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To Asses Prevalence of Group B Streptococcus Anogenital Colonization and Associted factors Among Pregnant Women Attending Anc Follow Up At Two Referal Hospitals in Bahir Dar City, North West Ethiopia, 2019: Hospital Based Cross Sectional Study

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TO ASSES PREVALENCE OF GROUP B STREPTOCOCCUS ANOGENITAL COLONIZATION AND ASSOCITED FACTORS AMONG PREGNANT WOMEN ATTENDING ANC FOLLOW UP AT TWO REFERAL HOSPITALS IN BAHIR DAR CITY, NORTH WEST ETHIOPIA, 2019: HOSPITAL BASED CROSS SECTIONAL STUDY

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BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCES, SCHOOL OF MEDICINE

PREVALENCE OF GBS ANOGENITAL COLONIZATION AND ASSOCITED FACTORS AMONG PREGNANT WOMEN ATTENDING ANC FOLLOW UP AT TWO REFERAL HOSPITALS IN BAHIR DAR CITY, NORTH WEST ETHIOPIA, 2019: HOSPITAL BASED CROSS SECTIONAL STUDY

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Finally, I would like to say thank you to my colleagues and junior residents.

Abstract

Background: Anogenital colonization of group B streptococcus in pregnancy is common, which is identified as common cause of early onset neonatal disease. Most neonates acquire the disease through vertical transmission during labor and delivery. However, the prevalence of group B streptococcus colonization in pregnancy in this particular area is not studied.

Objective: To assess prevalence of maternal anogenital group B streptococcus colonization and associated factors among pregnant mothers attending antenatal care at two referral hospitals in Bahir Dar city, Amhara region, Ethiopia.

Methods: Institutional based cross sectional study design was conducted from March 1st to July 30th, 2019 on pregnant mothers attending antenatal care at TGSH and FHCRH b/n GA of 35-37weeks. Total of 195 pregnant mothers in the study with response rate of 97.5%. Data was collected with structured questionnaire and anogenital swab taken using cotton applicator, transported in charcoal medium and cultured on blood agar medium. Data entered to epi info 7, transported to SPSS version 23 and analyzed using both bivariate and multivariate analysis.

Result: Among total of 195 participant pregnant women, 25(12.8%) with 95% CI (8.2%, 17.4%) were found to be colonized by GBS bacteria. None of the independent variables had statistically significant association with GBS anogenital colonization with p value <0.05.

Conclusion: The results of this study showed prevalence of anogenital GBS colonization is significant which calls for routine screening near term and further epidemiologic studies in the future.

Key words: Group B streptococcus(GBS), prevalence, anogenital colonization.

Abbreviations and Acronyms

ANC	Ante natal care
AOR	Adjusted odds ratio
CDC	Center for disease control
CI	Confidence interval
COR	Crude odds ratio
CPS	Capsular polysaccharide
EONS	Early onset neonatal sepsis
FHCRH	Felege hiwot comprehensive referral hospital
GBS	Group B streptococcus
LONS	Late onset neonatal sepsis
PROM	Premature rupture of membranes
SRS	Systematic Random Sampling
TGSH	Tibebe Ghion specialized hospital
WHO	World Health Organization

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1. Introduction

1.1. Background

Streptococcus agalactiae is a gram-positive encapsulated coccus that produces β hemolysis when grown on blood agar. It was first described as a cause of bovine mastitis in 1887. Lancefield and Hare subsequently identified GBS in vaginal swabs in 1935(1). Human isolates of GBS express a capsular polysaccharide (CPS), a major virulence factor that helps the microorganism evade host defense mechanisms. Isolates of GBS can be divided into ten CPS serotypes (Ia, Ib, II, III, IV, V, VI, VII, VIII, IX) each antigenically and structurally unique(2).

About 20% to 25% of pregnant women in the United States harbor this group B Streptococcus (GBS) in their lower genital tract and rectum. GBS colonization can be transient, chronic, or intermittent, and detection is dependent on the culture technique, the locations tested, the culture media, and the population studied.

Neonatal GBS infection can be divided into early-onset and late-onset infection. About 80% to 85% of cases of neonatal GBS infection are early in onset and result almost exclusively from vertical transmission from a colonized mother. Early-onset infection presents primarily as a severe pneumonia and overwhelming septicemia. In preterm infants, the mortality rate from early-onset GBS infection may approach 25%. In term infants, the mortality rate is lower, averaging about 5%(3, 4).

