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The acceptability of implementation of group B Streptococcus testing: Perspectives from women and health professionals in the GBS3 trial: A qualitative study

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ABSTRACT

Objective: To determine the acceptability of different methods of routine testing for group B Streptococcus (GBS) colonisation to pregnant women and health care professionals (HCPs), and to examine barriers and facilitators to their implementation.
Design: Qualitative study, embedded in a cluster randomised trial
Setting: Four NHS maternity units participating in the GBS3 Trial: two conducting routine antenatal enriched culture medium (ECM) testing; and two using routine rapid intrapartum testing.
Sample
39 women and 25 HCPs purposively sampled to ensure representation of women with various birthing experiences and different professions.
Methods
Women were interviewed approximately 12 weeks postpartum by telephone or online video call, using a semi-structured topic guide. HCPs were interviewed during the testing period of the trial. Interviews were transcribed for thematic analysis and summarised using the framework method.
Results: Four categories of interest emerged: (1) views of routine testing; (2) acceptability of the testing procedure; (3) preferences on the types of test; (4) improving the testing procedure. Routine GBS testing was well received by both women and HCPs. Most participants found the procedure acceptable and were willing to receive the offer of testing in the future. Preferences for different testing methods varied, with participants emphasising the importance of evidence and informed choice.
Conclusions: Routine GBS testing is acceptable to most women and HCPs. Areas for consideration and the practicalities of implementing testing in maternity services are highlighted.

Abbreviations: GBS, group B Streptococcus; HCP, Healthcare professional; IAP, Intrapartum antibiotic prophylaxis; RCOG, Royal College of Obstetricians and Gynaecologists; NIHR, National Institute for Health and Care Research; NICE, National Institute for Health and Care Excellence; PAE, Perinatal Adverse Event; RM, Research Midwife.

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Statement of Significance	
Problem or Issue	Transmission of group B Streptococcus (GBS) bacteria can lead to neonatal infections such as pneumonia, meningitis and sepsis and serious complications in infants.
What is Already Known	Testing and treatment vary worldwide. In the UK, routine testing is not currently recommended due to a lack of definitive evidence on clinical and cost effectiveness. There is limited evidence on the acceptability and feasibility of implementing routine GBS testing in universal healthcare.
What this Paper Adds	Routine GBS testing is acceptable to most women and HCPs interviewed. Areas for consideration and the practicalities of implementing testing in maternity services are highlighted.

Inclusion statement

The authors recognise that people have diverse gender identities, and in this paper, the word 'women' is used to describe individuals whose sex was assigned at birth as female, whether they identify as female, male, or non-binary.

Introduction

In the United Kingdom (UK) 20–25 % of pregnant women carry group B Streptococcus (GBS) bacteria and 36 % of those who have GBS in labour will pass this to their baby [1]. Transmission can lead to neonatal infections such as pneumonia, meningitis and sepsis and serious complications. The incidence of early-onset infection was reported at 0.57 per 1000 live births across the UK and Ireland in 2014, [2] with an overall mortality rate of 6–10 % of all infected neonates [3].

Testing and treatment vary worldwide [4]. Some countries employ a universal testing practice offering vaginal-rectal swabs to all pregnant women to detect colonisation [5]. Others only offer testing to those who have clinical risk factors for neonatal GBS, if GBS is identified, intrapartum antibiotic prophylaxis (IAP) is offered during labour to reduce transmission to the baby [6].

In the UK, routine testing is not currently recommended due to a lack of randomised evidence, the low predictive power of maternal testing for neonatal infection, the potential for unnecessary antibiotic use and the similar rate of neonatal infection in the UK compared to countries where screening has been implemented [1,7]. The UK National Institute of Health and Care Research (NIHR) therefore commissioned the GBS3 trial [8] to compare the effectiveness of Enriched Culture Medium (ECM) testing carried out antenatally around 36 weeks' gestation, routine rapid testing carried out during labour, and the usual risk-based approach based on Royal College of Obstetricians and Gynaecologists (RCOG) and National Institute of Clinical Excellence (NICE) guidelines (control group). The current qualitative study was undertaken as part of this trial, to understand the acceptability of routine GBS testing to women and healthcare professionals (HCPs), as well as implementation and contextual factors.

Pregnant women have limited awareness about GBS [9–12]. Our previous study found that GBS testing was viewed similarly to other routine tests offered during pregnancy [13]. While most had positive attitudes towards testing, concerns included the invasiveness of testing; risks to themselves or their baby; potential side effects of antibiotics; and impact on choices over preferred place of birth. Evidence on the acceptability of testing to women and HCPs indicates that women's preferred time to be tested for GBS (antenatal vs intrapartum), varies between individuals [14]. Other literature indicates that certain aspects of the testing procedures, such as self-swabbing, [15–17] have mixed acceptability. Although we do have evidence on the acceptability of GBS testing broadly, there is limited evidence on the acceptability and feasibility of implementing routine GBS testing in universal healthcare [13].

