Prevalence and Risk Factors of *Streptococcus agalactiae* (Group B) Colonization in Mothers and Neonatal Contamination at Srinagarind Hospital

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Abstract

From July 1999 to November 1999, 901 pregnant women at Srinagarind Hospital, who fulfilled the criteria and had signed consent forms, were cultured from the lower vagina and perineum for group B streptococcus (GBS). Their neonates were also cultured from ears and anuses within 30 minutes after birth. There were 56 cases or 6.22 per cent colonization in pregnant mothers at the onset of labor and 14 cases or 1.55 per cent colonization in their neonates. Risk factors for GBS colonization in mothers were intrapartum fever and episiotomy. The risk factors for GBS colonization in the neonates were; 1. husband's occupation, 2. antepartum fever, 3. intrapartum fever, 4. postpartum morbidity and 5. gestational age. No cases during the study period had clinical infection from GBS.

The prevalence rate in this study was much lower than the United States but similar to many developing countries. At this moment, it is not possible to culture for GBS in all pregnant women in Thailand. Intrapartum antibiotic prophylaxis for GBS infection was recommended if, 1. maternal fever was more than 38°C, 2. ruptured membranes of more than18 hours and 3. previous birth with neonatal GBS infection.

Key word : Prevalence, Risk Factors, Streptococcus Agalactiae (Group B), GBS, Colonization, Mothers, Neonatal Contamination, Srinagarind Hospital

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Group B streptococci (GBS) colonization of the vagina and perineum is associated with puerperal infection and neonatal infection. In the United States 5-20 per cent of neonatal deaths are caused by this organism(1). Standard recommendation is taking culture from the vagina and perineum for GBS during 35-37 weeks of gestation. If GBS colonization occurs, penicillin or erythromycin is mandatory and should be continued every 4 hours until delivery. In the cases that lack GBS culture, antibiotics are recommended(2). In this study, the authors wanted to find out the prevalence and risk factors of GBS colonization in mothers and their neonates during the peripartum period from an adequate sample size.

MATERIAL AND METHOD

901 pregnant women who met the inclusion and exclusion criteria were enrolled in this study (after signing consents forms) in the labor room of Srinagarind Hospital. The inclusion criteria were 1. pregnant women who planned vaginal delivery, had spontaneous labor or induced labor after more than 34 weeks of gestation 2. no evidence of GBS infection 3. signed the consent forms after the informed consent processes. The exclusion criteria were 1. pregnant women who had received antibiotics within one week of admission in the labor room 2. had elective caesarean section and 3. refused to enroll in this study.

The specimens were collected from the lower $^1/_3$ of the vagina and perineum by sterile cotton swabs. This process was done before pelvic examination and fleet enema on the first day of admission in the labor room. History taking was done after completion of the questionnaires and after delivery in the postpartum ward. Specimens were collected from the external auditory canals and anuses of the neonates within 30 minutes after birth.

The specimens were inoculated on the blood agar and incubated at 35°C for 18-24 hours. Identification for bacteria that caused beta-hemolysis with 1. gram stain 2. catalase test 3. pigment production in Islam's starch medium and 4. hippurate test. If the growing bacteria were gram positive, negative catalase test, positive pigment production in Islam's starch medium and positive hippurate test, this bacteria would be tested for agglutination with specific antisera for group B streptococci.

After streaking the specimens on the blood agar, the remaining specimens were inoculated in Todd-Hewitt broth which contained gentamicin and nalidixic acid of 8 and 15 μg/ml respectively and incubated at 35°C for 18-24 hours. Transfer of the organisms from broth in the blood agar for identification of β-hemolytic group B streptococci was carried out as mentioned above. This procedure was done to identify the light colonization of GBS.

Laboratory results of GBS in the pregnant women and their neonates were compared with 27 risk factors and analysed with the Epi Info version 6 program.

RESULTS

1. Prevalence of Streptococcus agalactiae (group B) colonization

1.1 Fifty six pregnant women from 901 cases or 6.22 per cent at the onset of labor were colonized with GBS. 47 cases had heavy colonization and 9 cases had light colonization.

