Prevalence of maternal Group B Streptococcus rectovaginal colonization among pregnant women in Ethiopia: protocol for a systematic review and meta-analysis

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Protocol

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Abstract

Background: Rectovaginal colonization with Group B streptococcus (GBS) during pregnancy is an important risk factor for serious infections including neonatal sepsis, pneumonia, and meningitis. It is also associated with stillbirth and preterm birth. Since globally rates of GBS colonization, as well as rates of vertical transmission to the newborn, differ broadly, having national data is important for implementing strategies to reduce neonatal morbidity and mortality as a result of GBS infection. We propose this systematic review and meta-analysis to describe the prevalence of rectovaginal GBS colonization, rate of vertical transmission, and the antibiotic resistance pattern among third trimester pregnant women in Ethiopia.

Methods: A systematic search will be done of PubMed (MEDLINE), EMBASE, CINHAL, and Cochrane Library. In addition, google scholar will be searched, and a reference list of the already identified articles will be checked to find additional eligible articles that were missed during the initial search. Two reviewers will screen all retrieved articles and assess the methodological quality of included studies using the Newcastle-Ottawa Scale (NOS) checklist. Any disagreement between two reviewers will be resolved by a third reviewer. We will extract data using the JBI data extraction tool for the systematic review of prevalence studies. The data analysis will be conducted using Stata Statistical Software: Release 15. We will present pooled estimates of the prevalence of GBS colonization and rates of vertical transmission with a 95% confidence interval.

Discussion: This will be the first synthesis of data on GBS during pregnancy at a national level. It will inform decision-makers in determining whether a universal or a risk-based screening strategy is most appropriate, as well as guiding them in adopting an intrapartum antibiotic protocol.

Registration: Submitted to PROSPERO on 18/03/2021

Background

Maternal rectovaginal colonization with Group B streptococcus (GBS) is an important risk factor for maternal and neonatal morbidity and mortality. In pregnant and postpartum women, GBS is a frequent cause of asymptomatic bacteriuria, urinary tract infection, upper genital tract infection (i.e., intraamniotic infection or chorioamnionitis), postpartum endometritis, pneumonia, puerperal sepsis, and bacteremia without a focus (1). For the newborn, it can cause serious infections including neonatal sepsis, pneumonia, and meningitis (2-5). Furthermore, rectovaginal colonization with GBS during pregnancy is associated with stillbirth and preterm birth, and thus the sequelae of prematurity in the neonate (6, 7).

The prevalence of maternal rectovaginal colonization with GBS varies significantly from place to place. A systematic review done to assess the prevalence in Africa showed an overall prevalence of 19.3% with significant variation (8). In this review the highest estimate was observed in Southern Africa countries, 23.8%, followed by Northern Africa, 22.7% while the lowest estimate was noted in Eastern Africa, 15.4%.
There are different recommendations regarding the prevention of neonatal infection following rectovaginal GBS colonization during pregnancy. Some recommend universal screening of pregnant mothers during the third trimester while others practice risk-based screening and intrapartum antibiotic prophylaxis (IAP) for women who screen positive. The American College of Obstetricians and Gynecologists recommends performing universal GBS screening between 36 0/7 and 37 6/7 weeks of gestation, while the Royal College of Obstetricians and Gynecologists recommends risk-based screening (9-11). Based on their results, all women whose vaginal-rectal cultures are positive for GBS will receive appropriate IAP unless a prelabor cesarean birth is performed in the setting of intact membranes.

In Ethiopia, there are no guidelines regarding GBS screening or antibiotic prophylaxis. Several studies have been completed to assess the prevalence of GBS rectovaginal colonization among pregnant women from different parts of the country. These studies show a wide range of prevalence ranging between 7.2% to 25.5% (12, 13). There was also a high vertical transmission rate which is reported to be as high as 63.3% in one study (14). The antibiotic resistance pattern of GBS in one study found that close to 40% of isolates were resistant to 3 or more antibiotics (13). However, these findings are not compiled in a systematic way to assist clinicians and policy decision-makers. To assess if this work is currently underway, a preliminary search of PROSPERO, MEDLINE, the Cochrane Database of Systematic Reviews, and the JBI Database of Systematic Reviews and Implementation Reports was conducted, and we identified no current or in-progress systematic reviews on the topic.

Thus, this review will be conducted to estimate the pooled prevalence of maternal colonization with GBS, rates of vertical transmission, and antibiotic resistance reported from the various studies conducted in Ethiopia. The result of the review will help policymakers to decide the best strategy to decrease the risk of neonatal morbidity and mortality related to GBS infection.

Objectives

The objectives of this review are to describe the prevalence of rectovaginal GBS colonization, rate of vertical transmission, and the antibiotic resistance pattern among third trimester pregnant women in Ethiopia.

Methods

Reporting of the review findings

This protocol was developed following the Preferred Reporting Items for Systematic Review and Meta-analysis Protocols (PRISMA-P) statement (15). The protocol has been submitted to the International Prospective Register of Systematic Reviews (PROSPERO) database and is awaiting registration. The Preferred Reporting Items for Systematic review and Meta-analyses (PRISMA-2009) statement will be used to report the findings (16).
Eligibility Criteria

This review will include studies based on the following inclusion criteria: 1) the study is an observational study design including prospective and retrospective cohort studies, case-control studies, and cross-sectional studies; 2) published in English; 3) studies report the prevalence of rectovaginal GBS colonization or rate of vertical transmission of GBS or GBS antibiotic resistance pattern among pregnant women; 4) study was conducted in Ethiopia. Studies will be excluded if the full text of the article is neither available nor accessible after three emails to the corresponding authors. Additionally, commentaries, letters to the editor, reviews (narrative, systematic, scoping), study protocols, validation/ methodology studies, meta-analyses, and case reports will also be excluded.

