ORIGINAL ARTICLE

Incidence of early onset neonatal sepsis in preterm newborn and characteristic of maternal vaginal pathogen, Prapokklao hospital

Wasanai Jermsirisakpong M.D.*
Praparb Yuthavisuthi M.D.*
Urai Punavakul M.D.**

Abstract **Incidence of early onset neonatal sepsis in preterm newborn and Characteristic of maternal vaginal pathogen, Prapokklao hospital**
Wasanai Jermsirisakpong M.D*
Praparb Yuthavisuthi M.D*
Urai Punavakul M.D.**
* Department of Obstetrics and Gynecology, Prapokklao Hospital, Chanthaburi Province, Thailand.
** Department of Community Medicine, Prapokklao Hospital, Chanthaburi Province, Thailand.
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Background : **Preterm labor is a leading cause of neonatal morbidity and mortality. Intrauterine infection has been found to play a major role in preterm labor. The most common pathway of intrauterine infection is thought to be the ascending route from cervix and vagina. Vaginal infection increase not only the incidence of preterm labor, but also opportunities of early onset neonatal sepsis.**

Objectives : **The purpose of this research was to sort the type of maternal vaginal pathogen and incidence of early onset neonatal sepsis in preterm infants born at Prapokklao hospital.**

Methods : **Prospective descriptive study was carried out at Prapokklao hospital during 1 May 2005-30 April 2006. Eighty-five pregnant women who had spontaneous preterm labor at GA 20-36^{+6} without complications agreed to participate in this project. Vaginal discharges were collected for aerobic culture and the health status data of both infants and mothers were analyzed.**

** Department of Obstetrics and Gynecology, Prapokklao Hospital, Chanthaburi Province, Thailand.*

*** Department of Community Medicine, Prapokklao Hospital, Chanthaburi Province, Thailand.*

Main Outcome Measures : **Types of vaginal pathogen and the incidence of early onset neonatal sepsis in preterm infants.**

Results : One hundred and fifty five preterm labor women admitted at Prapokklao hospital and 85 out of 155 cases were included in this study. Seventy one participants gave birth and most of them delivered at GA> 35 weeks (57.7 percent). Most of preterm infants did not have sepsis. Nine cases had suspected sepsis and only one case met the definition of definite sepsis which was found S.aureus. The incidence of early onset neonatal sepsis in preterm infants was 14.1 percent, equivalent to 2.14 per 1,000 live births. Among 35 out of 85 pregnant women found vaginal pathogen (41.2 percent). The organisms were Escherichia coli (10.6 percent), Enterococcus faecalis (8.2 percent), Candida spp. (7.1 percent), Group B streptococcus (5.9 percent) and Gardnerella vaginalis (4.7 percent) respectively. Most clinically septic infants, maternal vaginal cultures were negative. Mother and newborn was not necessary sharing the same pathogen.

Conlusion : The results of this research could not be generalized to general population. They showed some importance such as the high incidence of early onset neonatal sepsis in preterm newborns that mostly have negative hemoculture.

Keywords : Preterm labor pain, early onset neonatal sepsis, vaginal pathogen

Introduction

Preterm labor is a leading cause of neonatal morbidity and mortality. A large body of evidence suggests that asymptomatic infections are associated with preterm labor. Intrauterine infection has been found to play a major role in preterm labor and is thought to be responsible for preterm birth in up to 40 percent of cases. The most common pathway of intrauterine infection is thought to be the ascending route from cervix and vagina. A meta-analysis of 67 articles[1] have shown an association between a variety of vaginal infection and preterm birth, there is little evidence that treatment of these organisms decreases risks.The common pathogens are GBS, E.coli, Gardnerella vaginalis, Trichomonas vaginalis, Chlamydia, and Ureaplasma ,etc[1,2]. Those organisms increase not only the incidences of preterm labor, but also the opportunities of the early incidence of neonatal sepsis in previous study

