Knowledge and Attitudes of Hong Kong Pregnant Women on Group B Streptococcus Screening

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Objectives: To evaluate the knowledge and attitudes of Hong Kong pregnant women and the difference between first- and third-trimester pregnant women with regard to screening for Group B streptococcus.
Methods: Unselected consecutive pregnant women who attended the antenatal clinic over a 1-month period for nuchal translucency examination in the first trimester and cardiotocogram in the third trimester were invited to complete a self-administered anonymous questionnaire. The questionnaire contained items on their sociodemographic characteristics, knowledge about and acceptance of Group B streptococcus screening.
Results: Of 230 questionnaires, 213 were included in the analysis (109 were from participants in the first trimester and 104 were in the third trimester). Only 36% of the participants had ever heard about Group B streptococcus. The mean score for knowledge about Group B streptococcus was 3 out of 17, whilst 41% of participants could not answer any questions correctly. However, 81% of them were willing to have Group B streptococcus screening during pregnancy, and 66% agreed that universal Group B streptococcus should be implemented. Participants who had ever heard about Group B streptococcus had higher scores on knowledge of Group B streptococcus ($p<0.001$) and better acceptance to its screening ($p=0.003$).
Conclusions: Our results indicate that awareness and knowledge of Group B streptococcus were remarkably poor. It is important to improve public awareness and knowledge on the subject to allow women to make informed decisions about whether to receive Group B streptococcus screening and intrapartum antibiotics prophylaxis. Specific initiatives should be targeted to new immigrants and visitors from China, as they had lower awareness, knowledge, and acceptance to Group B streptococcus screening.
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Introduction

A case of early neonatal death related to Group B streptococcus (GBS) sepsis was heard in a Hong Kong Court in 2007. The court recommended that GBS screening be included in antenatal care programmes. Since then, there has been increasing community concern on the complications of early-onset Group B streptococcus (EOGBS) disease. The prevalence of GBS colonisation in the Hong Kong antenatal population has increased from 0.8% in 1995[1] to 10.4% in 2002[2] with swabs taken at a mean gestation of 18 weeks. Of all term infants born to pregnant women colonised by GBS, approximately 1 to 2% develop EOGBS disease[3]. The most effective method for EOGBS disease prevention currently available is intrapartum antibiotics prophylaxis (IAP). Depending on the frequency of EOGBS, prevalence of clinical risk factor and cost-effectiveness consideration, different screening strategies — including the use of risk factors or swab and culture-based screening — have been adopted in different countries to select patients for IAP[4]. With the introduction of national guidelines for maternal GBS screening and interventions by the Centers for Disease Control and Prevention in 1996, the EOGBS disease incidence in the United States has decreased from 1.7 per 1000 live births in 1993 to 0.6 per 1000 in 1998[5,6]. Among Hong Kong pregnant women, current data suggest that swab-based GBS screening is more effective than risk factor–based screening[7]. The majority of carriers among Hong Kong pregnant women were identified by low vaginal swabs (78%) while high vaginal swabs and rectal swabs only identified 31% and 30% of carriers, respectively[2]. Based on the current data, universal antenatal GBS screening has been implemented in Hong Kong since January 2012.

Without prerequisite knowledge on GBS, it is difficult for women to make an informed decision about whether to receive the screening and IAP. The objectives of this study were to evaluate the knowledge, attitudes, and acceptance displayed by Hong Kong pregnant women and

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the difference between first- and third-trimester pregnant women regarding screening for GBS. The study was carried out in December 2011, that is, the month just before implementation of local universal GBS screening. Findings of the study may help to identify areas where knowledge was deficient and where reinforcement of patient education was needed. Moreover, women's acceptance towards screening of GBS colonisation could have a significant impact on the uptake of universal GBS screening in our obstetric population.

