. A presentation of the treatment out come for the period is presented in Figure 2.

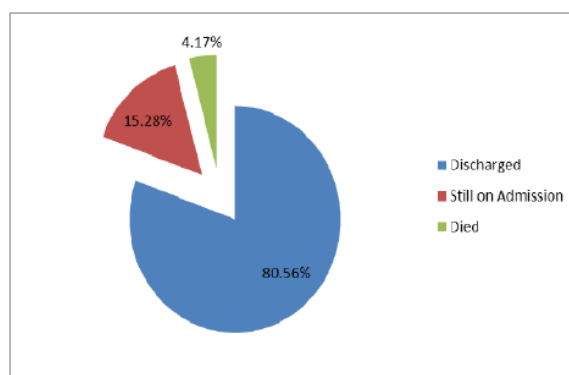


Fig 3. Details of Treatment Outcome

4.4 Sensitivity patterns

From this study it was observed that most of the organisms that caused neonatal sepsis in the subjects were gram-negative micro – organisms and it was noted that there was a change in their sensitivity to the commonly used antibiotics for empirical management of neonatal sepsis. Details of the sensitivity patterns of cultured microorganisms are shown in Table 3.

Table 3. Micro - organisms' sensitivity pattern

Micro-organism	Sensitive agents	Resistant agents
<i>Proteus species</i>	Amoxiclav, Gentamycin, Cefuroxime, Ceftaxidime	Ampicillin
<i>Staph. Epidermidis</i>	Cloxacillin, Erythromycin	Penicillin
<i>E-coli species</i>	Amikacin	Ampicillin, Gentamycin
<i>Staph. Epidermidis</i>	Cloxacillin	Ampicillin, Gentamycin, cefuroxime
<i>Citrobacter species</i>	Ciprofloxacin , Flucloxacillin	Amoxyclav, Ceftriaxone, Gentamicin, Cefuroxime
<i>Coliform</i>	Ampicillin, Amoxyclav, Ciprofloxacin, Cefuroxime.	Not stated
<i>Citrobacter koseri</i>	Ciprofloxacin , Amikacin	Cefuroxime, Ampicillin, Gentamycin, Ceftriaxone, Amoxiclav

4.5. Pattern of antibiotic usage

Out of the 72 cases analysed, 95.83% all the subjects were started on empirical antibiotic management. 3(4.17%) had their empirical antibiotics changed when their culture and sensitivity report came in. The extent of empirical antibiotic combinations given is presented in Table 3.

Table 4. Empirical Antibiotics Usage

Drug combinations	Frequency	%
Cloxacillin + Crystalline Penicillin	1	1.39
Ampicillin + Gentamycin	27	37.5

Amikacin + Cloxacillin	13	18.06
Cefotaxime+ Cloxacillin	19	26.39
Amikacin	1	1.39
Cloxacillin + Gentamycin	4	5.56
Cefotaxime + Ampicillin	1	1.39
Ampicillin+Gentamycin then Cefotaxime + Cloxacillin	2	2.78
Cefotaxime + Ampicillin then Cloxacillin	1	1.39
No Drug given	3	4.17

5.0 Discussion

The study was to evaluate the empirical management of neonatal sepsis at the Children's Department of the Korle – Bu Teaching Hospital. During the study period, 82 (30.26%) of all the neonates admitted were diagnosed with neonatal sepsis which would yield a significant value of 320 cases of Neonatal sepsis within the year. Neonatal sepsis occurred in 1 to 21 infants per 1,000 live births in America [19]. Much work has not been done on the Epidemiology of Neonatal Sepsis in Ghana but it appears to be one of the causes of neonatal mortality in the country.

From this study, Neonatal sepsis was a common diagnosis on our paediatric wards. More than half (n=61, 84%) of the subjects diagnosed with Neonatal Sepsis had Early onset Neonatal Sepsis according to Aurangzeb and Hammeed's [12] classification of Early Onset Neonatal Sepsis (EONS). Out of the 61.84% diagnosed with EONS, majority of the subjects were diagnosed within the first 24 hours of their lives.

In a study conducted by [20] the case fatality of Neonatal sepsis was around 9.8%. The case fatality rate for Neonatal Sepsis in this study was 4.11% which was lower than that obtained in the Seale et al study. Most of the studies reviewed in the Sale, et al, 2014 Systematic review and Meta –analysis were conducted over a longer period of time and since this study was just over a period of one month the short duration could be the reason for the low fatality rate obtained.

