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Original Articles

Knowledge, Attitudes and Practices Regarding Pregnancy Screening for Group B Streptococcus Among Women of Reproductive Age in Asir, southwestern Saudi Arabia: A Cross-Sectional Study

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Summary

Background: Group B Streptococcus (GBS) is a leading cause of early-onset neonatal sepsis, and antenatal screening with intrapartum antibiotic prophylaxis substantially reduces disease burden. Maternal awareness of, and participation in, GBS screening in Saudi Arabia remain poorly characterised.

Aim: To assess knowledge, attitudes, and practices (KAP) of women in the Asir Region, southwestern Saudi Arabia, regarding pregnancy screening for GBS, and to identify factors associated with higher knowledge, better practices, and more positive attitudes.

Methods: A cross-sectional study was conducted between June and November 2024 among women aged 18–45 years in the Asir Region. Data were collected using a validated, self-administered questionnaire assessing sociodemographic characteristics, pregnancy history, and GBS-related KAP. Composite scores were standardised to a 0–100 scale and dichotomised using the median. Multivariable logistic regression identified independent predictors.

Results: A total of 371 women participated (mean age 32.6 ± 9.3 years); 74.7% had heard of GBS. High knowledge, good practice, and positive attitude scores were observed in 49.1%, 35.8%, and 41.2% of participants, respectively. Previous pregnancy, prior history of GBS, and specialist obstetric care were independently associated with better practices and attitudes.

Conclusion: Despite relatively high awareness, GBS screening practices remain suboptimal, underscoring the need for standardised antenatal screening protocols and targeted education.

Keywords: Attitudes, Health Knowledge, Mass Screening, Practices, Pregnancy, Prenatal Care, Saudi Arabia, Sepsis, *Streptococcus agalactiae*

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INTRODUCTION

Group B streptococcus (GBS), also known as *Streptococcus agalactiae*, is an encapsulated gram-positive diplococcus commonly found in the female urogenital tract and rectum [1]. Although mainly asymptomatic, it can be a cause of premature rupture of membranes, lower birth weight, premature birth, sepsis, and meningitis in newborns, thereby increasing morbidity and mortality during the neonatal period [2].

The pooled case fatality risk of invasive infant GBS disease is 8.4% (95% CI 6.6–10.2%), with the highest risk among preterm and very low birth weight infants [3]. Late-onset disease presents between 7 and 89 days of life, is not preventable by intrapartum antibiotic prophylaxis, and in settings with established universal screening now equals or exceeds early-onset disease in incidence [4]. Pooled global estimates place maternal GBS colonisation at 18% (95% CI 17–19%), with regional variation from 11% to 35% [5]; reported rates in Saudi Arabia range from 9.2% to 31.6% [6,7].

Two prevention strategies are used internationally. Universal culture-based screening entails vaginal–rectal culture of all pregnant women at 36 0/7 to 37 6/7 weeks of gestation, with intrapartum antibiotic prophylaxis for colonized women, as recommended by the American College of Obstetricians and Gynecologists [8]; the risk-based approach instead restricts prophylaxis to women with defined intrapartum risk factors [9]. The protection conferred by prophylaxis depends on the agent chosen and on the interval between administration and delivery [10]. Evaluations of screening programmes and direct comparisons of the two strategies report higher case ascertainment and greater disease prevention with culture-based screening [11,12], and management of the exposed neonate has been standardised accordingly [13]. To date, very little research has been conducted in the southwestern region of Saudi Arabia to assess women's knowledge, attitudes, and practices (KAP) in relation to GBS screening protocols, and none in the Asir Region. Knowledge of these factors is crucial for the development of effective public health policies aimed at improving health outcomes for women and infants. This study may help inform the development of educational policies to improve maternal and neonatal health in the region.

METHODS

Study design and setting

A cross-sectional analytical study was conducted between June and November 2024 in the southwestern region of Asir, one of Saudi Arabia's 13 administrative provinces. Asir is characterised by mountainous terrain, mixed urban and rural settlements, and an estimated population of approximately 2.2 million [14]. It is served by a network of primary healthcare centres, district hospitals, and tertiary care facilities, providing comprehensive maternal and child health services [15].

Study population and sampling

Participants

The target population comprised women of reproductive age residing in the Asir Region. Both pregnant and non-pregnant women were included, to capture KAP across the reproductive life course. Inclusion criteria were: women aged 18–45 years, residence in the Asir Region, and willingness to participate. Among women who met these criteria, participants were excluded if they declined to give informed consent, returned an incomplete questionnaire, or had taken part in the pilot study.

Sample size

The required sample size was determined using the Raosoft sample size calculator. The 95% confidence interval reflected the desired statistical certainty, a 5% margin of error specified the acceptable difference between sampling results and true population value, and a 50% response distribution assumed maximum variability (a conservative choice when prior estimates are unavailable). Using these parameters, the minimum required sample size was 385 participants.To reduce the impact of data loss, an allowance was added for anticipated non-response or incomplete questionnaires (10%); this increased the target recruitment to 425 women. After recruitment, 371 women completed the questionnaire adequately and were included in the analysis; resulting in a response rate of 87.3% (371 out of 425), above the required minimum and therefore sufficient to maintain the planned statistical power for the study's analyses. Participants were recruited using non-probability convenience sampling. No stratification or quota sampling was applied to ensure proportional representation of rural, less-educated or lower-income women; the composition of the final sample therefore reflects who chose to respond.

