Pregnant women's knowledge, practices, and needs related to food safety and listeriosis

A study in British Columbia

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Abstract

Objective To understand the knowledge, attitudes, practices, and needs of pregnant women regarding food safety, including the risk of listeriosis, in order to develop targeted messages and educational resources in British Columbia (BC).

Design Qualitative study using focus groups and quantitative study using a standardized questionnaire.

Setting Seven family practice clinics in BC. Focus groups were conducted in 3 program groups for new mothers.

Participants Pregnant women and women who had recently delivered babies.

Methods Three focus groups were conducted with women who had recently delivered. Qualitative analysis to identify common themes was conducted. A questionnaire was completed by pregnant women at their health care providers' (HCPs') offices. Statistical analysis was done to assess associations between demographic features, knowledge, and practices. Results from both study methods were compared and common findings were presented.

Main findings Participants reported that food safety and the risk of listeriosis were important to them during pregnancy; however, their knowledge of high-risk foods and safe food practices was limited. Although they identified their HCPs as a valuable source of information, they explained there were barriers to getting information from them. Participants reported doing their own research using books, websites, and social networks. They made recommendations to improve food safety messages, as well as the availability and format of resources.

Conclusion Women in BC identified a gap between the information on food safety and listeriosis that they needed during pregnancy and the resources that were available. Using the information collected from this study, resources that are targeted at women of childbearing years, as well as their HCPs, are under development in BC.

EDITOR'S KEY POINTS

- This study explains the knowledge, awareness, practices, and needs regarding food safety and listeriosis of pregnant women and new mothers in British Columbia.
- This study demonstrated that there was a gap between the information that pregnant women wanted on food safety and listeriosis and the information that was available to them.
- Participants wanted access to resources that included information about what food was safe to eat or what food to avoid, food safety practices, transmission of listeriosis and symptoms, and risk. They needed the information to be clear, memorable, and focused on details important to pregnant women.

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Connaissances, façons de faire et besoins des femmes enceintes en rapport avec la listériose et la sécurité des aliments

Étude effectuée en Colombie-Britannique

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Résumé

Objectif Déterminer les connaissances, attitudes, façons de faire et besoins des femmes enceintes en rapport avec la sécurité des aliments, y compris le risque de listériose, et ce, dans le but de concevoir des messages et des ressources éducationnelles spécifiques en Colombie-Britannique (C.-B.).

Type d'étude Étude qualitative au moyen de groupes de discussion et étude quantitative à l'aide d'un questionnaire standardisé.

Contexte Sept cliniques de médecine familiale de C.-B. On a organisé des groupes de discussion dans trois groupes de programmes pour les nouvelles mères.

Participantes Femmes enceintes ou ayant récemment accouché.

Méthodes On a tenu 3 groupes de discussion avec des femmes ayant accouché récemment. Une analyse qualitative a servi à identifier les thèmes communs. Les femmes enceintes ont répondu à un questionnaire à la clinique où elles étaient suivies. Une analyse statistique a servi à évaluer les associations entre caractéristiques démographiques, connaissances et façons de faire. On a comparé les résultats des 2 méthodes d'étude afin d'en extraire les observations semblables.

Principales observations Les participantes ont déclaré que la sécurité des aliments et le risque de listériose étaient des sujets importants pour elles durant la grossesse; elles avaient toutefois des connaissances limitées sur les aliments à haut risque et sur l'utilisation sécuritaire des aliments. Même si elles identifiaient leur soignant comme une source d'information valable, elles ajoutaient qu'il n'était pas toujours facile d'en obtenir de l'information. Les participantes disaient faire leur propre recherche à partir de livres, de sites Web et des réseaux sociaux. Elles émettaient des recommandations pour améliorer les messages sur la sécurité des aliments de même que sur la disponibilité et le format des ressources.

Conclusion Les femmes de C.-B ont observé un écart entre les renseignements sur la listériose et la sécurité des aliments dont elles avaient besoin durant la grossesse, et les ressources auxquelles elles avaient accès. À partir des renseignements obtenues dans cette étude, des ressources visant les femmes en âge d'enfanter ainsi que leurs soignants sont en voie de développement en C.-B.

