Prevalence of Group B streptococcus colonization during labour in Sudanese women

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Abstract

Background: Group B streptococcus (GBS, *Streptococcus agalactiae*) is recognized as a major cause of neonatal sepsis and meningitis. The prevalence of GBS colonization is very variable across the world. There is no published data on the prevalence of GBS among Sudanese women.

Method: A cross-sectional study was conducted at Khartoum Teaching Hospital, Sudan. Obstetric data, low vaginal and rectal swabs were collected during labour.

Results: Two hundred women were included. Only one case of GBS colonization during labour was identified giving a prevalence of 0.5%. Almost 12% of the study population reported use of antibiotics in the last two weeks preceding labour, which may be a factor in the low culture positive rate.

Conclusion: There is a low prevalence of GBS intra-partum colonization among Sudanese women.

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Background and literature review

Group B streptococcus (GBS, *Streptococcus agalactiae*) is recognized as a major cause of neonatal sepsis and meningitis [1-3].

GBS infection acquired from the colonized birth canal during labour or after membrane rupture can lead to miscarriage, stillbirth, prematurity, or invasive neonatal disease [4]. Vaginal colonization with GBS is acquired from the gastrointestinal tract and a large proportion of healthy adults are colonized [5].

The prevalence of GBS colonization is very variable across the world ranging between 1.8% to 26% in various studies [6-14]. Maternal GBS colonization varies by population characteristics such as age, parity, socio-economic status and geographic location [10]. Therefore, a policy of screening of all pregnant women for GBS has been adopted by some countries [2]. Intra-partum antibiotic prophylaxis in cultures-positive women is associated with a 70% reduction in neonatal early-onset sepsis [15].

There is no published data on GBS among Sudanese women; therefore, this study was conducted to determine the prevalence of GBS colonization among parturient women and to verify the risk factors associated with colonization.

Method

A cross-sectional study was conducted at Khartoum Teaching Hospital, Sudan, over a period of five months.

After signing an informed consent, data was collected to gather socio-demographic characteristics, obstetric history and the outcome of labour using a pretested data collection form.

The sample size was calculated using (Kish L. 1965) $n = (Z_{1-\alpha})^2(P(1-P)/D^2)$

where n = sample size,

Z = Z statistic for a level of confidence of 95%, which is conventional, Z1-α value is 1.96

P = expected prevalence, in the absence of local data, was taken as the median prevalence of GBS carriage among pregnant women in developing countries (12%), [16]

d = precision (in proportion of one; if 5%, d = 0.05).

The calculated required sample size was 162

Low vaginal and rectal swabs were taken and sent to the laboratory within one hour for culture.

Swabs were cultured on blood agar and Mc Conky agar. The isolated organism was confirmed as GBS by Lancefield grouping after the observation of complete zone haemolysis. Antimicrobial sensitivity was determined for positive swabs. Sensitivity test was done using Bioanalyse antibiotic kit, in Muller Hinton culture media with the use of Mac Farland 0.5 as a standard.

Ethical approval was obtained from the Ethical Committee of Sudan Medical Specialization Board and the Hospital Research Ethics Committee.

Results

Two hundred women were included in the study. Age ranged from 15 – 41 years with a mean (SD) of 27.0 (5.8) years. Demographic data and previous history are summarised in Table (1).

Table (1) Demographic data and previous history of the study population

	Mean (SD)
Age	27.0 (5.8)
Parity	1.7 (2)
Gestational age	38.5 (2.5)
	Number (%)
Urban residence	149 (74%)
Secondary school education and above	149 (74%)
Regular Ante-natal care	192 (96%)
History of miscarriage	34 (17%)
History of urinary tract infection	108 (54%)
History of vaginal discharge	53 (26.5%)

Three women(1.5 %) had diabetes mellitus. The haemoglobin concentration of the participants ranged from 9 to 14.5 gram/dl with a mean (SD) of 11.6 (1.17) g/dl.

In 50% of the cases, vaginal and rectal swabs were taken after rupture of the membranes. The interval between membrane rupture and delivery was more than 18 hours in 21 women (10.7%).

