Association between Colonization with Group B Streptococcus and Preterm Delivery

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ABSTRACT

Background: Despite major advances in perinatal care, preterm delivery (PTL) is still the predominant cause of perinatal mortality and a major cause of neurological morbidity in surviving infants.

Objective: the objective of this study is to find any association between maternal group B streptococcus (GBS) colonization and preterm delivery.

Patients and Method: This study is a prospective study including 100 pregnant women between 28 – 36 weeks of gestation from those who attended the Emergency Department at Al-Galaa Maternity Teaching Hospital from April 2015 to August 2015. All patients were tested for genital colonization with Group B streptococcus (GBS) by taking low vaginal swab that was sent for microbiological examination.

Results: In this study there was a significant difference between positive and negative cases as regard obstetric data. As regard preterm labor, 80% of positive swab cases had preterm labor compared to 46.2% of negative swab cases and this was statistically significant. Positive vaginal swab cases are at 7 times higher risk to have preterm labor compared to negative cases.

Conclusion: GBS vaginal colonization was associated with premature labour in the studied population. Women with GBS vaginal colonization qualify for intrapartum chemoprophylaxis. The study results suggest that the early prenatal screening for GBS may identify pregnant women at risk of PTL.

Keywords: Group B Streptococcus, Preterm Delivery.

INTRODUCTION

Although the determinants of preterm delivery are uncertain, evidence suggests maternal genital tract colonization with specific organisms can play a role in preterm rupture of membranes and preterm delivery. Bacterial products such as phospholipases A2 and C, endotoxin, and induction of the cytokine cascade can stimulate the prostaglandin pathway and initiate labor **(1).**

Reproductive tract infections or colonization associated with preterm delivery include Chlamydia trachomatis and bacterial vaginosis **(2).**

Up to 36 % of pregnant women are colonized with GBS in the vagina or rectum. GBS colonization during pregnancy can be transient, intermittent, or persistent **(3).**

Preterm delivery in group B streptococcus (GBS) colonized mothers is a recognized risk factor for early onset neonatal GBS disease (GBS-EOD), but whether maternal GBS genital colonization is related to preterm delivery is unclear **(4).**

It is universally accepted that group B streptococcal infection is a major cause of neonatal sepsis resulting in serious neonatal morbidity and mortality. It is probable that in early onset neonatal infection transmission from maternal genital tract occurs just prior to or during labour **(3).**

GBS is also associated with late onset disease (LOD) affecting neonates and infants between one week and three months old, resulting in bacteremia and/or meningitis. GBS may also be a cause of stillbirth and premature labor **(5).**

AIM OF THE WORK

The objective of this study is to find any association between maternal GBS colonization and preterm delivery.

PATIENTS AND METHOD

This study is a prospective study including 100 pregnant women between 28 – 36 weeks of gestation from those who attended the Emergency Department at Al-Galaa Maternity Teaching Hospital from April 2015 to August 2015.

All patients were tested for genital colonization with Group B streptococcus by taking low vaginal swab that was sent for microbiological examination.

Ethical approval and written informed consent:

An approval of the study was obtained from Al-Azhar University Academic and Ethical Committee. Every patient signed an informed written consent for acceptance of the operation.

Inclusion criteria:

1-Age: between 20 - 40 years.
2-Gestational age: between 28-36 weeks.
3-Intact membranes.

Exclusion criteria:

1-Preterm premature rupture of membranes (PPROM).
2-Pregnant <28 weeks

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and >36 weeks.

3-Current antibiotic intake or any medications.

Patient assessment:

- A full obstetric history was taken from each patient (e.g.: Age, Parity, Medical disorders before or during pregnancy).
- General examination and abdominal examination were done for each patient.
- Ultrasound and cardiotocography (CTG) were done for all the patients.
- After delivery; neonatal assessment was done by Apgar score at 1 and 5 minutes.

***Specimen collection and preparation [6]:**

1- All patients were subjected to low vaginal swab obtained by sterile cotton tipped swab, inserted 1 – 2 inch beyond the vaginal vestibule and rotated before withdrawal.

2-Swabs are collected into appropriate transport medium which is sealed in a container.

3-Specimens were transported and processed within 2 hours after being obtained.

4-In the lab: After removal of the swabs from the container, the caps of the swabs were removed.

5-The swabs were placed in the lim broth, broke off the swab stick.

* Lim broth is an enriched media (5 mL Todd-Hewitt broth supplemented with 10 µg/mL colistin and 15 µg/mL nalidixic acid).

6- Culture: After an overnight incubation at 35-37°C in 5% CO_2 incubator, subculture with sterile loop and inoculation on blood agar were done.

7-After an overnight incubation, observation of plates for colonies and its identification.

If Negative; Reincubate for an additional 24 hours before reporting a negative result.

