ANTIMICROBIAL RESISTANCE AMONG STREPTOCOCCUS AGALACTIA COLONIZERSIN PREGNANT WOMEN

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ABSTRACT:

Background: *Streptococcus agalactiae (Group B Streptococcus, GBS), a leading cause of sepsis and meningitis in infants, can be transmitted vertically from mother to infant during passage through the birth canal. Detection of GBS colonization in perinatal women is a major strategy for the prevention of postpartum neonatal disease.*

Aim of the work: *To determine the in vitro antimicrobial susceptibility profile of group β Streptococcus in cases of pregnant females between 34 and 37 weeks of gestation for guiding the antimicrobial prophylaxis for cases of GBS colonized pregnant females.*

Patients and methods: *This study included 29 isolates of group β Streptococcus recovered from rectovaginal swabs taken from 112 pregnant women between 34 and 37 weeks of gestation. All swabs were inoculated on blood agar plate with bacitracin disc. Isolates that give B-haemolysis on blood agar and are bacitracin resistant were identified by catalase and CAMP test as group B- streptococci and they were 29 isolates. Antibiotic susceptibility by disc diffusion was done to the 29 isolates, using cation adjusted Mueller Hinton agar using the following antibiotic discs: penicillin, vancomycin, clindamycin, erythromycin, levofloxacin and cefotaxime according to the Clinical and Laboratory Standard Institute* **.**

Results: *The highest level of resistance was reported against cefotaxime where 20/29 (69%) were resistant. Whilst the minimum resistance was exhibited against levofloxacin with a 27.5% (8/29) resistance rate.*

Conclusion: *The prevalence rate of GBS colonization among pregnant women included in the study was 29/112 (25.9%) which is concordant with many other local and international studies. Thus, it is very important to expand the prenatal GBS screening among pregnant women to avoid the maternal and neonatal complications. It is recommended to perform antimicrobial susceptibility to pregnant women with GBS.*

Keywords: *GBS, antimicrobial resistance, rectovaginal swabs.*

INTRODUCTION:

Group B *Streptococcus* (GBS) is a human commensal, where, the gastrointestinal tract being the natural reservoir and more likely the source for vaginal colonization. At any given time, 10–40% of healthy adults are commonly colonized by GBS in the gastrointestinal and genital tract but remain asymptomatic. Vaginal colonization is unusual in childhood but becomes more common in late adolescence[1].

Group β *Streptococcus* (GBS) or *Streptococcus agalactiae* has been considered one of the most important risks for the development of neonatal diseases. GBS is often associated with medical intercurrences during pregnancy and the postpartum period and can be associated with life-threatening disease in newborns due to sepsis, pneumonia, and meningitis[2].

Among pregnant women GBS carriage rate in the vaginal and rectal microbiota ranges from 10% to 37% and is similar in both developing and developed countries. Large variations in colonization rates can be observed and can relate to ethnicity, body sites sampled, microbiological procedures performed and population studied[1].

Prenatal GBS screening is recommended by the Centers for Disease Control and Prevention (CDC) by means of specimens harvestedrom the vaginal in troitus and perianal region from all the pregnant women between 35 and 37weeks of gestation[1].

Intrapartum antibiotic prophylaxis (IAP) reduce both the vertical transmission of *Streptococcus agalactiae* or group β *Streptococcus* (GBS) and the early onset of neonatal sepsis. However, existing guidelines do not recommend that antimicrobial susceptibility testing (AST) be routinely performed. Penicillin or ampicillin are indicated as first-choice antibiotics, cefazolin being an alternative in the case of history of mild allergic reactions, and vancomycin orclindamycin an alternative in severe reactions. Concerns about IAP pertain potential toxicity and, mainly, potential pressure towards antibiotic resistance among GBS strains[1].

Penicillin remains the agent of choice for intrapartum antibiotic prophylaxis, with ampicillin as an acceptable alternative. Penicillin-allergic women who have a history of anaphylaxis, angioedema, respiratory distress or urticaria following administration of penicillin should receive cefazolin[3].