This study explores the acceptability of different methods of routine testing for GBS colonisation for pregnant women and HCPs and highlights barriers and facilitators to the implementation of either routine testing strategy.

Methods

Design

We used semi-structured interviews with a topic guide (supplementary file 1) informed by a theoretical framework of acceptability [18]. Constructs included affective attitudes, burden, perceived effectiveness, ethicality, intervention coherence, opportunity costs and self-efficacy. This guide also included site-specific contextual factor using the NICE guidelines on identifying barriers to changing practice [19], including practical, environmental and organisational barriers and facilitators.

Sampling

Participants were recruited from four NHS GBS3 trial sites that had been randomised to either of the two routine testing groups (two ECM and two Rapid testing maternity units). These were in the north (n=2) and south (n=2) of England and were all urban locations. Participants were purposively sampled to include predefined characteristics that may influence the acceptability of GBS testing. For women, these were place of birth (hospital, home, birth centre), term and preterm birth, younger and older age, and diverse ethnicity. For staff, sampling spanned representation from different disciplines, clinical experience levels, and settings for clinical practice (hospital, home, birth centre).

Eligibility criteria

Women were eligible if they were: up to 12 weeks postpartum following a live birth; at least 16 years old; sufficiently fluent in English to give informed consent, and to understand the interview questions and answer them conversationally; and if they had given birth at a GBS3 site. HCPs were eligible if they were registered health professionals working in one of the four selected GBS testing sites.

All women should have been provided with information about GBS in the form of a leaflet developed by the Royal College of Obstetricians and Gynaecologists, with an additional paragraph relating to the GBS3 trial. All HCPs had access to the trial protocol and cascaded trial specific training. Neither women nor HCPs needed to acknowledge receipt of information on GBS or the GBS3 trial to be eligible for interviews.

Procedure

A research midwife (RM) approached women during pregnancy or after birth to provide them study information, answer any questions, and seek consent. Details for women who consented were then sent to the research team. All women who had been offered ECM or rapid testing were invited to share their experience, regardless of whether they accepted or declined testing. A £10 retail voucher was offered as a thank you for participation. GC contacted the RM around 10 weeks postpartum to find out if participants had experienced any perinatal adverse events (PAE) such as a stillbirth. If not, GC contacted the participants to introduce themselves and offer a time for interview. For women who had experienced a PAE, a tailored letter was sent which offered them the

choice of continuing in the study or not. If women did not respond, no further contact attempt was made. Two women experienced a PAE and one continued with the study. Women gave birth between May and December 2022 and were interviewed approximately 12 weeks postpartum. The RM approached HCPs providing information about the study, giving the opportunity to ask questions, and obtaining consent from interested staff. Contact details were shared with GC, who contacted HCPs after 48 hours to arrange an interview.

Interviews were conducted by telephone or online video call by an experienced qualitative researcher (GC, female, PhD). Consent was reaffirmed verbally before each interview. Interviews were one-to-one, following the interview schedule (supplementary file 1). Field notes were recorded to monitor data saturation and maintain reflexivity. Audio recordings were transcribed verbatim, transcripts de-identified, and coded by site and participant number.

Data analysis

A combination of thematic analysis [20] and the framework method [21] was used to analyse the data in NVIVO12 software [22]. Transcripts were read twice by GC to refamiliarise herself with the data and then coded until no further codes were generated. Codes were reviewed by GC and SA to identify frequency and salience, and were clustered into themes. The framework method [21] was then used to identify the elements from the pre-selected acceptability framework [20] and the NICE guidelines on practical, organisational and environmental barriers and facilitators to implementation [19] which were incorporated when developing the interview schedule. Data were examined for confirming and disconfirming information for each theme. The final findings present both new themes that emerged, as well as key elements from the a priori framework.

Results

Sample characteristics

Women

Seventy-two women consented to take part and 39 (54 %) were interviewed. Reasons women were not interviewed included lack of time or that the research team was unable to contact them. Sample characteristics are provided in Table 1. Nineteen had been offered an ECM test at 36 weeks. Twenty had an intrapartum rapid test. Two interviewees declined the test. Interviews lasted 17 minutes on average, ranging between 8 and 31 minutes (SD 4.43).

Healthcare professionals

Thirty-eight HCPs consented to take part and 25 (66 %) were interviewed. The main reason HCPs were not interviewed was lack of time. Table 2 provides the sample characteristics of HCPs. Eleven HCPs were from an ECM testing site and 14 from a Rapid testing site. HCP interviews lasted 23 minutes on average, ranging between 14 and 42 minutes (SD 7.52).

