Original Research Article

Pattern of maternal vaginal flora in labor and its effect on the newborn

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Abstract

Background: Neonatal sepsis is the most important cause of morbidity and mortality in developing countries. Early onset sepsis is attributed to abnormal bacterial colonization of the maternal urogenital tract which leads to either an ascending but silent amniotic fluid infection or symptomatic chorioamnionitis. **Aims & Objectives:** 1. To study the pattern of maternal vaginal flora in labor. 2. To study the outcome in the neonate. **Methods:** This study was conducted on 250 mothers in labor & their babies followed up till discharge in the departments of OBG & neonatology in a tertiary care medical college hospital, Deliveries by caesarean section were excluded. **Results:** Out of 250 mothers 130 (52%) of them showed colonization. Out of the 130 babies born to colonised mothers, 50 (38.46%) showed features of sepsis, while only 10 (8.34%) born to non-colonised mothers had features of sepsis. This study showed a statistically significant association between features of sepsis in babies and maternal vaginal colonization. Of the 60 babies with suspected sepsis, 40 had positive blood culture which is the gold standard investigation for sepsis. All of these culture positive babies i.e all 40(100%) had maternal colonization with a statistically significant association. **Conclusion:** This study shows that maternal vaginal colonisation has significant association with neonatal sepsis. Hence, finding the organism in the maternal vaginal flora and treating it as per sensitivity might result less cases of neonatal sepsis.

Key words: Vaginal colonization, Neonatal sepsis, Blood culture positivity

Introduction

The new-born period is one of the phases of increased vulnerability to infections and this threat begins right from the intrauterine period and passage through the maternal birth canal.

Neonatal sepsis is the single most important cause of neonatal morbidity and mortality in the community, accounting for around 30- 50%. As many as 2% of fetuses are infected in utero, and up to 10% of infants have infections in the 1st month of life [1].

The incidence of sepsis in developing countries is higher (1.8-18/1000) than the incidence in developed countries (1-5/1000). WHO reports that 5 million babies do not survive until 28 days age per year and 98% of mortality are from developing countries. Neonatal deaths in developing countries were caused by infections (42%), asphyxia and birth trauma (29%), preterm babies and low birth weight (10%), congenital abnormalities (14%) and other causes (4%). Although the infection can be caused by viruses, fungi, and parasites, bacterial infection is the leading cause in neonatal sepsis [2].

The exposure that occurs during pregnancy or during childbirth is classified into early onset sepsis (early onset) and the exposure that occurs after birth is classified into slow-onset sepsis (late onset) [3].

Early onset sepsis is attributed to abnormal bacterial colonization of the maternal urogenital tract which leads to either an ascending but silent amniotic fluid infection or symptomatic chorioamnionitis [4].

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Abnormal bacterial colonization of the rectum and anus during pregnancy may create an abnormal vaginal and cervical microbial environment. Studies in the West have revealed Group B Streptococcus (GBS) causing infection among 1-2/1000 live births with mortality rates up to 20% in affected neonates due to preterm labour, sepsis, respiratory distress and meningitis or sometimes benign asymptomatic colonization [5].

In developing countries where the incidence of neonatal sepsis is high and is the leading cause of mortality in the new-born, the role of GBS is not conclusively proved and many other organisms have been suspected to be instrumental [6].

Identification of the abnormal colonization of the genital tract by a culture based approach has been recommended by the CDC 2000. This will definitely aid in the early recognition of mothers who need to be effectively treated which in turn will prevent new-born infections.

Furthermore, a baseline knowledge of empirical antibiotic therapy in clinically suspected sepsis of early onset can be standardised and established in our situation. In the long run reduction in neonatal mortality and morbidity can be achieved [7].

Aims & Objectives

1. To study the pattern of maternal vaginal flora in labor.
2. To study the outcome in the neonate

Methods

Place of study: This study was conducted on all mothers in labor and their newborns followed up till discharge in the departments of OBG and Neonatology in a tertiary care medical college hospital in Tiruvalla Kerala.

Type of study: The study was a cross sectional study conducted between September 2007 to August 2008.

Inclusion criteria

1. 250 mothers in labor& their newborn were included in the study.
2. Only mothers who underwent normal delivery were included
3. The aims and objectives of the study were explained to the mothers and the study was conducted after obtaining their consent.

Exclusion criteria- Deliveries by caesarean section were excluded. All mothers in labor were interviewed and detailed history taken regarding age, parity, socioeconomic status, antenatal problems. High vaginal swab was taken without local cleaning using Gusco's speculum from the posterior fornix as per CDC recommendations. The swab was then immediately transported to the microbiology lab and swabs were cultured using standard culture methods.The swabs were inoculated onto Blood agar, Chocolateagar, McConkey's agar and Thioglycolate medium and incubated and results evaluated at the end of 48-72 hours with the help of a qualified microbiologist. Group B Streptococcus was looked for by watching for lysis on blood agar.