Major risk factors for early-onset infection include preterm labor, preterm premature rupture of the membranes (PROM); intrapartum maternal fever (chorioamnionitis); prolonged rupture of membranes, defined as greater than 18 hours; previous delivery of an infected infant; young age; and black or Hispanic ethnicity. About 25% of pregnant women have at least one risk factor for GBS infection. The neonatal attack rate in colonized patients is 40% to 50% in the presence of a risk factor and less than 5% in the absence of a risk factor(5).

Late-onset neonatal GBS infection occurs as a result of both vertical and horizontal transmission. It is typically manifested by bacteremia, meningitis, and pneumonia. The mortality rate from late-onset infection is about 5% for both preterm and term infants. Unfortunately, obstetric interventions have proved ineffective in preventing late-onset neonatal infection(6).

The gold standard for the diagnosis of GBS infection is bacteriologic culture. Todd-Hewitt broth or selective blood agar is the preferred medium. Specimens for culture should be obtained from the lower vagina, perineum, and perianal area using a simple cotton swab(7).

In 2010, the CDC issued its most recent guidelines for prevention of early-onset GBS infection. The newest guidelines recommend universal cultures in all patients as the optimal method of prevention. Cultures should be performed at 35 to 37 weeks' gestation. All patients who test positive should receive intrapartum antibiotic prophylaxis. Ideally, antibiotics should be administered at least 4 hours before delivery(8).

1.2 Statement of the problem

GBS disease has an impact on both maternal and fetal complications. Several obstetric complications occur with increased frequency in pregnant women who are colonized with GBS. It is one of the major causes of chorioamnionitis, postpartum endometritis, post cesarean wound infection and 2 to 3% of lower urinary tract infections in pregnant women(9).

The prevalence of neonatal GBS infection now is about 0.5 per 1000 live births, and about 10,000 cases of neonatal streptococcal septicemia occur each year in the United States. GBS is one of the most important causes of early-onset neonatal infection(3).

Colonization studies from developing countries have reported only limited variation in maternal GBS colonization rates, similar to those of high income countries (Middle East/North Africa, 22%; Asia/Pacific, 19%; Sub-Saharan Africa, 19%; India/Pakistan, 12%; and Latin America,14%)(5).

GBS disease is also associated with significant morbidity and mortality. GBS meningitis, in particular, results in long term neurodevelopmental impairment. Bedford et al. described 5-year neurodevelopmental outcomes following an acute episode of neonatal meningitis in 98 children, of whom 13% had severe, 17% moderate and 18% mild disability at 5 years. Overall 50% of those with GBS meningitis had neurodevelopmental impairment at 5 years of age(10). A recent small series from the USA has shown similar rates of sequalae(up to 44% with moderate–severe impairment)(11).

The mean incidence of EO disease was 0.43. Incidence was highest in studies from Africa 0.53% whilst studies from Southeast Asia reported the lowest incidence 0.11%. The incidence of LO disease was again highest in Africa 0.71. The case fatality ratio was three times higher in low-income countries (12.6%, 95% CI 10.8–14.9) than in high-income countries which is 4.6%(12).

The reported overall incidence of GBS in resource-poor settings ranged between 0 and 3.06 per 1000 live births(13). Variation was also evident across studies from Latin America (0.39–1.15 per 1000 live births (14, 15), whereas studies from Asia and the Middle East reported a lower GBS incidence (0–0.26 per 1000 live births(16-18). Reported case fatality rates (median, 20%; range, 10–60%) also varied within and between geographic regions (13). In our country, the incidence of GBS infection ranges from 7.2 to 19% in studies conducted in teaching hospitals of Mekelle, Jimma and Addis Ababa(19-21).

As to my knowledge, there is no such a study conducted in this area. So, the purpose of this study is to determine the prevalence of GBS infection and associated factors in pregnant women at two referral hospitals in Bahir Dar city, northwest Ethiopia.

1.3 Significance of study

The result of this study would serve as baseline information for other large scale population based epidemiologic studies. The finding of this study will help us to consider future screening programs for GBS and effective intrapartum treatment to decrease maternal and neonatal complications. It will be an input for the institution in future guideline development and for policy makers and planners for future implementation.

2. Literature review

2.1 Prevalence of maternal GBS infection

A systematic review to determine the prevalence of maternal group B streptococcal colonization in European countries shows that eastern Europe 19.7–29.3%, Western Europe 11–21%, Scandinavia 24.3–36%, and Southern Europe 6.5–32%(22). In developed countries an estimated 20–30% of pregnant women are colonized with GBS(23), approximately 50% of their babies become colonized and 1% progress to develop invasive disease (24). In a study conducted to determine the prevalence of GBS and to identify GBS colonization risk factors in a multicultural population of pregnant women in The Netherlands, twenty-one percent was GBS carrier late in pregnancy (25).