Province onset neonatal infection, especially in early preterm infants[3]. The occurred 0.5-8.0/1,000 live births. Perinatal cluster of bacterial infections reveals that pathogens were usually found in utero during labor or when the fetus passed through the colonized birth canal. The intensity of maternal colonization is directly related to risk for invasive disease in newborn. Organisms reach the bloodstream by fetal aspiration or swallowing of contaminated amniotic fluid, leading to bacteremia. The ascending route of infections helps to explain such phenomena as the high incidence of PROM in neonatal infection and bacteriologic characteristics of neonatal sepsis which reflect the flora of the maternal vagina. The fatality rate of neonatal sepsis is two to four times higher in LBW than in full-term newborns. The overall mortality rate of early onset neonatal sepsis is 15 percent to 50 percent[4]. In 2005, there were 243 cases of preterm infants with complication who admitted at the pediatric ward in Prapokklao hospital and 87 out of 243 cases had early onset

neonatal sepsis (these included preterm infants born at Prapokklao hospital and those born at other hospitals). So the incidence of early onset neonatal sepsis was as high as 35 percent. None of researchers collected data of early onset neonatal sepsis in preterm infants born in our hospital and type of vaginal pathogen in preterm pregnant women. The purpose of this research was to sort the type of maternal vaginal pathogen and incidence of early onset neonatal sepsis in preterm infants born at Prapokklao hospital during 1 May 2005-30 April 2006.

Materials and Methods

This prospective descriptive study was carried out at Prapokklao hospital during 1 May 2005-30 April 2006. Approval from Prapokklao Ethics Committee and written consents from all participants were obtained. Inclusion criteria were pregnant women who had preterm labor pain between $20-36^{+6}$ weeks of gestation and already confirmed gestational age by ultrasonography at first trimester. The pregnant women were excluded if they had following complications :

1. obstetrical complications such as hypertension, premature rupture of membranes, antepartum hemorrhage, placenta previa, multiple pregnancies and severe medical Complications,

2. Abnormality of fetus, for example, fetal death, fetal anomaly, fetal demis.

3. Uterine abnormality or incompetent cervix.

Vaginal discharges were collected from all participants for aerobic culture then all women were treated following the standard guidelines. Then health status data of both infants and mothers were analyzed.

The data was presented as percentage, mean, and standard deviation using SPSS computer software version 12. The incidence of early onset neonatal sepsis was estimated.

Results

During study period, there were 155 preterm labor women admitted at Prapokklao hospital and 85 out of 155 cases were included in this study. Those cases were excluded because of obstetrical complications. Most of participants were 21-34 years old (50.5 percent) and graduated from primary and secondary school (67.1 percent). Seventy one participants gave birth and most of them delivered at GA> 35 weeks (57.7 percent). Also, 59.2 percent of infants weighted at birth more than 2,500 gm and 94.4 percent of infants had no birth asphyxia at 5 minute after birth. In addition, most premature complications found were jaundicing about 32.4 percent and RDS 12.7 percent. Most of preterm infants did not have sepsis. Nine cases had suspected sepsis and only one case met the definition of definite sepsis which was found S.aureus in hemoculture. The incidence of early onset neonatal sepsis in preterm infants was 14.1 percent, equivalent to 2.14 per 1,000 live births. It was calculated from numbers of infants in suspected sepsis group and sepsis group. Table 1 showed the septic status of preterm infants according to gestational age at delivery Among 35 out of 85 pregnant women found vaginal pathogen were (41.2 percent). The organisms were Escherichia coli (10.6 percent), Enterococcus faecalis (8.2 percent), Candida spp. (7.1 percent), Group B streptococcus (5.9 percent) and Gardnerella

vaginalis (4.7 percent) respectively as shown in table 2 and 3. Most clinically septic infants, maternal vaginal cultures were negative as shown in table 4. Mother and newborn was not necessary sharing the same pathogen. During postpartum period, all women had no complications after giving births.