Data collection

Questionnaire development

Data were collected using a validated, anonymous, self-administered questionnaire adapted from previously published tools assessing awareness and screening practices regarding GBS among women in Saudi Arabia, with permission from the original authors [16]. This questionnaire was developed in Arabic and reviewed by an expert panel comprising obstetricians, family physicians, epidemiologists and public health specialists to ensure content validity and cultural appropriateness. Items were refined based on panel feedback to improve clarity and relevance to the Asir context.

The final instrument covered five domains: sociodemographic characteristics, pregnancy and healthcare history, GBS-related knowledge, GBS-related practices, and attitudes towards GBS screening:

Section 1: Sociodemographic characteristics
Included 10 items on age, nationality, marital status, educational level, occupation, monthly household income, and place of residence.

Section 2: Pregnancy and healthcare history
Included eight items on gravidity, parity, current pregnancy status, attendance at antenatal clinics, type of healthcare provider, level of care (primary, secondary, tertiary), and place of delivery.

Section 3: GBS knowledge
Comprised 15 items assessing awareness of GBS, modes of transmission, risk factors, maternal and neonatal complications (e.g. sepsis, pneumonia, meningitis), and preventive strategies, including intrapartum antibiotic prophylaxis.

Section 4: GBS practices
Included 12 items on health-seeking behaviour, whether GBS testing was discussed during antenatal visits, actual test uptake, timing of testing, test results, and adherence to recommended treatment in case of positive results.

Section 5: Attitudes towards GBS screening
Comprised 10 items evaluating support for routine versus risk-based screening, preference for mandatory or optional screening, willingness to be tested, and cost acceptability (e.g. preference for free or low-cost testing).

Pilot testing

A pilot study was conducted among 30 women who met the inclusion criteria, to assess the clarity of items, cultural appropriateness, and time required to complete the questionnaire. Minor wording changes were made to improve understanding, particularly in items related to screening protocols and medical terminology. To assess reliability, 20 of the pilot participants completed the questionnaire a second time after two weeks. Internal consistency for the main domains (knowledge, practices, and attitudes) was evaluated using Cronbach's alpha, which was ≥ 0.75 for all domains, indicating acceptable reliability. Pilot data were not included in the main analysis to preserve sample independence.

Data collection procedures

Multiple approaches were used to maximise coverage and representativeness. Most participants completed the questionnaire electronically via a secure online platform, with the survey link disseminated through social media channels (WhatsApp, X (Twitter), Telegram, and Snapchat). To reach women with limited internet access, trained data collectors administered the questionnaire face-to-face in selected healthcare facilities and community settings, and by telephone where appropriate. All data collectors received training on the study protocol, neutral administration of questions, and strategies to ensure privacy, confidentiality and data quality. For participants who completed the questionnaire online, consent was recorded through an electronic consent process that had to be completed before any questionnaire items were displayed. Completed questionnaires were checked for completeness and consistency prior to entry into the database.

Scoring and categorisation

Knowledge score

A composite knowledge score was derived from items relating to GBS awareness, routes of transmission, risk factors, maternal and neonatal complications, and preventive measures. Correct or appropriate responses were assigned positive points, while incorrect or "don't know" responses received lower or zero points. The total raw score was converted to a standardised scale ranging from 0 to 100, with higher scores indicating better knowledge.

Practice score

The practice score reflected behaviours relevant to GBS screening and management. For women who had ever been pregnant, items included whether GBS testing had been discussed with a healthcare provider, actual test uptake, timing of the test in relation to gestational age, and adherence to recommended treatment in case of a positive result. For women who had never been pregnant, the score was based on intention-related items, such as willingness to be tested in a future pregnancy and likelihood of following medical advice. Responses were weighted according to their clinical importance, summed and standardised to a 0–100 scale, with higher scores indicating better GBS-related practices.

Attitude score

The attitude score captured support for GBS screening policies and personal acceptance of screening. Items contributing to the score included preferred screening strategy (universal versus high-risk only), preference for mandatory versus optional screening, willingness to undergo testing, and views on cost and financial accessibility. Responses were coded and aggregated into a 0–100 scale, with higher scores indicating more positive attitudes towards GBS screening.

Dichotomisation of KAP scores

For analytical purposes, each of the three domains (knowledge, practices, and attitudes) was dichotomised into "high" and "low" categories using the sample median as the cut-off value. Participants with scores equal to or above the median were classified as having high knowledge, good practice, or positive attitude, respectively; those with scores below the median were classified as low. This approach yields approximately balanced groups and is robust to skewed distributions.