In cross sectional study conducted in a university hospital in eastern Turkey, about 32% of the pregnant women and 17.3% of overall newborns were colonized with GBS, with overall rate of GBS vertical transmission was 54.2%(26). In a similar study conducted in Trinidad, the prevalence of vaginal and rectal GBS colonization was 32.9% (27).

Over all prevalence of GBS colonization among pregnant women was 23% in a facility based cross sectional study conducted in Dares Salaam, Tanzania. A higher proportion of GBS were isolated from the vagina (12.3%) as compared to the rectum (5%)(28). In a similar study done in Ille-Ife, Nigeria, the incidence of GBS colonization was 7.5%(29).In Ethiopia, studies conducted in teaching hospitals of Addis Ababa, Jimma and Mekelle showed that anogenital GBS colonization ranges from 7.2% to 19%(19-21).

2.2 Associated factors

The effect of cervical group B streptococcus on the conservative management of preterm premature rupture of membranes was examined in 140 consecutive patients. Upon the patient's admission, we obtained cervical cultures for group B streptococcus, genital mycoplasmas, and chlamydia. In one study that compare patients with and without group B streptococcus shows, intra-amniotic infection (six of 16 versus 26 of 120) and endometritis (four of ten versus three of 94) were significantly more common in group B streptococcus patients(30).

Age, profession, residence, marital status and education were assessed but not found to be associated with GBS colonization in a cross sectional study done in Greece. However, the influence of the number of previous pregnancies proved to be significant, as pregnant women with 2 or more previous pregnancies tended to be more frequently colonized than prim gravida(31).

In a case control study conducted in a teaching hospital in Florida, USA, women with pre-gestational diabetes are at increased risk of group B streptococcus colonization (OR 3.1, 95% CI 1.8, 5.2) after it was adjusted for maternal age, race, and obesity(32).

In a prospective study conducted in a teaching hospital in Sao Paulo, Brazil involving 207 women divided in two groups: HIV group (n = 101) and a control group consisting of HIV-uninfected pregnant women (n = 106) to assess regional colonization by GBS. Twenty (19.8%) HIV-1-infected pregnant women were found to be colonized by GBS at between 35 and 37 weeks' gestation and the prevalence of GBS was 14.1% in the control group. No significant increase in GBS colonization was observed in HIV-1-infected pregnant women(33).

In a prospective study conducted in Malawi from 2008 to 2010 GC, the overall carriage frequency of GBS is 20% in HIV-positive pregnant women which is comparable with those HIV negative mothers(34).

Maternal GBS colonization rate was significantly higher in younger ages ($p<0.01$) when maternal age of 20 years was taken as a cut-off point in a facility based study in eastern Turkey(26). Primigravidity is shown to be a risk factor for anogenital GBS colonization in a study conducted at TASH and GMH, Addis Ababa(21).