The high rate of resistance in GBS strongly supports the current Centers for Disease Control and Prevention recommend-dation that antibiotic susceptibility testing be performed if erythromycin or clindamycin therapy is needed to prevent neonatal GBS infection[4].

AIM OF The WORK:

To determine the in vitro antimicrobial susceptibility profile of group β *Streptococcus* in cases of pregnant females between 34 and 37 weeks of gestation for guiding the antimicrobial prophylaxis for cases of GBS colonized pregnant females.

PATIENTS AND METHODS:

This study included 29isolates of group β *Streptococcus* recovered from rectovaginal swabs taken from 112 pregnant women between 34 and 37 weeks of gestation. This study was performed during the period between December 2017 and May 2018. All swabs were inoculated on blood agar plate and were confirmed to be GBS by conventional species identification techniques including catalase test, bacitracin disc. CAMP test was done for B haemolytic and bacitracin resistant isolates (29 isolates) (Diagrams 1, 2).

Diagram (1): The beta hemolytic colonies of GBS on blood agar resistant to Bacitracin

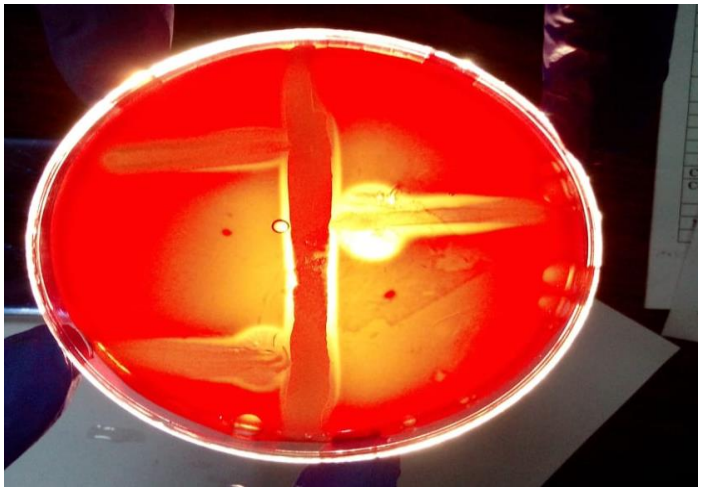

Diagram (2):The enhanced beta hemolytic colonies of GBS on blood agar indicating positive CAMP test

Antibiotic susceptibility by disc diffusion was being done to all isolates using cation adjusted Mueller Hinton agar using the following antibiotic discs: penicillin, vancomycin, clindamycin, erythromycin, levofloxacin and cefotaxime. All used antibiotic discs were purchased from (Oxoid, UK).

Procedure:

Discs containing cefotaxime, clinda-mycin, erythromycin, levofloxacin, penicillin and vancomycin were placed on Muller Hinton blood agar plate where 0.5 McFarland bacterial suspension was inoculated. The plates were incubated overnight at 37°C.Sensitivity of the bacteria to one of the antibiotics was measured by the zone of inhibition around the antibiotic disc[5].

Interpretation:

Interpretation was performed according to the Clinical and Laboratory Standard Institute[6].

Statistical Analysis: The collected data were revised, coded, tabulated and introduced to a PC using Statistical Package for Social Science (SPSS 20). Data were presented and suitable analysis was done according to the type of data obtained for each parameter.

RESULTS:

Table (1) shows the percentage range of parity between 0.9% and 35.7%, the

percentage range of abortions between 3.1% and 43.8% and the percentage range of gravida between 1.1% and 29.5% among pregnant females included in the study.

Table (1): The percentage range of parity, abortions and gravid among pregnant females included in the study

	Parity		**Abortions**		**Gravida**	
	N	**%**	**N**	**%**	**N**	**%**
PG	24	21.4%				
1	40	35.7%	14	43.8%	1	1.1%
2	33	29.5%	10	31.3%	26	29.5%
3	14	12.5%	7	21.9%	25	28.4%
4	1	.9%	0	0.0%	19	21.6%
5	0	0.0%	1	3.1%	9	10.2%
6	0	0.0%	0	0.0%	6	6.8%
7	0	0.0%	0	0.0%	2	2.3%

Table (2) shows that there was no statistically significant difference between GBS and non-GBS groups as regards the mean of both age and gestational age (GA) with p value of (0.429, 0.447) respectively.