Themes

Themes were summarised into four categories of interest: (1) Views of routine testing; (2) Acceptability of the testing procedures; (3) Preferences on the type of test; and (4) Improving the testing procedures. The themes and subthemes are outlined in Table 3 and discussed in more detail below. Where participants raised elements of the priori framework, these have been indicated in the table in italics. Supplementary file 2 provides supporting quotes.

Table 1
Sample characteristics for women (N=39).

Characteristic	N (%)
Age	
20 or younger	2 (5.1)
21–30	17 (43.6)
31–39	19 (48.7)
40+	1 (2.6)
Ethnicity	
White British	31 (79.5)
White Other	3 (7.7)
Asian British or Asian Other	4 (10.3)
Black British	1 (2.6)
Parity at the time of participation	
First child	21 (53.8)
Two children	12 (30.8)
Three or more children	6 (15.4)
Relationship status	
Married	15 (38.5)
Engaged	6 (15.4)
Living with partner	16 (41)
Single	2 (5.1)
Employment	
Full-time	25 (66.7)
Part-time	10 (25.6)
Unemployed	4 (10.3)
Job Sector	
Health, Research and Social Care	13 (33.3)
Education, Law, Graphic Design, Media	7 (17.9)
Civil Service, Gas and Electricity Industry, Manufacturing	4 (10.3)
IT, Recruitment, Banking, Pensions	5 (12.8)
Retail, Fashion, Beauty, Hospitality, Catering	6 (15.4)
Education	
Degree (Postgraduate, Undergraduate, Foundation)	22 (56.4)
A-levels, Apprenticeship, NVQ/ BTEC Diploma[a]	11 (28.2)
GCSEs[b]	5 (12.8)
GBS Status	
GBS positive in current or a previous pregnancy	10 (25.6)
GBS positive in two or more pregnancies	3 (7.7)
Never had GBS	26 (66.7)
GBS testing site	
ECM site 1	11 (28.2)
ECM site 2	8 (20.5)
Rapid site 1	10 (25.6)
Rapid site 2	10 (25.6)
Place of Birth	
Hospital	34 (89.7)
Birth Centre	4 (10.3)
Home	1 (2.6)
Gestation	
Term	37 (94.9)
Preterm	2 (5.1)

[a] NVQ National Vocational Qualification level 3 BTEC Business & Technology Education Council level 3
[b] GSCE General Certificate of Secondary Education

Views of routine testing

A welcomed change

The affective attitudes elicited from most participants who had had previous pregnancies was that it was a welcomed change, and had been requested by some of them in their previous pregnancies. Some women had sought testing through online private test kits as it was not previously offered. Overall, most respondents said they felt comfortable with the test as it was simple and similar to other tests offered during their pregnancy.

> "I think it's a really good idea, it's a very minimal like swab to have to do to have a positive outcome, yes, I don't know why it hasn't been done before now really when you think of how many babies are affected by it."(ECM-Woman-P54)

HCPs reciprocated these attitudes stating it is something they

Table 2
Sample characteristics for health professionals (N=25).

Characteristic	N (%)
Discipline	
Midwife	13 (52)
Obstetrician	7 (28)
Laboratory manager (Clinical scientist)	2 (8)
Neonatal nurse	2 (8)
Microbiologist	1 (4)
Clinical Grade	
Consultant	4 (16)
Specialty Registrar	2 (8)
Specialty Trainee Year 6	1 (4)
Band 7	4 (16)
Band 6	11 (44)
Band 5	1 (4)
Non-clinical staff	2 (8)
Years of practising since qualifying	
Late career (qualified 15 or more years)	11(44)
Mid-career (qualified 5–15 years)	9 (36)
Early career (qualified <5 years)	5 (20)
Exposure to GBS testing*	
Every day	7 (28)
2–6 times a week	9 (36)
Once a week	4 (16)
Once a month	1 (4)
Supporting staff who offer the testing (neonatal/microbiology/ manager)	4 (16)
GBS testing site	
ECM site 1	8 (32)
ECM site 2	3 (12)
Rapid site 1	7 (28)
Rapid site 2	7 (28)

* Defined as offering or discussing testing with women

thought the NHS should be offering to women. Most felt it would reduce risk to the baby, and that it was better to have more testing than not enough, with the attitude that providing this testing reassures women.

> "I think because we're all quite excited about it, so it's something that we feel like it's been coming or needing to be done for a long time" (Rapid-Obstetrician-P32)

When asked about willingness to accept a future GBS test, most women were happy with this, as long as those who did not want it could easily decline. Nearly all healthcare respondents were willing to continue to offer testing, suggesting high levels would agree to offer and conduct the testing if routine testing is implemented in future.

One respondent said '*now that testing is here it should stay*'; a sentiment echoed by many women and HCPs. HCPs shared this view with many explaining they were surprised by the number of women identified as GBS positive by routine testing.

