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The prevalence of group B streptococcal infection during intrapartum period among high-risk group in labour

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Abstract

Background and objective: Pregnancy associated Group B streptococcal infection is a well-established cause of significant neonatal morbidity and mortality. A cross-sectional study was conducted to determine the prevalence of Group B streptococcal infection among women presenting in labor at different ages and gestational ages and its correlation with different risk factors.

Methods: Vaginal swab and urine sample for culture from 150 women having risk factors and being in labor and having risk of developing Group B streptococcal infection from 2nd of November 2020 to 2nd of December 2021.

Results: The prevalence of Group B streptococcal infection among risky group women during labor in Maternity Teaching Hospital was 8%. The rate of agreement between the vaginal swab results and urine culture results was 92%. There was no significant association between urine culture results with age, parity and prolonged rupture of membrane. A significant high rate of infected urine in culture was found among women with a very extreme preterm gestational age (*P* value = 0.049), and it was also significant among women with pyrexia (*P* value = 0.001).

Conclusion: The prevalence of Group B streptococcal infection among high-risk group of women during labor in Maternity Teaching Hospital of Erbil city was 8%.

Keywords: Group B Streptococcus; Intrapartum; Urine culture; Premature rupture of membranes; Chorioamnionitis.

Introduction

Pregnancy associated group B streptococcus infection (GBS) is a well-established cause of significant neonatal morbidity and mortality.[1] Maternal GBS colonization and infection have been associated with numerous adverse outcomes such as higher rates of febrile morbidity and chorioamnionitis, which are associated with maternal sepsis.

In addition, it can cause endometritis and postoperative wound infections. Maternal GBS bacteriuria is associated with pyelonephritis and other ascending infections, which lead to maternal sepsis as well as preterm birth. [2] GBS colonization is usually asymptomatic, and vertical transmission generally occurs after the onset of labor or rupture of the fetal membranes.[3] The GBS colonization rate varies among racial groups, with the highest rates in people of black African ancestry and the lowest in people of South Asian ancestry.[4] A 2016 meta-analysis including data for over 70,000 pregnant women estimated global prevalence of maternal GBS colonization at 17.9%. [5] Approximately one in five women presenting for labor in Jordan was colonized with GBS. [6]

Risk factors for GBS in pregnancy includes one or more of the followings: a previous baby affected by GBS disease, GBS bacteriuria, a vaginal swab positive for

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GBS, preterm birth, prolonged rupture of membranes, suspected maternal intrapartum infections including chorioamnionitis a maternal temperature of 38°C or greater in labour.[4]

Extensive efforts are directed towards the prevention of this devastating infection.[7] Current recommendations focus on maternal GBS screening and intrapartum prophylactic antibiotics to prevent early-onset of neonatal infection.[8]

It remains controversy about the best strategy to prevent early onset group B streptococcal disease,[5] and to screening strategies for GBS maternal carrier. One approach is to screen women during pregnancy approximately between 35 and 37 weeks. An alternative approach is to undertake screening only when women present in labor.[3]

No data exists at Maternity Teaching Hospital in Erbil city regarding the rate of GBS infection among women during labor. This study was conducted to determine the prevalence rate of GBS colonization in women during labour and the associated risk factors.

Methods

Study design and sample size

This was a cross-sectional study conducted on 150 pregnant women admitted in labor and delivery wards that were at risk of GBS infection in the Maternity Teaching Hospital, Erbil City, Kurdistan region, Iraq. The study started from 2nd November 2020 to 2nd December 2021. The Maternity Teaching Hospital is the main public maternity hospital in the city in which women of different backgrounds give birth.[9]

Inclusion and exclusion criteria

Women at risk of developing group GBS during labor (preterm labor, prolonged rupture of membranes, fever, chorioamnionitis, patients with positive history of GBS infection in previous delivery or in previous pregnancy or being carrier in current pregnancy) and accept to participate in the research. Exclusion criteria were women who refused to participate in the study and who have received antibiotics at the time of the study.

Data and specimen collection

Data was collected from women admitted for labor using a questionnaire designed for the study. This included maternal age, parity including preterm labor, gestational age, prolonged rupture of membrane more than 18 hours, intrapartum pyrexia more than 38°C, and patients with history of GBS carriage in previous pregnancy. Screening specimen consisted of two samples, vaginal swab and urine sample. After taking consent and maintaining the patient's privacy (i.e., covering the patient properly), the vaginal swab was taken by inserting the swab 2 cm into the vagina.

A mid-stream urine sample was collected by the patient in a disposable urine cup. The two samples were fully labeled with name, date and time of collection. Samples were immediately transported to the microbiology laboratory at Maternity Hospital for GBS culture and colonization. The swabs were inoculated in blood agar. Antibiotic sensitivity was undertaken for the presence of GBS infection.