The babies of these mothers were evaluated twice daily with regard to temperature, skin color, feeding, activity and those babies with suspected sepsis were identified. These babies were then subjected to Blood culture which is the gold standard for neonatal sepsis and other tests as the need demanded. These babies were given an empirical treatment with I.V antibiotics Ampicillin and Amikacin, the duration of which was determined by the culture reports. All the babies completed treatment successfully and were discharged in a healthy condition. The effect of various maternal parameters on vaginal colonization and the effect of maternal colonization on various neonatal parameters were studied.

Statistical analysis: Data analysis was done using Microsoft XL and Epi Info. Chi square test was used to assess the significance and 'p value' of <0.05 was considered to be significant.

Results

250 mothers and their newborns were studied, out of which 130 (52%) of them showed colonization & remaining 120 (48%) did not show any colonization.

Out of 130, 84.6% of them showed colonization of single organism remaining 15.4% showed mixed growth. Total number of organisms identified were 150. Individual organisms & their distribution is show in table 1.

Table-1: Distribution of various organisms.

Name of the organisms	Total number n=150	Percentage
Coagulase negative Staphylococcus	30	20%
E.coli	20	13.3%
Klebsiella	20	13.3%
Non-albicans Candida	20	13.3%
Candida Albicans	20	13.3%
Staphylococcus aureus	11	7.33%
Enterococcus	10	6.66%
Pseudomonas	10	6.66%
Non-fermenting GNB	9	6%

Table-2: Relation between age and vaginal colonization.

Age	Growth	No growth	Total n=250
< 20 yrs	10 (100%)	0	10
20 – 30 yrs	100 (52.63%)	90 (47.37%)	190
> 30 yrs	20 (40%)	30 (60%)	50

Table 2 shows the effect of age on vaginal colonization. Of the 250 mothers 10 were below 20 years and all of them (100%) were found to have vaginal colonization with a statistically significant ($p<0.05$) decrease in colonization with increasing age.

Table-3: Relation between parity and vaginal colonization.

Parity	Growth	No growth	Total n=250
Primi	110 (64.7%)	60 (35.3%)	170
Non-primi	20 (25%)	60 (75%)	80

Table 3 shows the relation between parity and vaginal colonization. Out of the 250 mothers in labor, 170 were primigravida with 110 (64.7%) of them having vaginal colonization, where as among the non-primi mothers 25% showed colonization. This study showed a statistically significant ($p<0.05$) association between primi mothers and vaginal colonization

Table-4: Relation between suspected sepsis and maternal colonization.

Growth	Suspected Sepsis	Normal	Total
Present	50 (38.46%)	80 (61.54%)	130
Absent	10 (8.34%)	110 (91.66%)	120

Table 4: shows the relation between features of suspected sepsis in the new-borns and maternal vaginal colonization. Out of the 130 babies born to colonized mothers, 50 (38.46%) showed features of sepsis, while only 10 (8.34%) born to non-colonised mothers had features of sepsis. This study showed a statistically significant association between features of sepsis in babies and maternal vaginal colonization.

Table-5: Relation between blood culture positivity and maternal colonization.

	Growth	No Growth	Total
Blood c/s Positive	40 (100%)	0	40
Blood c/s negative	10 (50%)	10 (50%)	20

Table 5 shows the relation between blood culture positivity and maternal vaginal colonization. Of the 60 babies with suspected sepsis, 40 had positive blood culture which is the gold standard investigation for sepsis. All of these culture positive babies i.e. all 40(100%) had maternal colonization with a statistically significant association

In this study 40 babies had blood culture positive sepsis. All of them had colonized mothers. The predominant organism grown in the blood culture was Coagulase negative Staphylococcus (CoNS) (75%) in 30 babies with 10 of their mothers having CoNS as the vaginal flora as well, with a blood culture and vaginal colonization showing a correlation in 33.33% of cases.

Discussion

The present study conducted in 250 pregnant women and their newborns conforms to previous studies in some aspects and points to some interesting observations contrary to previous studies in others. Neonatal sepsis causes about 718.000 deaths each year or about 23.4% of the 3.1 million deaths in 2010 [8]. Neonates are particularly vulnerable to infection in the first week of life. There are 42% of deaths in the first week of life caused by infection [9]. EONS (early onset neonatal sepsis) is generally caused by microorganisms that obtained from the mother before or during the birth process. Maternal genital tract organisms have an important role in EONS incidence[10]. Rectovaginal colonization of pregnant women was suspected to be a risk factor for neonatal sepsis within the first seven days of life [11].