It was however observed that *E. coli* were responsible for about a third (33.33%) of the case fatalities. This is very possible since published work by Simonson and colleagues in 2014 also found *E-coli* to be the most common cause of mortality in Neonatal sepsis. In 2006, the work of Anderson-Berry and Co showed that most early onset neonatal sepsis cases were diagnosed within the first 24 hours of life [21]. This was observed in this study as 45.90% of study subjects were diagnosed within the first 24 hours of their life.

Apart from clinical symptoms and maternal risk factors, the subjects were diagnosed based on their Septic screen result or their C-reactive protein screen results. Out of the subjects whose data was analysed, only 59.72% had septic screens done and 58.33% had CRP test done. In this study it was noticed that 72.50% of the subjects had a non- reactive results and 6.25% of this had their septic screens yielding positive growth of microorganism. This low yield might have been because of the timing of CRP levels which is critical in the definitive diagnosis of Neonatal sepsis [22]. This was termed a false- negative result [23]. Another observation made was the fact that most of the subjects who had their first CRP results being negative were not retested but were put on empirical antibiotics for an average of one week. Most of these subjects ended up being discharged. Internationally, to use CRP as a diagnostic marker for Neonatal sepsis one should at least take two samples, twelve to twenty four hours apart but this was not done in this study. According to Benitz, et al. study conducted in 1998[23], two levels of CRP are required less than 1mg/dL obtained within 24 hours apart and 8 to 48 hours after presentation from a patient to confirm that the patient does not have bacterial infection. However, the sensitivity of a normal CRP at the initial evaluation is not

sufficient to justify withholding antibiotic therapy [23]. The positive predictive value of elevated CRP levels is low, especially for culture-proven early-onset infections. In this study, more of the subjects had their samples taken for CRP test than for septic screen. This could be attributed to the fact that the CRP test was cheaper than the septic screen and the results were available within 24 hours after the sample is taken. The cost of the Septic screen could be one of the reasons why most of the subjects did not do it, since the National Health Insurance did not cover it and most of the subjects had mothers who were middle-income earners.

Considering the 72 subjects whose data was analysed, a little over half had their sample taken and sent for septic screen. It was observed that most parents of the subjects could not provide the clinicians with the culture bottles for the samples to be drawn into and sent to the laboratory. Out of the samples sent for septic screen, more than half did not grow any micro-organism. These subjects were however managed with empirical antibiotics and were all treated and subsequently discharged. This confirms the statement made by [18] about the fact that the treatment of neonatal sepsis should be based ideally on the results of culture and sensitivity, there are many episodes of clinical neonatal sepsis that are managed empirically with antibiotics despite having no pathogen Isolated.

In this study, it was observed that 5 out of the 6 organisms cultured were gram-negative organisms. This corresponds to the findings from a study done in [13]. Among the organisms cultured in this study were *E. coli*, *Citrobacter koseri*, *Coliform*, *Citro bacter spp* and *Proteus species*. The positive organisms cultured in this study were *Staph. Epidermidis* and *Staph Areus*. Contaminants formed 54.54% of the positive cultured samples and out of this, 58.33% were *Staph Epidermidis*. In a study by Zaidi in 2009[24], it was found out that due to technical difficulties of sterile venipuncture in small babies, there is a high rate of contaminant growth, which include organisms like *Staph. Epidermidis* and this could lead to the misinterpretation of the results. This is because *Staph. Epidermidis* could either be a normal skin floral or a pathogenic organism in preterms and infants with indwelling blood vessel catheters [25]. It is said in literature that coagulase negative *staphylococci* denote an essential, very often a case in point [26]. It is said that coagulase negative *staphylococci* were believed to be the commonly occurring contaminants in blood culture. They usually represent 70%- 80% of contaminants cultured in blood samples. This statement is confirmed by our study just like other studies since *Staph. Epidermidis*, a coagulase negative *Staphylococci*, formed 45.45% which was the highest cultured organism in the study.

One of the observations made from this study was the fact all newly diagnosed subjects were put on empirical treatment within twenty-four hours of diagnosis and this was in accordance with the fact that there could be rapid progression of sepsis in infants which may be associated with high morbidity and mortality [27]. In literature it is advised that the treatment of Neonatal Sepsis should not wait for a positive culture before it is initiated since it is estimated that only 1 in 6 to 1 in 20 infants who are treated for suspected sepsis end up having positive culture [27].