Statistical analysis

All analyses were conducted using SAS software (version 9.4), and all tests were two-tailed with a statistical significance threshold of $p \leq 0.05$. Continuous variables were summarised using means and standard deviations (±SD), along with their observed ranges, to provide a clear description of their distribution. The normality of continuous variables was evaluated using the Shapiro–Wilk test to determine the appropriateness of parametric statistical procedures. Categorical variables were assessed in terms of frequencies and percentages. Univariate analysis included independent sample t-tests to compare continuous variables between high and low outcome groups, with homogeneity of variance assessed using Levene's test. Chi-square tests of independence were used to examine associations between categorical predictors and each outcome variable; when expected cell counts were < 5, Fisher's exact test was applied as a conservative alternative. For each of the three outcome domains (knowledge, practices, and attitudes), separate binary logistic regression models were constructed to identify independent predictors while adjusting for potential confounders. Variables with univariate p-values ≤ 0.20 were entered into the initial multivariable models to minimise the risk of excluding potentially meaningful predictors. Backward stepwise elimination was employed, with variables retained in the final model only if $p < 0.05$. The dependent variables, high vs. low knowledge, good vs. poor practices, and positive vs. less positive attitudes, were derived using median-split dichotomisation of standardised 0–100 domain scores. Independent variables included sociodemographic characteristics, reproductive history, healthcare utilisation factors, and GBS-related awareness measures. To avoid statistical circularity and artificial inflation of effect sizes, variables inherently used in calculating the practice score (e.g. having undergone a GBS test) were excluded from the multivariable practice model. Multicollinearity among predictors was assessed using variance inflation factors (VIF), with VIF < 2 considered acceptable. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were reported for all final models. Analyses were restricted to complete cases; no imputation was undertaken for missing values.

Ethical consideration

The study protocol was reviewed and approved by the Scientific Research Ethics Committee of Jazan University, Saudi Arabia (HAPO-10-Z-001; approval number REC-46/07/1371). All procedures were conducted in accordance with the Declaration of Helsinki.

Before participation, the women received informed about the study's objectives, procedures, potential risks and benefits, confidentiality measures, and their right to withdraw at any time without consequences for their care. Written informed consent was obtained from all participants. Questionnaires were anonymised using unique identification codes, and any potentially identifying information was stored separately in password-protected files accessible only to the core research team.

RESULTS

Participant characteristics

A total of 371 women participated in the study, with a mean age of 32.6 ± 9.3 years (range 18–45). Most participants were Saudi nationals and resided in the main urban centres of the Asir Region. Overall, 60.4% (n = 224) reported at least one previous pregnancy; among those, the mean number of pregnancies was 2.95 ± 1.85 and the mean number of births was 2.72 ± 1.73. Educational attainment was generally high: 77–78% had a university degree or higher; around half were students, followed by employed women. Monthly household income was distributed across all the categories, with roughly one quarter earning < 5,000 SAR and about one quarter earning > 15,000 SAR per month (Table 1) (see appendix).

GBS knowledge and awareness

Overall, 74.7% (n = 277) of women reported that they had heard of GBS, while 25.3% (n = 94) had no prior awareness. When knowledge items were combined into a composite score (0–100 scale), the mean knowledge score was 72.15 ± 18.45. Using the median split, 49.1% (n = 182) of participants were classified as having high knowledge and 50.9% (n = 189) as low knowledge. Only 39.1% of women demonstrated a comprehensive understanding of GBS (including transmission, complications, and prevention), 35.6% had basic knowledge, and

25.3% had limited or incorrect knowledge. Personal history of GBS infection was reported by 6.2%. Risk perception varied: 42.0% viewed GBS as highly dangerous, 36.1% as a medium risk, and 21.8% considered it low risk or were unsure. Healthcare providers were the most frequently reported source of information (about 45%), followed by the internet and social media platforms, with smaller contributions from family and friends (Table 2).

GBS screening practices

Among women with previous pregnancy (n = 224), 59.8% reported that GBS testing was discussed during antenatal care, while 40.2% had never been informed about it. Only 34.4% (n = 77) reported having undergone a GBS test during pregnancy, whereas 65.6% (n = 147) had not been tested. Among those who were not tested, the most common reason was that the test was not offered by their healthcare provider (about 60%), followed by patient refusal and cost concerns. Among women who were tested, approximately three-quarters reported that testing occurred at the recommended gestational window of 35–37 weeks. Around one in five tested women (≈20%) reported a positive result, and the majority of them reported receiving appropriate treatment. The mean practice score for the whole sample was 28.65 ± 35.20 (0–100). Using the median cut-off, 35.8% (n = 133) of women were classified as having high practice scores and 64.2% (n = 238) as low practice scores, indicating that most women had limited engagement in GBS-related screening behaviour despite relatively high awareness (Table 2).

Attitudes towards GBS screening

Attitudes towards GBS screening were generally favourable. More than half of participants (57.4%) believed that GBS testing should be performed routinely for all pregnant women, while 42.6% felt it should be limited to women at high risk. Regarding implementation, 50.9% supported mandatory screening, 39.1% preferred optional screening with counselling, and only 10.0% thought it should be offered only on request. Cost was an important consideration: 72.0% believed GBS testing should be free of charge, 21.0% were willing to accept testing if the cost was low, and only a minority reported that cost was not an important factor. The mean attitude score was 71.85 ± 22.30. Using the median cut-off, 41.2% (n = 153) were classified as having positive attitudes and 58.8% (n = 218) as less positive (Table 2).