POINTS DE REPÈRE DU RÉDACTEUR

- Cette étude voulait préciser les connaissances, façons de faire et besoins des femmes enceintes et des nouvelles mères de la Colombie-Britannique à propos de la listériose et de la sécurité des aliments.
- L'étude a montré qu'il existe un écart entre les renseignements que les femmes enceintes voulaient avoir sur la sécurité des aliments et sur la listériose, et ceux auxquels elles avaient accès.
- Les participantes souhaitaient avoir accès à des ressources les informant sur les aliments qu'elles pouvaient consommer sans danger et ceux qu'elles devaient éviter, les façons de faire sécuritaires avec les aliments, le mode de transmission de la listériose, ses symptômes et le risque de la contracter. L'information devrait être claire, facile à retenir et porter spécialement sur les aspects propres aux femmes enceintes.

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Listeria monocytogenes is a bacterial pathogen most commonly transmitted to humans by eating contaminated foods such as unpasteurized milk, unpasteurized or soft cheese, ready-to-eat meat products (eg, pâté, deli meats), seafood (eg, smoked salmon), and produce.[1] Vertical transmission from mother to fetus is also possible.[2]

Most healthy individuals are asymptomatic or experience mild symptoms such as fever, myalgia, headache, and diarrhea. In vulnerable populations (eg, the elderly, those with weakened immune systems, pregnant women), the infection can become invasive causing meningoencephalitis, sepsis, or death. Infection is rare, but among vulnerable populations the outcome can be serious, with an overall mortality of 20% to 30%.[1] Infection is 18 times more common during pregnancy; and during the third trimester, women are at increased risk owing to the decline in cell-mediated immunity.[2] Listeriosis might also cause stillbirth, premature labour, spontaneous abortion, and neonatal infection.[3]

In British Columbia (BC) (population 4.5 million), invasive listeriosis is a reportable disease. Between 2002 and 2010, 118 cases of invasive listeriosis were reported.[4] Eight (6.7%) cases were pregnant women and an additional 3 (2.5%) were neonate infections for a total of 11 (9.3%) pregnancy-related infections.

International studies have demonstrated that pregnant women have an incomplete knowledge of the risks associated with *Listeria,* that they might not be taking all preventive measures,[5-8] and that although their health care providers (HCPs) are a trusted source of information, HCPs are providing limited information on the risks.[9-11] As listeriosis is almost entirely preventable through proper food handling and choices, it is important for vulnerable populations to have knowledge of safe food practices.

Owing to the large listeriosis outbreak in Canada in 2008,[12] there has been an interest in improving information provided to high-risk populations, but there are currently no published studies that demonstrate the knowledge and practices of pregnant women regarding food safety or practices specific to the prevention of *Listeria* infections. The objective of this study was to better understand the knowledge, attitudes, practices, and needs of pregnant women regarding food safety, including the risk of listeriosis, in order to develop targeted messages and resources in BC. We used both qualitative and quantitative methods to improve our understanding and meet our objective.

METHODS

Focus groups

Between July 2009 and February 2010, 3 focus groups were conducted with English-speaking women who had recently delivered babies. Women were recruited through established programs for new mothers offered by Fraser Health Authority (population 1.6 million) located in southwest BC. Groups were selected from different geographic regions based on sociodemographic features. Open-ended inquiry was used in each focus group. Twenty questions were used related to knowledge and importance of food safety and *Listeria*, the format and quality of information that participants received during pregnancy, and participants' recommendations to improve resources for pregnant women. During the focus groups, probing based on discussion by the group and an iterative process between focus groups allowed for additional exploration of content before analysis. All group discussions were audiotaped and transcribed verbatim. Content analysis to identify common themes was done using NVivo, version 8. Comparison between group transcripts was conducted to identify common and different themes.

Questionnaire

Women from a convenience sample of 7 family practice clinics in Vancouver Coastal and Fraser health authorities (population 2.7 million) located in southwest BC who were aware that they were pregnant and who were able to read English were asked to complete a self-administered questionnaire in their HCPs' offices. Each clinic had between 1 and 10 practising physicians, and 6 clinics were in urban settings. Three of the clinics had a large number of ethnic clients and 2 served First Nations communities. All women were eligible to participate and the questionnaire was provided to them by a medical office assistant upon check-in and was completed and returned anonymously before their visits. The questionnaire was designed by the investigators but modified from previous studies that explored knowledge, attitude, and behaviour toward listeriosis and food safety during pregnancy.[5,7] Data collection was conducted between October 2010 and February 2011. The questionnaire consisted of 18 questions designed to assess women's knowledge and current food safety practices regarding *Listeria* infections during pregnancy. It also evaluated the sources the women used to gather information on food safety and how trustworthy they found these sources. Data were entered in Excel. Statistical analysis was performed using SPSS, version 17.0, and χ^2 tests were done to test significance at $P < .05$.

Ethics approval was obtained through the University of British Columbia Behavioural Research Ethics Board for both the focus groups and the questionnaire, as well as from Fraser Health Research Ethics Board for the focus groups.