One hundred eighty six (93%) and 14 (7%) had spontaneous and induced labour, respectively. One hundred seventy four (87%), 9 (4.5%) and 17(8.5%) delivered vaginally, had instrumental delivery and had emergency caesarean section, respectively. Fifteen (7.5%) women had pre-term delivery (< 37 weeks)

Antibiotics were used intra partum in 17women (8.7%), while 23 (11.9 %) reported positive history of using antibiotics in the last two weeks before delivery. The most commonly used antibiotic was the broad spectrum second generation Cephalosporin, Cefuroxime.

The culture was positive in one woman (0.5%) who was a 22 years old, para 2, secondary school graduate, had regular antenatal care and did not use any antibiotics in the two weeks preceding labour. The swabs were taken before rupture of the membranes.

The isolated GBS was sensitive to penicillin, Erythromycin, Cefuroxime, Ceftriaxone, Ceftazidime, Amikacin and Ciprofloxacine but was resistant to Cephalexin.

Table (2) Prevalence of GBS during pregnancy/labour in studies from some countries

Study	Country of study	Prevalence
Steenwinkel et al., 2008 (8)	Mozambique	1.8%
Sharmila et al., 2011(12)	South India	2.3%
Woldu et al., 2014 (26)	Ethiopia	7.2%
Chan et al., 2013 (27)	Bangladesh	7.7%
Puccio et al., 2014 (13)	Italy	8%
Eun Ju Kim et al., 2011 (11)	Seoul Korea	8%
Drowela et al., 2005 (28)	Malawi	16.5%
Hassan et al., 2011(29)	UK	19%
Kraśnianin et al., 2009 (9)	Poland	20%
Mitima et al., 2014 (30)	Democratic Republic of the Congo	20%
Javanmanesh et al., 2013 (7)	Iran	22.8 %
Agricola et al., 2009 (14)	Tanzania	23%
Mavenyengwa et al., 2010 (10)	Zimbabwe	23%
Campbell et al., 2000 (6)	USA	26%

Discussion

The main finding of the current study was the low prevalence (0.5%) of GBS. However, a low prevalence was reported in Seoul Korea (8%) [11], South India (2.3%)[12] and Mozambique (1.8%) [8]. This prevalence is low when compared to a prevalence of around 20-25 % in other countries like Iran [7], Poland [9] and Zimbabwe [10]. Table (2)

In this study, 11.9% had history of antibiotics use in the two weeks preceding labour, which could explain the low prevalence (0.5%) of GBS in this setting. In addition to that, a high room temperature more than (30 ^{0}C) was reported to be associated with loss of positive cultures [17] which is another possible factor as it is usually very hot in this country .

The prevalence of diabetes in this study was 1.5% slightly lower than the reported prevalence of 2-6% in other international and local studies [18-20]. However, GBS positivity during pregnancy was reported not to be associated with diabetes [21]

Intra-partum clinically-suspected chorioamnionitis is known to be present in 4%–10% of women in

labour[22]; In our study antibiotics were administered in 8.7% of the cases due to this suspicion. In spite of the low prevalence of GBS in this population the incidence of pre-term labour is comparable to the international literature of 7-11% [23, 24]

Caesarean section and intact membranes did not seem to prevent the transmission of GBS to a newborn in a Polish study [9]

The most commonly used antibiotic during this study was the second generation Cephalosporin, Cefuroxime, and the isolated GBS was found to be sensitive to it as supported by other studies [25]

Conclusion

There is low prevalence of GBS among the studied parturient Sudanese women (0.5%). Although this low prevalence does not support routine antenatal screening, further studies including a larger population as well as studies looking at the incidence of GBS neonatal infections are recommended to guide establishing the appropriate screening polices.

Conflict of Interest

The authors declare that they do not have competing interests.

Author and Contributors

HA, SS and IA initiated the research idea and drafted the proposal. . SS and DR collected the samples and data. SA and NA performed the laboratory work. HA, DR and IA supervised the research, performed the data analysis. All authors contributed to the writing of the paper and approved the final manuscript.