Factors associated with high knowledge

In univariate analyses, age, parity, education, nationality, marital status, and other sociodemographic variables were not significantly associated with knowledge level. However, prior exposure to GBS information and risk factor awareness were strongly associated with high knowledge. Among women who had heard of GBS, 74.7% fell into the high-knowledge group, compared with 25.3% of those who had not. Similarly, women who were aware of GBS risk factors were more likely to have high knowledge scores than those who were unaware or unsure. In the multivariable logistic regression model, having heard of GBS remained the strongest independent predictor of high knowledge (adjusted OR 3.45, 95% CI 2.08–5.73, $p < 0.001$), followed by awareness of risk factors (OR 2.13, 95% CI 1.41–3.22, $p < 0.001$). University education showed a positive but borderline association (Table 3).

Factors associated with good practices

Women with high practice scores were slightly older on average and had experienced significantly more pregnancies and births than those with low practice scores. Pregnancy experience itself was a major determinant: 83.5% of women in the good-practice group had been pregnant compared with 47.5% in the poor-practice group. Among women with pregnancy experience, good practice was associated with receiving care from specialist obstetricians rather than general practitioners and with actually undergoing GBS testing. In multivariable analysis, previous pregnancy remained the strongest predictor of good practice (adjusted OR 5.82, 95% CI 3.42–9.91, $p < 0.001$). Older age and follow-up with specialist obstetric care were also independently associated with higher practice scores (Table 3).

Factors associated with positive attitudes

Positive attitudes were more frequent among women with university-level education and among employed women compared with students. Prior awareness of GBS and perception of GBS as a high-risk condition were also strongly associated with positive attitudes, and women who supported routine testing for all pregnant women were more likely to fall into the positive-attitude group. In the multivariable model, university education (adjusted OR 2.08, 95% CI 1.18–3.67, $p = 0.012$), having heard of GBS (OR 1.89, 95% CI 1.16–3.08, $p = 0.011$), and perceiving GBS as high risk (OR 1.71, 95% CI 1.14–2.57, $p = 0.009$) independently predicted positive attitudes. Student status was inversely associated with positive attitudes (OR 0.65, 95% CI 0.43–0.98, $p = 0.041$), suggesting that this subgroup may require targeted educational interventions (Table 3).

DISCUSSION

This study provides the first assessment of knowledge, attitudes, and practices related to group B streptococcus (GBS) screening among women in the Asir Region of Saudi Arabia. The findings demonstrate a clear discrepancy between awareness and actual screening practices. Although 74.7% of participants had heard of GBS, only 34.4% of pregnant women reported undergoing screening. Nearly half of the women demonstrated high knowledge (49.1%) and over one-third showed positive attitudes (41.2%), but practices remained poor (35.8%). These findings likely reflect, at least in part, the characteristics of our sample (which was predominantly urban and highly educated, and may not be fully representative of all women in the Asir Region), and highlight a persistent knowledge–practice gap that has important implications for maternal and neonatal health.

Our results align with theoretical predictions of the Knowledge–Attitude–Practice (KAP) model, which suggests that knowledge alone is insufficient to produce behavioural change [17]. Multivariable analysis further clarifies this pathway: prior awareness and understanding of risk factors significantly predicted higher knowledge, while pregnancy experience and previous testing were the strongest independent predictors of better screening practices. Positive attitudes were strongly associated with higher education, prior knowledge of GBS, and perceiving GBS as a high-risk condition.

Regional and international comparisons reveal significant heterogeneity in GBS awareness and screening [16,18,19,20]. In the Saudi context, in Al-Madinah, 66.8% of women had never heard of GBS and only 12.7% had ever been offered screening [19]. In Jeddah, 85.3% of women were unaware of GBS and knowledge scores were generally low [18]. A recent study in Jazan reported awareness of only 23% [16]. In contrast, 74.7% of women in our study reported prior awareness, suggesting relatively better exposure in Asir. However, our sample differed substantially from these populations: more than three-quarters of our participants had a university degree, and many were recruited through online platforms. It is therefore likely that the higher awareness observed in our study reflects sampling of a more educated, health-engaged subgroup rather than a true regional difference in GBS-related knowledge across the entire Asir population.

International findings also mirror the gap between awareness and implementation. For example, in Australia, over 60% of women lacked adequate knowledge about GBS despite established screening recommendations [20]. In Jordan and the United Arab Emirates, high rates of maternal colonisation have been documented in the absence of a unified national screening policy, with intrapartum prophylaxis largely left to clinician discretion [21,22]. These patterns indicate the global challenge of achieving consistent GBS screening outside of systems with unified national policies.

Notably, global evidence consistently demonstrates the superiority of universal screening over risk-based approaches [8,9,23,24]. Universal GBS screening has reduced early-onset neonatal disease in the United States by nearly 80%, from 1.9 to 0.3–0.4 cases per 1,000 live births [9]. A systematic review and meta-analysis confirmed that universal, culture-based screening reduces early-onset GBS disease by approximately 57% compared with risk-based protocols [25]. It is noteworthy that Saudi Arabia currently lacks national screening guidelines [16,18,19], which likely contributes to the low screening rates observed in this and other regional studies.