Table (2): The age and Gestational age (GA) mean in GBS and non-GBS groups.

	Blood agar				t test		
	Non- GBS		GBS				
	Mean	SD	Mean	SD	t	p value	sig.
Age	27.61	5.43	28.55	5.79	-0.80	0.429	NS
G.A.	35.39	1.45	35.58	1.06	-0.76	0.447	NS

The results of pus cells and Gram stain could not be correlated with growth on blood agar. So, they can neither be used as diagnostic or confirmatory method of GBS colonization in our study (Table2) (Diagram 3).

Table (3): Results of blood agar inoculation, bacitracin, CAMP test, pus cells and Gram stain of the specimens.

		N	%
Blood agar	NO haemolysis	79	70.5%
	Bhaemolysis	33	29.5%
CAMP test	Negative	0	0%
	Positive	29	100%
Bacitracin	Sensitive	83	74.1%
	Resistant	29	25.9%
Puscells	Negative	102	91.1%
	Positive	10	8.9%
Gramstain	gram-ve bacilli	9	8.0%
	gram+ve cocci	23	20.5%
	gram-ve bacilli& gram +ve cocci	80	71.4%

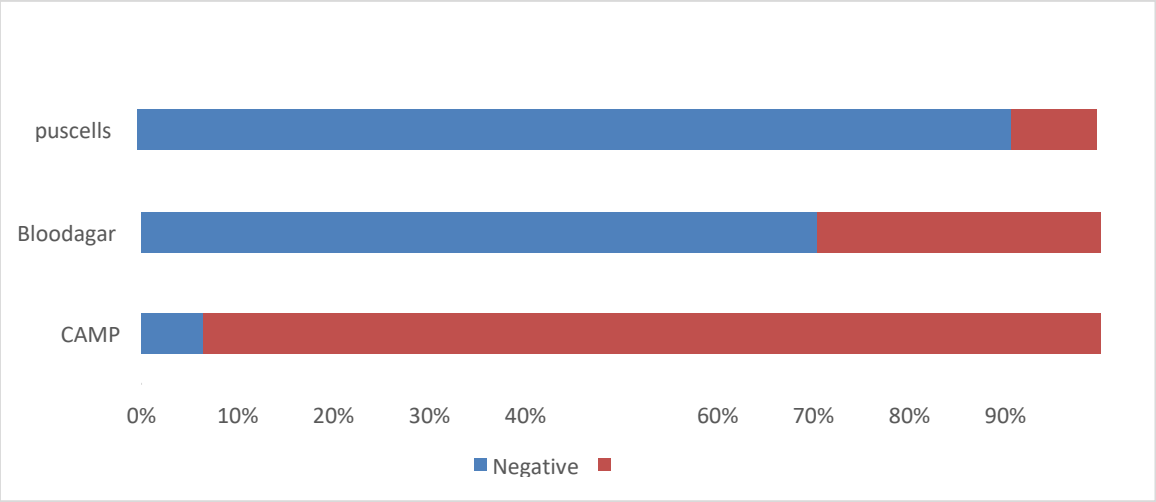

Diagram (3): Results of blood agar, pus cells and CAMP test

Regarding the results of antimicrobial susceptibility testing, the highest level of resistance was reported against cefotaxime where 20/29 (69%) were resistant. Whilst the minimum resistance was exhibited against levofloxacin with a 27.5% (8/29) resistance rate. The results are summarized in table (4), diagrams (4 & 5).