RESULTS

Twenty-five women participated in the focus groups and 107 women completed the questionnaire. **Table 1** presents participants' characteristics.

Table 1. Characteristics of focus group and questionnaire participants

CHARACTERISTICS	FOCUS GROUP PARTICIPANTS (N = 25),* N (%)	QUESTIONNAIRE PARTICIPANTS (N = 107),* N (%)
> 30 years of age	4 (16.0)	62 (57.9)
Post–high school education	21 (84.0)	74 (69.1)
Number of children		
• 0	0 (0)	49 (45.7)
• 1	24 (96.0)	39 (36.4)
• ≥ 2	1 (4.0)	19 (17.8)
HCP during pregnancy		
• Family physician	13 (52.0)	107 (100)
• Obstetrician	8 (32.0)	0 (0)
• Midwife	2 (8.0)	0 (0)
Ethnicity	NA	
• White		68 (63.6)
• Asian		15 (14.0)
• South Asian		4 (3.7)
• First Nations		8 (7.5)
• Mixed		5 (4.7)
• Other		6 (5.6)
• Unsure		1 (0.9)
Planned pregnancy	NA	
• Yes		78 (75.0)
• No		21 (20.2)
• Unsure		5 (4.8)
Household income	NA	
• < $50 000		33 (30.8)
• ≥ $50 000		65 (60.7)
• Unsure or not answered		9 (8.4)

HCP—health care provider, NA—not asked.
*Not all focus group and questionnaire participants answered all questions.

Themes

Four themes were identified during the qualitative analysis of focus group data. The quantitative data collected through the questionnaire supported the following findings.

Food safety is important, but knowledge is limited and practices are somewhat unsafe. In the questionnaire, most women responded that they had concerns about food being contaminated by *Listeria* and that *Listeria* could pose a threat to themselves and their babies (**Table 2**). In the focus groups, women expressed that they routinely thought about food safety during their pregnancies and tried to find information. However, there was little knowledge about *Listeria* among participants, and preventive measures for high-risk foods were not consistently followed (**Table 2**).

Table 2. Questionnaire participants' awareness and knowledge of *Listeria* and high-risk foods, as well as safe food practices

PARTICIPANTS' RESPONSES	RESPONSES,* N (%)
Is concerned about food being contaminated by *Listeria*	78 (72.3)
Think *Listeria* poses a risk to ...	
• You	65 (63.1)
• Your baby	70 (66.7)
Know what *Listeria* is	57 (54.3)
Identify the following as high-risk food	
• Cold deli meat	70 (66.0)
• Soft cheese	67 (63.2)
• Pâté	57 (53.8)
• Smoked fish	41 (38.7)
Frequently† consume the following identified high-risk food	
• Cold deli meat	29 (26.9)
• Soft cheese	22 (20.4)
• Pâté	4 (3.8)
• Smoked fish	9 (8.4)
Follow safe food practices‡	
• Cook hot dogs and deli meats to steaming hot	41 (48.2)
• Consume perishable foods as soon as possible	81 (80.2)
• Thoroughly cook all meat	98 (94.2)
• Wash produce	97 (91.5)
• Wash surfaces, utensils, and hands after handling raw meat and eggs	105 (97.2)
• Separate raw meats from produce	101 (97.1)
• Avoid unpasteurized milk products	100 (94.3)

*Not all questionnaire participants answered all questions.
†*Frequently* is defined as consumption once every 2 weeks, weekly, 2-3 times a week, or daily.
‡Practice ranked as 4 (maybe to always) or 5 (always) on questionnaire.

Just over half of the women reported knowing what *Listeria* was. Deli meat, soft cheese, and pâté were identified as high-risk foods by most of the women. However, smoked fish was identified as a high-risk food by less than 40% of questionnaire participants (**Table 2**). Eighteen (16.7%) women consumed 2 or

more high-risk foods at least every 2 weeks. Cold deli meats and soft cheeses were most commonly reported (**Table 2**). Age, ethnicity, education, and income were factors that influenced participants' knowledge of *Listeria* (**Table 3**). In addition, women who had knowledge of *Listeria* were more likely to have adequate knowledge of high-risk foods and to consume them less frequently ($P<.001$).