1.2 There were 14 neonates from 901 neonates or 1.55 per cent who were contaminated with GBS within 30 minutes after birth. GBS colonization was found from the external auditory canal in 5 cases, from the anus in 1 case and from both the external auditory canal and the anus in 8 cases. There was no GBS colonization in neonates whose mothers had light colonization with GBS. However, 3 neonates were colonized with GBS although GBS was not found in their mothers. This might be associated with the sampling technique or laboratory technique.

2. Risk factors of Streptococcus agalactiae colonization in mothers and their neonates

2.1 GBS colonization in pregnant women and 27 risk factors were evaluated. The authors found that maternal age, residential area, gravida, parity, duration from admission to delivery, gestational age, occupation, husband's occupation, education, husband's education, chief complaint, day since last sexual intercourse, oral sex practiced during pregnancy, number of pelvic examinations, fetal weight, antepartum fever, type of service provider, route of delivery, modality of vaginal delivery, obstetric complications, postpartum morbidity, postpartum antibiotics, gestational age, neonatal jaundice and neonatal condition were not significant risk factors for GBS colonization.

Significant risk factors for GBS colonization in pregnant women were intrapartum fever and episiotomy. (p value = 0.0200 and 0.0126 respectively)

2.2 GBS colonization in neonates and 27 risk factors were evaluated. We found that maternal

Variables	Maternal GBS colonization			GBS colonization in neonates		
	Number of +ve / Total	Per cent	χ^2 test P value	Number of +ve / Total	Per cent	χ^2 test P value
1. Maternal age (years)						
Total	56/901	6.22		14/901	1.55	
16-20	3/116	2.59		1/116	0.86	
21-25	22/283	7.77	4.73	3/283	1.06	2.47
26-30	18/292	6.16	0.4502	7/292	2.4	0.7812
31-35	9/161	5.59		2/161	1.24	
36-40	4/45	8.89		1/45	2.22	
> 40	0/4	0		0/4	0	
2. Residential area						
Urban	22/258	8.53	2.78	7/259	2.7	2.17
Rural	34/643	5.29	0.0953	7/642	1.09	0.1406
3. Gravida						
1	27/399	6.77		10/399	2.51	
2	19/344	5.52		2/344	0.58	
3	8/131	6.11	1.45	2/131	1.53	4.92
4	2/20	10	0.9189	0/20	0	0.4258
5	0/4	0		0/4	0	
6	0/3	0		0/3	0	
4. Parity						
0	32/481	6.65		10/481	2.08	
1	19/353	5.38	1.39	3/353	0.85	2.11
2	5/61	8.2	0.7087	1/61	1.64	0.5502
3	0/6	0		0/6	0	
5. Duration from admission to delivery (hours)						
< 5	20/378	5.29		4/378	1.06	
5-10	15/262	5.73		3/262	1.15	
10-15	12/121	9.92	5.45	5/121	4.13	7.19
15-20	1/49	2.04	0.2439	0/49	0	0.1262
> 20	7/89	7.87		2/89	2.25	
6. Gestational age (weeks)						
34-36	0/20	0		0/20	0	
37	6/86	6.98		0/86	0	
38	15/219	6.85	2.29	4/219	1.83	6.54
39	16/284	5.63	0.891	2/284	0.7	0.3656
40	12/199	6.03		5/199	2.51	
41	6/73	8.22		2/73	2.74	
>42	1/20	5		1/20	5	
7. Occupation						
Farmer	17/237	7.17		7/237	2.95	
Housewife	10/212	4.72	1.88	1/212	0.47	8.21
Government official	5/103	4.85	0.7581	0/103	0	0.0841
Business woman	7/93	7.53		3/93	3.23	
Employee	17/255	6.67		3/255	1.18	
8. Husband's occupation						
Farmer	14/206	6.8		8/206	3.88	
Unemployed	5/26	19.23		0/26	0	
Government official	10/173	5.78	8.46	1/173	0.58	10.31
Business man	5/112	4.46	0.0762	2/112	1.79	0.0355
Employee	22/383	5.74		3/383	0.78	
9. Education						
Never attended school	0/3	0		0/3	0	
Less than primary	3/50	6		1/50	2	
Primary	17/302	5.63	1.88	7/302	2.32	6.41
Secondary	23/375	6.13	0.866	5/375	1.33	0.2684
Post secondary	2/15	13.33		1/15	6.67	
University + higher level	11/156	7.05		0/156	0	