> "Oh yes…I don't think we should stop it now we've got it going. And before we used to not know about so many, didn't we, because we didn't used to screen? So I would not want to go back to not screening" (Rapid-Consultant Obstetrician-P23)

Despite this, HCPs reported that some team members were initially resistant. Concerns raised at both Rapid and ECM sites included the burden of additional work and time pressure. However, this resistance was reported to have disappeared as teams became familiar with the testing process and it became integrated into routine care and clinical appointments.

> "So, at the beginning, there was definitely quite a lot of pushback from mainly midwives I would say, community midwives. Just because like I was saying with the time pressures, the 36 weeks appointment you have to cover … the birth plan, there is a lot of stuff to talk about …, when you have only got a 15-minute time slot it's quite significant. And often clinics are already running behind … I think it has improved, I don't know whether that's just kind of accepting that we are doing it and complaining won't kind of change anything … But I think everyone kind of agrees it's an answer that we need to know. So, they seem to be happy to do it now." (ECM-Midwife-P16)

Table 3
Themes and subthemes from women and healthcare professionals' experiences.

Framework	Themes	Subthemes: Women only	Subthemes: HCPs only	Subthemes: women and HCPs
1. **Views of routine testing**	A welcomed change *(affective attitudes)*	Better more testing than not enough Protect baby and prevent harm Quick, easy and forgettable It was my choice If tests were routine there would be more awareness and support	Gives health professionals an advantage From initial pushback to gradual acceptance *(burden)*	Long time coming Willingness to accept/offer the test in the future Now testing is here it should stay
	More evidence needed *(ethicality)*		Scepticism of GBS testing in the absence of a clear evidence base	Opinion on testing may change based on GBS3 trial results
1. **Acceptability of the testing procedures**	Factors influencing the acceptability of the testing	Unexpected non-invasiveness of the testing Concern about unnecessary intervention *(ethicality)*		Acceptability might vary for certain groups (e.g. ethnicity, previous complications/ trauma) Impact on choice for out-of-hospital birth Views on routine antibiotic use *(ethicality)*
2. **Preferences on the types of test**	Preference for timing of test *(Burden)* Swabbing preference			Preference for ECM testing Preference for Rapid testing Preference for clinician swab Preference for self-swab
3. **Improving the testing procedures**	Practicalities of offering testing	Opaque swab tubes Toilets are not ideal places for sample-taking Having to ask for the test	Cartridge supply Not enough time in antenatal clinics Visual reminders	Birth occurred too quickly for testing Shocked or caught off guard by the offer of testing
	Implementation advice		Having a facilitator at the site Having the whole team on board Addressing fears about extra work	Improving communication Midwife approach to offering testing
	Understanding of GBS testing *(intervention coherence)*	Results are not always communicated to women Support women who test positive	Women's understanding of their own anatomy	Quality of information to women about GBS and the testing procedure Honesty with women about the implications of testing Should be an informed choice

More evidence is needed

However, participants also discussed the need for more evidence before routine testing is implemented. Women and HCPs both shared concerns about the ethicality of testing if it potentially leads to unnecessary interventions and women having to make decisions that may make them feel guilty, influence decisions about place of birth, and waste scarce financial resources. To alleviate some of these ethical concerns, both groups agreed that testing must be an informed choice and it should be made clear to the women that it is not compulsory.

> "you want to make them happy that it is in full consent and it's not a compulsory thing and that they're not going to feel that they're not looking after themselves if they don't have it done." (ECM-Midwife-P07)

Acceptability of the testing procedure

Factors influencing the acceptability of the testing

Several women raised the non-invasiveness of the testing. Many deemed the vaginal and rectal swabs for the test as insignificant to their overall pregnancy and birth experience, as evidenced in statements such as they *'barely remember the procedure'* or it was *'nothing compared to labour itself',* and especially compared to other tests such as blood test which were seen as much more invasive. Some felt that by having the testing in pregnancy they were protecting their baby from potentially invasive procedures later, including potentially avoiding serious neonatal infection and consequent treatment.

However, some women did find the prospect of a rectal swab (sampling from inside the anal sphincter) more invasive than a vaginal swab. Some reported being embarrassed or finding it uncomfortable or painful, as well as misconceptions that it involved a speculum being inserted into the vagina or rectum. Others found the thought of the test daunting when first offered, but then found it was 'over in seconds' and therefore not a concern for them.