Conceptual Framework

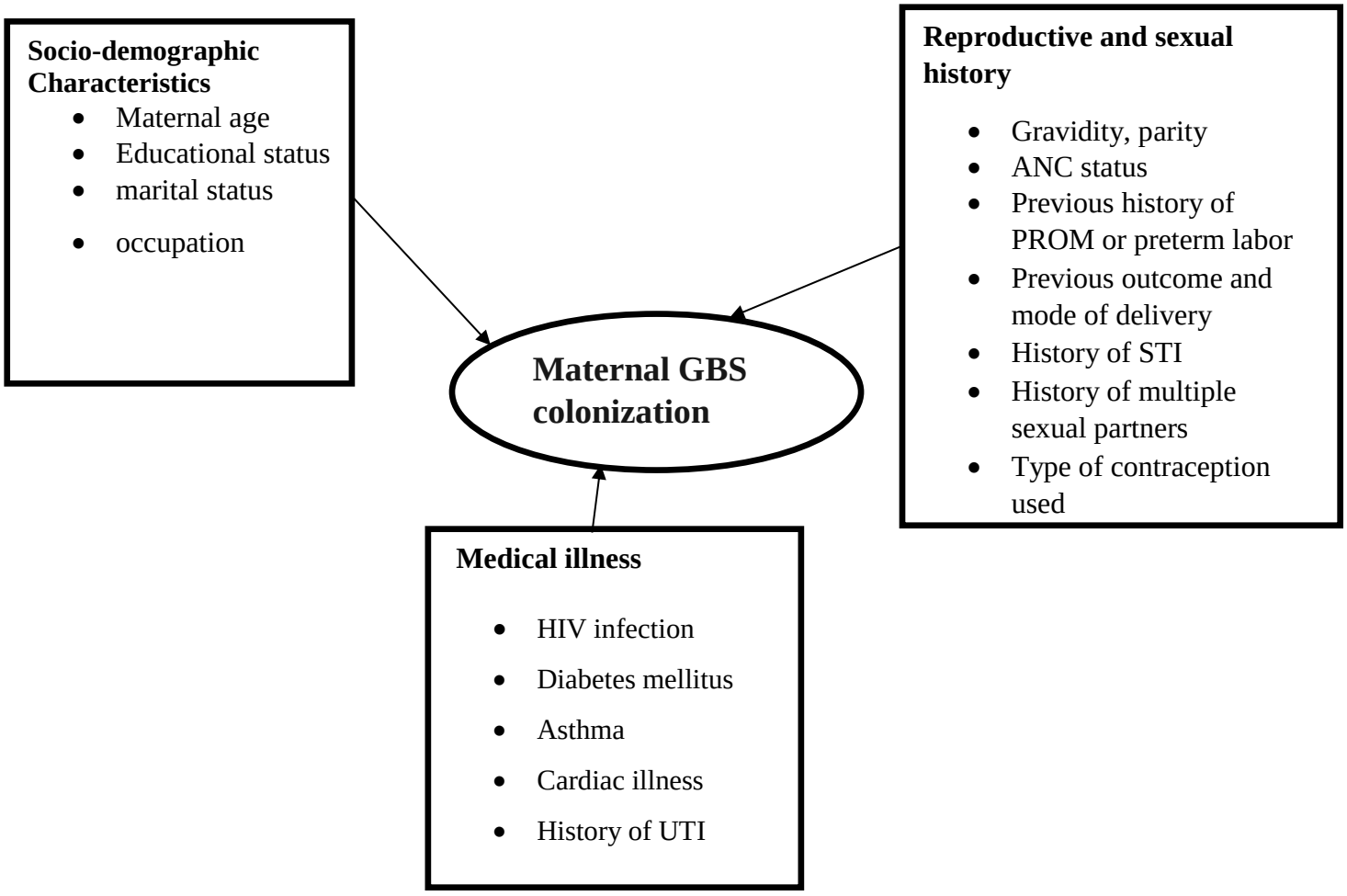

Figure 1: Conceptual framework for GBS colonization in pregnancy, Bahir Dar city, North West Ethiopia, 2019(19-21)

4. Objectives

4.1 General Objective

- To assess prevalence of maternal anogenital GBS colonization and associated factors at Felegehiwot referral hospital in Bahir Dar, Amhara region, Ethiopia.

4.2 Specific Objectives

- To assess the prevalence of maternal anogenital GBS colonization at Felegehiwot referral hospital and Tibebe Ghion specialized hospital in Bahir Dar city, Amhara region, Ethiopia.
- To assess associated factors with anogenital GBS colonization.

5. Methods

5.1 Study Design and period

A Hospital-based cross-sectional study was conducted from March 1 to August 30, 2019.

5.2 Study area

Bahirdar is located in northwestern part of Ethiopia, in Amhara National Regional State, at a distance of 565km from Addis Ababa. Its astronomical location is 11º38'North latitude and 37º15'east longitude. Bahirdar is one of the reform towns in the region and has a city administration, metropolitan administration consisting of municipality and 18 urban and four rural districts.

It has two tertiary hospitals. Felege hiwot is a regional comprehensive referral hospital located inside the town. Tibebe Ghion specialized hospital is a teaching hospital located 7 kms away from the town in the southwest direction. Both hospitals operate 24 hrs which will provide emergency gynecology, delivery, inpatient and outpatient services supervised by specialists in obstetrics and gynecology. It is estimated to give service for about nine million people.

5.3 Source population

All pregnant women who visited antenatal clinics of the two referral hospitals during the study period.

5.4 Study population

All pregnant women b/n gestational age of 35 to 37 weeks who visited Felegehiwot referral hospital and Tibebe Ghion specialized hospital antenatal clinics during the study period.

5.5 Study unit: each individual pregnant woman

5.5 Variables

5.5.1. Dependent Variable

- Maternal anogenital GBS status

5.5.2 Independent Variables

Socio-demographic factor

- Age
- Residence
- Occupation
- Educational status

Obstetric and sexual variables

- Gravidity
- Parity
- Gestational age
- Previous PPROM
- History of preterm labor
- Life time sexual partners
- Practice of douching
- Contraception use
- History of

Maternal habits and chronic illness

- Smoking
- Alcohol drinking
- Maternal medical illness (diabetes, HTN, asthma, cardiac disease, HIV, UTI etc.)

5.6 Inclusion and exclusion Criteria

5.6.1 Inclusion Criteria

- Pregnant women b/n gestational age of 35 to 37 weeks who will visit FHCRH and TGSH ANC clinic from 1st March 2019 to 30thAugust 2019.