Variables	Maternal GBS colonization			GBS colonization in neonates		
	Number of +ve / Total	Per cent	χ^2 test P value	Number of +ve / Total	Per cent	χ^2 test P value
10. Husband's education						
Never attended school	0/1	0		0/1	0	
Less than primary	1/61	1.64		2/61	3.28	
Primary	18/242	7.44	4.66	3/242	1.24	4.96
Secondary	23/422	5.45	0.4586	9/422	2.13	0.4208
Post secondary	1/18	5.56		0/18	0	
University + higher level	13/153	8.5		0/153	0	
11. Chief complaint						
Labor pain	39/702	5.56		9/702	1.28	
Mucous bloody show	3/25	12	4.76	1/25	4	2.27
Leakage of fluid per vagina	11/111	9.91	0.1906	3/111	2.7	0.5176
Schedule for induction of labor	3/62	4.84		1/62	1.61	
12. Days since last sexual intercourse						
1	3/30	10		1/30	3.33	
2-7	3/80	3.75		0/80	0	
8-14	4/44	9.09	4.44	1/44	2.27	3.44
15-30	8/201	3.98	0.35	5/201	2.49	0.4868
> 30	38/546	6.96		7/546	1.28	
13. Oral sex practiced during pregnancy						
No	44/741	5.94	0.12	12/741	1.62	0
Yes	11/156	7.05	0.7314	2/156	1.28	0.963
14. Number of pelvic examinations						
1-3	17/255	6.67		5/255	1.96	
4-6	27/456	5.92		7/456	1.54	
7-10	10/163	6.13	1.29	1/163	0.61	3.05
11-14	2/19	10.53	0.8623	1/19	5.26	0.5487
> 15	0/8	0		0/8	0	
15. Fetal weight (Grams)						
1,501 - 2,000	0/3	0		0/3	0	
2,001 - 2,500	3/36	8.33		1/36	2.78	
2,501 - 3,000	24/298	8.05	5.25	3/298	1.01	2.87
3,001 - 3,500	21/413	5.1	0.5122	9/413	2.18	0.8244
3,501 - 4,000	6/135	4.44		1/135	0.74	
4,001 - 4,500	2/15	13.33		0/15	0	
> 4,500	0/1	0		0/1	0	
16. Antepartum fever						
No	55/898	6.12	3.8	13/898	1.45	4.49
Yes	1/3	33.33	0.0513	1/3	33.33	0.034
		Fisher exact 1- tailed p-value 0.1753			Fisher exact 1- tailed p-value 0.0459	
		2-tailed p-value 0.1753			2-tailed p-value 0.0459	
17. Intrapartum fever						
No	51/870	5.86	3.8	12/870	1.38	2.26
Yes	5/31	16.13	0.02	2/31	6.45	0.0248
		Fisher exact 1- tailed p-value 0.0379			Fisher exact 1- tailed p-value 0.0806	
		2-tailed p-value 0.0379			2-tailed p-value 0.0806	
18. Type of service provider						
Private	24/339	7.08	0.48	4/339	1.18	0.18
Service	32/562	5.69	0.4888	10/562	1.78	0.6696
19. Route of delivery						
Vaginal delivery	47/805	5.84	1.28	11/805	1.37	0.77
Emergency cesarean section	9/96	9.38	0.2572	3/96	3.13	0.3787
					Fisher exact 1-tailed p-value 0.1801	
					2-tailed p-value 0.1801	
20. Modality of vaginal delivery						
1. Normal labor	32/634	5.05		7/634	1.1	
2. Forceps extraction	6/91	6.59	5.08	3/91	3.3	2.85
3. Vacuum extraction	9/80	11.25	0.079	1/80	1.25	0.2408