Methods

Participants and Recruitment

Unselected consecutive pregnant women who attended the antenatal clinic in December 2011 in the first trimester for nuchal translucency examination, and in the third trimester for cardiotocogram testing were invited to complete a self-administered anonymous questionnaire. Pregnant women who did not understand English or Chinese were excluded. The questionnaires were written in English, and traditional and simplified Chinese to suit patients' needs. Participation in this survey was voluntary. The questionnaires were collected by the nursing staff before the patients left the clinic. Every patient only had one questionnaire to complete throughout their gestation. Approval from the Institutional Review Board of the Hospital Authority Research Ethics Committee (Kowloon Central/Kowloon East) was obtained before commencement of the study.

Questionnaire

The questionnaire was designed to collect data on the participants' knowledge and attitudes about screening for GBS. Basic demographic data were also collected. The questionnaire contained 18 questions assessing the knowledge on GBS and IAP, of which 17 entailed a 'yes', 'no', or 'don't know' answer. Each correct answer resulted in a score of 1, and each incorrect or 'don't know' scored 0. The sum of these possible scores ranged from 0 to 17; higher scores indicated better knowledge. One question asked the participants to estimate the percentage of GBS carriers among Hong Kong pregnant women, and their response was to be indicated on a 10-point Likert (from 0% to 100%).

The questionnaire also contained another 13 questions assessing the attitude of pregnant women to GBS, including who should receive GBS screening, whether they would support such screening to be performed on them, and how much they would be willing to pay it. They were also asked whether GBS screening involving having a low-vagina, high-vagina, or rectal swab would be acceptable to them.

Sample Size Calculation

It was assumed that differences in knowledge and attitudes between the first- and third-trimester participants would be 50% and there would be a within-group standard deviation of 1. The sample size required for a type 1 error of 0.5% and a power of 90% was 86 in each group. Assuming an 80% response rate, the sample size in each group was estimated to be around 110.

Statistical Analyses

All the women who returned the questionnaire with more than 80% of it being completed were included in the study. All descriptive variables were computed. Independent Student's *t* test and the two-tailed Chi-square test with Yates' correction were used to compare knowledge and attitude scores between groups, as appropriate. Data analysis was performed using the Statistical Package for the Social Sciences (Windows version 16.0; SPSS Inc, Chicago [IL], US), and a p value of <0.05 was considered statistically significant.

Results

A total of 230 questionnaires were distributed and 227 were collected. Fourteen were excluded as data completion was <80%. Thus, 213 questionnaires were included in the final analysis, of which 109 participants were from in the first trimester and 104 in the third trimester. The overall response rate was 93%.

Within the entire cohort, 55 participants were new immigrants and 6 were visitors from China. There were no statistically significant differences in the mean age, parity, occupation, place of birth, Hong Kong residency status, education level, and family income for participants in the first and third trimesters.

Only 36% of the participants had ever heard about GBS. Participants who had resided in Hong Kong for 7 years or more (p=0.0001) and who were employed (p=0.0344) were more likely to have heard about GBS.

The knowledge score ranged from 0 to 16. The mean knowledge score was 3 out of 17, and 41% of the participants scored 0. Some (13%) of our participants thought that GBS was a sexually transmitted disease (Table 1). Most (72%) of the participants overestimated the percentage of Hong Kong pregnant women colonised by GBS; on average, they perceived 30% of such women to be GBS carriers. Only 15 (7%) of the participants correctly

Table 1. Frequency (%) of correct answers about knowledge on Group B streptococcus (GBS) screening

Question	Correctly answered (%)			p Value
	Overall	First trimester	Third trimester	
1. GBS is sexually transmitted	13	10	16	0.251
2. If a woman carries GBS during pregnancy,				
i. baby's health must be affected	10	7	14	0.214
ii. her own health must be affected	15	13	17	0.472
iii. she cannot have vaginal delivery	17	16	19	0.604
iv. she cannot breast-feed	19	11	28	0.003
3. The risk of GBS being passed from mother to baby is highest during				
i. antenatal period	17	10	25	0.007
ii. labour	33	19	47	<0.001
iii. puerperium (after delivery)	28	19	37	0.008
4. If a woman carries GBS during pregnancy, what is the risk of her baby having serious GBS infection?	4	3	5	0.669
5. If a woman carries GBS during pregnancy,				
i. she must receive antibiotics at that time to prevent harm to her and her baby even if she has no discomfort	8	6	10	0.380
ii. she needs antibiotics when she has vaginal delivery	29	21	37	0.019
iii. she needs antibiotics when she has (pre-labour) Caesarean section	14	9	19	0.056
6. To prevent newborn from infection, antibiotics given during vaginal delivery is safe	9	6	12	0.182
7. Screening and intrapartum antibiotics are effective in preventing				
i. baby from GBS infection in the first week of life	23	18	27	0.183
ii. baby from GBS infection in the first month of life	9	6	14	0.079
iii. baby from all infections	17	10	25	0.007
8. If GBS is not detected in your vagina during pregnancy, your baby will not have GBS infection in the first few weeks of life	12	8	16	0.111
Mean score (maximum = 17)	3	2	4	0.001