Study variables

Parity was defined as the number of times that a woman has given birth to a fetus with a gestational age of 24 weeks or more, regardless of whether the child was born alive or was stillborn.[10] Established preterm labour was defined as a woman in established preterm labour if she has progressive cervical dilatation from 4 cm with regular contractions.[11]

Chorioamnionitis was defined as an infection with resultant inflammation of any combination of the amniotic fluid, placenta, fetus, fetal membranes, and decidua. [12]

Isolated maternal pyrexia was defined as any temperature between 38°C and 38.9°C with no other clinical criteria indicating intraamniotic infection, and with or without persistent temperature elevation.[13]

Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 25). Fisher's exact test was used

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(instead of the Chi square test) when the expected frequency (value) was less than 5 of more than 20% of the cells of the table. McNemar test was used to compare the proportions of the same sample using two different tests. A *P* value of ≤ 0.05 was considered as statistically significant.

Ethical considerations

Ethical approval was obtained from the Research Protocol Scientific Committee of Kurdistan Higher Council of Medical Specialties on 4th October 2020, number 714. Written informed consent was obtained from each woman who agreed to participate in the study at the time of the first interview. All participants were assured that their information would be kept confidential and would be used for research purposes only. All interviews were carried out in accordance with the ethical standards of the institutional research committee.

Results

During the study period, out of 160 women, 150 women agreed to participate in the study with no exclusion criteria, and results of 10 women were lost.

Table 1 shows that the largest proportion of the sample were aged 30-34 years. More than half of the women were multiparous and 28% were primigravid women. Around 34% of the women were full term, and the rest were either very extreme preterm or moderate late preterm. Around half of the women sustained prolonged rupture of membrane of more than 18 hours. 26% of the women had pyrexia, and 22% had suspected intra partum chorioamnionitis.

Table 1 Basic characteristics of the studied sample.

	No.	%
Age		
< 20	18	12.0
20-24	33	22.0
25-29	30	20.0
30-34	40	26.7
35-39	29	19.3
Parity		
Primi-gravida	42	28.0
Multiparous	94	62.7
Grand multiparous	14	9.3
Gestational age		
Very extreme preterm	30	20.0
Moderate late preterm	69	46.0
Full term	51	34.0
Prolonged rupture of membrane > 18 hours		
No	89	59.3
Yes	61	40.7
Pyrexia		
No	111	74.0
Yes	39	26.0
Suspected intrapartum chorioamnionitis		
No	117	78.0
Yes	33	22.0
Total	150	100.0

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Only nine (6%) women had positive urine culture for GBS. There was no significant association between urine culture results with age, parity and prolonged rupture of membrane. Significant high rate of urine culture (13.3%) was found among women with very extreme preterm gestational age, and it was statistically significant among women with pyrexia. It was significantly high among women with suspected intra partum chorioamnionitis as presented in Table 2.

Table 2 Positive Urine culture results by the studied factors.

		Urine culture		
		Negative	Positive	
	N	No. (%)	No. (%)	*P value*
Age				
< 20	18	18 (100.0)	0 (0.0)	
20-24	33	32 (97.0)	1 (3.0)	
25-29	30	27 (90.0)	3 (10.0)	
30-34	40	36 (90.0)	4 (10.0)	
35-39	29	28 (96.6)	1 (3.4)	0.528*
Parity				
Primi-gravida	42	41 (97.6)	1 (2.4)	
Multiparous	94	87 (92.6)	7 (7.4)	
Grand multiparous	14	13 (92.9)	1 (7.1)	0.482*
Gestational age				
Very extreme preterm	30	26 (86.7)	4 (13.3)	
Moderate late preterm	69	68 (98.6)	1 (1.4)	
Full term	51	47 (92.2)	4 (7.8)	0.049*
Prolonged rupture of membrane > 18 hours				
No	89	86 (96.6)	3 (3.4)	
Yes	61	55 (90.2)	6 (9.8)	0.160*
Pyrexia				
No	111	109 (98.2)	2 (1.8)	
Yes	39	32 (82.1)	7 (17.9)	0.001*
Suspected intra partum chorioamnionitis				
No	117	115 (98.3)	2 (1.7)	
Yes	33	26 (78.8)	7 (21.2)	< 0.001*
Total	150	141 (94.0)	9 (6.0)	

*By Fisher's exact test.

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Only three (2%) women had positive vaginal swab culture as presented in Table 3.

No significant association was detected between vaginal swab culture and the following variables: age, parity, gestational age, prolonged rupture of membrane, pyrexia, suspected intra partum chorioamnionitis, and mode of delivery (Table 3).

Table 3 Vaginal swab results by the studied factors.