References

1- Bergeron MG, Ke D, Menard C, Picard FJ, Gagnon M, Bernier M, et al. Rapid detection of group B streptococci in pregnant women at delivery. *N Engl J Med*. 2000 ; 343: 175–179.

2- Schrag S, Gorwitz R, Fultz-Butts K, Schuchat A. Prevention of perinatal group B streptococcal disease. Revised guidelines from CDC. MMWR Recom Rep. 2002; 51:1–22.

3- Hyde TB, Hilger TM, Reingold A, Farley MM, O'Brien KL, Schuchat A, et al. Trends in incidence and antimicrobial resistance of early-onset sepsis: population-based surveillance in San Francisco and Atlanta. Pediatrics.2002; 110:690–695.

4- Edwards MS, Baker CJ. Group B streptococcal infections. In: Remington JS,Klein JO, editors. Infectious diseases of the fetus and newborn infant. 5th edition. Philadelphia: Saunders; 2001. p.1091–156.

5- Van der Mee-Marquet N, Fourny L, Arnault L, Domelier AS, Salloum M, Lartigue MF, Quentin R. Molecular characterization of human-colonizing Streptococcus agalactiae strains isolated from throat, skin, anal margin, and genital body sites. *J. Clin. Microbiol*. 2008;46:2906-11.

6- Campbell JR, Hillier SL, Krohn MA, Ferrieri P, Zaleznik DF, Baker CJ. Group B streptococcal colonization and serotype-specific immunity in pregnant women at delivery. *Obstet Gynecol* 2000 Oct; 96:498--503.

7- Javanmanesh F, Eshraghi N. Prevalence of positive recto-vaginal culture for Group B streptococcus in pregnant women at 35-37 weeks of gestation. *Med J Islam Repub Iran.* 2013 Feb; 27:7-11.

8- Steenwinkel, F.D.O. Tak, H.V. Muller, A.F. Nouwen, J.L. Oostvogel, P.M. Mocumbi, S.M. Low carriage rate of group B streptococcus in pregnant women in Maputo, *Mozambique Tropical Medicine & International Health.* 2008;13: 427-429.

9- Kraśnianin E1, Skret-Magierło J, Witalis J, Barnaś E, Kluz T, Kozieł A, Skret A. The incidence of Streptococcus Group B in 100 parturient women and the transmission of pathogens to the newborn. Ginekol Pol. 2009;80:285-9.

10- Mavenyengwa RT, Afset JE, Schei B, Berg S,

Caspersen T, Bergseng H, Moyo SR. Group B Streptococcus colonization during pregnancy and maternal-fetal transmission in Zimbabwe. *Acta Obstet Gynecol Scand*. 2010; 89:250-5

11- Eun Ju Kim, Kwan Young Oh, Moon Young Kim, Yong Soo Seo, Jung-Hwan Shin, Young Rae Song et al., Risk Factors for Group B Streptococcus Colonization Among Pregnant Women in Korea. *Epidemiol Health*. 2011; 33: e2011010.

12- Sharmila V, Joseph NM, ArunBabu T, Chaturvedula L, SistlaS.Genital tract group B streptococcal colonization in pregnant women: a South Indian perspective. *J Infect DevCtries.* 2011; 5:592-5.

13- Puccio G, Cajozzo C, Canduscio LA, Cino L, Romano A, Schimmenti MG, Giuffrè M, Corsello G. Epidemiology of Toxoplasma and CMV serology and of GBS colonization in pregnancy and neonatal outcome in a Sicilian population. *Ital J Pediatr*. 2014 22; 40:23.

14- Agricola J, Mecky I, Furaha A, Eligius F. Maternal and neonatal colonisation of group B streptococcus at Muhimbili National Hospital in Dar es Salaam, Tanzania: prevalence, risk factors and antimicrobial resistance. *BMC Public Health* 2009;9:437.