> "I mean the initial thought of it's a bit like 'oh god' but when you're actually doing it it's not a problem at all (ECM-Woman-P54)

In circumstances where the midwife appeared uncomfortable or embarrassed by offering the rectal swab, some women reported that it was presented as optional, and slightly dismissed as not as important. Some said more training on how to offer rectal swabs is needed to help staff introduce it to women confidently and boost their self-efficacy in offering rectal swabs

> "as soon as you say anal swab everybody's like, eww, but you know, in my mind, I think I wouldn't like to have that done myself, but look, look at the benefits and I've said to all my staff it's the way you present it to the women, there's talk about the benefits of and this is how we would advise that it's done which is the optimal, that you have the vaginal and anal."(Rapid-Midwife-P26)

Routine antibiotic use following a positive test was also influential for women. Those who had received intrapartum antibiotic prophylaxis for GBS described it as awkward to have intravenously but felt it was necessary to prevent illness in the baby, and therefore acceptable. Some with prior experience of GBS stated that they would be less likely to accept routine testing if a negative result meant they were unable to have intrapartum antibiotic prophylaxis. In contrast, some HCPs were positive about reducing the amount of antibiotics offered through better targeting of GBS-positive women only following routine rather than risk-based testing. This aligned well with HCPs views on the ethicality of the testing.

> "But equally the way we were doing things, I think we were being very over-generous with our antibiotics. And that in itself, there haven't been huge amounts of looking at the consequences of that, have they, and the effect on the foetal biome, and microbiome and that sort of thing was. But that won't be without consequences. So no, I think it's a very positive thing." (Rapid-Consultant Obstetrician-P17)

Participants also identified groups of women who might find routine testing less acceptable including those who do not accept smear tests, who want to avoid unnecessary interventions, have experienced previous complications or trauma surrounding childbirth, or are experiencing their first pregnancy. Additionally, there was discussion that women from certain ethnic groups or with lower socioeconomic status may be more likely to decline. Many also raised circumstances where a partner or child is present which may prevent women from agreeing to be tested. In contrast to these assumptions, interviewees with these characteristics did not necessarily say they would decline testing.

The impact on planned place of birth was raised by some women and HCPs because a positive test could potentially mean women being hospitalised. A couple of women discussed being made to feel irresponsible for declining the testing due to their choice to birth outside of hospital. HCPs in the study also alluded to this, saying women planning a home birth have a more challenging decision around testing. HCPs were worried that some women who test positive may decide to go ahead with a home birth against medical advice making it challenging to support them. HCPs and women in the current study also discussed that some women may find it too difficult to decline testing as a result of pressure and responsibility surrounding the decision.

> "I think the implications of a positive result is huge for them because they've got their heart set on a home delivery" (ECM-Midwife-P21)

Preferences on the types of test

Preference for the timing of test

Women and HCPs were asked to share their views on the timing of GBS testing at around 36 weeks gestation or during labour. For many, both timepoints were acceptable. However, some women did have views on which was preferable. Table 4 highlights the barriers and facilitators they considered when stating their preferences.

Some said this preference should be based on results of the GBS3 trial. Women were also keen to know if they could choose the best timepoint for themselves if the testing was introduced routinely, while others valued HCPs opinions on what would work best for them.

Overall, these views suggest there are possible issues with both strategies and neither will be perfect for every woman or HCP. Therefore, addressing these issues is important to ensure that either testing strategy is offered in the best way for women and that those offering and being offered testing are fully informed about the pros and cons of each approach.

Swabbing preference

Women thought both clinician and self-swabbing was acceptable but many had a preference for one or the other. Table 5 lists the common barriers and facilitators for both.

A very small number of women deemed it not acceptable to have the clinician perform the test on them. Some also considered the potential views of others who might be in a vulnerable position (e.g. those who had been sexually abused), and who might not feel able to decline the offer of this method, even though it could be re-traumatising. Overall, respondents agreed that women should be given the choice where possible.

> "I think for some women they would prefer somebody else to do it. And for others, they would prefer to do it themselves… And it's really variable what people's responses are. So, I think to have the

Table 4
Women and healthcare professionals' views on different timings of tests.

Antenatal Testing	Intrapartum testing
Facilitators	**Facilitators**
-Earlier so more time to decide about testing and treatment	- Early labour is an acceptable time for testing
-One less thing to think about during labour	-During labour is acceptable if you have been informed earlier (antenatally)
-Not in pain so easier to consider information	-Already being examined so an extra test is not a problem
-Privacy (option to self-swab at this time)	-More accurate at the time of labour (as colonisation can be transient)
-Can give women time to prepare for labour and birth if they receive a positive result (know what to expect)	-Even if there was no time for antibiotics the baby would be observed 12hrs post birth.
-More time to support women if positive	-If they missed testing in pregnancy it is another chance to be tested
-More time for HCPs to put a plan in place for treatment	-A result in labour would be dealt with at the time so be less likely to be missed (real time sharing of results)
-Can be assertive when arriving in labour to ensure antibiotics are administered	**Barriers**
-Early is better to prepare for breastfeeding if the baby is unwell i.e. pumping and storing milk	-Concerns about missing test (those who birth early or too quickly)
Barriers	- Women might not ask enough questions in labour to make an informed decision (e.g. due to stress or pain)
-Antenatal colonisation status could change by time of birth	-Adding another procedure to existing intrapartum care may be burden some
-Results might not be available to labour ward team if tested in community (poor communication)	-Perception that testing could slow the labour progressing
-Women might give birth prematurely and miss the opportunity	

Table 5
Women and HCPs' views on clinician or self-swabbing.

