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Prevalence of Group B *Streptococcus* (GBS) among Pregnant Women Attending Al-Ramadi Teaching Hospital for Maternity and Children/ West of Iraq

Samar Sabah Erzaik[1]
Haidar Kadum Yakob[2]
Department of Biology, College of Education for Pure Sciences, University Of Anbar, Iraq
[1]sam22u1008@uoanbar.edu.iq [2]halsalamany@uoanbar.edu.iq

Abstract:

Group *B Streptococcus* (GBS) B (*Streptococcus agalactiae*) is a major infectious bacterium in pregnant women and newborns. In neonates, it can cause sepsis, pneumonia, meningitis, neurodevelopmental impairment, disability, and death. Due to the lack of published studies on the epidemiology and prevalence of GBS among pregnant women in Ramadi, western Iraq, this study aimed to determine the prevalence of GBS among pregnant women attending Ramadi Teaching Hospital for Gynecology and Pediatrics. One hundred and seventy vaginal samples were collected from pregnant women between 18 and 40 years of age, in their 35th and 39th weeks of pregnancy. The swabs were cultured on HichromeTM Strep B selective agar with selective supplements (Colistin, Nalidixic acid, and Gentamicin, HIMEDIA, India) and incubated for 24 hours at 37°C. Bacterial isolates were diagnosed based on cultural characteristics, blood agar hemolysis, microscopic examination after Gram staining, biochemical tests, and VITEK 2 Compact. The isolation rate of *Streptococcus agalactiae* was 41%, or 69 positive isolates. The study found that pregnant women between the ages of 26 and 30 are more susceptible to infection with Streptococcus agalactiae. Therefore, it is recommended that GBS testing be included in the routine testing of pregnant women, especially between weeks 35 and 37 of pregnancy, as this is the optimal time to detect the presence of the bacteria. Early diagnosis and treatment help reduce complications for the mother and fetus and increase the chances of a safe delivery.

Keywords: Group B *Streptococcus*, *Streptococcus bacteria*, Pregnant women, Newborns, Iraq

انتشار المكورات العقدية من المجموعة ب (GBS) بين النساء الحوامل المراجعات لمستشفى الرمادي التعليمي للولادة والأطفال / غرب العراق

سمر صباح إرزَيك[1]
حيدر كاظم يعقوب[2]
قسم علوم الحياة، كلية التربية للعلوم الصرفة، جامعة الأنبار، العراق[1.2]
[1]sam22u1008@uoanbar.edu.iq [2]halsalamany@uoanbar.edu.iq

الملخص:

تُعد المكورات العقدية من المجموعة ب (Streptococcus agalactiae) من البكتيريا المُمرِضة الرئيسية لدى النساء الحوامل وحديثي الولادة. حيث يمكن أن تتسبب لدى الأطفال حديثي الولادة في الإصابة بتسمم الدم، الالتهاب الرئوي، التهاب السحايا، ضعف في النمو العصبي، الإعاقة، وحتى الوفاة. ونظرًا لندرة الدراسات المنشورة حول وبائيات وانتشار هذه البكتيريا بين النساء الحوامل في مدينة الرمادي، غرب العراق، هدفت هذه الدراسة إلى تحديد مدى انتشار المكورات العقدية من المجموعة ب بين النساء الحوامل المراجعات لمستشفى الرمادي التعليمي لأمراض النسائية والأطفال .تم جمع 170 عينة مهبلية من نساء حوامل تتراوح أعمارهن بين 18 و40 سنة، وكنّ في الفترة ما بين الأسبوع 35 إلى 39 من الحمل. تمت زراعة المسحات على وسط HichromeTM Strep B الانتقائي المدعّم بمضادات حيوية انتقائية (كولستين، حمض النااليديكسيك، وجنتاميسين – من شركةHIMEDIA ، الهند)، ثم حُضنت الأطباق لمدة 24 ساعة بدرجة حرارة 37 مئوية جرت عملية تشخيص العزلات البكتيرية بالاعتماد على الخصائص الزرعية، وأنماط التحلل على وسط الآغار الدموي، والفحص المجهري بعد تلوين غرام، بالإضافة إلى الاختبارات الكيميائية الحيوية، وجهاز .VITEK 2 Compact بلغ معدل عزل بكتيريا Streptococcus agalactiae نحو 41%، أي ما يعادل 69 عزلة موجبة. وقد أظهرت الدراسة أن النساء الحوامل ضمن الفئة العمرية من 26 إلى 30 عامًا أكثر عرضة للإصابة بهذه البكتيريا. وبناءً على ذلك، توصي الدراسة بإدراج فحص المكورات العقدية من المجموعة ب ضمن الفحوصات الروتينية للنساء الحوامل، وخصوصًا ما بين الأسبوعين 35 و37 من الحمل، حيث يُعد هذا التوقيت الأنسب للكشف عن وجود البكتيريا. إن التشخيص المبكر والعلاج المناسب يُسهمان في تقليل المضاعفات لدى الأم والجنين، ويزيدان من احتمالية حدوث ولادة آمنة.