Several barriers previously reported appear to limit screening uptake in the current setting [25–27]. Patient-level barriers include limited understanding of severity, inconsistent risk perception, and concerns about cost—72% of participants preferred free screening. Provider-level barriers are likely the most influential: previous studies show that many physicians in Saudi Arabia lack formal training in GBS screening, and more than half cite unclear protocols or inconsistent institutional policies as barriers [18]. Our data similarly show that specialist care significantly predicted better screening practices, reinforcing the importance of provider training and consistent practice standards.

At the system level, the absence of national policies creates inconsistent antenatal pathways. Countries that have adopted universal guidelines achieve significantly higher screening rates and better neonatal outcomes [8,9,24,25,26,27,28,29]. Saudi Arabia's variable colonisation rates (2.1–32.8%) and documented early-onset GBS disease burden [6,7,30] support the need for structured national screening to prevent avoidable maternal and neonatal morbidity.

The implementation of national, evidence-based GBS screening guidelines would provide a clear, actionable pathway to improve maternal and neonatal outcomes. Studies from multiple settings indicate that universal screening can be cost-effective by reducing neonatal intensive care admissions and long-term disability [30,31]. A systematic review of intrapartum antibiotic prophylaxis policies worldwide found that countries with formal, nationally endorsed screening and prophylaxis protocols achieve more consistent implementation than those relying on local or discretionary practice [32]. Given that 57.4% of women in our population preferred routine screening and 72% preferred free access, these findings support scaling screening through existing antenatal care services. Operationally, policymakers could integrate GBS screening into national maternal health programmes, ensure subsidised or free testing for eligible women, and couple rollout with provider training, standardised testing protocols, and referral pathways for intrapartum antibiotic prophylaxis. Public education and integration with national digital health or registration platforms could further improve uptake and continuity of care.

Several limitations must be acknowledged. First, the use of convenience sampling and online recruitment, together with the high proportion of university-educated participants, introduces selection bias and limits the generalisability of our findings to all women of reproductive age in the Asir Region. The relatively high levels of awareness and positive attitudes observed in this study are therefore likely to overestimate population-level KAP. Second, the cross-sectional design precludes causal inference. Third, the practice score combines both actual behaviour among previously pregnant women and intention-related items among nulligravid women, which may introduce heterogeneity in the construct and complicate interpretation. Fourth, missing data are an additional source of bias. Of the 425 women approached, 54 (12.7%) did not return an adequately completed questionnaire and were excluded, and all analyses were restricted to complete cases without imputation. Non-response of this magnitude is unlikely to have been completely at random: women who were older, less educated, resident in rural districts or unfamiliar with GBS may plausibly have been more likely to leave the questionnaire incomplete. If so, the knowledge, practice, and attitude estimates reported here are likely to be biased upwards, and the adjusted odds ratios could be biased in either direction, because selection that depends jointly on a covariate and the outcome may either inflate or attenuate an association. In addition, the items capturing actual screening behaviour could be answered only by the 224 women with a previous pregnancy, so those estimates are conditional on that subgroup and are correspondingly less precise. Because respondents and non-respondents were not compared on baseline characteristics, the direction and magnitude of this bias cannot be quantified, and the findings should be read as describing responders rather than all women of reproductive age in the Asir Region. Fifth, although the analysis is framed by the KAP model, the structural relationships that the model implies—knowledge acting on attitudes and attitudes acting on practices—were not formally tested; the three domains were modelled as separate outcomes. Finally, self-reported data are subject to recall and social desirability bias, and we did not assess providers' knowledge or institutional policies, which are critical determinants of screening uptake.

Future research in Saudi Arabia should include longitudinal designs to assess changes in KAP over time, qualitative studies exploring decision-making during pregnancy, and provider-focused studies to identify supply-side barriers. Formal testing of the KAP pathway using path analysis or structural equation modelling would allow the relationships between the three domains to be estimated directly rather than inferred. Economic evaluations tailored to the Saudi system would strengthen the policy case for universal screening. Pilot implementation projects comparing universal and risk-based strategies could provide the pragmatic evidence needed to support a national guideline.

CONCLUSION

Although awareness of GBS was relatively high in our largely urban, highly-educated sample from Asir, screening practices remained suboptimal, indicating a knowledge–implementation gap. Because our participants may not be fully representative of the broader Asir female population, these findings should be interpreted with caution and should temper any generalisation-based claims. Interventions should nonetheless prioritise provider training, standardised antenatal protocols, and patient education to improve systematic GBS screening and maternal and neonatal outcomes, while future studies using more representative sampling are needed to confirm the magnitude of this knowledge–practice gap at the population level.

FUNDING

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Anonymised data supporting the conclusions of this study may be made available upon reasonable request to the corresponding author, subject to ethical approval and participant consent.

USE OF ARTIFICIAL INTELLIGENCE (AI)

The authors used artificial intelligence (Claude Opus 5, Anthropic) solely to improve the English language of the manuscript and to check consistency and formatting. The tool was not used to generate scientific content, analyse data, or interpret results. All AI-assisted text was reviewed and edited by the authors, who take full responsibility for the content of the publication.