The present study yielded Coagulase Negative Staphylococcus (CoNS) in 20% of the cases, followed by Escherichia Coli, Klebsiella, and Candida spp. In 13.3% of the cases. Hall etal also observed Coagulase Negative Staphylococcus (CoNS) as the most common organism in their study [12]. This is comparable to other Indian studies by Vidya Ayengar et al, Ahmedabad [13], Stoll Barbara et al [14] & Habeebullah et al [15]which also did not yield GBS as the incidence of GBS colonization in India is quite low(19%).

In a study from Delhi the most common organism isolated from maternal genital tract was Esch. coli followed by Staphylococcus aureus and Klebsiella-Spp [16].

Table 2 shows that 100% of mothers <20 years had colonization, whereas, it was 52.63% in 20-30 years and 40% in > 30 years, showing a statistically significant decreasing trend of colonization with increasing maternal age. This is comparable to the observations of Meharban Singh et al [17] which names maternal age of <20 years as one of the predisposing factors for vaginal colonization. The possible explanations could be either decreased local resistance due to thin vaginal epithelium or a relatively higher pH; predisposing to colonization. From Table 3, vaginal colonization seems to be more in primipara (64.7%) which conforms to the study by Meharban Singh et al [17] where in primipara are said to be at an increased risk of colonization.

Table 4 showed that 60 of the babies had suspected sepsis and 50 (38.46%) of these were born to colonized mothers, while only 8.34% of them were born to non-colonized mothers. This conforms to the study by Vikas Gautam et al [18].

The present study showed that 50 of the 60 babies with suspected sepsis were born to colonized mothers and 40 (80%) of these had confirmed sepsis i.e. blood culture positivity. It was found that of the 40 babies with blood culture positivity, all were born to mothers with vaginal colonization; and not a single one was born to non-colonized mothers. This was considered as a significant observation, given the 82% sensitivity and 96% specificity of blood culture in the detection of neonatal sepsis in accordance with the Edward Squire et al study [4].

In the present study, Co NS was grown in blood culture in 75% of cases, followed by Enterococcus in 10% of the cases, which was similar to E.S Shinewell et al [19]. Other similar studies have shown different

organisms like Klebsiella & CoNS [20] and Klebsiella, E. coli, Acinetobacter [21].

Rectovaginal bacterial colonization of pregnant women and chorioamnionitis has a positive correlation with the incidence of early-onset neonatal sepsis. Babies who born from mothers with chorioamnionitis lead to bacterial colonization and sepsis faster [22].

There are a number of parallels between maternal genital colonization with group B streptococcus and with *E. coli.* Both bacteria probably colonize the vagina from a rectal source and do not usually cause an infection of the vaginal epithelium. These two bacteria are of interest and concern because of their vertical transmission to the neonate and their role in neonatal sepsis, meningitis, and death [23].

Summary

- 38% of babies born to colonized mothers had suspected sepsis, compared to 8% in those born to non-colonised mothers.
- Blood culture positivity was found only in those babies born to colonized mothers.
- CoNS was the predominant pathogen in 75% of cases, followed by Enterococcus in 10%.
- 10 mothers of babies with CoNS had the same organism as their colonizer, with 33% correlation in the pathogen

Conclusion

52% of mothers in labor had vaginal colonization, predominantly CoNS.80% of babies of these mothers had culture proven sepsis. The same organism was obtained in both mother and baby with sepsis in 33%. Contrary to the western studies and our popular belief, Group B Streptococcus was not a significant issue in proven neonatal sepsis in the present study.

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Addition to current knowledge: Contrary to the western studies and our popular belief, Group B Streptococcus was not a significant issue in proven neonatal sepsis in the present study.

Recommendations: Pattern of vaginal flora can guide antibiotic selection in neonatal sepsis in view of 33.33% similarity in growth. Institution wise study is recommended to identify the pattern of flora and antibiotic sensitivity. Periodic assessment of these studies need to be done to update the data.

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References

1. Stoll BJ. Infections of the Neonatal Infant. In: Kliegman, Behrman, Jenson, Stanton, editors. Nelson textbook of Pediatrics. 18th ed. Philadelphia: Elsevier; 2007. p. 794

2. Child Health Research. Project special report: Reducing perinatal and neonatal mortality, report of a meeting. Baltimore, Maryland. 1999; 6-12.

3. Leal YA, Nemegyei JA, Velázquez JR, et al. Risk factors and prognosis for neonatal sepsis in south eastern Mexico. BMC Pregnancy Childbirth 2012; 12: 48.

4. Yoon BH, Romero R, Moon JB, Shim SS, Kim M, Kim G, Jun JK. Clinical significance of intra-amniotic inflammation in patients with preterm labor and intact membranes. Am J Obstet Gynecol. 2001 Nov;185(5):1130-6.