15- Baltimore RS. Consequences of prophylaxis for group B streptococcal infections of the neonate. *Semin Perinatol*. 2007; 31:33–38.

16- Stoll BJ, Schuchat A. Maternal carriage of group B streptococci in developing countries. *Pediatr Infect Dis J*. 1998;17: 499-503.

17- Stoner KA, Rabe LK. Effect of transport time, temperature, and Concentration on the survival of group B Streptococci in Amies transport Medium. *J Clin Microbiol* 2004; 42:5385-7.

18- Mamabolo RL, Alberts M, Levitt NS, Delemarre-van de Waal HA, Steyn NP. Prevalence of gestational diabetes mellitus and the effect of weight on measures of insulin secretion and insulin resistance in third-trimester pregnant rural women residing in the Central Region of Limpopo Province, South Africa. *Diabet Med*. 2007; 24: 233-9.

19- Buckley BS, Harreiter J, Damm P, Corcoy R, Chico A, Simmons D, Vellinga A, Dunne F; DALI Core Investigator Group. Gestational diabetes mellitus in Europe: prevalence, current screening practice and barriers to screening. A review. *Diabet Med.* 2012 ; 29:844-54.

20- Shalayel M H.F, Ahmed Salah A.M., Khattab A. H. & Gwiria M. H. Satti. Frequency of Gestational Diabetes Mellitus and Impaired Glucose Tolerance in Urban Sudanese Pregnant Women in The Third Trimester. *Sudan J.M.S.*2012; 7 :101-104

21- Romanik M, Nowosielski K, Poręba R, Sioma-Markowska U, Martiroisian G, Groborz J.Streptococcus group B serotype distribution in anovaginal isolates of women in term pregnancy. *Neuro Endocrinol Lett. 2*014; 35 :301-5.

22- Martinelli P., Sarno L., Maruotti G.M., Paludetto R. Chorioamnionitis and prematurity: A critical review. *J. Matern. Fetal Neonatal Med*. 2012;2 5:S29–S31.

23- Lawn J.E., Kinney M.V, Belizan J.M, Mason E.M, McDougall L, Larson J et al., Born too soon: Accelerating actions for prevention and care of 15 million newborns born too soon. *Reprod. Health*. 2013;10.

24- Marcos Z. Arriving too early. Lancet Neurol. 2013;12:332–333.

25- Panda B, Iruretagoyena I, Stiller R, Panda A. Antibiotic resistance and penicillin tolerance in ano-vaginal group B streptococci. *J Matern Fetal Neonatal Med.* 2009 Feb; 22 :111-4.

26- Woldu ZL, Teklehaimanot TG, Waji ST[1], Gebremariam MY. The prevalence of Group B Streptococus recto-vaginal colonization and antimicrobial susceptibility pattern in pregnant mothers at two hospitals of Addis Ababa, Ethiopia. Reprod Health. 2014 ;5:11:80.

27- Chan GJ, Modak JK, Mahmud AA, Baqui AH, Black RE, Saha SK. Maternal and neonatal colonization in Bangladesh: Prevalences, etiologies and risk factors. *J Perinatol.* 2013; 33:971-6.

28- Drowela T, Komolafe O, Igbigbi A. Prevalence of group B Streptococcus colonization in an antenatal women at Queen Elizabeth Central Hospital, Blantyre-a preliminary study. *Malawi Med J.* 2005; 17 :97–99.

29- Hassan IA, Onon TS, Weston D, Isalska B, Wall K, Afshar B, Efstratiou A. A quantitative descriptive study of the prevalence of carriage (colonisation) of haemolytic streptococci groups A, B, C and G in pregnancy. *J Obstet Gynaecol.* 2011; 31:207-9.

30- Mitima KT, Ntamako S, Birindwa AM, Mukanire N, Kivukuto JM, Tsongo K, Mubagwa K. Prevalence of colonization by *Streptococcus agalactiae* among pregnant women in Bukavu, Democratic Republic of the Congo. *J Infect Dev Ctries*. 2014; 12; 8:1195-200.