الكلمات المفتاحية: المكورات العقدية من المجموعة ب، البكتيريا العقدية، النساء الحوامل، حديثو الولادة، العراق

1.Introduction

Group B *Streptococcus agalactiae* bacteria are Gram-positive bacteria that are naturally present in the human body (in the urinary and reproductive systems) (Le Doare et al., 2017). They are among the most common bacteria that cause invasive infections, especially in pregnant women and newborns, and can lead to many diseases, including meningitis, encephalitis, sepsis, and neonatal pneumonia (Vekemans et al., 2019; Madrid et al., 2017). The period between 35 and 37 weeks of pregnancy is the period during which pregnant women are most susceptible to group B *Streptococcus agalactiae* infection. Therefore, this is the optimal period for screening and treatment to prevent transmission from mother to child and reduce the complications it may cause (Schrag et al., 2016). As for its global prevalence, studies have varied widely, with global prevalence rates ranging between 10% and 35% (Seale et al., 2016). This variation in prevalence is attributed to multiple factors, such as geographic location, level of personal hygiene, health awareness, and periodic examinations during pregnancy. Furthermore, the type of test used for diagnosis plays a significant role, as molecular diagnostic techniques such as PCR show more accurate results than

traditional diagnostic methods (Verani et al., 2020). Despite the importance of the topic, studies currently addressing its prevalence in Iraq (and western Iraq in particular) are very few. Therefore, this study aimed to determine the prevalence of *Streptococcus agalactiae* type B among pregnant women attending the Ramadi Teaching Hospital for Gynecology and Pediatrics.

2.Materials and Methods

1.2Specimens Collection

170 samples were collected from pregnant women at the end of the third trimester (weeks 35 to 37), the period suitable for the growth of *Streptococcus agalactiae*. Vaginal swabs were taken using cotton swabs soaked in saline and then transferred to the laboratory for testing to detect the bacteria and determine the infection rate.

2.2 Bacterial Isolation and Identification

Samples were cultured on Hichrome™ Strep B agar containing antibiotics that promote the growth of Streptococcus agalactiae only. Plates were incubated at 37°C for 24 hours, and the colonies were transferred to Hichrome™ Strep B agar to confirm selectivity and Blood agar to observe hemolysis. Bacteria were identified based on colony morphology, hemolysis type on blood agar, microscopic examination after Gram staining, and biochemical tests. Bacterial identification was confirmed using a VITEK 2 Compact (Rosa et al., 2014).

3.Results and Discussion

The results of the study showed that of the 170 vaginal samples collected from pregnant women at Ramadi Teaching Hospital for Gynecology and Pediatrics, the percentage of Streptococcus agalactiae isolation was 41% (69 isolates) positive, while 101 isolates (59%) were negative for this bacterium.

Colonies of this bacterium appeared after incubation for 24 hours at 37°C on Hichrom strep B Selective Agar medium as round colonies with regular edges and a blue or blue-green color (Figure 1).