A look at the outcome of the treatment of subjects in this study revealed that, out of the 72 patients whose data were analyzed, 80.56% were discharged, 4.17% percent died and as of when the data collection had ended 15.28% of the subjects were still on admission. This is an indication that, patients diagnosed with neonatal sepsis are well managed at the pediatric wards of the Korle-Bu Teaching Hospital. But the fact still remains that since most of the subjects were not confirmed cases of neonatal sepsis the hospital would have to put in more measures to have every patient diagnosed with Neonatal sepsis at least screened with a culture before the empirical treatment is given. Also the pediatric department of the hospital would have to look at least two serial tests of the C- Reactive Protein since internationally it is said that it is not right to use one value obtained from C-Reactive protein test to diagnose Neonatal Sepsis. When considering the CRP result, it is essential to consider the time that the test was done since when it is done too early there is a probability of having a non- reactive results which might be false negative.

During the management of Neonatal sepsis with empirical antimicrobials, it is vital for one to have knowledge of the pathogens often responsible for causing septicemia in neonates and their antimicrobial susceptibility pattern in order to be able to select the right antibiotic treatment [28]. The susceptibility patterns of antimicrobials for the pathogens differ geographically and they momentarily rely on local pathogens and patterns of antimicrobials for suspected sepsis [28]. In this study it was observed that most of the subjects did not have septic screen done and so the choice of antibiotics used in the management of the subject were mostly empirically selected. This did not make it possible for the microbial sensitivity and resistance patterns to be studied.

In 2002, Rahman, Hameed, Roghani and Ullah did a study titled ‘ Multi drug resistant neonatal sepsis in Peshawar, Pakistan’[29] in which it was observed that Gram-negative organisms were mostly the cause of neonatal sepsis. The most commonly cultured Gram-negative organism was *E-coli* and it was noted that it was highly resistant to the commonly used antibiotics like ampicillin, augmentin and gentamycin. This pattern was observed in this study too. The *E-coli* cultured was resistant to Ampicillin and Gentamycin (commonly used antibiotics) but sensitive to Amikacin. Another study conducted by Matthew et al, in 2008[30] it was also observed that ampicillin resistant *E-coli* was a cause of neonatal sepsis and this observation is comparable to what was observed in this study.

Literature has proven that a number of neonates suspected to have neonatal sepsis are treated with Empirical antimicrobials when in fact the incidence of culture – proven EONS is only between 1 and 4.6 cases per 1000 live births [31], [32]An obvious challenge with the diagnosis of Neonatal Sepsis is the fact that its clinical symptoms are non- specific. Since it has high morbidity and mortality rates, clinicians do not hesitate to initiate empirical antimicrobials to treat it. By this doing, it has been confirmed that neonatal morbidity and mortality is hugely reduced. From this study, it was observed that most (94.5%) of the subjects had the Ampicillin plus Gentamycin administered to them and 80.56% of them were well and discharged at the end of their treatment. This could suggest that most of the subjects had organisms that were susceptible to that Ampicillin and Gentamycin combination. This observation was in line with a previous work by [33], where he showed the common antibiotics susceptibilities of the most common organism causing EONS as Ampicillin and an aminoglycoside. In this study most subjects (94.5%) had the initial empirical antimicrobial therapy being Ampicillin and an aminoglycoside, which in the case of this study was Gentamycin. It is believed that this combination expands the antimicrobial spectrum and also offers synergistic bacterial killing and also is relatively cheap and affordable [34].

5.1 Limitations of the study

- The researcher had limited time to complete and submit the whole write up of work by the end of the fifth semester.
- Most of the subjects did not have septic screen done even though it was requested because the clinicians never received the sample bottles into which they would have put the sample when drawn to be sent to the laboratory
- The Neonatal Intensive Care Unit (NICU) of the hospital is under renovation and the temporary place being used at the time of the study was crowded and so having access to subjects folder was a challenge
- Since the study covered a short period, results cannot be generalised.

6.0 Conclusion

Neonatal sepsis diagnosis at the department was usually of Early onset and empirical treatment used for its management appeared effective. Most of the subjects did not have septic screen done making it impossible for microbial sensitivity and resistance patterns to be studied.

6.1 Recommendations

Further work would have to be done to be able to determine the susceptibility and resistant pattern of the bacterial organisms that are the cause of neonatal sepsis in the babies seen at the hospital. A detailed work over a longer period should be done on the same topic with the intervention of ensuring that any subject who needs a septic screen gets it done. So that the susceptibility and resistance pattern of the Bacterial Isolates that would be cultured would inform the choice of Antibiotics for the best management of Neonatal sepsis in the Hospital. Also this information would inform policies on antibiotic purchases by the hospital for managing neonatal sepsis and would prevent the waste of resources in the hospital.

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