Table (4): Results of antibiotic susceptibility of GBS isolates by disc diffusion method

	Resistant		Sensitive	
	N	%	N	%
Levofloxacin	8	27.50%	21	72.50%
Penicillin	11	37.90%	18	62.10%
Vancomycin	13	44.80%	16	55.20%
Cefotaxime	20	69%	9	31%
Clindamycin	15	51.70%	14	48.30%
Erythromycin	11	37.90%	18	62.10%

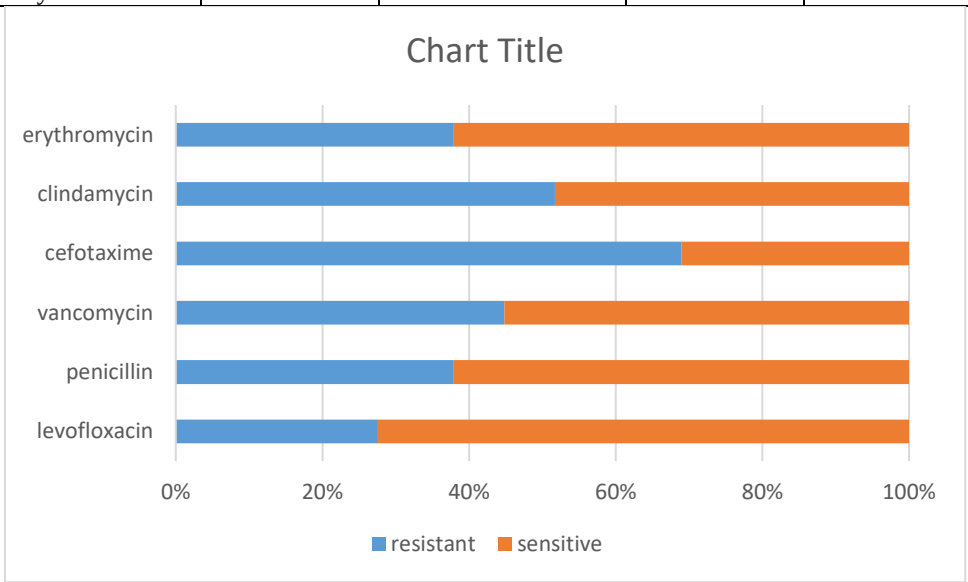

Diagram (4): Results of antibiotic susceptibility of GBS isolates by disc diffusion method.

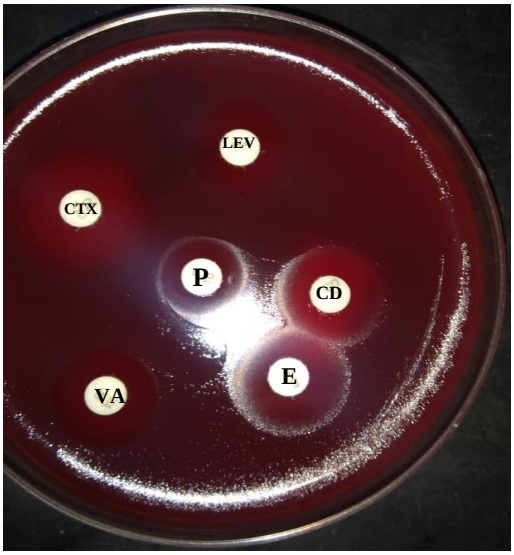

Diagram (5): Antibiotic susceptibility testing of GBS by disc diffusion showing resistance to penicillin, clindamycin, levofloxacin, erythromycin and sensitive to cefotaxime

DISCUSSION:

Streptococcus agalactiae (Group B *Streptococcus*, GBS), a leading cause of sepsis and meningitis in infants, can be transmitted vertically from mother to infant during passage through the birth canal. Detection of GBS colonization in perinatal women is a major strategy for the prevention of postpartum neonatal disease. The U.S. Centers for Disease Control and Prevention recommends that all women under govaginal-rectal screening for GBS colonization at 35-37 weeks of gestation[7].

In the present study, a prevalence rate of 25.9% was found for GBS among pregnant females. These results were concordant with other studies carried out in Egypt [8&9]. Similarly, another study performed by ***Sadaka et al.*** [10] at Alexandria reported a similar prevalence rate.

Other countries also showed agreement with the prevalence rate of GBS found in our study. ***Da Rocha et al.***[11] from Brazil, and ***Morita et al.***[7]from Japan reported prevalence rates of (28.2%, and22.4%) respectively.

