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Original research article

Vaginal colonization by group B Streptococcus among pregnant women and antibiotic resistance profile in some hospitals in N'Djamena, Chad

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ABSTRACT

Vaginal carriage of group B streptococcus in pregnant women is generally asymptomatic and often overlooked. This bacterium can cause severe infections in both mother and newborn, resulting in significant mortality and morbidity rates. This study aimed to evaluate the rate of asymptomatic carriage of group B streptococcus in pregnant women in Ndjamena and to assess the resistance profile of isolates obtained. Vaginal swabs collected from participants were subjected to bacteriological analysis. Bacteria were isolated on Columbia agar supplemented with fresh sheep blood, and the resulting colonies were subcultured under the same conditions to obtain pure colonies. Group B streptococcus identification was made using pure colonies and different techniques: control Gram stain, biochemical test (catalase), and the Lancefield test. Antibiogram was based on antibiotics frequently used to treat Group B Streptococcus infection and following EUCAST guidelines. Pregnant women (152) were enrolled in this study, aged from 14 to 38 years, predominantly represented by the age group [19-23 years] N = 48 (31.57%). The majority of women, 107 (70.39%), were housewives, and 100 (65.79%) of them had between 0 and 2 children. Gestational age ranged from 3 to 41 weeks of amenorrhea, and the most represented was [29 - 41 weeks] N= 81 (53.28%). The carriage rate was 21.05%, with cases of co-infection, the most frequent being Group B Streptococcus-Staphylococcus. The number of children per participant, abdominal pain, and itching were statistically associated with Group B Streptococcus carriage. The isolates showed a high level of antibiotic resistance, especially to ß-lactams, and sensitivity to vancomycin. Asymptomatic carriage of Group B Streptococcus is a reality in pregnant women, and the isolated strains exhibit a concerning antibiotic resistance profile.

Keywords: vaginal colonization, group B streptococcus, pregnant women, resistance profile, Chad.

RÉSUMÉ

Le portage vaginal du streptocoque du groupe B par la femme enceinte est généralement asymptomatique et souvent ignoré. Cette bactérie peut entraîner des infections sévères tant chez la mère que chez le nouveau-né à l'origine d'un important taux de mortalité et de morbidité. Cette étude visait à évaluer le taux de portage asymptomatique du streptocoque du groupe B par la femme enceinte à N'Djamena et à évaluer le profil de résistance des isolats obtenus. Des prélèvements vaginaux ont été effectués chez les participantes et soumis à une analyse bactériologique. Les bactéries ont été isolées sur gélose Columbia supplémentée en sang de mouton frais, et les colonies obtenues ont été repiquées dans les mêmes conditions afin d'obtenir des colonies pures. L'identification du streptocoque du groupe B a été réalisée à partir de ces colonies pures et par différentes techniques : coloration de Gram, test biochimique (catalase) et test de Lancefield. L'antibiogramme a été établi selon les recommandations de l'EUCAST et en fonction des antibiotiques fréquemment utilisés pour traiter les infections à streptocoque du groupe B. 152 femmes enceintes, âgées de 14 à 38 ans, ont participé à cette étude et la tranche d'âge la plus représentée était celle de [19-23] ans, N = 48 (31,57%). La quasi-totalité des femmes était au foyer N=107 (70,39 %) et 100 d'entre elles (65,79 %) avaient entre 0 et 2 enfants. L'âge gestationnel variait de 3 à 41 semaines d'aménorrhée, et la tranche la plus représentée était celle de [29-41 semaines] N= 81 (53,28%). Le taux de portage était de 21,05% avec des cas de co-infection dont le plus fréquent était le

streptocoque du groupe B (Staphylococcus). Le nombre d'enfants par participante, les douleurs abdominales et les démangeaisons étaient statistiquement liés au portage du streptocoque du groupe B. Les isolats ont montré un niveau élevé de résistance aux antibiotiques, surtout aux ß-lactamines, et une sensibilité à la vancomycine. Le portage asymptomatique du streptocoque du groupe B est une réalité chez la femme enceinte et les souches isolées présentent un profil de résistance aux antibiotiques inquiétant.

Mots clés: portage vaginal, streptocoque du groupe B, femmes enceintes, profil de résistance.