Discussion

Most of spontaneous preterm labor occurred at GA >35 wk. None of risks of preterm labor was found in pregnant women. The finding showed that E.coli, Enterococcus faecalis, Candida spp., GBS and Gardnerella vaginalis were the most frequently pathogens found in vagina of participants. This result was similar to other studies. Previous studies found plenty of E.coli and K..pneumoniae load which obviously involved in preterm delivery. However, there had not any beneficial effect of treatment of these organisms to prevent preterm

Table 2 Percentage of each type of vaginal pathogen according to delivery status

Vaginal pathogen	Delivery group number(percent) N=25	Non delivery group number(percent) N= 10	Total (percent)
Escherichia coli	8 (32.0)	1 (10.0)	9 (25.7)
Candida spp.	5 (20.0)	1 (10.0)	6 (17.1)
Group B streptococcus	4 (16.0)	1 (10.0)	5 (14.3)
Enterococcus faecalis	3 (12.0)	4 (40.0)	7 (20.0)
Acenetobacter baumanii	2 (8.0)	0	2 (5.7)
Gardnerella vaginalis	2 (8.0)	2 (20.0)	4 (11.4)
Hemophilus influenza	1 (4.0)	0	1 (2.9)
Proteus spp.	0	1 (10.0)	1 (2.9)

Table 1 The septic status of preterm infants according to gestational age at delivery

number (%) / GA (weeks)	Sepsis	Suspected sepsis	Probable sepsis	No sepsis
20 – 24^{+6}	0	0	0	0
25 – 29^{+6}	1 (1.4)	2 (2.9)	0	0
30 – 34^{+6}	0	6 (8.5)	1 (1.4)	20 (28.1)
>35	0	1 (1.4)	0	40 (56.3)
รวม	**1 (1.4)**	**9 (12.8)**	**1 (1.4)**	**60 (84.4)**

birth[1,5,6].

Mary Frances Cotch[7] found that the prevalence of moderate to heavy Candida colonization of midgestation was 10 percent and not associated with adverse pregnancy outcomes.

GBS was found to be the leading cause of preterm delivery and early onset neonatal sepsis up to 3.5 per 1,000 live births. The previous studies found that prevalence of GBS in rectovagina of pregnant women was 10–30 percent[4]. In contrary,

GBS was detected in vagina only of 5 pregnant women in this study. The different finding

Table 3 Type of vaginal pathogen according to gestational age at admission

Vaginal pathogen / Gestational age	No growth	E.coli	GBS	A.baum	E.fecalis	GD	Candida	H. influenza	Pepto strepto coccus
20 – 24^{+6}	0	0	0	0	0	0	0	0	0
25 – 29^{+6}	2	1	0	0	2	0	0	0	0
30 – 34^{+6}	20	3	2	2	3	1	3	1	0
> 35	28	5	3	0	2	3	3	0	1
Total	**50**	**9**	**5**	**2**	**7**	**4**	**6**	**1**	**1**

Table 4 Data of vaginal pathogen and septic status

Septic / Vg pahtogen	No sepsis	Probable sepsis	Suspected sepsis	Sepsis
No growth	37	1	7	1
E. coli	5	0	2	0
GBS	5	0	0	0
A.baumanii	2	0	0	0
E. fecalis	3	0	0	0
Gardnerella	2	0	0	0
Candida spp.	5	0	0	0
H. influenza	1	0	0	0
Total	**60**	**1**	**9**	**1**