Variables	Maternal GBS colonization			GBS colonization in neonates		
	Number of +ve / Total	Per cent	χ^2 test P value	Number of +ve / Total	Per cent	χ^2 test P value
21. Episiotomy						
1. Spontaneous tear	0/92	0		0/92	0	
2. No episiotomy	0/28	0	8.74	1/28	3.57	2.33
3. Episiotomy	47/685	6.86	0.0126	10/685	1.46	0.3121
22. Obstetric complications						
No	51/851	5.99	0.7	12/851	1.41	0.72
Yes	5/50	10	0.4014	2/50	4	0.3949
					Fisher exact 1-tailed p-value 0.1797	
					2-tailed p-value 0.1797	
23. Postpartum morbidity						
No	53/883	6	1.86	12/883	1.36	5.52
Yes	3/18	16.67	0.1732	2/18	11.11	0.0188
		Fisher exact 1- tailed p-value 0.0955			Fisher exact 1- tailed p-value 0.0298	
		2-tailed p-value 0.0555			2-tailed p-value 0.0298	
24. Postpartum antibiotics						
a. No	42/764	5.5		10/764	1.31	
b. Yes	14/137	10.22		4/137	2.92	
b / 1 Ampicillin	5/39	12.82	3.67	2/39	5.13	1.06
b / 2 Amoxycillin	8/96	8.33	0.0554	1/96	1.04	0.3036
b / 3 Cefazolin	1/2	50		1/2	50	
		Fisher exact 1-tailed p-value 0.1931			Fisher exact 1-tailed p-value 0.1505	
		2-tailed p-value 0.2299			2-tailed p-value 0.2480	
25. Gestational age						
a. Term	54/888	6.08		13/888	1.46	
b. Preterm	1/7	14.29	1.93	0/7	0	9.12
c. Postterm	1/6	16.67	0.3802	1/6	16.67	0.0105
26. Neonatal jaundice						
a. No	46/786	5.85		11/786	1.4	
b. Yes	10/115	8.7	0.95	3/115	2.61	0.33
b / 1 Phototherapy	10/114	8.77	0.3307	3/114	2.63	0.5649
b / 2 Blood exchange	0/1	0		0/1	0	
27. Neonatal condition						
a. Normal	55/839	6.16	0	14/893	1.57	1.16
b. Abnormal	1/8	12.5	0.9967	0/8	0	0.2807
		Fisher exact 1-tailed p-value 0.4028			Fisher exact 1-tailed p-value 0.8818	
		2-tailed p-value 0.4028			2-tailed p-value 1.0000	

age, residential area, gravida, parity, duration from admission to delivery, gestational age, occupation, education, husband's education, chief complaint, day since last sexual intercourse, oral sex practiced during pregnancy, number of pelvic examinations, fetal weight, type of service provider, route of delivery, modality of vaginal delivery, episiotomy, obstetric complications, postpartum antibiotics, neonatal jaundice, and neonatal condition were not significant risk factors for GBS colonization.

Significant risk factors for GBS in neonates were the occupation of the pregnant woman's husband, antepartum fever, intrapartum fever, postpartum morbidity, and gestational age. (P value = 0.0355, 0.034, 0.0249, 0.0188 and 0.0105 respectively)

DISCUSSION

The prevalence of *Streptococcus agalactiae* colonization in this study was 6.22 per cent (56 cases from 901 cases) in pregnant women and 1.55 per cent (14 cases from 901 cases) in their neonates respectively. The prevalence was similar to the study of Pengsa K[3] in 1982 that GBS colonization was 6.0 per cent (13 cases from 216 cases) and 1.7 per cent in their neonates (3 cases from 181 cases). The reported prevalence from other countries varied a great deal. Collins TS[1] found the prevalence of

GBS in pregnant women in Lima, Peru to be 6.0 per cent. Reports of low prevalence rates of GBS were 4 per cent seen by DeLourdes Collado and others in Mexico City[4], Italy (6.6%)[5], Turkey (8.7%)[6] and Ethiopia (9%)[7]. Reports of high prevalence rates of GBS were 15-25 per cent in the United States[2], Jordan (30%)[8], Trinidad (31%)[9] and Gambia (22%)[10]. In the United States, Anthony et al found a lower prevalence of carriage in Mexican-Americans (18.4%) than whites (40.9%) or blacks (31.3%)[11].