1. INTRODUCTION

Streptococcus genus includes ubiquitous bacteria comprising numerous species being commensal, saprophytic, or pathogenic. They are anaerobic, Gram-positive, coccus-shaped bacteria often arranged in diplococci or short chains. The streptococci' pathogenicity is limited to a few species, including group B streptococcus (GBS), whose scientific name is *Streptococcus agalactiae*. This is a beta-hemolytic bacterium whose main reservoir is the human gut or vagina, where they live as a commensal. Vaginal carriage of GBS is generally asymptomatic, but this bacterium can cause severe infections both in newborns and mothers. According to the World Health Organization (WHO), GBS infections around childbirth account for approximately one-tenth of the global burden of maternal deaths. Furthermore, an estimated one million neonatal deaths annually are associated with maternal infections before and during childbirth (WHO 2023). In addition to a considerable number of deaths and severe morbidity, women affected by GBS perinatal infections tend to suffer long-term disabilities (chronic pelvic pain, blocked fallopian tubes, etc.) (WHO 2023).

Maternal-fetal transmission is mainly aerodigestive, by inhalation or ingestion of contaminated amniotic fluid after rupture of membranes or during passage through the urogenital tract colonized by GBS (Group B Strep 2017). Premature birth, rupture of the membranes more than 18 hours before delivery, rupture of the membranes before the onset of labour, and intrapartum fever were found to be significant risk factors for newborn GBS infection (Oddie & Embleton 2002). Newborns can develop early or late infections with serious consequences. The number of deaths occurring in the neonatal period (0-27 days) is estimated at 41% in 2008, the main causes of death being complications of premature delivery and births from asphyxia, with a significant number of deaths due to pneumonia, meningitis and sepsis (Black *et al*. 2010, WHO 2026). The highest number of neonatal mortality cases is found in the countries of Southeast Asia (2.390 million deaths) and Africa (4.199 million deaths) (Black *et al*. 2010). Approximately 287,000 women died during or after pregnancy or childbirth, with nearly 95% of maternal deaths occurring in low- and middle-income countries in 2020 (WHO 2024). Despite the commitment and willingness of global health authorities to limit maternal mortality, we still observe many cases of maternal and child deaths in health facilities, especially in sub-Saharan Africa, where the health system still has many shortcomings. Pregnant women are exposed to several risk factors that can lead to these deaths during childbirth, and vaginal carriage of GBS occupies a prominent place among these factors. Systematic reviews of group B streptococcus infection during pregnancy and infancy aimed at estimating regional and global burden showed that in 2020, 231 800 early-onset and 162 200 late-onset infant GBS infection cases were estimated to have occurred (Gonçalves et *al*. 2022). In Sénégal, a positivity rate for GBS vaginal carriage of 15.4% was reported in pregnant women (Ngom et *al*. 2023). However, in Zimbabwe, a positivity rate of 75.2% was found (Mavenyengwa et *al*. 2010).

In Cameroon, groups B and D streptococci were the third most common germ responsible for neonatal meningitis, after pneumococcus and enterobacteria at the Yaoundé Central Hospital (Kago et *al*. 2010). A retrospective study conducted at the Yaoundé General Hospital from June 2001 to May 31, 2002 showed a vaginal carriage rate of GBS of 6.70% (Foumane et *al*. 2009). There is very little data on vaginal carriage of GBS in pregnant women and neonatal infections due to this bacterium in Chad. The precarious living conditions of populations, the lack of qualified personnel and adequate technical platforms are all factors that mean that pregnant women in Chad are not systematically treated during the prenatal period. Many of them are unaware that they are carriers of GBS at the time of delivery, thus increasing the risk of maternal mortality or neonatal infections, which can have serious consequences. Given the above regarding GBS and the lack of data on this subject in Chad, we hypothesise that the rate of GBS carriage among pregnant women would be high in this country. Therefore, this study aimed to assess the rate of vaginal carriage of GBS in pregnant women in three referral hospitals in Ndjamena, Chad, and to determine the resistance profile of isolated GBS.

