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Association of Neonatal Birth weight and neonatal sepsis along with pathogen distribution in Karachi population

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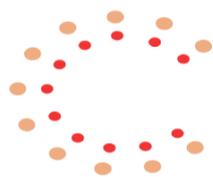
Abstract

Background: neonatal mortality rates are high in infants with low or very low birth weight (VLBW) as they are prone to sepsis. Early onset sepsis (EOS) that occur at 48hr of life remains an important cause of illness and death in VLBW infants.

Objective: of the study is to analyze association of Neonatal birth weight and neonatal sepsis in Karachi population and to study their pathogen distribution in positive isolates.

Methodology: a prospective cross-sectional study took place in Karachi leading hospitals Darul sehat hospital and Abdus Samad hospital neonatal birth weight and neonatal blood culture sensitivity test were studied for positive sepsis. data were analyzed using SPSS applying Chi square test

Results: out of 120 neonate's blood culture sensitivity test 12 neonates had positive sepsis. Weight of 6 neonates out of 12 positive was 2.1-3kg and other 6 neonates weight was 3kg. 3 isolates were streptococcus pneumonia and 9 were staphylococcus aureus.



Conclusion: Infants with positive sepsis are of healthy weights. Therefore, results found to have no significant relation in between neonatal birth weight and neonatal sepsis .EOS remains an uncommon yet important cause of morbidity and mortality among VLBW infants.

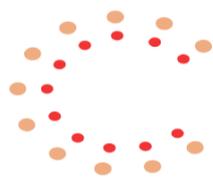
Introduction

2.6 million Neonatal deaths were reported by UNICEF in 2016 highlighting it as a global issue (1-3) (2-4) neonatal death rate is more in developing countries then in developed countries that is 34 and 5 per 1000 live births respectively(5, 6). 50% of neonatal deaths reports in Asian countries in which Pakistan contributes 10% (3, 7).

Among causes of neonatal deaths infections predominates that is 36% (1, 8, 9).Sepsis has a highest mortality rate reports that is 400,000/year(9-11).sepsis incidence rate varies in accordance to multiple factors such as race, geographical location and advance medical resources .Asia ranges between 7.1-38 cases of sepsis per 1000 live birth(12)

Any systemic infection that may develop in infant within 90 days of birth is neonatal sepsis(10) (13) . Infant having sepsis within 7 days period of birth is early onset sepsis (14) (15) usually start within 48hrs of birth(16) . Sepsis after 7 days of birth is as late onset sepsis(10) (13) (17) (12). EOS complications may lead to permanent hearing loss, seizures, neurological defects and death in neonates (18).Due to normal appearance at time of birth EOS (6)diagnosis is questionable and often shows delayed clinical signs(15, 19) and often recommends with empiric treatment to infants having risk factors (20, 21).Culture/sensitivity test of blood and CSF of neonates remains gold standard for EOS diagnosis(3)((20) (6)

Group B streptococcus and Escherichia coli are common pathogen isolated with positive EOS (21)



However, positive EOS isolates shows varying gram-positive pathogen such as staphylococcus aureus, streptococcus Pneumonia, Group B streptococci (GBS) or streptococcus agalactiae and Escherichia coli, klebsiella pneumonia and acinetobacter are predominate gram negative pathogen causing EOS(18) (9) (6) (10)

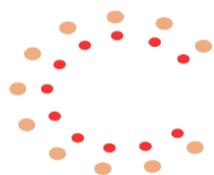
Early onset sepsis is accompanied by various obstetric complications that may include premature rupture of membrane, amniotic fever ,preterm labor and low birth weight infant (17, 22). Infants having birth weight very low are likely to have EOS therefore EOS incidence rate increases from 1-4.6 to 11-36 cases per 1000 births of infants weighing less than 1.5kgs (22) (7)

Low birth weight infants(LBW) are those having weight less than 2500g at time of birth and weight under 1500g consider very low birth weight (VLBW) infants(23). VLBW infants are more at risk of having sepsis and may lead to death therefore mortality rate of VLBW infant is high (24, 25). 20% death is reported in VLBW infants with sepsis(26).