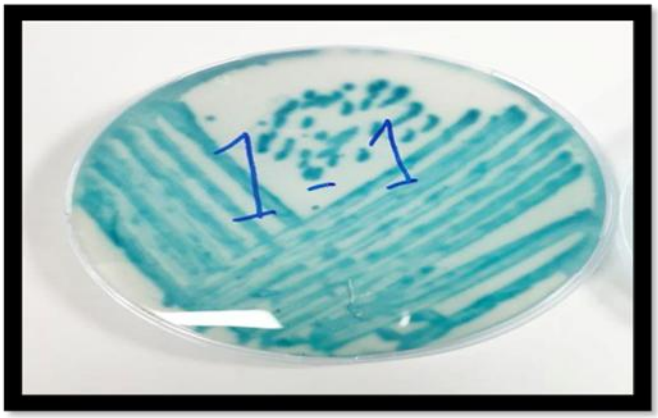

Figure 1 Streptococcus agalactiae colonies on Hichrom strep B Selective Agar

Hichrom strep B Selective Agar is a selective medium for isolating these bacteria. It facilitates diagnosis, as *Streptococcus agalactiae* appears blue. This color results from the breakdown of the gel substrate by the enzyme β-lactamase, which documents the diagnosis (siegrist, 2023).

When *Streptococcus agalactiae* was examined under a light microscope after staining with Gram stain, the bacterial cells appeared Gram-positive, spherical (cocci) in shape. These cells are nodular and arranged in chains (Figure 2).

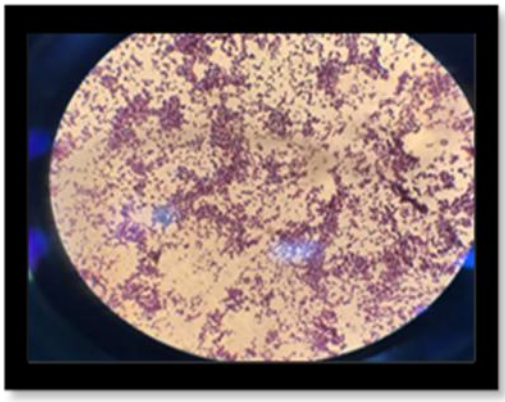

Figure (2) Streptococcus agalactiae cells stained with Gram stain under a light microscope (magnification power 400x).

Cultivation of this bacterium on Blood Agar at 37°C for 24 hours revealed that it is capable of β-hemolysis, which is considered a virulence factor as it causes hemolysis. This bacterium also has the ability to produce streptolysin toxins, which leads to tissue penetration and disintegration, thus spreading the infection.

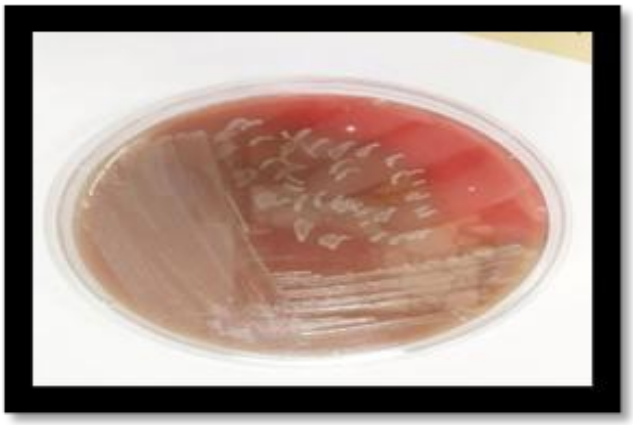

Figure 3 Streptococcus agalactiae isolates on Blood Agar medium

A total of 170 vaginal samples were collected from pregnant women at Ramadi Teaching Hospital for Gynecology and Pediatrics. The incidence of *Streptococcus agalactiae* in pregnant women at Ramadi Teaching Hospital for Gynecology and Pediatrics was 41% (69 culture-positive samples) (Table 1). This rate is high compared to previous studies. The results of a study conducted in India (Rosin and Margarit, 2025) showed an incidence of 18.6%, which is lower than our study. This difference is attributed to environmental and living conditions and the period in which the study was conducted. Hassan & Saleh, 2019) found in their study conducted in Duhok Governorate, Iraq, that the incidence of *Streptococcus agalactiae* was 22.2%. This difference is attributed to differences in social environments, environmental conditions, and the availability of healthcare for pregnant women.