REFERENCES

1. Morgan JA, Zafar N, Cooper DB. Group B streptococcus and pregnancy. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 [cited 2025 Jan 10]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK482443/.
2. Mańdziuk J, Kuchar EP. Streptococcal meningitis. [Updated 2025 Jun 22]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554448/
3. Madrid L, Seale AC, Kohli-Lynch M, Edmond KM, Lawn JE, Heath PT, Madhi SA, Baker CJ, Bartlett L, Cutland C, Gravett MG, Ip M, Le Doare K, Rubens CE, Saha SK, Sobanjo-Ter Meulen A, Vekemans J, Schrag S; Infant GBS Disease Investigator Group. Infant group B streptococcal disease incidence and serotypes worldwide: systematic review and meta-analyses. Clin Infect Dis. 2017;65(Suppl 2):S160–72. doi:10.1093/cid/cix656.
4. Nanduri SA, Petit S, Smelser C, Apostal M, Alden NB, Harrison LH, Lynfield R, Vagnone PS, Burzlaff K, Spina NL, Dufort EM, Schaffner W, Thomas AR, Farley MM, Jain JH, Pondo T, McGee L, Beall BW, Schrag SJ. Epidemiology of invasive early-onset and late-onset group B streptococcal disease in the United States, 2006–2015: multistate laboratory and population-based surveillance. JAMA Pediatr. 2019;173(3):224–33. doi:10.1001/jamapediatrics.2018.4826.
5. Russell NJ, Seale AC, O'Driscoll M, O'Sullivan C, Bianchi-Jassir F, Gonzalez-Guarin J, Lawn JE, Baker CJ, Bartlett L, Cutland C, Gravett MG, Heath PT, Le Doare K, Madhi SA, Rubens CE, Schrag S, Sobanjo-Ter Meulen A, Vekemans J, Saha SK, Ip M; GBS Maternal Colonization Investigator Group. Maternal colonization with group B streptococcus and serotype distribution worldwide: systematic review and meta-analyses. Clin Infect Dis. 2017;65(Suppl 2):S100–11. doi:10.1093/cid/cix658.
6. Musleh J, Al Qahtani N. Group B streptococcus colonization among Saudi women during labor. Saudi J Med Med Sci. 2018;6:18. doi:10.4103/sjmms.sjmms_175_16.
7. Mohamed AM, Khan MA, Faiz A, Ahmad J, Khidir EB, Basalamah MA, Aslam A. Group B streptococcus colonization, antibiotic susceptibility, and serotype distribution among Saudi pregnant women. Infect Chemother. 2020;52:70–81.
8. American College of Obstetricians and Gynecologists' Committee on Obstetric Practice. Prevention of group B streptococcal early-onset disease in newborns: ACOG Committee Opinion, Number 797. Obstet Gynecol. 2020;135(2):e51–72. doi:10.1097/AOG.0000000000003668.
9. Verani JR, McGee L, Schrag SJ; Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention (CDC). Prevention of perinatal group B streptococcal disease—revised guidelines from CDC, 2010. MMWR Recomm Rep. 2010;59(RR-10):1–36.
10. Berardi A, Spada C, Vaccina E, Boncompagni A, Bedetti L, Lucaccioni L. Intrapartum beta-lactam antibiotics for preventing group B streptococcal early-onset disease: can we abandon the concept of "inadequate" intrapartum antibiotic

prophylaxis? Expert Rev Anti Infect Ther. 2020;18:37–46. doi:10.1080/14787210.2020.1697233.