CoCoPop search guide

We will use the Condition, Context and Population (CoCoPop) search guide as follows (17)

Population: We will include studies involving women in the third trimester of pregnancy. The third trimester includes all pregnant women after 28 weeks up to the delivery of the neonate.

Condition: We will include studies reporting on GBS colonization confirmed by rectovaginal swab culture, and/or vertical transmission, and/or antimicrobial resistance

Context: We will include studies conducted in any settings in Ethiopia

Search strategy

A combination of Medical Subject Heading (Mesh), and text words combined using "OR" and "AND" Boolean operators will be used to develop the search strategy for our chosen databases. A systematic search will be done on PubMed (MEDLINE), EMBASE, CINHAL, and Cochrane Library. Our PubMed search string can be found in Additional file 2. Furthermore, we will search the gray literature using Google and Google Scholar. Additionally, reference lists from the included articles will be screened for additional eligible articles. All identified articles will be collated into an EndNote library and duplicates will be removed.

Selection of studies

Identified records will be exported to an excel spreadsheet. Two researchers will independently screen the titles and abstracts from the search results and classify each reference as “Definitely include”, “Unsure”, and “Definitely exclude” based on the inclusion criteria. Disagreements for article inclusion will be resolved through discussion with a third researcher. Articles classified as “definitely include” and “unsure” will be added to a second tab in the excel sheet for the full-text screening. Based on the inclusion criteria, full-text articles will be reviewed and classified as “Definitely include”, and “Definitely exclude”.

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Documents will be excluded if they do not meet inclusion criteria. Reasons for full-text exclusion will be documented.

**Data extraction**

Data will be extracted onto a Microsoft Excel spreadsheet using the JBI systematic review of prevalence studies data extraction tool. Data abstraction will include study characteristics summary, population studied, prevalence data with 95% CI if available, vertical transmission, antibiotic resistance, raw data used to calculate prevalence, sample size, outcomes studied. Two of the authors (DB and DGA) will extract the data from the included studies. If there is a discrepancy between data extractors, it will be discussed to reach a consensus. If a consensus cannot be reached, the authors will consult a third reviewer (LBT).

**Assessment of methodological quality**

A quality assessment of all articles included in the study will be done by three authors (DB, LB, and WG). The Newcastle–Ottawa assessment checklist for observational studies will be used to assess the quality of each study(18). The tool has three sections. The first section will be on methodological assessment and rated out of four stars, and the second section will be on comparability evaluation and will be rated out of two stars. The third section of the quality assessment tool will be on assessing the outcome for each included study and will be rated out of 3 stars. There will be a joint discussion between the authors for uncertainty, and the mean quality score will be used to decide the quality of the included studies in the meta-analysis.

**Data synthesis and analysis**

Data extracted from each primary (original) study through Microsoft Excel will be exported to Stata Statistical Software: Release 15 (14). A narrative description of the study population, the studies included, the rate of rectovaginal colonization, vertical transmission and antibiotic resistance pattern will be performed. Tables and figures will be used to summarise the selected studies and results. We will determine the pooled prevalence of maternal rectovaginal colonization among pregnant women in Ethiopia.

The magnitude of heterogeneity between the included studies will be quantitatively measured by an index of heterogeneity ($I^2$ statistics)(19). The low, medium, and high heterogeneity will be represented as the $I^2$ values of 25%, 50%, and 75%, respectively. The statistical significance of heterogeneity will be determined by a p-value of $I^2$ statistics. A p-value $\leq$ of 0.05 will be taken as statistically significant heterogeneity. If the $I^2$ value is greater than 50%, will use the Dersimonian and Liard random effect model to determine the pooled estimates of GBS colonization proportion, rate of vertical transmission, and antibiotics resistance(20). To examine the possible risk of publication bias, we will use funnel plots and
Egger’s test(21). A p-value < 0.10 will be considered indicative of statistically significant publication bias. If there is evidence of publication bias, we will use Duval and Tweedie’s trim-and-fill method(22). We will conduct sensitivity analysis, to assess the stability of the pooled estimates to outliers and the impact of individual studies.

**Discussion**

This review will provide important evidence on the prevalence of GBS rectovaginal colonization among pregnant women in Ethiopia, the extent of vertical transmission, and the antibiotic resistance pattern. This will be the first synthesis of this data at a national level and would inform decision-makers in designing appropriate strategies for screening and IAP.

**Dissemination plan**

We will publish the results of this systematic review and meta-analysis in a peer-reviewed journal and present our findings at national and international research conferences. A policy brief will be prepared based on the findings of the review.

**List Of Abbreviations**

GBS: Group B streptococcus; IAP: Intrapartum antibiotic prophylaxis; JBI: Joanna Briggs Institute; NOS: Newcastle-Ottawa Scale

**Declarations**

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**Availability of data and materials**

There was no primary data collection.

**Contributions**

DB conceived and designed the protocol. DB wrote the first draft. LBT & DB designed a search strategy. WG, DGA & MW critically reviewed the protocol. All authors read and approved the final protocol.

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Ethics approval and consent to participate.

Not applicable.

Consent for publication

Not applicable since the protocol does not contain any individual person’s data.

Competing interests

The authors declare that they have no competing interests.

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