2. MATERIAL AND METHODS

2.1. Study area

A prospective and cross-sectional study was conducted on vaginal carriage of GBS in pregnant women from August to October 2023. Participants were recruited in three referral hospitals in N'Djamena, Chad: the University Hospital for Mothers and Children (UHMC), the Abena Health Center (AHC), and the Union Hospital (UH). Bacteriological analysis of collected samples was carried out at the Laboratory of the National University Hospital of N'Djamena, which had an adequate technical platform. N'Djamena is a city located in the center-west of Chad, at the confluence of the Chari and Logone rivers, on the right bank of the Chari. Founded by the French explorer and administrator Émile Gentil on May 29, 1900, on a small Kotoko village site named Fort-Lamy. It has an estimated population of 1,454,671 inhabitants, including 773,982 men and 680,689 women, with an average density of 2,356.72 inhabitants/km² (INSEED 2023). The staple foods of Chadians are millet, sorghum, rice, meat (pork, beef, goat, mutton, chicken), and vegetables.

2.2. Sample size

All pregnant women received at one of the hospitals selected for this study during the study period constituted the study population. A sample size of 139 participants was estimated according to the Lorenz formula using a prevalence of 10% found in a previous study (ANAES 2023).

$$N = \frac{t^2 \times P(1-P)}{m^2};\ N = \frac{1{,}96^2 \times 0{,}1 \times (1-0{,}1)}{0{,}05^2} = 138{,}2976 \cong 139$$

N: minimum sample size for obtaining significant results

t: confidence level (the typical value for the 95% confidence level was 1.96)

p: relative prevalence borrowed from the literature 10% = 0.1

m: margin of error (generally set at 5% = 0.05)

2.3. Participant recruitment and sample collection

All pregnant women who came to the three selected hospitals for cervical vaginal swab (CVS) examination during our study period were approached. Those who consented to participate in our study and had not taken antibiotics in the previous 15 days were recruited. Women who did not consent to participate in the study or who were receiving antibiotic therapy were not recruited. After obtaining each woman's consent during a confidential interview, informed consent was signed, and each woman's personal information (sociodemographic and clinical) was recorded on a pre-prepared collection sheet. Each participant was positioned in the gynaecological position. We swabbed the entire vaginal cavity (exocervix), particularly the lower half of the vaginal wall, up to the vulvar orifice (ANAES 2023). Sampling was carried out under strict aseptic conditions to avoid possible contamination. The collected samples were packed in a cooler and immediately transported to the laboratory of the National University Reference Hospital of N'Djamena for bacteriological analysis. Vaginal sampling is neither traumatic nor potentially iatrogenic, but prior psychological preparation of the participant was necessary.

2.4. Ethical consideration

This study was performed in line with the principles of the Declaration of Helsinki (direct involvement of women on whom the cervicovaginal sampling was carried out). Approval was granted by the National Ethics Committee of Chad with approval number 066/MESRI/SE/ SG/CNBT/2023 on 04th December 2023. Informed consent was obtained from all individual participants included in the study, as well as research authorizations from managers of selected hospitals for the study.

2.5. Bacteriological Analysis of Samples

Macroscopic examination was performed on all samples to note their abundance, appearance, odor, and color of leukorrhea. Samples analysis in a drop of physiological saline between slide and coverslip to assess the motility, morphology, and clustering pattern of bacteria, as well as abnormal presence of cells such as epithelial

cells and leukocytes. Microscopic observation of samples after Gram staining allowed observation of Gram-positive cocci, their shape and color, and GBS clustering pattern (short chains). Samples were inoculated using the quadrant technique onto Columbia Blood Agar previously prepared and incubated at 37°C for 24 hours in an atmosphere enriched with 5 to 10% CO_2 (**Choi et *al*. 2022)**. Gram control staining on colonies obtained was performed before subculturing on fresh blood agar and incubating at 37°C for 24 hours to obtain pure GBS colonies, which were used to further identify GBS and determine the resistance profile of GBS isolates obtained. Other germs were isolated in samples by inoculating culture media such as Chapman agar and CHROMagar Candida. GBS identification was based on the Gram type (Gram+), morphological (cocci), and cultural characteristics (beta-hemolytic colonies on blood agar). The catalase test distinguished streptococci (negative) from staphylococci (positive). The Lancefield identification test based on the immuno-optical detection of the group B polysaccharide antigen of streptococci (Pastorex™ Strep B Latex 61727 agglutination test) was used to confirm the GBS identification **(Lancefield 1966)**. Two or three pure GBS colonies isolated on Columbia Blood Agar were placed onto a drop of latex reagent at the periphery of the agglutination card, then the colonies were carefully emulsified to obtain a homogeneous suspension, and the suspension was spread over the entire surface of the circle. The card was gently shaken horizontally and observed for agglutination visible to the naked eye formed within one minute. The size of the agglutinates and the speed of their appearance depended on the antigenic concentration of the extract (**Lancefield 1966)**.