might result from difference in culture media which previous studies used selective broth such as Granada medium, colistin–nalidix acid and LIM broth. These culture media had substances that stimulate GBS growth and inhibit growth of other organisms. Therefore, they increased in detection of GBS up to 40 percent when compare with non selective broth[8–11]. In this study, we used non selective broth (5 percent sheep blood agar) for detection of GBS which might give the result of underestimation of GBS load. Most of infants were born at GA>35 wk and 59.2 percent of infant birth weight were more than 2,500 gm. It can be explained as rare cases of premature complication. The incidence of early onset neonatal sepsis in this study was 14.1 percent, equivalent to 2.41 per 1,000 live birth. When compare it to previous study that was 1.2–6.6 per 1,000 live birth, it was similar to our incidence. Most of clinically septic infants were born at GA $30–34^{+6}$ wk. As the previous study, risk factors of early onset neonatal sepsis were preterm infants (GA<37wk), low birth weight (<2,500g), or very low birth weight (<1,500g)[12]. The overall mortality rate was 0.34 per 1,000 live births. Most common pathogens were gram negative infection and GBS. Gram negative sepsis, most common with E.coli, usually was found in preterm infants (<1,500g) and might contribute to their premature delivery whereas GBS sepsis tended to occur in term newborns[13]. However, we mostly found no organisms in hemoculture of preterm infants who had clinically sepsis. These could be result of blood collecting method for culture that took only 0.5 cc per sample and had only one sample. The culture media could culture only aerobic organisms, which led to higher opportunity of undetectable organism. Hence, the Merck Manual[4] suggests to collect blood of infant from two peripheral sites and takes 1 cc from each site that will result in getting higher efficient incubation and will be better identifying type of organism. Also, determining antibiotic susceptibility of each type of organism should give a result in better selecting of antibiotic usage and illness treatment. However, the sample size was too small for making reliable general conditions. Further randomized trial with improving efficiency of collection of vaginal discharges and blood samples for culture in order to identify type of organisms that found in vagina of preterm labor women and in infants will benefit selection of antibiotic to be used to prevent intrauterine infection and for better treatment of early onset neonatal infection. This research did not have comparison groups between term pregnancy and very preterm group. The required comparison groups could help to discover different vaginal pathogens that are the causes of early onset neonatal infection. Therefore, a larger sample size, through collaboration of several medical institutes, would provide greater outcomes.

Conclusion

The results of this research could not be generalized to general population. They showed some importance such as the high incidence of early onset neonatal sepsis in preterm newborns that mostly have negative hemoculture, the low sensitivity of culture media, and blood collection technique. More researches of much larger sample size are needed to provide greater results and be usefulness.

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อุบัติการณ์การติดเชื้อในกระแสเลือดของทารกที่คลอดก่อนกำหนดในช่วง 7 วันหลังคลอด กับลักษณะของเชื้อที่พบในช่องคลอดของมารดาที่เจ็บครรภ์คลอดก่อนกำหนด ในโรงพยาบาลพระปกเกล้า จังหวัดจันทบุรี

วัสนัย เจิมศิริศักดิ์พงษ์ พ.บ.*
ประภาพ ยุทธวิสุทธิ พ.บ.*
อุไร ภูนวกุล พ.บ.**

วัตถุประสงค์

1. เพื่อทราบอุบัติการณ์การติดเชื้อในกระแสเลือดของทารกที่คลอดก่อนกำหนดในช่วง 7 วันหลังคลอด ในโรงพยาบาลพระปกเกล้า ในช่วงเวลาตั้งแต่ 1 พฤษภาคม พ.ศ. 2548 – 30 เมษายน พ.ศ. 2549

2. เพื่อทราบชนิดของเชื้อที่พบบ่อยในช่องคลอดของหญิงตั้งครรภ์ที่เจ็บครรภ์คลอดก่อนกำหนดที่โรงพยาบาลพระปกเกล้า ตั้งแต่ 1 พฤษภาคม พ.ศ.2548 – 30 เมษายน พ.ศ. 2549

ชนิดของการวิจัย : การวิจัยเชิงพรรณนา (longitudinal descriptive study)