Method

A cross sectional study was designed of 6-8 months duration took place in Darul sehat hospital and Abdus samad hospital of Karachi .IRB approvals were taken. Neonatal profile were studied data were filed in Performa containing gender, weight, birth route , gestational period , medical condition and blood culture sensitivity profile . 117 live infants completing 28 weeks gestation included in study.

Study parameter include neonatal birth weight and blood culture/sensitivity profile of neonates with positive isolates. Two techniques used to obtain results .Automated (BacTec) Technique and Conventional (broth) technique. Data will be analyzed applying chi square



test with the help of SPSS for statistical significance. Neonatal birth weight would be independent variable and positive/negative sepsis is dependent variable $P < 0.05$ considered significant.

Parents with proper counselling signed informed consent, confidentiality ensured with intact participant's identity and complete ethical consideration.

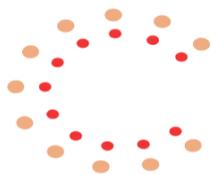
Data availability

Due to privacy and ethical concerns, supporting data can only be made available to bona fide researchers subject to a non-disclosure agreement. Details of the data and how to request access are available from *summayya.sk@gmail.com*.

Result

This study includes 120 neonates. During study, their maternal history taken and maternal factors that may be contributing to antibiotic resistance in neonates noted. Medical history depicts 83(69.2%) have no co-morbidity whereas 37(30.8%) had hypertension and diabetes. Medicine history of all mothers shows intrapartum / Antepartum antibiotic administration for multiple reasons that is 72(60%) are urinary tract infections, upper respiratory tract infections PROM Vaginal discharge and Amnionitis. Among them 108(89.3%) taken prophylactic antibiotic due to caesarean delivery. Amoxicillin clavulanic acid, Cefexime, Cephotaxime, cefoperazone+salbactam, ceftizoxime and ceftriaxone are antibiotics administered to them. Mothers given birth to live infant completing 28 weeks gestation .22 neonates born via natural vaginal delivery rest 112 delivered through caesarean.

Neonatal birth weight of 120 infants are 2(1.7%)1kg, 8(6.6%) 1-2kg, 83(63.6%) 2.1-3kg and 27(22.3%) greater than 3 kg. These 120 neonates undergo blood culture sensitivity testing for



positive early onset sepsis 12(9.9%) results with positive sepsis and 108(89.3%) with negative sepsis. Weight of 12 neonates with positive sepsis noted as 6(50%) 2.1-3kg and 6(50%) greater than 3kg ($\chi^2=6.301$, $P=0.098$) which shows no significant relation between positive neonatal sepsis and neonatal birth weight.