If Positive: Colonies on blood agar of B- streptococcus bacteria appears grey translucent with surrounding zone of beta-hemolysis. **Figure (1)**

Detection of carriage of group B streptococci was done [7]:

Collected specimens

↓

Lim Broth (5mL Todd-Hewitt broth supplemented with 10 µg/mL colistin and 15 µg/mL nalidixic acid)

↓

Incubated at 35-37°C, 5-10% CO_2 18-24hrs

↓

Subcultured to blood agar

↓

Incubated at 35-37°C in the appropriate atmosphere for 24-48 hr, read at 18-24 hr

↓

ID 4 - Confirm identification of Group B Streptococci

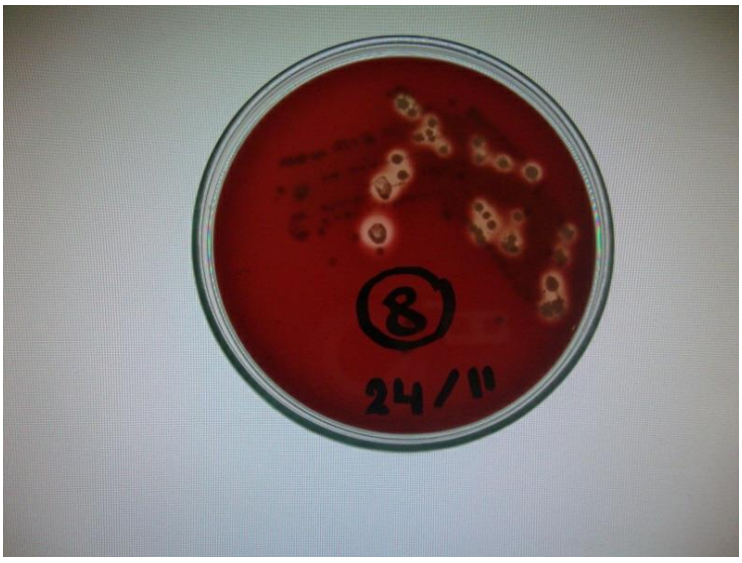

Figure (1): GBS colonies growing on blood agar after 48 hrs incubation.

Data Management and Analysis:

The collected data were revised, coded, tabulated and introduced to a PC using statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Data were presented and suitable analysis was done according to the type of data obtained for each parameter.

i. Descriptive statistics:

1. Mean, standard deviation (± SD) and range for parametric numerical data.
2. Frequency and percentage of non-numerical data.

ii. Analytical statistics

1. **Student T** test was used to assess the statistical significance of the difference between the means of the two study group.
2. **Chi-Square test** was used to examine the relationship between two qualitative variables
3. **Fisher's exact test:** was used to examine the relationship between two qualitative variables when the expected count is less than 5 in more than 20% of cells
4. **Logistic regression:** useful in the prediction of the presence or absence of an outcome based on a set of independent variables. It is similar to a linear regression model but is suited when the dependent variable is qualitative (categorical)

P- value: level of significance

-P>0.05: Non significant (NS).
-P< 0.05: Significant (S).
-P<0.01: Highly significant (HS).

RESULTS

All patients were tested for genital colonization with Group B streptococcus.

Table (1): Description of personal and relevant medical history among cases.

	Min.	Max.	Mean	±SD
Age (years)	20	40	30.4	7.07
GA (weeks)	28	36	32.83	2.22

		No.	%
Parity	Primigravida	44	44%
	P1-P2	33	33%
	>p3	23	23%
Previous abortion	Yes	6	6%
	No	94	94%
Previous C.S	Yes	10	10%
	No	90	90%
Diabetes	Yes	6	6%
	No	94	94%

This table describes the personal and relevant medical data among cases.

Table (2): Relation between vaginal swab result and personal and medical characteristics among cases

		Positive		Negative		p	Sig.
		No.	%	No.	%		
Parity	PG	12	34.3%	28	43%	0.416	NS
	P1-P2	16	45.7%	21	32.3%		
	>P3	7	20%	16	24.6%		
Previous abortion	Yes	3	8.6%	3	4.6%	0.420	NS
	No	32	91.4%	62	95.3%		
Previous C.S	Yes	2	5.7%	8	12.3%	0.487	NS
	No	33	94.3%	57	87.7%		
D.M	Yes	5	14.3%	1	1.5%	0.019	**S**
	No	30	85.7%	64	98.5%		

There was no significant difference between positive and negative cases as regard personal and medical data except for diabetes.

Table (3): Relation between vaginal swab result and obstetric characteristics of study participants.

	Vaginal swab				P	Sig.
	Positive		Negative			
	No.	%	No.	%		
Delivered	28	80%	30	46.2%	0.001	HS
Not	7	20%	35	53.8%		

As regarding preterm labor, 80% of positive swab had delivered compared to 46.2% of negative swab cases and this was statistically significant.

Table (4): Relation between vaginal swab result and neonatal characteristics of study participants.

	Vaginal swab				P	Sig
	Positive (N=??)		Negative (N=??)			
	Mean	±SD	Mean	±SD		
Neonatal weight	1870.59	553.13	1897.67	538.38	0.813	NS
APGAR score 1 MIN	3.35	0.86	3.47	0.77	0.477	NS
APGAR score 5 MIN	5.47	1.12	5.82	0.98	0.108	NS

There was no significant difference between positive and negative swabs as regard neonatal findings (Weight and APGAR score).