An epidemiologic study found a regional difference of GBS serotypes[2]. Individual serotypes had differences in their clinical courses[2]. 901 pregnant women were recruited in the present study, from July 1999 until November 1999. In this 4 $^1/_2$ month period there were 1677 cases of delivery and 288 newborns who were admitted to neonatal intensive units. However, no incidence of neonatal infection from GBS was found in our study. The incidence of early onset of GBS disease in Latin America was 0.7 cases/1000 live births[12]. This is comparative to rates seen in Europe, Canada, and Israel[13-15].

ACOG (American College of Obstetricians and Gynecologists)[16] recommendations for intrapartum antibiotics for women with labor risk factors

1. temperature 38°C or higher
2. rupture of membranes after 18 hours or more
3. preterm labor (< 37 weeks' gestation)
4. premature rupture of the membranes
5. previous neonatal GBS infection

In this study the significant factors associated with maternal GBS colonization were 1. intrapartum fever 38°C or more and 2 episiotomy. The significant risk factors of neonatal GBS colonization were 1. husband's occupation 2. antepartum fever 3. intrapartum fever 4. postpartum morbidity and 5. gestational age

From 805 cases of vaginal route delivery, 685 cases (85.09%) had episiotomy done. However, GBS culture was taken on admission before pelvic examination was done. This significant risk factor for maternal GBS colonization may be just by chance and it was not a significant risk factor for neonatal GBS contamination.

The significant risk factor in this study was intrapartum maternal fever. There was a high prevalence of maternal GBS colonization and neonatal GBS contamination. Antepartum maternal fever was a significant risk factor for neonatal GBS contamination but was not significant in maternal GBS colonization which might be due to having only 3 cases from 901 cases with a history of antepartum fever.

Three from 56 cases of maternal GBS colonization (5.36%) had postpartum morbidity. Fifteen from 845 cases (1.78%) that had no maternal GBS colonization had postpartum morbidity, however, this was not statistically significant.

Two from 14 cases of neonatal GBS colonization (14.29%) had maternal postpartum morbidity. Sixteen from 887 cases (1.8%) that had no neonatal GBS colonization had maternal postpartum morbidity which was statistically significant. This study confirmed that maternal GBS colonization increased the risk of postpartum morbidity and the role of GBS infection in the postpartum period.

Gestational age of the newborn was not a risk factor for maternal GBS colonization but it was a risk factor for neonatal GBS colonization especially postterm. However, most of the newborn were term. Fifty six pregnant women with GBS colonization delivered 54 term, 1 preterm and 1 postterm neonate. Fourteen cases of neonatal GBS colonization were found in 13 term and 1 postterm neonates.

This study confirmed that the recommendation of the ACOG that intrapartum antibiotics for women with fever 38°C or more was benificial for prevention of GBS infection. In the present study, the authors found that the duration from admission to delivery and the number of pelvic examinations were not risk factors of GBS colonization. However, increased labor time and number of pelvic examinations were associated with puerperal infection and were indicated for prophylactic antibiotics. Previous neonatal GBS infection was important for prophylactic intrapartum antibiotics.

In the present study maternal GBS colonization was 6.22 per cent and neonatal GBS contamination was 1.55 per cent. Three newborns had GBS colonization without maternal GBS colonization. Eleven newborns from 14 newborns with GBS colonization were born from mothers with GBS heavy colonization. Three cases of these newborns might have been contaminated by their mothers but it might also be due to culture technique and laboratory processes. Following this hypothesis, maternal GBS colonization would be 59 cases instead of 56 cases from 901 cases or 6.55 per cent.

Prevalence of GBS colonization at Srinagarind Hospital and other hospitals in Thailand was

low and the number of reported cases of early onset of GBS sepsis was less than in the United States. The practice of intrapartum antibiotics for all cases without GBS screening between 35-37 weeks' of gestation might be inappropriate and too expensive for Thailand. The appropriate reason for using intrapartum antibiotics for Thailand may be 1. maternal fever of 38°C or more 2. ruptured membranes of more than 18 hours and 3. previous neonatal GBS infection.