Clinician swabbing	Self-swabbing
Facilitators	**Facilitators**
-Perceived as more accurate	-Instructions were detailed and easy to follow
-Quicker	-Greater privacy if self-swab
-Easier for clinician to do it	-Can ask their partner to help
-Pregnancy too big to reach around so easier for someone else to do it	-Able to do it at home
-Do not have to self-swab in the clinic or remember to return the swab if taken at home	-If forgotten, can be done at the clinic (two chances)
Barriers	-Way to avoid unnecessary examinations
-Not necessary, as women are capable of self-swabbing	-Might be more acceptable to hesistant groups e.g. first-time mothers, trauma history or certain cultures
-Waste of clinician time and resources	**Barriers**
-Imposes on women's dignity and privacy	-Forgetting to return the self-collected swab (thereby missing testing)
-Causes embarrassment	-Felt untrained to do on self
	-Lack of confidence to self-swab correctly
	-Can't reach to self-swab, especially rectal self-swab
	-Clinic toilets too small (restricted movement)
	-Concerns about contaminating the swab

option is preferable than dictating one way or the other."(Rapid-Registrar-P24)

Improving the testing procedure

Practicalities of offering testing

Practical barriers to implementation meant some women in ECM testing units had to ask for the test after seeing advertisements because they were not offered it directly. A few women who self-swabbed at home said the midwife did not ask them for their sample when they brought it to the appointment and women were too embarrassed to raise the topic themselves.

> "It was just brought up once, and then I had to ask for it again, later on, because I wasn't too sure when it was, when I'd be offered it, it was all fine and I got it. Yes, I think that was like, just wasn't too sure when it was going to happen." (ECM-Woman-P68)

Some women were only offered a vaginal swab, without being informed that a rectal swab was also an option. Others were unaware they could have a clinician perform the swabs if needed. While many of the women attended the appointment with a sample they had collected at home having been provided the swab kit at a previous appointment, some women had forgotten and were offered the opportunity to test in the appointment. This group of women were concerned about performing self-swabbing at the antenatal clinic as toilets are not ideal places for testing due to the small space to manoeuvre when pregnant, cleanliness and chance of contaminating the swab. It was also raised that having opaque swab tubes would have been better, as several women mentioned feeling embarrassed by providing the sample in a clear tube visible to others.

Other practical concerns included not enough time in antenatal clinics to discuss testing with HCPs suggesting extra time needs to be provided in appointments to enable this. Experiences of women being shocked or caught off guard by being offered a test in labour were also reported which may be due to lack of time for midwives to inform women about it antenatally. This issue was also raised by midwives.

> "We really need to push that they're getting this information in the antenatal period, not when they're coming into the assessment unit." (Rapid-Midwife-P26)

Being unable to perform the rapid test due to running out of test cartridges was also a barrier impacting in-labour testing. Unfortunately, both rapid testing sites had a period of over a month when testing was not available, after which some staff reported that they became out of practice with the process.

Some respondents reported that adding the test supplies to the equipment trolley on the labour assessment unit and using this as a visual reminder to offer the test was beneficial for increasing the number of tests offered. In some cases where there was only one rapid test machine in one maternity unit, it made it more difficult to get results efficiently as this relied on the staff sending the samples across to this maternity unit and waiting for the results to be tested and returned.

Women and HCPs also shared concerns about those who gave birth too quickly, worrying there would be no time to be tested or for women to receive antibiotics if they consented to this after testing positive. However, several HCPs stated that this had happened to very few women.

> "Yes, so didn't know the result of the swab so couldn't give the antibiotic cover without knowing that result. But it was negative anyway but to deliver before the result had come back, it was so quick. I don't think it is that common to be fair, it only happened to me one time." (Rapid-Midwife-P28)

Implementation advice

Midwives' views and confidence performing the swabs were recognised as a key facilitators in the acceptability of testing. Midwives having a calm, confident attitude and putting women at ease about a GBS positive result was important. Some HCPs reported that their 'script' about the testing improved with practice, allowing them to become confident and natural in test conversations. Some felt that this reduced embarrassment for women during the swabbing procedure.

> "Like I just say to women like 'Look, we're, it's our bread and butter like we're not bothered. Please don't worry about it". (Rapid-Midwife-P34)

Initial worries about offering rectal swabs changed over time,

especially given the increased accuracy of rectal swabs.

> "Everybody's been surprised at how accepting women are of both, having to have both, because I think when we were training, they're going oh, nobody's going to want to have something up their bum, but actually the majority of the time they don't mind. And once you tell them it gives you more accuracy they're like yeah, fine." (Rapid-Consultant Obstetrician-P17)

Engaging HCP teams was aided by having a facilitator at each site who was responsible for introducing testing to staff, and educating and supporting the frontline and wider team (obstetricians, midwives, neonatal teams, microbiologists, managers for instance). HCPs also recognised the importance of including temporary or agency or night-shift staff who may not have been involved in initial launches or able to attend the formal training.