answered that 10% of Hong Kong pregnant women were GBS carriers.

Only eight (3 in the first trimester and 5 in the third trimester) correctly answered that approximately 1 to 2% would develop EOGBS disease among all infants born to colonised parturients. Most participants (n=153, 89%) overestimated the risk of EOGBS infection when delivered by a carrier. Almost half (n=105, 49%) answered that the risk of serious neonatal infection from a GBS carrier mother was more than 50%. Some of them thought that the baby's health (10%) and their own health (15%) would be affected. Only 8% and 14% of the participants correctly answered that antibiotic treatment was not indicated for asymptomatic carriers and pre-labour Caesarean section, respectively. Only 9% of participants correctly answered that use of IAP might be associated with adverse consequences (Table 1).

Participants in the third trimester had higher knowledge scores compared to those in the first trimester (mean scores 4 versus 2; p=0.001). More participants in the third trimester than first trimester correctly answered that the risk of GBS being passed from mother to baby was highest during labour (47% vs. 19%; p<0.001), that GBS carriers warranted antibiotics to cover vaginal delivery (37% vs. 21%; p=0.019), and that it was safe to breast-feed (28% vs. 11%; p=0.003). More third-trimester patients also answered that screening and IAP were not effective in preventing all infections in babies (25% vs. 10%; p=0.007) [Table 1]. Participants in the third trimester were more likely to have heard about GBS (43% vs. 28%; p=0.032) and be more willing to have GBS screening performed (89% vs. 73%, p=0.009) than those in the first trimester (Table 2).

Participants with higher knowledge scores on GBS were those who were in the third trimester (p=0.001), had ever heard about GBS (p<0.001), accepted GBS screening (p<0.001), had family monthly incomes of >HK$20,000 (p=0.004), were employed (p=0.003), had resided in Hong Kong for ≥7 years (p=0.004), and had post-secondary

Table 2. Attitudes and acceptance to Group B streptococcus (GBS) screening among participants

Question	Positive answer (%)			p Value
	Overall	First trimester	Third trimester	
1. Have you ever heard about GBS?	36	28	43	0.032
2. Do you agree all pregnant women should be offered GBS screening during pregnancy?	66	62	70	0.290
3. If there is a test to help in detection of GBS in pregnancy, would you support it to be performed on you during pregnancy?	81	73	89	0.009
4. Would you support it to be performed for you to detect GBS in pregnancy, if a swab need to be taken from: (you can choose more than one options)				
i. Lower vagina without need for use of speculum	62	54	71	0.015
ii. Upper vagina with need for use of speculum	30	24	36	0.085
iii. Anus	13	17	8	0.054

Table 3. Comparison of mean knowledge scores about Group B streptococcus (GBS) in women with different epidemiological characteristics