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อุบัติการณ์และปัจจัยร่วมในการพบเชื้อสเตร็ปโตค็อคคัสกรุ๊ปบีในมารดาและทารกแรกคลอดที่โรงพยาบาลศรีนครินทร์

ยุทธพงศ์ วีระวัฒนตระกูล, พ.บ., โชติชนะ วิไลลักขณา, วท.ม.**, สุกัญญา ทักษพันธ์, พ.บ***, เจศฎา ถิ่นคำรพ, พ.บ.*, ไมตรี ปะการะสังข์, วท.ม.**, พวงรัตน์ เชาวะเจริญ, วท.บ.****, จันทิรา วชิราภากร, วท.บ.****, มยุรี เคนพรม, ป.พว.******

ระหว่างเดือนกรกฎาคม พ.ศ. 2542 ถึงเดือน พฤศจิกายน พ.ศ. 2542 สตรีตั้งครรภ์ที่มาคลอดที่โรงพยาบาลศรีนครินทร์ ที่ยินยอมเข้าร่วมโครงการและมีคุณสมบัติตามเกณฑ์ที่กำหนด 901 ราย จะได้รับการเพาะเชื้อจากบริเวณช่องคลอดส่วนล่างและฝีเย็บ เมื่อคลอดแล้วทำการเพาะเชื้อจากรูหู และทวารหนักของทารกภายใน 30 นาทีหลังคลอดก่อนเช็ดตัวทารก ผลการเพาะเชื้อพบเชื้อสเตร็ปโตค็อคคัสกรุ๊ปบีในมารดา 56 ราย หรือร้อยละ 6.22 และพบเชื้อนี้ในทารกแรกคลอด 14 ราย หรือร้อยละ 1.55 เมื่อวิเคราะห์ปัจจัยเสี่ยง 27 อย่างกับการพบเชื้อสเตร็ปโตค็อคคัสกรุ๊ปบีแล้ว ปัจจัยเสี่ยงที่มีนัยสำคัญทางสถิติในการพบเชื้อนี้ในมารดาคือ การมีไข้ในระหว่างรอคลอดและการตัดฝีเย็บช่วยคลอด ส่วนปัจจัยเสี่ยงที่มีนัยสำคัญทางสถิติในการพบเชื้อนี้ในทารกคือ 1. อาชีพของสามีผู้คลอด 2. การที่มารดามีไข้ในระยะก่อนคลอด 3. การที่มารดามีไข้ในระหว่างรอคลอด 4. การที่มารดามีภาวะผิดปกติในระยะหลังคลอด และ 5. อายุครรภ์ทารกแรกคลอด ในระยะเวลาที่ศึกษานี้ไม่พบภาวะการติดเชื้อสเตร็ปโตค็อคคัสกรุ๊ปบีในทารกแรกคลอด

อุบัติการณ์ที่พบในการศึกษานี้ ต่ำกว่าในสหรัฐอเมริกามาก แต่ใกล้เคียงกับประเทศกำลังพัฒนาหลายประเทศ ดังนั้นการเพาะเชื้อสเตร็ปโตค็อคคัสกรุ๊ปบีในสตรีตั้งครรภ์ทุกรายคงไม่เหมาะสมกับสถานการณ์ปัจจุบันของประเทศไทย สิ่งที่น่าจะทำได้สำหรับสถานการณ์ปัจจุบันของประเทศไทยคือ พิจารณาให้ยาปฏิชีวนะในระหว่างรอคลอดในรายที่ 1. มารดามีอุณหภูมิตั้งแต่ 38 องศาเซลเซียส 2. มีน้ำเดินหรือถุงน้ำคร่ำรั่วมากกว่า 18 ชั่วโมง และ 3. เคยคลอดทารกติดเชื้อสเตร็ปโตค็อคคัสกรุ๊ปบี

คำสำคัญ : อุบัติการณ์, ปัจจัยร่วม, สเตร็ปโตค็อคคัสกรุ๊ปบี, การพบเชื้อ, มารดา, ทารกแรกคลอด, โรงพยาบาลศรีนครินทร์,

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