Table (5): Multivariate analysis to study independent factors affecting positive vaginal swab.

	OR	95% C.I. for OR		P	Sig.
		Lower	Upper		
Age	**0.815**	0.675	1.984	**0.056**	**NS**
GA	0.914	0.729	1.146	0.435	NS
Parity*				**0.023**	**S**
P1-P2	7.379	1.761	30.914	0.006	HS
≥P3	13.447	1.055	171.446	0.045	S
Previous abortion	1.869	0.262	13.351	0.533	NS
Previous CS	0.047	0.002	1.251	0.068	NS
Diabetic	**35.714**	2.067	617.010	**0.014**	**S**

*Primigravida reference

After adjustment to all factors by logistic regression, it was found that parity and diabetes are independent risk factors for the occurrence of positive vaginal swab. Increased parity and presence of DM increased the risk of positive swab.

Table (6): Multivariate analysis to study independent factors affecting occurrence of delivery.

	OR	95% C.I. for OR		P	Sig
		Lower	Upper		
Age	1.072	0.900	1.278	0.437	NS
GA	**1.570**	1.214	2.030	**0.001**	HS
Parity*				0.957	NS
P0-P2	0.986	0.254	3.829	0.984	NS
≥P3	0.713	0.068	7.417	0.777	NS
Positive Vaginal swab	**7.095**	2.071	24.299	**0.002**	HS

*Primigravida reference

After adjustment to all factors by logistic regression, it was found that female gestational age and positive vaginal swab are independent risk factors for preterm labour. Increase GA and presence of infection increase the risk of preterm labour.

*Positive vaginal swab cases are 7 times more common to have preterm labor compared to negative swab cases.

DISCUSSION

In this study, analysis of personal and relevant medical history shows that primigravida represents 44% of cases while multigravida represents 56 % of cases. Cases with history of previous abortions represents 6 % of cases. Cases with diabetes mellitus represents 6 % of cases.

There was significant difference between positive and negative cases as regard diabetes where 14.3 % of diabetics have positive GBS swab compared to 1.5 % of diabetics who have negative GBS swab.

In this study 35 % of swabs were positive for GBS, while 65 % of swabs were negative.

Reported GBS colonization rates in the world are quite variable, but generally range from 6 to 35% [8]. The differences in colonization rates depend on the particular population and especially on the laboratory methods used to identify GBS [9].

In **Nomura *et al.*** [9] study, GBS colonization rate for women with preterm labour was 30%. In **Aali *et al.*** [10] study, maternal colonization rate was calculated to be 9.2%.

In this study there was a significant difference between positive and negative cases as regard obstetric data. Regarding preterm labor, 80% of positive swab cases had preterm labor compared to 46.2% of negative swab cases and this was statistically significant.

Based on multivariate logistic regression, positive vaginal swab cases in the current study were at seven times higher risk to have preterm labor compared to negative cases with odds ratio 7.095 and 95 % confidence interval for odds ratio between 2.071 and 24.299 which is statistically highly significant.

In **Nomura *et al.*** [9] study, colonization rate with GBS for women with preterm labour was 30%. However, based on multivariate logistic regression, GBS positive women were nearly three times more likely to suffer from preterm labor than negative ones[2].

On the other hand, **Tsolia *et al.*** [8] found no association between prematurity and GBS colonization.

In a multivariate analysis in this study, after adjustment to all factors, it was found that parity and diabetes mellitus (DM) are independent risk factors for the occurrence of positive vaginal swab. High parity and presence of DM increased the risk of positive vaginal swab.

In **Aali *et al.*** [10] gravidity and parity showed no significant association with preterm labor.

On the other hand, **Tsolia *et al.*** [8] indicated that multiparity was associated with a lower colonization rate.

Older women are more susceptible to be colonized with this microorganism[8]. While in this study maternal age has no relation to GBS colonization.

Romero *et al.* concluded that there was no evidence of an association between GBS colonization from the maternal genital tract and preterm delivery[11].

Gibbs *et al.* [12] found no relation between maternal genital tract GBS colonization and preterm delivery. However there was a significant association between maternal genital group B streptococci colonization and preterm labour.

The study of **Regan *et al.*** [13] showed an increased incidence of PROM and premature delivery in women colonized with GBS. In another prospective study, antenatal vaginal carriage of GBS was shown to be significantly associated with both PROM and preterm labour [14].

In this study positive vaginal swab cases are 7 times more common to have preterm labor compared to negative cases.

Finally when solving a problem, we should clearly distinguish causes and consequences. Although some studies considered in this review described patients admitted to hospital because of uterine contractions before 37 weeks of gestational age.

Most studies did not make it clear whether deliveries where spontaneous or whether membranes where intact or not and whether preterm uterine contractions led to preterm delivery or not.

CONCLUSION AND RECOMMENDATION

GBS vaginal colonization was associated with premature labour in the population studied. Women with GBS vaginal colonization qualify for intrapartum chemoprophylaxis. The study results suggest that the early prenatal screening for GBS may identify pregnant women at risk of PTL.

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