5.6.2 Exclusion criteria

- Women who took antibiotics in 2 weeks' time
- Women with GA below 35wks and above 37 completed weeks
- Women with unknown gestational age in weeks

5.7 Operational definitions

- **Early onset neonatal sepsis:** Neonatal infection occurring in the first 7 days of life primarily present as a severe pneumonia and overwhelming septicemia.
- **Preterm PROM:** rupture of membrane before 37 completed weeks or stated 8 month or before.
- **Preterm labor:** rupture of membrane before 37 completed weeks or stated 8 month or before.
- **GBS infection:** when growth of GBS isolates identified in the culture medium.
- **Multiple sexual partner:** women having two or more partners in her life time
- **ANC status:** women having at least 2 prior antenatal visits
- **Douching:** when women uses soap or water to wash the internal parts of vagina or introitus

5.8 Sample size determination

1. **Sample size calculation**

The required sample size was calculated using a single population proportion formula for a cross-sectional survey. The sample size was calculated

$N= (Z\alpha/2)^2 P (1-P)$

d^2

Where: N= Sample size

Z = Standardized deviation for the normal distribution; =1.96

P =The overall prevalence of colonization of GBS infection were 13.7%, based on the colonization of GBS infection indicated in a study conducted in Mekelle, Northern Ethiopia, which was 13.7%(20).

D= Expected margin of error (precision) =5%

$N = (1.96)2 \times 0.137(1 - 0.137)/0.05^2 = 182$

Considering 10% non-response rate, the total sample size will be calculated as

n = n + (n (10%)) = 182 + (182 *0.1) = 200, Accordingly, the final sample size is **200**

2. Sample size calculation by using Factor that have high risk ratio from a study conducted in Iran(35).

Factor		RR	CI	Power	Ratio	% out came in unexposed group	% out came in exposed	Sample size result
1	Preterm labor	2.94	95%	80%	1	14.3%	36.3%	**138**
2	Prolonged ROM	2.13	95%	80%	1	2.63%	16.3%	**170**

- ✓ Sample size that calculated by single population proportion is highest (**200**) when it compared to that calculated by factors. So, sample size for this study is 200.
- ✓ Calculated sample size allocated proportionally to the two institutions based on the average ANC attendance per month, 72 at FHCRH and 32 at TGSH.

N =n1/Nt, where

N-sample size to be allocated, n1-monthly ANC attendee in one facility, Nt- monthly ANC attendee in both facilities.

Sample allocated to TGSH=32/104*200=62

“ “ FHCRH=72/104*200=138

5.9 Sampling procedure

Systematic random sampling technique will be used to select candidates. The assumption is that 104 mothers will be enrolled at ANC clinic every month at both centers, duration of data collection is 5 months. Total number of mothers is, 5*104= 520. Then 520/200 = 2.6, approximated to the nearest integer, 3. Accordingly, every third woman b/n gestational age of 35 to 37 weeks will be sampled.

5.10 Data collection tools and procedures

A well-structured standard questionnaire was filled with face to face interview by trained data collectors. Specimen was collected by brushing the vagina and anal area with two separate sterile cotton swabs and transported to the regional laboratory within 3-5 hrs. of collection.

It was then inoculated to a Todd-Hewitt broth culture plate, incubated with C02 at 370c for 24 hrs. Positive growths were further analyzed based on morphology, catalase reaction and CAMP test. Culture media with no growth was discarded immediately.

Some of pregnant mothers who tested positive for GBS got treatment intrapartum. Clients card number was coded and traced back for treatment intrapartum. Among 25 GBS positive cases, 13 were already delivered, 7 not returned back either delivered home or other health facility and the rest of 5 cases got intrapartum prophylaxis as per the protocol.

5.11 Data quality control

The data collection format was checked for its completeness and consistency on a daily basis. One-day training was given for two midwifes at FHCRH and two residents at TGSH about detail data collection procedures and how to take anogenital swab. Pretest conducted before the actual study starts on 10 participants

5.12 Data processing and analysis

Data was cleaned, coded and entered to Epi info7 and exported to SPSS version 23 for analysis using both bivariate and multivariate analysis. In bivariate analysis those variables with p value less than 0.2 was used to select candidate variables for multivariate analysis. And those variables with p value less than 0.05 in multivariate analysis was considered as statistically significant.

5.13 Ethical Consideration

Ethical clearance obtained from Bahir Dar University College of Medicine and Health Sciences, Institutional Review Board. Further permission was obtained from FHCRH. Before data collection, verbal consent was taken from each study participants after reading the written consent during the study. Confidentiality was maintained by making the data collectors aware not to record any identification information of participants. Managing team was communicated and five pregnant mothers who tested positive for GBS got treatment intrapartum as per the protocol.