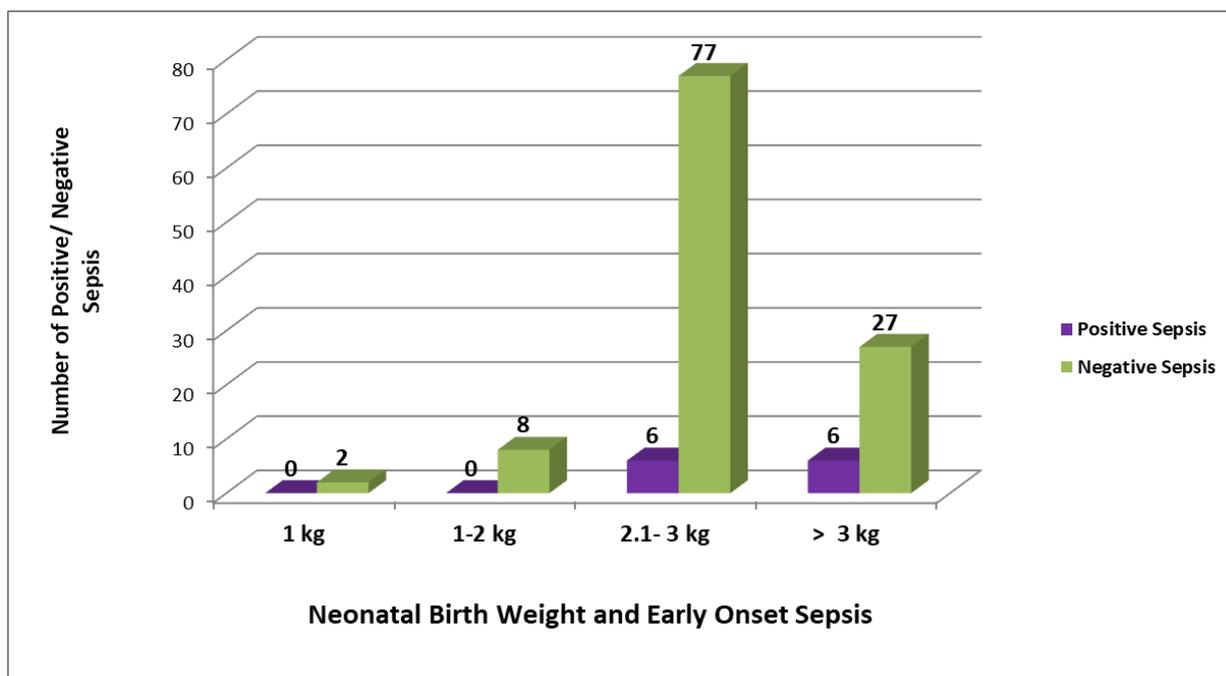


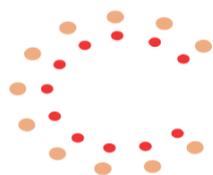
Figure 1: birth weight of neonates born to 120 mothers and number of blood culture positive /negative results.

Each bar representing number of positive/ negative sepsis in neonates of particular birth weight with $p=0.098$

In this 12 positive sepsis, 3 species isolated were streptococcus pneumonia and 9 were staphylococcus aureus.

Discussion

In this study birth weight of infants association to neonatal sepsis were analyzed showing no significant relation .Two gram positive pathogen was isolated staphylococcus aureus and



streptococcus pneumonia. Mothers of these neonates exposed to different type of antibiotics for their multiple intrapartum/Antepartum complications.

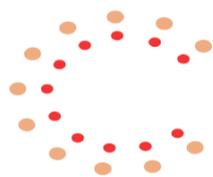
Studies reveals birth weight of infant as contributing factor for EOS and found positive EOS with ampicillin resistant E.coli in VLBW infants with mean weight of 804kg(27).where as this study couldn't conclude significant relation of neonatal birth weight with positive EOS as all infants included in study were of healthy weight and resulted positive EOS.

Another study reveal inverse relation of neonatal birth weight and neonatal sepsis. Increase in rate of early onset sepsis infection takes place with low birth weight infants. The most common species isolated were group B streptococci (GBS) in term infants and Escherichia coli in preterm infants.(28) On the other hand, this study culture sensitivity results shows early onset sepsis in twelve neonates all were having healthy weights. Pathogen isolated were streptococcus pneumonia and staphylococcus aureus.

One more studies shows Escherichia coli major cause of neonatal early onset sepsis related deaths among low birth weight infants and second common cause in term infants.(29) Whereas in this study among positive sepsis no Escherichia coli pathogen were isolated.

Limitations

This study highlighted important aspects in identifying risk factors associated to EOS but, limited sample size, limited population, and reluctant participation from mothers to allow their infant blood culture test limits definite conclusion. The current study recommends further multicenter prospective study with longer duration and larger sample size and inclusion of infants of all birth weight.

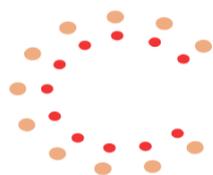


Conclusion

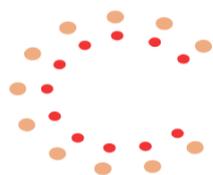
Concluding low or very low birth weight neonates as a risk factor to develop sepsis draw attention to empiric treatment initiation resulting in decrease mortality rate. Empiric Antibiotic treatment to neonates with risk of EOS decreases mortality rate of neonates but increasing risk of developing resistance against antibiotic thus limiting their ability to fight infections therefore complete understanding of distribution of pathogen responsible for EOS in VLBW and LBW infants needed and antibiotic use should be rationalized .

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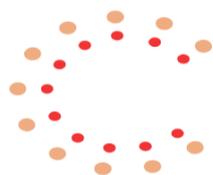
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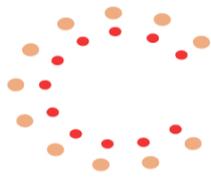
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