11. Gopal Rao G, Nartey G, McAree T, O'Reilly A, Hiles S, Lee T, Wallace S, Batura R, Khanna P, Abbas H, Tilsed T, Nicholl R, Lamagni T, Bassett Pet al. Outcome of a screening programme for the prevention of neonatal invasive early-onset group B streptococcus infection in a UK maternity unit: an observational study. BMJ Open. 2017;7:e014634. doi:10.1136/bmjopen-2016-014634.
12. Khalil MR, Uldbjerg N, Thorsen PB, Møller JK. Risk-based approach versus culture-based screening for identification of group B streptococci among women in labor. Int J Gynaecol Obstet. 2019;144:187–91. doi:10.1002/ijgo.12721.
13. Puopolo KM, Lynfield R, Cummings JJ; American Academy of Pediatrics, Committee on Fetus and Newborn, Committee on Infectious Diseases. Management of infants at risk for group B streptococcal disease. Pediatrics. 2019;144(2):e20191881. doi:10.1542/peds.2019-1881.
14. General Authority for Statistics, Kingdom of Saudi Arabia. Population in Asir Region by gender, age group and nationality (Saudi/non-Saudi). Riyadh: GASTAT; [cited 2025 Jan 10]. Available from: https://www.stats.gov.sa/en/6140
15. Almalki M, Fitzgerald G, Clark M. Health care system in Saudi Arabia: an overview. East Mediterr Health J. 2011;17(10):784–93. doi:10.26719/2011.17.10.784.
16. Zoli SI, Baiti MA, Alhazmi AA, Khormi RM, Sayegh MA, Altubayqi T, Darisi AM, Alhasani RA, Alhazmi SH, Gharawi SO, Muhajir AA, Alhazmi AHet al. Factors affecting awareness of pregnancy screening for group B streptococcus infection among women of reproductive age in Jazan Province, Saudi Arabia. J Multidiscip Healthc. 2023;16:2109–16. doi:10.2147/JMDH.S421412.
17. Kelly MP, Barker M. Why is changing health-related behaviour so difficult? Public Health. 2016;136:109–16. doi:10.1016/j.puhe.2016.03.030.
18. Alamri Y, Albasri S, Abduljabbar GH, Alghamdi H, Balkhair AM, AlAam R. Awareness of pregnancy screening for group B streptococcus infection among women of reproductive age and physicians in Jeddah, Saudi Arabia. Cureus. 2021;13(10):e18765. doi:10.7759/cureus.18765.
19. Alshengeti A, Alharbi A, Alraddadi S, Alawfi A, Aljohani B. Knowledge, attitude and current practices of pregnant women towards group B streptococcus screening: a cross-sectional study, Al-Madinah, Saudi Arabia. BMJ Open. 2020;10:e032487. doi:10.1136/bmjopen-2019-032487.
20. Giles ML, Buttery J, Davey M-A, Wallace E. Pregnant women's knowledge and attitude to maternal vaccination including group B streptococcus and respiratory syncytial virus vaccines. Vaccine. 2019;37:6743–9. doi:10.1016/j.vaccine.2019.08.084.
21. Clouse K, Shehabi A, Suleimat AM, Faouri S, Khuri-Bulos N, Al Jammal A, Chappell J, Fortner KB, Chamby AB, Randis TM, Ratner AJ, Aronoff DM, Halasa Net al. High prevalence of group B streptococcus colonization among pregnant women in Amman, Jordan. BMC Pregnancy Childbirth. 2019;19:177. doi:10.1186/s12884-019-2317-4.
22. AlZuheiri STS, Dube R, Menezes G, Qasem S. Clinical profile and outcome of group B streptococcal colonization in mothers and neonates in Ras Al Khaimah, United Arab Emirates: a prospective observational study. Saudi J Med Med Sci.

2021;9:235–40. doi:10.4103/sjmms.sjmms_213_21.

23. Abdelmaaboud M, Mohammed AF. Universal screening vs. risk-based strategy for prevention of early-onset neonatal group B streptococcal disease. J Trop Pediatr. 2011;57:444–50. doi:10.1093/tropej/fmr014.
24. Schrag SJ, Zell ER, Lynfield R, Roome A, Arnold KE, Craig AS, Harrison LH, Reingold A, Stefonek K, Smith G, Gamble M, Schuchat A; Active Bacterial Core Surveillance Team. A population-based comparison of strategies to prevent early-onset group B streptococcal disease in neonates. N Engl J Med. 2002;347(4):233–9. doi:10.1056/NEJMoa020205.
25. Hasperhoven GF, Al-Nasiry S, Bekker V, Villamor E, Kramer BWW. Universal screening versus risk-based protocols for antibiotic prophylaxis during childbirth to prevent early-onset group B streptococcal disease: a systematic review and meta-analysis. BJOG. 2020;127:680–91. doi:10.1111/1471-0528.16085.
26. Pangerl S, Sundin D, Geraghty S. Group B streptococcus screening guidelines in pregnancy: a critical review of compliance. Matern Child Health J. 2021;25:257–67. doi:10.1007/s10995-020-03113-z.
27. Rao GG, Khanna P. To screen or not to screen women for group B streptococcus (*Streptococcus agalactiae*) to prevent early-onset sepsis in newborns: recent advances in the unresolved debate. Ther Adv Infect Dis. 2020;7:2049936120942424. doi:10.1177/2049936120942424.
28. Angstetra D, Ferguson J, Giles WB. Institution of universal screening for group B streptococcus (GBS) from a risk management protocol results in reduction of early-onset GBS disease in a tertiary obstetric unit. Aust N Z J Obstet Gynaecol. 2007;47:378–82. doi:10.1111/j.1479-828X.2007.00760.x.
29. Stephens K, Charnock-Jones DS, Smith GCS. Group B streptococcus and the risk of perinatal morbidity and mortality following term labor. Am J Obstet Gynecol. 2023;228(Suppl 1):S1305–12. doi:10.1016/j.ajog.2022.07.051.
30. Gonçalves BP, Procter SR, Paul P, Chandna J, Lewin A, Seedat F, Koukounari A, Dangor Z, Leahy S, Santhanam S, John HB, Bramugy J, Bardají A, Abubakar A, Nasambu C, Libster R, Sánchez Yanotti C, Horváth-Puhó E, Sørensen HT, van de Beek D, Bijlsma MW, Gardner WM, Kassebaum N, Trotter C, Bassat Q, Madhi SA, Lambach P, Jit M, Lawn JE; GBS Danish and Dutch collaborative group for long term outcomes; GBS Low and Middle Income Countries collaborative group for long term outcomes; GBS Scientific Advisory Group, epidemiological sub-group; CHAMPS teamet al. Group B streptococcus infection during pregnancy and infancy: estimates of regional and global burden. Lancet Glob Health. 2022;10:e807–19. doi:10.1016/S2214-109X(22)00093-6.
31. Colbourn T, Asseburg C, Bojke L, Philips Z, Welton NJ, Claxton K, Ades AE, Gilbert REet al. Preventive strategies for group B streptococcal and other bacterial infections in early infancy: cost effectiveness and value of information analyses. BMJ. 2007;335(7621):655.
32. Le Doare K, O'Driscoll M, Turner K, Seedat F, Russel NJ, Seale AC, Heath PT, Lawn JE, Baker CJ, Bartlett L, Cutland C, Gravett MG, Ip M, Madhi SA, Rubens CE, Saha SK, Schrag S, Sobanjo-Ter Meulen A, Vekemans J, Kampmann B; GBS Intrapartum Antibiotic Investigator Group. Intrapartum antibiotic chemoprophylaxis policies for the prevention of group B