สถานที่ที่ทำวิจัย : กลุ่มงานสูตินรีเวชกรรม โรงพยาบาลพระปกเกล้า จังหวัดจันทบุรี

กลุ่มตัวอย่าง : หญิงตั้งครรภ์ที่เจ็บครรภ์คลอดก่อนกำหนดตั้งแต่อายุครรภ์20–36+6สัปดาห์ ที่รับไว้ในห้องคลอดโรงพยาบาลพระปกเกล้าและไม่มีถุงน้ำคร่ำแตกก่อนการเจ็บครรภ์ ไม่มีภาวะแทรกซ้อนทางสูติศาสตร์และอายุรศาสตร์ และให้ความยินยอมในการเข้าร่วมโครงการวิจัย ในช่วงเวลาตั้งแต่ 1 พฤษภาคม พ.ศ. 2548– 30 เมษายน พ.ศ. 2549

วิธีการศึกษา : เพาะเชื้อจากสารคัดหลั่งในช่องคลอดของหญิงตั้งครรภ์ที่เจ็บครรภ์คลอดก่อนกำหนด และให้การดูแลรักษาตามมาตรฐาน หลังจากนั้นรวบรวมข้อมูลของทารกที่คลอดก่อนกำหนดและภาวะของมารดาหลังคลอด

ผลที่ต้องการวัด : อุบัติการณ์การติดเชื้อในทารกที่คลอดก่อนกำหนดในช่วง 7 วันหลังคลอดและชนิดของเชื้อที่พบในช่องคลอด ของหญิงตั้งครรภ์ที่เจ็บครรภ์คลอดก่อนกำหนดที่อายุครรภ์ $20–36^{+6}$ สัปดาห์

ผลการศึกษา : มารดาที่เจ็บครรภ์คลอดก่อนกำหนดในช่วงเวลาทำการศึกษามีทั้งหมด 155 คน และมีจำนวนมารดาที่เข้าเกณฑ์การศึกษานี้ 85 คนในจำนวนนี้มีมารดาที่ไม่คลอดบุตร 14 คน ทารกส่วนใหญ่คลอดที่อายุครรภ์ตั้งแต่ 35 สัปดาห์ขึ้นไปร้อยละ 57.7 จากจำนวนทารกที่คลอด 71 คนอุบัติการณ์การติดเชื้อในทารกที่คลอดก่อนกำหนดในช่วง 7 วันแรกหลังคลอดเท่ากับร้อยละ 14.1 และร้อยละ 90 ของทารกที่มีการติดเชื้อในกระแสเลือด ตรวจไม่พบเชื้อ สำหรับผลการเพาะเชื้อในช่องคลอดของหญิงตั้งครรภ์ที่เจ็บครรภ์คลอดก่อนกำหนดจำนวน 85 คนพบว่าส่วนใหญ่ไม่พบเชื้อร้อยละ 58.8 จากมากไปน้อย 5 อันดับแรกดังนี้ *Escherichia coli* ร้อยละ 10.6, *Enterococcus faecalis* ร้อยละ 8.2, *Candida* spp. ร้อยละ 7.1, Group B streptococcus ร้อยละ 5.9 และ Gardnerella vaginalis ร้อยละ 4.7 ของหญิงตั้งครรภ์ที่คลอดก่อนกำหนดทั้งหมด

สรุป : อุบัติการณ์การติดเชื้อในทารกแรกคลอดที่คลอดก่อนกำหนดในช่วง 7 วันหลังคลอดในโรงพยาบาลพระปกเกล้ามีอัตราที่สูง แต่จากการศึกษาพบว่าในทารกที่มีอาการของการติดเชื้อไม่สามารถเพาะเชื้อได้เพราะอาจมีข้อจำกัดในวิธีการเพาะเชื้อ จึงควรมีการศึกษาเพิ่มเติมด้วยวิธีการเพาะเชื้อที่มีความไวและแม่นยำมากขึ้นเพื่อเป็นข้อมูลที่นำไปเป็นแนวทางในการลดอุบัติการณ์การติดเชื้อในทารกแรกคลอดที่คลอดก่อนกำหนดในช่วง 7 วันหลังคลอดต่อไป

คำสำคัญ Preterm labor pain, early onset neonatal sepsis, vaginal pathogen.