Characteristic	Mean knowledge score	P value; mean difference (95% confidence interval)
Trimester		
Third trimester (n=104; 8.8%)	3.7	0.001; 1.74 (0.77-2.72)
First trimester (n=109; 51.2%)	1.9	
Had ever heard about GBS?		
Yes (n=76; 35.7%)	5.3	<0.001; 3.87 (2.96-4.79)
No (n=137; 64.3%)	1.4	
Accepted GBS screening?		
Yes (n=172; 80.8%)	3.2	<0.001; 2.46 (1.23-3.70)
No (n=41; 19.2%)	0.8	
Parity		
Nulliparous (n=105; 49.3%)	3.1	0.224; 0.63 (-0.38 to -1.63)
Multiparous (n=108; 50.7%)	2.5	
Participant's employment status		
Employed (n=121; 56.8%)	3.4	0.003; 1.55 (0.55-2.54)
Housewives (n=92; 43.2%)	1.9	
Family income		
>HK$20,000 (n=85; 39.9%)	3.7	0.004; 1.50 (0.49-2.51)
≤HK$20,000 (n=128; 60.1%)	2.2	
Residency in Hong Kong		
≥7 years (n=152; 71.4%)	3.2	0.004; 1.61 (0.513-2.7)
<7 years (n=61; 28.6%)	1.6	
Education level		
More than secondary school (n=76; 35.7%)	3.8	0.002; 1.60 (0.58-2.64)
Secondary school or below (n=137; 64.3%)	2.2	

education level or higher (p=0.002) [Table 3].

In all, 66% of participants in the cohort agreed with universal GBS screening, while 81% wanted to have GBS screening performed during their current pregnancy. Participants in the third trimester had a higher acceptance rate for low vaginal swabs (71% vs. 54%; p=0.015) but a lower acceptance rate for anal swabs, which was not statistically significant (8% vs. 17%; p=0.054) [Table 2].

About two-thirds of the participants accepted low-vaginal swabs (62%), and fewer (30%) accepted high-vaginal swabs for screening. Only 13% of participants accepted anal swabs as the screening test (Table 2). Participants who had heard about GBS had a higher acceptance rate for anal swab screening than those who had never heard of it (20% vs. 9%; p=0.036).

Participants were more likely to accept screening if they had resided in Hong Kong for ≥7 years (p=0.009), were employed (p=0.042), were nulliparous (p=0.020), and had heard about GBS (p=0.003) [Table 4].

A total of 131 (62%) of the participants agreed to pay for the GBS screening, of which 84 (39%) were willing to pay if the screening costed less than HK$100, while 45 (21%) would pay between HK$101 and HK$500 for testing. The remaining 73 (34%) would consider the screening only if it was free.

Discussion

Despite the potentially serious perinatal morbidity and mortality associated with GBS infection in the newborn, our results indicated that awareness and knowledge about GBS was remarkably poor. Only 36% had heard of GBS, and 41% could not answer any question correctly. Poor awareness and knowledge about GBS were also observed in studies in Canada[8] and Australia[9].

Obtaining anal swabs may cause discomfort or pain, which was reflected in our study; only 13% of participants accepted this screening test. Trappe et al[10] found that agreement between the vaginal-rectal and the vaginal-perianal collection methods was high. More data are awaited before vaginal-perianal cultures can be considered as an alternative.

A significant proportion of our participants thought that GBS was a sexually transmitted disease. This

Table 4. Patient numbers accepting or rejecting Group B streptococcus (GBS) screening among subjects with different epidemiological characteristics

Characteristic	No. of patients		p Value
	Accepted GBS screening	Refused GBS screening	
Had ever heard about GBS?			
Yes	70	6	0.003
No	102	35	
Parity			
Nulliparous	92	13	0.020
Multiparous	80	28	
Participant's employment status			
Employed	104	17	0.042
Housewives	68	24	
Family income			
>HK$20,000	69	16	0.898
≤HK$20,000	103	25	
Residency in Hong Kong			
≥7 years	130	22	0.009
<7 years	42	19	
Education level			
More than secondary school	64	12	0.440
Secondary school or below	108	29	

misconception may cause anxiety in pregnant women and act as a barrier to discuss GBS screening with others, including healthcare providers. On the other hand, in our study most participants overestimated the risks of GBS among carriers and among pregnant women. Such a high perceived risk may explain the high acceptance of GBS screening (81%) and willingness to pay (62%).