6. Dissemination of the result

The results of this study will be presented to the department of obstetrics and gynecology. Hard and soft copies of the result will be given to the study hospital and the regional health bureau. It will be presented in national and international scientific conferences. It will also be published in scientific journals.

7. Results

7.1 Characteristics of study participants

A total of 195 pregnant women attending ANC in the selected sites were recruited with response rate of 97.5%. The mean age of the women in the study was 27.28(SD=4.4) years ranging from 18 to 40 years. More than half of (55%) women were in the age group of 20-34 years. Most women with positive anogenital GBS status were in the childbearing years of 25–34 (64 %). Women Age >=35 comprised 8% out of GBS cases. Eighty percent (80%) of GBS positive mothers were from urban area. Nearly a third of study participants (30.8%) attended college education. (Table 1)

Table 1: Socio-demographic characteristics of study participants at two tertiary hospitals in Bahir Dar city, Amhara region,2019.

Characteristics	GBS positive (%)	GBS negative (%)	Total(%)
Age(years)			
18-24	7(28)	48	55 (27.4)
25-34	16(64)	107	123(55)
>=35	2(8)	15	17(17.6
Educational status			
No formal education	9(36%)	53	62(31.8%)
Primary	4(16%)	29	33(17%)
Secondary	6(24%)	34	40(20.5%)
College and above	6(24%)	54	60(30.7%)
Marital status			
Married	24(96%)	163	187(95.9%)
Unmarried	1(4%)	7	8(4.1%)
Occupation			
Employee	5(20%)	40	45(23.1%)
Merchant	3(12%)	27	30(15.4%)
Housewife	17(68%)	103	120(61.5%)

Overall, 68% of GBS cases isolated in multigravida women which is in contrast to study done in Addis Ababa of which 86.5% of cases are prim gravida(21). This may be explained by the lower fertility rate in more urban centers. Outcome of delivery was alive baby in 110(84%) with

normal vaginal mode of delivery in 94(74%) of clients. Eighty-nine percent of GBS colonized women used some form of contraception and 11% of cases were non-users.

Previous pregnancy was complicated by preterm PROM in 8.6% and preterm labor in 9.8% of study participants. 96.4% of women had at least two antenatal visits in the current pregnancy which is much higher than the study in Mekelle (56%)(20).All women with positive GBS colonization had two or more prior visit to health institution for antenatal care. All pregnant women with GBS colonization used some form of hormonal contraception prior to current pregnancy.

Table2: Obstetric and sexual characteristic of pregnant women attending ANC at two referral hospitals in Bahir dar city, Amhara region, 2019.

Characteristics	**GBS positive**	**GBS negative**	**Total (%)**
Gravidity			
Primigravida	8(32%)	56	64(32.8)
Multigravida	17(68%)	114	131(67.2)
Outcome of previous delivery			
Alive baby	14(56)	96	110(84)
Perinatal loss	3(12)	18	21(16)
Mode of delivery			
Vaginal	15(60)	82	97(74.6)
Cesarean	2(4)	28	30(23.4)
Current GA			
35wks	5(20)	40	45(23.08)
36wks	8(32)	41	49 (25.13)
37wks	12(48)	89	101(51.79)
History of PROM			
Yes	3	9	12(8.6)

No	14	102	116(91.4)
History of preterm labor			
Yes	2	11	13(9.8)
NO	18	101	119(90.2)
Life time sexual partners			
1–2	24(96)	162	186(95.4)
>=3	1(4)	8	9(4.6)
History of STI			
Yes	1(4)	46	11(5.6)
No	24(96)	24	184(94.4)
Practice douching during perineal wash			
Yes	13(52)	70	83(42.1)
No	12(48)	100	112(57.9)

7.2 Factors associated with GBS colonization

Among 195 study participants, 25(12.8%) were found to be GBS positive. About 96% of GBS colonization's were isolated from married pregnant women, but not statistically significant (AOR 0.74; 95% CI 0.08 ,6.57). Out of 25 positive GBS isolates, 17(68%) were multigravida women. But, the difference in anogenital GBS colonization with gravidity was not statistically significant (AOR 0.92; 95% CI 0.39,2.35).

From a total of 14 variables included in the bivariate analysis, three were found independently associated with positive GBS anogenital colonization. These were history of preterm PROM, mode of delivery and practice of douching during perineal wash.