2.6. Resistance Profile of GBS Isolated

Antibiogram is an in vitro susceptibility test of bacterial isolates to a range of antibiotics using the agar diffusion technique to guide the treating physician's prescription. It consists of collecting a few pure GBS colonies from a 24-hour pure culture and introducing them into a hemolysis tube containing 5 mL of physiological saline and shaking vigorously to obtain an inoculum; turbidity was adjusted to the 0.5 Mac Ferland standard (approximately 10^8 CFU/mL).

Fresh blood Columbia agar was flood-inoculated using the prepared inoculum. Seven discs impregnated with different antibiotics commonly used to treat GBS infection were firmly placed on the agar surface, and inoculated plates were incubated at 37°C in an atmosphere enriched with 5 to 10% CO_2 for 18 to 24 hours. Two outcomes were possible: resistant or susceptible, depending on the inhibition diameter around the antibiotic disc **(EUCAST 2023)**.

2.7. Statistical Analyses

Data collected were entered into spreadsheets and checked for completeness using MS Excel. Data were cleaned and imported to Statistical Package for Social Sciences (SPSS) version 22.0 biostatistics software. Categorical variables were presented as frequency and percentage, whereas continuous variables were expressed as median. Association between participants' characteristics and GBS positivity was analyzed using chi-squared tests, and the level of significance was set at $P < 0.05$.

3. RESULTS

3.1. Sociodemographic characteristics of participants

One hundred and fifty-two (152) pregnant women were recruited in this study, including 78, 70, and 4, respectively, in UH, AHC, and UHMC. Participants' ages ranged from 14 to 38 years, with a mean age of 25.30 and a median of 24.00. The most represented age group was [19-23 years] N = 48 (31.57%), followed by [24-28 years] N = 47 (30.92%); the least represented age group was [14-18 years] N = 17 (11.88%). Five different occupations were identified, including 107 (70.39%) housewives, 23 students (15.13%), and civil servants were the least represented with N = 5 (3.28%). One hundred participants (65.79%) had 0 to 2 children, 40 (26.31%) between 3 and 5 children, and 12 (7.89%) had more than 6 children (Table 1).

Table 1: Socio-demographic characteristics of participants and association with GBS positivity

Variables	Number (n)	Percentage (%)	GBS Positivity		Khi2	P-value
			Number	%		
Age (years)						
[14 ; 18]	17	11.18	5	29.41	2.487	0.647
[19 ; 23]	48	31.57	11	22.91		
[24 ; 28]	47	30.92	7	11.89		
[29 ; 33]	22	11.84	4	18.18		
[34 ; 38]	18	14.47	5	27.77		
Mean age	14					
Median (years)	24.00					
Marital Status						
Single	35	16.44	6	24	0.156	0.693
Married	127	83.55	26	20.47		
Occupation						
Seller	8	5.26	3	37.5	1.694	0.792
Student (secondary education)	23	15.13	5	21.73		
Student (higher education)	8	5.26	1	12.5		
Housewife	107	70.39	22	20.37		
Civil servant	5	3.28	1	20		
Number of children						
[0 ; 2]	100	65.78	21	21	7.81058	**0.020**
[3 ; 5]	40	26.31	5	12.5		
≥6	12	7.89	6	50		