Use of IAP might be associated with adverse consequences (anaphylaxis and the emergence of antimicrobial-resistant infections) which could be serious. In fact, GBS with reduced susceptibility to penicillin has also been reported locally[11]. In addition, the use of IAP does not protect the baby from all infections, or from late-onset GBS infection. In 2005, Glasgow et al[12] found that infants with late-onset serious bacterial infection were more likely than healthy controls to have been exposed to intrapartum antibiotics and were more likely to be infected with ampicillin-resistant pathogens. Other studies also showed that use of IAP can lead to an increase in Gram-negative or drug-resistant early-onset infection[13-15].

In this cohort, most of our participants (88%) thought that their babies would not develop EOGBS disease, if they had negative screening for GBS antenatally. The sensitivity of screening depends on the site and number of swabs taken and the culture media used. In a local study, the majority of carriers were identified by low vaginal swabs (78%), while high vaginal swabs and rectal swabs only identified 31% and 30% of the carriers, respectively[2]. Evidently, direct agar plating, instead of selective enrichment broths, led to false-negative culture results in as many as 50% of GBS women carriers, so the latter method was recommended to maximise sensitivity[16]. False-negative results give false reassurance to patients. In addition, one should be aware of the limitations of screening, with 6% of GBS carriers remaining undetected in antenatal cultures[3]. The risk-factor approach, taking into consideration different risks (preterm labour, after prolonged rupture of membranes, maternal fever during labour, previous delivery of an infant with GBS disease, and GBS bacteriuria during the current pregnancy) should also be adopted. Patients with any such risk factor should be counselled for intrapartum antibiotics despite being screened negative before[5,17].

Improvement of knowledge, awareness, and acceptance was observed between participants in first and third trimester in this cohort. This might be due to increasing health awareness and health education during the course of antenatal care. As GBS screening will be performed late in the third trimester, programmes for enhancing patients' knowledge on GBS should be launched earlier to achieve optimal results.

Our study also revealed a positive relationship between GBS screening awareness, knowledge, and acceptance. According to the Health Belief Model[18], preventive actions are taken by the mother if the potential disease is perceived as serious, the pregnant woman considers herself or her child susceptible, the action is effective, and few barriers exist. Without such prior knowledge about GBS, it would be difficult for a woman to make an informed decision about whether to receive relevant screening and IAP. Clearly, increasing public awareness and education is an important step for the implementation of GBS screening.

Approximately 29% of participants in this study were new immigrants or visitors from Mainland China. We found that they had lower awareness, knowledge, and acceptance of GBS screening. Often, this patient group had poorer compliance with antenatal follow-up in Hong Kong and might miss the screening period (35-37^{+6} weeks of gestation). Specific measures to target such individuals appear necessary to improve their awareness and knowledge, so as to allow them to make informed decisions.

One limitation of this study was that information was gathered by a self-reported questionnaire, so some responses might have been reported incorrectly due to misinterpretation of the questions or other factors. We nevertheless provided participants with assistance for difficulties encountered during completion of the questionnaires, by having dedicated healthcare personnel on-site to completion of the form. Secondly, we did not collect the information on the sociodemographic characteristics of the small number of pregnant women who declined the survey, though we believe the possibility of a potential selection bias should be slight. Finally, no validation test had been performed for this generic questionnaire. Further research to administer this questionnaire in different obstetric populations to evaluate how generalisable it was would be helpful.

The strengths of this study were that it provided timely information on attitudes and knowledge about GBS screening in Hong Kong pregnant women, before the commencement of universal screening. Thus it could have a meaningful bearing on the successful implementation of the universal screening in Hong Kong. Furthermore, it showed that in our study population, the high proportion (29%) of new immigrants and visitors from China uniquely

affects our current situation in Hong Kong. As this group of women currently accounts for a significant proportion of obstetrical patients, promotion of universal GBS screening should target these women in addition to local citizens. Finally, the participation rate was high, which probably reflects heightened interest for this survey just before the launching of the universal screening programme in all public obstetric units.

A similar follow-up questionnaire survey in third-trimester pregnant women before their scheduled GBS screening 6 to 12 months after implementation of universal GBS screening in public hospitals would be of interest. Such a survey could verify whether knowledge and attitudes of our pregnant women about GBS screening improve after the screening programme is introduced.

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