> "we all know her but equally she's been on the unit quite a lot discussing it with people, what you do, how you do it but she also works shifts still as a clinical midwife so she's on the shop floor, she's like can you remember, do you need any help, can I show you how to do that. So I think that has helped the transition." (Rapid-Midwife-P27)

Barriers to implementation included extra work for midwives, with some believing it was optional so not offering it to all women. HCPs suggested this barrier could be minimised if midwives could hear from HCPs at other GBS3 sites that the testing is not much more work and that it has beneficial effects. Seeing the increase in identified cases might also help staff accept and implement routine testing.

For three women, miscommunication of results from one maternity unit to another led to the need for them to undergo testing a second time and, although they obliged, midwives recognised the inconvenience.

> "the problem has been because basically the women who have come into Pregnancy Assessment, the, the machine is on the Birthing Centre and not on the Pregnancy Assessment … So, like I had a woman a few weeks ago, who said that she'd had the swab and when I looked on the system, the swab had never, like it had never been done, but it had been sent down from the Pregnancy Assessment through the, like the pod-system but just hadn't actually been processed. But I mean I offered it to her again and she did accept it but I felt that was detrimental to the woman because I had to repeat the swab." (Rapid-Midwife-P34)

Understanding of GBS testing

Women had varied experiences of receiving information about GBS and the testing procedure. This included information about the procedure itself and what it entails, as well as reassurance that it was not compulsory to have it, reinforcing the need for intervention coherence. More specifically, women requested honesty about implications of the testing; how the results could change their plans for birth if they test positive; how IAP treatment is offered; the impact of antibiotics; and that they might have to be monitored after birth or stay in hospital for an extended time. This was important as knowing about these issues might influence women's decisions and sense of control around labour and birth.

How the information was provided was also important. The methods cited by participants included face-to-face conversations, leaflets, posters, videos, emails and hospital apps. Several women stated that they would prefer information in a video or email format, as this would allow them to consider this information at home. Women also wanted to be provided this information earlier, such as in their antenatal packs (information routinely provided at an appointment before 10 gestational weeks).

Some HCPs felt that some women had limited understanding of their own anatomy which was a barrier to them agreeing to the swabbing in some cases. Language could also be a barrier to understanding, as medical terms were not always well understood, particularly if English was not the woman's first language. Using simple language to present information was felt to be important.

> "The women we look after don't have a great deal of information about their own anatomy…, if I'm using words like 'rectum' for someone and they just don't know what I'm talking about. I've got to sort of tailor my approach, so what I've started doing is, you know, giving the correct, you know, anatomical names for things, but then also giving it in like a colloquial way that the women can understand." (Rapid-Midwife-P19)

Finally, it was important to support women who tested positive, as the experiences of GBS-positive women suggested it can be difficult from an emotional and psychological point of view. This included women feeling at fault for their result, being generally shocked by the positive result, and/or mistakenly believing it was a sexually transmitted infection. Others were impacted by having to change their birth plans as a result of a positive GBS test. These findings highlight the need for extra support for women in this position.

Discussion

Routine GBS testing was well received by both women and HCPs and the majority found the procedure acceptable and were willing to receive or offer the testing in the future. Many stated that they would like the routine testing to continue in future after the trial is complete. However, a few women were concerned about issues including overmedicalisation of birth, choices surrounding place of birth, and the impact of potential overuse of antibiotics. A small number of HCPs said they would like to see the results of the GBS3 trial before they would agree to offer routine testing in future. Most emphasised the importance of information giving and informed consent, including the implications of routine testing.

While both ECM and Rapid testing procedures were deemed acceptable by the majority, strengths and weaknesses of the different methods of testing were outlined. There was no overall consensus on the optimal strategy. Whichever technique is implemented, the offer needs to be tailored to what works for the individual woman, ensuring full information to support authentically informed choices.

The findings also highlight areas for consideration surrounding the practicalities of implementing testing in maternity services. Specific barriers identified by HCPs to enable rapid intrapartum testing, included availability of supplies as well as the analysis equipment needing to be proximal to the labour ward and that the communication of results needs to be seamless, with no points of failure. For women, practical barriers included not offering opaque (discreet) sample tubes for swabs, and having to undertake swabbing in cramped public toilet cubicles.

Environmental factors were also raised, such as the need for sufficient time in antenatal clinics to properly understand the perspectives of each woman and tailor information to her needs, and for women to have appropriate physical space in which to perform the test (ECM). Important factors to the acceptability, implementation and uptake of testing included the midwives' approaches to explaining the testing, addressing staff's initial worries about women's reactions to rectal swabbing and the time taken to offer the test, visual prompts and 'how to use' instructions next to the rapid testing equipment, and having a GBS testing facilitator appointed to support staff.