On the other hand, other studies in different countries showed disagreement with the prevalence rate found in our study as a study carried out in Jordan showed lower prevalence rate of 19.5% [12].

Regarding the results of antimicrobial susceptibility testing, the highest level of resistance was reported against Cefotaxime where 20/29 (69%) were resistant. Whilst the minimum resistance was exhibited against levofloxacin with a 27.5% (8/29) resistance rate.

In this study, although levofloxacin is the drug with the highest sensitivity, however, it is not the drug of choice as it, unfortunately, has a high risk of spontaneous abortion [13], thus it is only used in life-threatening conditions.

Our study results were concordant in a great scale with other studies as ***Mengist et al.***[14] with results of penicillin resistance of 77.3%, and erythromycin resistance of 22.6%.

However, another study by ***Jalalifar and other***[15] in (2019) showed similar results to ours regarding clindamycin resistance (47%) and erythromycin resistance (52%) while their isolates displayed much lower resistance to penicillin (8%) and cefotaxime (8%).

Conclusion:

The prevalence rate of GBS colonization among pregnant women included in the study was 25.9% (29/112). Thus, it is very important to expand the prenatal GBS screening among pregnant women to avoid the maternal and neonatal complications.

It is recommended to perform antimicrobial susceptibility to pregnant women with GBS.

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المقاومة للمضادات الحيوية بين مستعمرات المجموعة ب من المكور العقدي في النساء الحوامل

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الخلفية: يمكن أن تنتقل المجموعة ب العقدية(GBS) من الأم إلى الرضيع أثناء المرور عبر قناة الولادة ، وهي سبب رئيسي للإنتان والالتهاب السحائى عند حديثى الولادة. يعد الكشف عن استعمار GBS في النساء في الفترة المحيطة بالولادة استراتيجية رئيسية للوقاية من امراض حديثي الولادة.

الهدف من البحث: تحديد الحساسية لمضادات الميكروبات في المختبر للمجموعة ب من المكور العقدي في حالات النساء الحوامل فى الفترة بين الأسبوعين 34 و 37 من الحمل لاعطاء المضادات الحيوية الوقائية فى حالات النساء الحوامل المصابات بالمجموعة ب من المكور العقدى .

المرضى و طرق البحث : اشتملت هذه الدراسة على 29 فصيلة من المجموعة ب من المكور العقدى تم تجميعها من المسحات الشرجية المهبلية المأخوذة من 112 سيدة من النساء الحوامل بين 34 و 37 أسبوعً من الحمل. تم زرع جميع المسحات على اطباق أجار الدم الذى يحتوى على قرص باسيتراسين. و تم التعرف على الفصائل التى اعطت B haemolysis على اجار الدم و كانت مقاومة لقرص الباسيتراسين باختبار catalase و CAMP على انها المجموعة ب من المكور العقدى و كان عددها 29 فصيلة. تم إجراء حساسية المضادات الحيوية عن طريق وضع اقراص المضادات الحيوية لجميع العزلات باستخدام أجار مولر هينتون المعدل الكاتيون باستخدام أقراص المضادات الحيوية التالية : البنسلين ، والفانكومايسين ، والكليندامايسين ، والإريثروميسين ، والليفوفلوكساسين ، والسيفوتاكسيم وفقًا لمعهد المعايير السريرية و المخبرية (2015).

النتائج: تم تسجيل أعلى مستوى من المقاومة ضد السيفوتاكسيم حيث كانت مقاومة 29/20 (69٪). بينما تم تسجيل الحد الأدنى من المقاومة ضد الليفوفلوكساسين بمعدل مقاومة 27,5٪ (29/8).

الخلاصة: كان معدل انتشار استعمار GBS بين النساء الحوامل المشمولات في الدراسة25,9 % وهو متوافق مع العديد من الدراسات المحلية والدولية الأخرى. وبالتالي ، من المهم جدًا توسيع فحص المجموعة ب من المكور العقدى قبل الولادة بين النساء الحوامل لتجنب مضاعفات الأم والمولود.و يوصى بإجراء حساسية مضادات الميكروبات للنساء الحوامل المصابات بهذا الميكروب.