		Vaginal swab results		
		Negative	Positive	
	N	No. (%)	No. (%)	*P value*
Age				
< 20	18	18 (100.0)	0 (0.0)	
20-24	33	33 (100.0)	0 (0.0)	
25-29	30	30 (100.0)	0 (0.0)	
30-34	40	39 (97.5)	1 (2.5)	
35-39	29	27 (93.1)	2 (6.9)	0.360*
Parity				
Primi-gravida	42	42 (100.0)	0 (0.0)	
Multiparous	94	92 (97.9)	2 (2.1)	
Grand multiparous	14	13 (92.9)	1 (7.1)	0.277*
Gestational age				
Very extreme preterm	30	29 (96.7)	1 (3.3)	
Moderate late preterm	69	68 (98.6)	1 (1.4)	
Full term	51	50 (98.0)	1 (2.0)	0.783*
Prolonged rupture of membrane > 18h				
No	89	87 (97.8)	2 (2.2)	
Yes	61	60 (98.4)	1 (1.6)	>0.999*
Pyrexia				
No	111	109 (98.2)	2 (1.8)	
Yes	39	38 (97.4)	1 (2.6)	>0.999*
Suspected intra partum chorioamnionitis				
No	117	115 (98.3)	2 (1.7)	
Yes	33	32 (97.0)	1 (3.0)	0.528*
Mode of delivery				
Emergency CS	40	40 (100.0)	0 (0.0)	
Elective CS	5	5 (100.0)	0 (0.0)	
Vaginal delivery	105	102 (97.1)	3 (2.9)	0.604*
Total	150	147 (98.0)	3 (2.0)	

*By Fisher's exact test.

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The rate of agreement between the vaginal swab results and urine culture results was 92% (138/150 * 100). Nine cases were found to have negative result by vaginal swab and positive result by urine culture, and three cases had positive vaginal swab and negative urine culture. No significant difference was detected between the results of the mentioned tests (P = 0.146). The Prevalence of Group B streptococcal infection detected by urine culture or vaginal swab in maternity teaching hospital in Erbil city is 8%.

Discussion

This study enrolled 150 women and included a positive GBS urine cultures & vaginal swabs as part of the GBS. It was revealed that (8%) women presented for labor at Maternity Teaching Hospital in Erbil were colonized with GBS. The frequency of GBS colonization we found is lower when compared to other countries in the Middle East region; in Jordan prevalence rate was (30.4%),[6] while in Saudi Arabia it was (31.6%).[3] In Egypt it was (11.3%),[5] and in Iran it was (11.8%).[14] In Kuwait it was 20.7%,[15] and in Morocco it was 24.0%.[16]

This could be adjusted by larger sample sizes to be the screened for, and different methodological ways and longer duration of time in relation to current study.

Significant high rate of urine culture was found among women with very extreme preterm gestational age, women with pyrexia and women with suspected intra partum chorioamnionitis.

Kim et al reported significant higher rates of preterm labor in GBS colonized pregnant women.[17] With a systematic cohort review where 45 studies were included. Preterm birth was associated with GBS bacteriuria.[18]

Regarding the intrapartum infection being significantly higher in women with GBS this finding is well known as a risk factor according to American college of obstetrician and Gynecologist.[19]

The National Screening Committee does not recommend universal bacteriological screening for GBS. There is no clear evidence to show that testing for GBS routinely would do better than harm. The reasons could be due to many women carry the bacteria and the majority of cases were babies born safely and without developing an infection.[20]

Giving all carriers of GBS intra partum antibiotic would mean that a very large number of women would receive treatment they do not need; this may increase adverse outcomes to mother and baby. This is why screening all women in pregnancy for GBS is not routinely offered in the UK.[4]

The strength of this study is being the first time to be conducted in our hospital and we used two routs of culture the vagina and urine culture.

The limitation of the study being not conducted on whole women in labor as it was included only women with known risk factors like preterm labor, PROM, suspected infection. On the other hand,

Table 4 Association between vaginal swab results with urine culture results.

	Urine culture			
	Negative	**Positive**	**Total**	
Vaginal swab	**No. (%)**	**No. (%)**	**No. (%)**	***P****
Negative	138 (93.9)	9 (6.1)	147 (100.0)	0.146
Positive	3 (100.0)	0 (0.0)	3 (100.0)	
Total	141 (94.0)	9 (6.0)	150 (100.0)	

*By McNemar test.

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women in our locality having no screening methods for GBS previously in able us to get history of previous GBS infection as a risk factor.

There are no established international standards for sampling GBS colonization; however, CDC recommends rectovaginal swabs at 35–37 weeks with selective enrichment broth culture, but this approach is not always feasible for low and middle-income settings.[21] Additional barriers to routine testing in these low resource settings includes the lack of microbiology laboratory capacity to perform routine testing for GBS, lack of timely knowledge of the results being reported back to the clinicians because of separate settings where prenatal care is performed and where lab testing would be performed, in addition to the lack of electronic medical records for the obstetricians to obtain antenatal results.[6] We recommend future studies to be conducted on larger sample sizes, during pregnancy and using rectovaginal methods for culture and sensitivity beside the vaginal and urine procedures.

Conclusion

The prevalence of GBS infection among risky group women during labor was 8%. These results highlight the unmet need for routine GBS testing during pregnancy and support expanded research in the region. They also emphasize the need for improved rapid GBS diagnosis for developing world settings. We recommend a larger sample size and the use of rectovaginal and rectal swabs for future studies.

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Competing interests

The authors declare that they have no competing interests.

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