5. A Dwi Bahagia Febriani, Andi Handriyati, Ema Alasiry, Dasril Daud. The correlation between the mothers vaginal bacterial colonization and incidence of early onset neonatal sepsis. CurrPediatr Res 2017; 21 (1): 105-111

6. Klein J, Marcy M. Bacterial sepsis and meningitis. In Remington J, Klein J eds. Infectious Diseases of the Fetus and Newborn Infant, Ed 4. Philadelphia, WB Saunders, 1995; 835-890.

7. Squire E, Favara B, Todd J. Diagnosis of neonatalbacterial infection: hematologic and pathologicfindings in fatal and nonfatalcases. Pediatrics. 1979 Jul;64(1):60-4.

8. Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE, Rudan I, Campbell H, Cibulskis R, Li M, Mathers C, Black RE; Child Health Epidemiology Reference Group of WHO and UNICEF. Global, regional, and national causes of child mortality: an

updated systematic analysis for 2010 with time trends since 2000. Lancet. 2012 Jun 9; 379 (9832): 2151-61. doi: 10. 1016/ S0140-6736 (12)60560-1. Epub 2012 May 11.

9. Thaver D, Zaidi AK. Burden of neonatal infections in developing countries: a review of evidence from community-basedstudies. Pediatr Infect Dis J. 2009 Jan; 28(1Suppl):S3-9. doi: 10. 1097 /INF.0b013e3181958755.

10. Basavaraj MK, Bhat BV, Harish BN, et al. Maternal genital bacteria and surface colonization in early neonatal sepsis. Indian J Paediatrics 2006; 73: 29-32.

11. Seale AC, Blencowe H, Manu AA, et al. Estimates of possible severe bacterial infection in neonates in sub-Saharan Africa, south Asia and Latin America for 2012: A systematic review and meta-analysis. Lancet Infect Dis. 2014 Aug;14 (8): 731-741

12. Hall SL, Hall RT, Barnes WG. Relationship of maternal to neonatal colonization with coagulase-negative staphylococci. Am J Perinatal. 1990; 7(4): 384-8

13. Vidya Ayengar, Madhulika, Vani SN. Neonatal sepsis due to vertical transmission from maternal genital tract. Indian J Pediatric. 1991; 58(5) 661-664

14. Stoll Barbara J, Schuchat Anne. Maternal carriage of group B streptococci in developing countries. The Pediatric Infectious Disease Journal. 1998; 17(6): 499-503

15. Habeebullah S, Vishnu Bhat B, Basavaraj Kerur M, Harish BN. Maternal genital bacteria and surface colonization in early neonatal sepsis. Indian J Pediatr. 2006; 73(1): 29-32.

16. Beargie R, Lynd P, Tucker E, Duhring J. Perinatal infection and vaginal flora. Am J Obstet Gynecol. 1975 May 1;122(1):31-3.

17. Singh M, Deorari AK. Pneumonias in newborn babies. Indian J Pediatr. 1995 May-Jun;62(3):293-306.

18.Vikas Gautam, Pallab Ray, Anil Narang. Blood culture confirmed bacterial sepsis in neonates in a north Indian tertiary care center: Changes over the last decade. Jpn. J. Infect.Dis. 2009; 62(1):46-50.

19.E. S.Shinwell·Y. Matrai-Kovalskis, D.Greenberg, D. Fraser. Positive blood cultures for coagulase-negative staphylococci in neonates: Does highly selective vancomycin usage affect outcome? Infection. 1998; 26(2): 85-92

20. Bhat BV, Pandey KK, Raghavan M, Kanugo R. Bacteriological profile of blood culture isolation from neonates. Indian Journal of Maternal and Child Health. 1994 Oct-Dec; 5(4): 114-6

21. Habeebullah S, Vishnu Bhat B, Basavaraj Kerur M, Harish BN. Maternal genital bacteria and surface colonization in early neonatal sepsis. Indian J Pediatr. 2006; 73(1): 29-32.

22.Chan GJ, Baqui AH, Modak JK, Murillo-Chaves A, Mahmud AA, Boyd TK, Black RE, Saha SK. Early-onset neonatal sepsis in Dhaka, Bangladesh: riskassociated with maternalbacterial colonisation and chorioamnionitis. Trop Med Int Health. 2013 Sep;18(9):1057-1064. doi: 10.1111/tmi.12150. Epub 2013 Jul 4.

23. Marijane A. Krohn, SoeSoe Thwin, Lorna K. Rabe. Vaginal colonization by Escherichia coli as a risk factor for very low birth weight deliveries and other perinatal complications. The Journal of Infectious Diseases. 1997; 175(3): 606-610

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