Table 1: Number and percentage of *Streptococcus agalactiae* isolates

Total number of samples	Number of positive cases (%)	Number of negative cases (%)
170	69 (41%)	(%59) 101

The study results also showed that the highest rate of infection with *Streptococcus agalactiae* was 13.5% in women aged 26-30 years, with 23 culture-positive cases. The lowest isolation rate was 3.5% in pregnant women aged 36 years and older, with 6 culture-positive cases. This indicates that the infection rate varies by age (Table 2).

Table 2: Rates of infection with *Streptococcus agalactiae* in pregnant women by age group.

Age group (years)	Number of women	Positive cases	Infection rate %
20-17	36	12	7.0%
25-21	52	20	11. 8%
30-26	50	23	13.5%
35-31	20	8	4.7%
36 and above	12	6	3.5%
Total	170	69	41%

In their 2021 study conducted in China, Ling et al. indicated that the infection rate among pregnant women was 9.8% in the 25-29 age group, a rate similar to the results of our study. This may be due to the fact that this age group is the most fertile and is characterized by increased sexual activity, which creates a favorable environment for bacterial growth. At this age, hormonal changes occur, leading to bacterial growth compared to other ages, whether older or younger. The results shown in Table 3, which relate to the distribution of bacterial infections among the areas where the pregnant women under study resided, show that the highest prevalence of *Streptococcus agalactiae* was 6.4% in the Al-Jazeera region, followed by Al-Tash, where it was 4.1%, and then Al-Sufiyya, where it was 3%. Similar rates were recorded in other areas, such as Al-Hawz, 5 Kilo, Al-Malaab, Hit, and Zankura, while the lowest rates were in Al-Buaitha, Fallujah, and Hay Al-Bakr. When comparing these rates with those of a study conducted in Dohuk, Saadi and Ali (2023) recorded a prevalence rate of 4.51%, with rates varying according to geographical environment. There are several reasons for this discrepancy in rates, including personal hygiene, health awareness, and living conditions.

Table 3: Distribution of Streptococcus agalactiae bacteria by area of residence for pregnant women

Residential area	Number of women	Positive cases	Infection rate %
Al-tash	**9**	**7**	**4.1%**
Zangora	**8**	**6**	**3.5%**
Al-sofeya	**19**	**5**	**3%**
Al-jazera	**20**	**11**	**6.4%**
Al-jamiya	**14**	**2**	**1.2%**
hit	**8**	**4**	**2.4%**
Al-habania	**17**	**5**	**2.9%**
Al-malaab	**10**	**3**	**1.8%**
Al-tamim	**9**	**5**	**2.9%**
5-kilo	**8**	**6**	**3. 5%**

20 street	**6**	**1**	**0.6%**
Al-bakir	**3**	**1**	**0.6%**
Al-jamiea	**14**	**5**	**2.9%**
Al-boatha	**1**	**1**	**0.6%**
Al-faloja	**3**	**1**	**0.6%**
Al-qaam	**7**	**5**	**2.9%**
Al-hamdiya	**14**	**1**	**0.6%**
total	**170**	**69**	**41%**

The results of this study are consistent with what was indicated by (Kumar et al., 2024), where he proved that the variation in infection rates with Streptococcus agalactiae bacteria is due to differences in geographical reality and living conditions, which leads to a noticeable variation in prevalence rates between different regions.

4.Conclusions and Recommendations:

It was found that *Streptococcus agalactiae* bacteria were clearly widespread in the study sample. This spread is attributed to the bacteria's ability to resist and the living conditions of the sample according to the geographical area. Therefore, it is recommended to conduct periodic examinations for pregnant women, especially during the period of pregnancy between weeks (35-37) of pregnancy age, to reduce the risk of transmission to the newborn.

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