The other variables, age, gravidity, place of residence, occupation, history of STI, frequency of perineal care, mode or outcome of previous delivery/abortion, history of preterm labor were not statistically associated with maternal anogenital GBS colonization.

Multivariable logistic regression showed that preterm PROM, practicing douching and mode of delivery not increased the risk of maternal GBS anogenital colonization.

8. Discussion

GBS is one of the common causes of post-partum maternal and neonatal sepsis. The disease burden is uncertain in many of the developing countries. Knowing anogenital GBS status of pregnant women is essential for planning and implementing prevention strategies. To date, there was no study conducted to know GBS prevalence and associated factors in this geographic area.

The present study revealed the overall prevalence of anogenital GBS carriage at two tertiary hospitals in Bahir dar city to be 12.8% with 95% CI (8.2%,17.4%). This finding was consistent with study conducted in Mekelle (13.7%)(20),Ille-Ife ,Nigeria (11.3%)(29). However the finding of this study was higher than the study conducted in Addis Ababa (7.2%)(21). This might be due to differences in sampling technique, socioeconomic conditions or geographic variations in GBS colonization.

The finding of this study was lower than the study conducted in Jimma (19%)(19), Mbarara university hospital , Uganda(28.8%)(36), Muhimbili national hospital in Dare Salam (23%)(28), Turkey (34%)(26), UK (21.3%)(23) and the Netherlands (21%)(37). In addition to geographic variation, it might be explained by differences in type of culture media used, ethnic and genetic factors.

This wide variation in prevalence might be explained by temporal and geographic variation in part and the difference in transport and culture media techniques in another.

Knowledge of the risk factors contributing for GBS colonization of pregnant women is relevant to minimize maternal and neonatal morbidity and mortality associated with GBS. Studies done in Jimma(19), Mekelle(20) and Addis Ababa(21) showed that there are not significant factors associated with anogenital GBS colonization even if they are not powered to study the association. However, the study done in Iran, preterm rupture of membranes is significantly associated with positive GBS colonization ($p < 0.001$)(35).

In this study, possible risk factors such as age, gravidity, occupation, residence, previous preterm labor or PROM, outcome of delivery, mode of delivery, history of STI, history of UTI and frequency of perineal wash were considered. However, none of the factors had statistically

significant association($p>0.05$) with maternal GBS colonization. This might be due to the small sample size of this particular study which will call for future large scale epidemiologic study.

Though this study has limitations due to small sample size, maternal and fetal outcome not included, drug sensitivity pattern not studied, the result of this study will help policy makers and health professionals to understand the magnitude of the problem.

9. Strength and Limitation

- The result of this study will help clinicians and policy makers to develop a guideline for antenatal GBS screening and intrapartum treatment to minimize grave neonatal and maternal complications.
- It will be used as a reference for future studies
- It is more informative as the study used primary data with culture and structured questionnaire to collect data.
- It may not tell us the whole picture of the community as it is hospital based study, relatively small sample size and perinatal maternal-neonatal outcomes not included.

10. Conclusions

Over all prevalence of maternal anogenital GBS colonization is 12.8%. This calls for incorporation of routine antenatal screening of anogenital GBS colonization in ANC guidelines.

11. Recommendations

- Further study should be done, preferably cohort or case control study, to determine impact of GBS on maternal and perinatal outcome and look for associated factors, the study period was short with small sample size.
- Consider late antenatal screening of anogenital GBS status at ANC guidelines in the future.

12. ANNEX

12.1 QUESTIONNAIRE IN ENGLISH

Bahir Dar University

College of Medicine and Health Sciences

School of Medicine

Department of Obstetrics and Gynecology

Interviewer's Name: _____Code: _____ Signature: _____ **Supervisor's Name:** _____ Code: _____ Signature: _____ Date: _____

INFORMATION SHEET AND CONSCENT FORM: Greetings! My name is_____ from Bahir Dar University, School of Medicine and Health Sciences, 4th year OBGYN resident and I want to conduct data collection among pregnant women to determine prevalence of GBS anogenital carriage and associated factors. The main objective of the study is to determine prevalence and associated factors of anogenital GBS colonization at FHCRH, Bahir Dar, North west Ethiopia. The data collection will be from pregnant mother's b/n gestational age of 35 to 37 weeks during the study period.

There is no harm during data collection and no direct financial benefit for you. But the result of this study will be beneficial to the community at large in the future and for you if you found to be GBS positive in this pregnancy.