3.2. Clinical characteristics of participants

Regarding clinical characteristics, 108 (71.05%) participants had previously given birth more than once compared to 44 (28.94%) who were giving birth for the first time. 83 (54.60%) were multiparous, 46 (30.22%) nulliparous, and 23 (15.13%) primiparous; 3 (1.97%) participants already had a miscarriage. Gestational age ranged from 3 to 41 weeks of amenorrhea, and the most represented gestational age range was [29 - 41 weeks] N= 81 (53.28%); the least represented was >41 weeks N= 1 (0.66%). 146 (96%) participants had no prior medical history; one (0.65%) participant had each of the following conditions: asthma, hepatitis B, and hypotension; 3 (1.97%) participants had previously experienced a miscarriage. Normal vaginal flora was found in 121 (79.6%) pregnant women versus 31 (20.39%) abnormal (unbalanced) vaginal flora. Vaginal discharge was scant, abundant, and very abundant in 21 (13.81%), 116 (76.31%), and 15 (9.86%) participants, respectively. The color of vaginal discharge was whitish, yellowish, and greenish in 145 (95.39%), 4 (2.63%), and 3 (1.97%) participants, respectively. Abdominal pain and itching were observed in the same number of participants, present in 62 (40.78%) and absent in 90 (59.21%) (Table 2).

Table 2: Clinical characteristics of participants and association with GBS positivity

Variables	Number (n)	Percentage (%)	GBS Positivity		Khi2	P-value
			Number	%		
Pregnancy						
Multigravida	108	71.05	21	(19.44)	0.581	0.446
Primigravida	44	38.95	11	(25)		
Parity						
Multiparous	83	56.61	18	(21.68)	1.134	0.567
Nulliparous	46	30.26	11	(23.91)		
Primiparous	23	15.13	3	(13.04)		
Gestational Age (Weeks of Amenorrhea)						
[3 ; 15]	11	7.23	4	(36.36)	2.165	0.539
[16 ; 28]	59	38.82	13	(22.03)		
[29 ; 41]	81	53.28	15	(18.51)		
>41	1	0.66	0			

Variables	Number (n)	Percentage (%)	GBS Positivity		Khi2	P-value
			Number	%		
Medical History						
Asthma	1	0.65	0			
Miscarriage	3	1.97	0			
Hepatitis B	1	0.65	0		5.086	0.279
Hypotension	1	0.65	1	100		
None	146	96.05	31	21.31		
Assessment of Vaginal Flora						
Normal	121	76.60	25	(20.66)	0.055	0.815
Imbalanced	31	20.39	7	(22.58)		
Leukorrhea						
Small	21	13.81	3	(14.28)		
Abundant	116	76.31	27	(23.27)	1.461	0.482
Very abundant	15	9.86	2	(13.33)		
Color of Leukorrhea						
Whitish	145	95.39	29	(20)		
Yellowish	4	2.63	2	(50)	2.386	0.303
Greenish	3	1.97	1	(33.33)		
Abdominal Pain						
Yes	62	40.78	19	(30.64)	5.797	**0.016**
No	90	59,.21	13	(14.44)		
Itching						
Yes	62	40.78	19	(30.64)	5.797	**0.016**
No	90	59.21	13	(14.44)		

3.3. GBS positivity and other organisms in pregnant women

In this study, a total of 152 samples were analyzed, and 32 were GBS positive, representing the positivity rate of 21,05% (Figure 1).

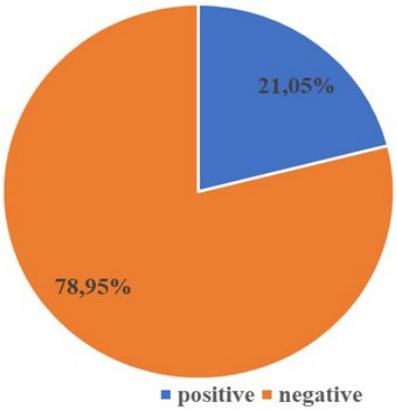

Figure 1: Group B Streptococcus carriage rates in pregnant women

Other organisms were isolated from these samples; Staphylococcus sp. was the most common, 41.44% (n=63), followed by *Staphylococcus aureus* 17.76% (n=27), and *Candida albicans* 15.78% (b=24). The least common organisms were *Streptococcus dysgalatiae* 0.65% (n=1). Co-infection of GBS with other organisms was noted, particularly GBS/Staphylococcus sp in 12 participants (7.89%), followed by GBS - *S. aureus* co-infection 6.57% (n=10), GBS - *C. albicans* 5.36% (n=8), and GBS - *Candida glabrata* 0.065% (n=1) (Table 3).