Strengths and limitations

A strength of this qualitative study is that it elicits the views of a large sample of women and healthcare professionals included in the first randomised controlled trial assessing the effectiveness of routine GBS testing in the UK. As this study relies on first-hand experiences of the two routine testing offers and not theoretical consideration of this testing, these experiences contribute important findings of women and HCPs attitudes towards, acceptability of, and beliefs about feasibility of

routine testing. Another strength is that both those who accepted and declined the testing, as well as those who had tested positive for GBS, could share their experiences. The sample was also carefully selected to include HCPs from a range of settings experience levels and professional roles. Purposive sampling meant that the sample included Black and Asian women, those who were younger, who had preterm births, those who declined testing, and those who gave birth out of hospital, even though numbers in each of these groups were small. [23]

In order for the findings of this research to be relevant to usual healthcare practice and settings, the information participants were given when they were offered the test was not standardised. Women's attitudes and views on the acceptability of GBS testing are likely to be affected by how the test was offered to women, as well as the information given to them at the time of being offered the test. Similarly, women vary in their levels of awareness and knowledge of GBS. [13,14] This may have been reflected in some of the women's interviews being shorter than typical in-depth interviews, although short interviews were usually because women did not identify any issues with their experience of testing.

Interpretation

The finding that most women were generally positive about the introduction of GBS testing is reflected in previous literature [9,13,24,25], particularly when they associate GBS testing with a reduction of risk [13]. However, the current study asks participants to share their views based on their experience of being offered/receiving the routine GBS test, as opposed to some of the available evidence in which women share their views without having necessarily been offered or having the test. In the current study, as in others, most women expected testing to reduce risk and therefore reassure them. Many stated they would rather have too much testing than not enough for this reason. However, a small number of women found the offer of universal testing unacceptable and were worried that it may lead to overmedicalisation of their birth. Nearly all the women booking a birth centre or home birth had concerns about overmedicalisation of their birth due to testing, despite four of them agreeing to partake in testing. HCPs should be particularly conscious that women who choose a birth centre or home birth might need more time in antenatal conversations about possible GBS testing.

While overall the techniques involved in both ECM and rapid testing were deemed acceptable by most women and HCPs, women had varied preferences for particular techniques, as identified in previous studies [13,14]. These views of mixed acceptability are also supported in previous studies, indicating that a choice of method of swabbing should always be offered [15–17]. Participants in the current study also discussed that some women may find it too difficult to decline testing as a result of pressure and responsibility surrounding the decision. Therefore, training for health professionals should ensure GBS testing programmes are offered to women in a way that informs them about the implications and makes them aware it is not compulsory, while also taking into account women's individual preferences, therefore helping them to decide without causing guilt.

Training is needed for midwives to overcome apprehension around offering and conducting rectal swabbing, and to enable them to offer the tests calmly and confidently, to minimise women's embarrassment. In addition, training is warranted to ensure that all staff provide the correct information about GBS testing and its implications [26]. Such information needs to be tailored to account for those women who may not have a good understanding of their own anatomy. Ensuring staff have the knowledge, time and capacity to support women who test positive for GBS is also critical. Clear explanations and information provided by HCPs can reduce anxiety surrounding testing positive [12,27,28].

Conclusion

This study shows routine GBS testing was acceptable to most women and HCPs. It highlights areas for consideration, particularly around how and when GBS testing should be introduced to women, and the need to tailor information and the type of swabbing techniques used based on the preferences and birth plans of individuals. Women who decline the test must not be made to feel guilty. Healthcare funders and providers should ensure that those offering the test and supporting those who test positive have the time, expertise and empathy to ensure that the experience of testing and the outcome is as positive as possible.

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Author Contribution

GC prepared materials, collected the data, analysed the data and drafted the manuscript; SA oversaw the design and conduct of the study, analysis and write up; SM prepared materials and supported the conduct of the study; EJM, KFW, JD and SD contributed to the design and write up of the study. All authors reviewed the manuscript. Members of the GBS3 Collaborative group also reviewed the manuscript.

Ethical Statement

The research was conducted in accordance to the Declaration of Helsinki and ethical approval for the study was obtained from both NHS Ethics East Midlands-Derby Research Ethics Committee (19/EM/0253) and City, University of London, School of Health Sciences Research Ethics Committee (Ref: ETH2223-1158). All participants provided written informed consent before participating.

Author agreement

The authors confirm this article is their original work and this article has not received prior publication and is not under consideration for publication elsewhere. All authors have seen and approved the manuscript as per the contribution statement below. Finally the authors abide by the copyright terms and conditions of Elsevier and the Australian College of Midwives.

Declaration of Competing Interest

The authors declare that they have no competing interests.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.wombi.2024.101832.

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