Are you volunteer to participate in this study: Yes ☐ No ☐

For more details: Contact Tesfaye Diress (Principal investigator) with +251-922-55-65-57

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ጤና ይስጥልኝ ስሜ ---------- ይባላል፡፡ የምሰራውም ---------- ---------- ነው፡፡ ወደዚህ የመጣሁበት ምክንያት በማህፀን ጫፍ ፊንጢጣ አካባቢ ያለውን የጅቢኤስ ባክቴሪያ መጠን እና ተዛማጅ ምክንያቶችን ለማጥናት መረጃ ለመሰብሰብ ነው፡፡ ጥናቱን የሚያካሂዱት በባ/ዳር ዩኒቨርሲቲ የህክምናና ጤና ሳይንስ ኮሌጅ በማህፀንና ፅንስ ት/ክፍል 4ኛ ዓመት የስፔሻላይዜሽን ተማሪ የሆኑት ዶ/ር ተስፋየ ድረስ ናቸው፡፡ ጥናቱም የሚካሄደው ከመጋቢት 01/2011 ዓ.ም እስከ ሐምሌ 30/2011 ዓ.ም በባህር ከተማ በሚገኙ ሁለት ሪፈራል ሆስፒታሎች ጥበበ ግዮን ስፔሻላይዝድ ሆስፒታል እና በፈለገ ህይወት ሪፈራል ሆስፒታል ነው፡፡ በጥናቱ የሚገኘው ውጤት ለሚመለከታቸው አካላት ግብዓት እና የመፍትሄ እርምጃ ለመውሰድ አቅጣጫ ተቋሚ ይሆናል፡፡ ስለሆነም ጥያቄውን ለመመለስ ፈቃደኛ ከሆኑ በታማኝነት ለሚጠየቁት ጥያቄ ተገቢውን መልስ ይሰጡ ዘንድ በትህትና እጠይቃለሁ፡፡

ጥያቄውን ለመመለስ ፈቃደኛ ነወት? አወ---------- አይደለም ---------- ----------

አመሰግናለሁ፡፡

ፈቃደኛ ከሆኑ፡- 1. ቀን ----------

2. መጠይቁን የሞላው ስም ---------- ፊርማ ---------- --------

የሱፐርቫይዘር ስም ---------- ፊርማ ----------

Structured questionnaires for data collection on prevalence of anogenital GBS colonization and associated factors among pregnant women at FHCRH

Section I. Socio demographic characteristics		
Code	Questions	Answers

D101	Age in years	_____	
D102	Educational status	1. Not attended formal education 2. Primary 3. Secondary 4. College and above	
D103	Marital status	0.single 1.married 2. Divorced 3. Widowed 4. other…….	
D104	Residence	0. Urban 1. Rural	
D105	Occupation	0.government employee 1.private employee 2.merchant 3.house wife 4.others, specify_____	
Section II. Maternal reproductive and sexual characteristics			
RS201	Gravidity	0. Primigravida 1. Multigravida	
RS202	Parity	0. Nulliparous 1. Prim parous 2. Multiparous	

RS203	Gestational age in weeks in current pregnancy	0. 35 1. 36 2. 37	
RS204	ANC follow up	0. Yes 1. No	
RS205	History of preterm labor before 37 weeks	2. Yes 3. No	
RS206	History of preterm PROM	0. Yes 1. No	
RS207	Outcome of previous delivery?	0. Healthy baby 1. Admitted to NICU 2. Early neonatal death 3. Preterm 4. Spontaneous abortion	
RS208	Previous mode of delivery	0. SVD with/out episiotomy 1. Instrumental delivery 2. C/D	
RS209	Current or previous history of STI	0. NO 1. YES	If NO skip to RS212
RS211	If yes, have been treated with your partner?	0. No 1. Yes	
RS212	Number of lifetime sexual partners	0. One 1. Two 2. Three or more	
RS213	History of UTI	0. No 1. Yes	
RS213	Have you used contraception	0. No 1. Yes	If no skip to H301

RS214	Type of contraception used	0. OCPs 1. IUDs 2. Implants 3. Injectable	

Maternal habit

H301	Current or previous cigarrete smoking	0. Yes 1. No	
H302	Do you drink alcohol?	0. Yes 1. No	
H303	How frequent do you wash your perineum?	0. Daily 1. Twice daily 2. More than twice daily	
H304	Do you practice douching or used soap during perineal wash?	0. Yes 1. No	

Maternal chronic medical illness

M401	HIV status	0. Negative 1. Positive 2. Discordant couple	If no skip to M404
M402	If positive, do you take ART?	0. No 1. Yes	
M403	If yes , how long you been on ART?	_____	

M404	Other chronic illness if any	0. DM 1. Cardiac illness 2. Hypertension 3. Asthma 4. Others if any……	

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Declaration

I, the under signed, declared that this is my original thesis, has never been presented in this University, and that all the resources and materials used for the research, have been fully acknowledged.

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