3.4. Association between GBS positivity and participant characteristics

Among all sociodemographic characteristics of women recruited in this study, only the number of children per recruited woman showed a statistical association with GBS positivity, with P-value = 0.020 ($P < 0.05$) (Table I). Regarding clinical characteristics, abdominal pain and itching showed a statistical association with GBS positivity, with a P-value = 0.016 ($P < 0.05$) for each one (Table 2).

Table 3: Other organisms isolated from samples.

Germs isolated		Number	%
Staphylococcus	sp	63	41.44
	aureus	27	17.76
Streptococcus faecalis		1	0.7
Candida albicans		24	15.78
Candida glabrata		2	1.31
Gardnerella vaginalis		5	3.28
Streptococcus dysgalatiae		1	0.65
Co-infections			
SGB-Staphylococcus	sp	12	7.89
	aureus	10	6.57
SGB-*Candida albicans*		8	5.36
SGB-*Candida glabrata*		1	0.065

3.4. Resistance Profile of GBS Isolates

GBS strains isolated from our samples showed variable resistance to the tested antibiotics. Among 32 isolates tested, we observed the following results: 31.25% (N=10) of isolates were resistant to penicillin G, 1% (N=3.25) were resistant to vancomycin, 25% (N=25) to clindamycin, 50% (N=16) to erythromycin, and 37.50% (N=12) to levofloxacin. 100% (N=32) of the isolates obtained were resistant to amoxicillin, and 65.62% (N=21) to gentamicin (Figure 2).

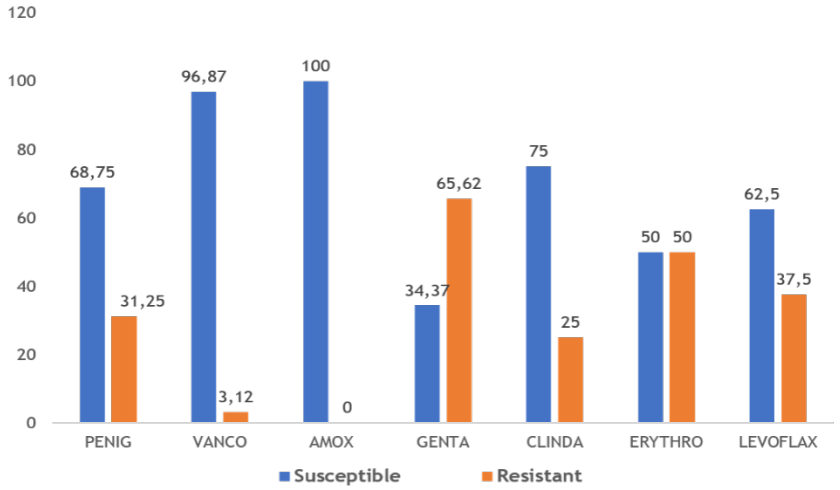

Figure 2: Antibiotic resistance profile. PENIG: Penicillin, VANCO: Vancomycin, AMOX: Amoxicillin, GENTA: Gentamicin, CLINDA: Clindamycin, ERYTRO: Erythromycin, and LEVOFLOX: Levofloxacin

4. DISCUSSION

This study involved 152 pregnant women recruited from three hospitals in N'Djamena, with an average age of 14 years, ranging from 14 to 38 years. The minimum age of 14 years reflects the early marriages observed in Chad, which would explain the lower average age than that found in a study conducted in two hospitals in Yaoundé (26.6) (Mve et *al*. 2017). Overall, 32 participants were positive for GBS, with a positivity rate of 21.05%, indicating that GBS is present in pregnant women. This rate is roughly equal to that found in a study conducted in the Marrakech region (20.2%), in which 52 pregnant women were positive out of 257 recruited (Bassir et *al*. 2016). However, it is very high compared to the rate of 6.70% reported by a study conducted at the Yaoundé General Hospital, certainly because the latter was a retrospective study based on the analysis of laboratory documents (Foumane et *al*. 2009). Similarly, another study conducted in Senegal reported a lower positivity rate than that found in the present study (Ngom et *al*. 2023). Although this study lasted 3 months, including 152 women, while the Senegalese study lasted 6 months, including 279 women, these differences could indicate that pregnant women in Chad are more exposed to GBS than those in Senegal. Pregnant women appear to be increasingly exposed to asymptomatic GBS carriage, given the prevalence, which has been increasing over time.