streptococcal disease worldwide: systematic review. Clin Infect Dis. 2017;65(Suppl 2):S143–51. doi:10.1093/cid/cix654.

APPENDIX

Table 1. Sociodemographic and reproductive characteristics of participants (N = 371)

Variable	Category / Statistic	n	% / Mean ± SD (Range)
Age (years)		371	32.6 ± 9.3 (18–45)
Gravidity*		224	2.95 ± 1.85 (0–8)
Parity*		224	2.72 ± 1.73 (0–7)
Nationality	Saudi	340	91.6
	Non-Saudi	31	8.4
Place of residence	Abha	125	33.7
	Mahayil Asir	98	26.4
	Khamis Mushait	78	21.0
	Other areas	70	18.9
Marital status	Single	187	50.4
	Married	165	44.5
	Divorced / Widowed	19	5.1
Education level	Secondary or below	68	18.3
	University	287	77.4
	Postgraduate	16	4.3
Occupation	Student	186	50.1
	Employee	145	39.1
	Housewife	28	7.5
	Retired / Other	12	3.3
Monthly household income (SAR)	< 5,000	89	24.0
	5,000–10,000	112	30.2
	10,001–15,000	78	21.0
	> 15,000	92	24.8
History of pregnancy	Yes	224	60.4
	No	147	39.6

Note. *Analysis limited to participants with pregnancy experience (n = 224).

Table 2. Knowledge, practices and attitudes related to group B streptococcus (GBS) screening

Domain	Indicator	Category / Response	n	%
Knowledge & awareness (N = 371)	Heard about GBS	Yes	277	74.7
		No	94	25.3
	Overall GBS knowledge level	Comprehensive understanding	145	39.1
		Basic understanding	132	35.6
		Limited / incorrect	94	25.3
	Ever had a GBS infection	Yes	23	6.2
		No	325	87.6
		Not sure	23	6.2
	Perceived danger of GBS	Highly dangerous	156	42.0
		Medium risk	134	36.1
		Low risk / not sure	81	21.8
	Aware of GBS risk factors	Yes	165	44.5
		No	134	36.1
		Not sure	72	19.4
		Yes	134	59.8

Screening practices (women ever pregnant, n = 224)	GBS test discussed in pregnancy	No	90	40.2
	Ever had GBS test	Yes	77	34.4
		No	147	65.6
	Main reason for not being tested†	Test not offered	89	60.5
		Declined testing	23	15.6
		Cost concerns	19	12.9
		Other reasons	16	10.9
	Gestational age at testing‡	35–37 weeks	56	72.7
		< 35 weeks	12	15.6
		> 37 weeks	9	11.7
	GBS test result‡	Positive	15	19.5
		Negative	62	80.5
	Treatment among positives§	Received treatment	12	80.0
		Did not receive treatment	3	20.0
Attitudes (N = 371)	Who should be tested	All pregnant women (routine screening)	213	57.4
		High-risk pregnancies only	158	42.6
	Preferred implementation	Mandatory screening	189	50.9
		Optional screening with counselling	145	39.1
		Only if requested	37	10.0
	Cost acceptability of testing	Should be free	267	72.0
		Acceptable if low cost	78	21.0
		Cost not important	26	7.0

Note. †Among women who had not been tested for GBS (n = 147), ‡Among women who reported having had a GBS test during pregnancy (n = 77), §Among women who reported a positive GBS test (n = 15).

Table 3. Multivariable logistic regression: predictors of high knowledge, good practices and positive attitudes towards GBS screening

Outcome	Predictor variable	Adjusted OR	95% CI	p-value
High knowledge	Heard about GBS (Yes vs No)	3.45	2.08–5.73	<0.001
	Aware of GBS risk factors (Yes vs No / Unsure)	2.13	1.41–3.22	<0.001
	University education (vs Secondary or below)	1.67	0.95–2.94	0.076
Good practices	Ever pregnant (Yes vs No)	5.82	3.42–9.91	<0.001
	Age (per 1-year increase)	1.04	1.01–1.07	0.012
	Specialist obstetric care (vs General / Other) *	2.34	1.23–4.45	0.009
Positive attitude	University education (vs Secondary or below)	2.08	1.18–3.67	0.012
	Heard about GBS (Yes vs No)	1.89	1.16–3.08	0.011
	Perceives GBS as high risk (vs Medium / Low)	1.71	1.14–2.57	0.009
	Student (vs Other occupation)	0.65	0.43–0.98	0.041

Note. *Analysis for these predictors is limited to women with pregnancy experience (n = 224).