Other pathogens were isolated among the participants; Staphylococcus was the most common (N=90, 59.21%), and GBS-Staphylococcus coinfection was more common, particularly GBS-*S. aureus* coinfection, which alone accounted for 6.57%. In contrast, *Candida albicans* was more common (48.45%) among pregnant women at the Yaoundé General Hospital, likely due to the difference in approaches and technical platforms used in the two studies (Foumane et *al*. 2009).

Among all socio-demographic characteristics studied, only the number of children per woman recruited showed a statistically significant association with GBS, with a P-value of 0.020, which is lower than 0.05. This is in contrast to Foumane's team, which found no statistical link with socio-demographic parameters and GBS carriage by pregnant women (Foumane et *al*. 2009). Similarly, abdominal pain and itching showed a statistical link with GBS carriage, with a P-value of 0.016 each. These two clinical parameters appear to be warning signs of GBS carriage; in contrast, a previous study showed that in Zimbabwe, women living in rural areas were significantly more colonized than those who lived in urban areas ($p < 0.001$) (Mavenyengwa et *al*. 2010). Other clinical parameters, such as vaginal discharge, color, and odor of leukorrhea observed in some participants, could be due to other germs isolated from them. These symptoms were confirmed by a vulvovaginal candidiasis study in women conducted in Algeria (Foughali et *al*. 2021).

The GBS strains isolated in this study exhibited high resistance to ß-lactam antibiotics, with 31.25% resistance to Penicillin G and 100% to Amoxicillin. The same observation was made in pregnant women followed in two hospitals in Yaoundé (Mve et *al*. 2017). In contrast, GBS isolated in previous studies were sensitive to penicillin and vancomycin (Al-Hamad et *al*. 2023). Self-medication, constant pre-registration of ß-lactams, especially amoxicillin and ampicillin in hospitals and prenatal consultations, the sale of ATB without prescription in pharmacies, and the use of street drugs could be the causes of the emergence of this resistance. ANAES recommends macrolides as an alternative in case of resistance to ß-lactams in per-partum antibiotic prophylaxis of GBS infection in pregnant women. However, we observed 50% resistance to Erythromycin and 25% to Clindamycin. These rates correspond to those found by Maharane *et al* in 2019 (Maharane et *al*. 2019), with 50% resistance to Erythromycin, and the National Reference Center (NRC) Streptococcus agalactiae in 2012, found a resistance rate of 24.5% to Clindamycin (Sacheli et *al*. 2012). Strong resistance was observed with Levofloxacin, with 37.50%; this rate is much higher than that established by the CNR SGB in 2012, with a resistance of 2.02% to levofloxacin. Some strains showed significant resistance to gentamicin, with 68.97%. The isolated strains were sensitive to Vancomycin at 96.87%; this rate corresponds to that of Lahmar et al between 2014 and 2023 in Saudi Arabia, with 100% sensitivity of SGB strains to Vancomycin (Lahmar et *al*. 2014, Al-Hamad et *al*. 2023).

5. CONCLUSION

Vaginal carriage of GBS by pregnant women, which is generally asymptomatic, can lead to severe infections in both the mother and the newborn, resulting in significant mortality and morbidity. The objective of this study was to assess the GBS carriage rate among pregnant women in three hospitals in N'Djamena.

Among 152 pregnant women enrolled in our study, 32 tested positive for GBS carriage, representing a prevalence of 21.05%. Coinfections were reported in some participants. GBS isolates showed high resistance to ß-lactams, levofloxacin, and gentamicin, and most were susceptible to vancomycin. It is critically important to follow adequate prophylaxis during the last weeks of pregnancy.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE: This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the National Ethics Committee of Chad with approval number 066/MESRI/SE/SG/CNBT/2023 on 04th December 2023. Informed consent was obtained from all individual participants included in the study.

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Original draft preparation. All authors: Visualization, Investigation. Boyomo Onana: Supervision. Solange Meyin A Ebong: Writing- Reviewing and Editing.

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