Table 3. Factors influencing participants' knowledge of *Listeria

CHARACTERISTICS	NO. OF PARTICIPANTS WHO KNEW WHAT *LISTERIA* WAS, N (%)	NO. OF PARTICIPANTS WHO DID NOT KNOW WHAT *LISTERIA* WAS OR WERE UNSURE, N (%)	*P* VALUE
Age			.009
• < 30 y	17 (39.5)	26 (60.5)	
• ≥ 30 y	40 (65.6)	21 (34.4)	
Planned pregnancy			.001
• Yes	49 (63.6)	28 (36.4)	
• No or unsure	6 (25.0)	18 (75.0)	
Ethnicity			.022
• White, Asian, South Asian	55 (57.9)	40 (42.1)	
• First Nations, other	2 (20.0)	8 (80.0)	
Education level			< .001
• Elementary school or high school	8 (26.7)	22 (73.3)	
• University, college, or postgraduate schooling	49 (66.2)	25 (33.8)	
Household income			< .001
• < $50 000	8 (25.0)	24 (75.0)	
• ≥ $50 000	43 (67.2)	21 (32.8)	

*Not all respondents answered the question about their knowledge of *Listeria*.

Focus group participants also demonstrated a limited knowledge of *Listeria,* high-risk foods, the symptoms of listeriosis, and the effects on their babies. In some situations their knowledge was inaccurate (eg, all cheese in Canada is pasteurized, all pasteurized cheese is safe). Participants explained that this lack of knowledge caused confusion and uncertainty. It was unclear to them what they could eat, what foods they should avoid and why, what practices they should follow to make their food safer, and what the possible outcomes of infection were (**Table 4**).

Relationship with the HCP is important. The HCP was identified as a trustworthy source of health information by both the focus groups and questionnaire participants (97.6% of the questionnaire participants). However, only 58% of women who completed the questionnaire received information on food safety (including listeriosis) from their HCPs. During the focus groups, participants described feeling that they had to prompt their HCPs for information on food safety, and when they received information from their HCPs, participants believed it was incomplete. Participants believed they had limited time and many items to discuss with their HCPs and they were not always able to see their HCPs when they were looking for information (**Table 4**).

Pregnant women do their own research on food safety and listeriosis. Participants described looking for information on a variety of topics early in their pregnancies before they had contact with their HCPs (**Table 4**).

In order to do their own research, questionnaire participants used a variety of tools, including books (59.8%), the Internet (29.9%), and social networks (37.4%). None of these alternative sources was considered as trustworthy as their HCPs. Questionnaire participants described pregnancy-specific books (61.3%) and government websites (68.1%) as being the most trustworthy sources after their HCPs (97.6%).

Participants identified challenges during their research, such as conflicting information provided by various sources (including their HCPs), too much information, and incomplete information, which caused uncertainty (**Table 4**).

Improvements in messages and availability of resources are desirable. Participants thought that resources for pregnant women could be improved and made more available. More than half of questionnaire respondents (53.7%) reported not receiving information on food safety and 60.7% had not received information on listeriosis. During the focus group discussions, women explained that they wanted information as soon as they became pregnant or while seriously considering pregnancy so that the information would be most meaningful to them. They would like to have access to information before seeing an HCP. One suggestion was for information to be placed in pharmacies.

Participants recommended that resources include information on what food is safe to eat or what food to avoid with examples, food safety practices, and transmission of listeriosis and symptoms, as well as a better understanding of risk. Information should be clear, memorable, and focused on details important to pregnant women. Formats such as charts, checklists, and visual

Table 4. Focus group participants' quotes related to themes

THEME	PARTICIPANTS' QUOTES
Food safety is important to pregnant women, but their knowledge is limited and their practices are somewhat unsafe	"I knew there was a lot of food you couldn't eat and I was really unsure which ones I could and couldn't eat"
	"[B]ut I figured since it was pasteurized, I could eat it. I would have stayed away from it had I known"
	"I wasn't sure if the sushi I was eating was flash frozen or if it wasn't [*sic*] coming in contact with other fish so then I just avoided it"
Relationship with the health care provider is important	"My doctor gave me a handout from the Internet that listed foods to avoid ... so she kind of gave me the literature and that was pretty much it"
	"I was able to ask questions. I always came in with a full list, but I did feel rushed"
	"I went to my doctor at 3 weeks .... the receptionist said I didn't need to see anyone for 6-8 weeks .... they wouldn't give me anything ... at the riskiest time in my pregnancy"
Pregnant women do their own research on food safety and listeriosis	"The first information I received about food safety I looked up myself"
	"There are a lot of questions out there and there's not really as much information as there could be"
	"I found that some websites or ... information said 'don't eat it' and some said 'it's fine to eat it'"
Improvements in messaging and availability of resources are desirable	"A nice chart with what to avoid, what's good to eat"
	"[I]t broke it down by categories ... I could break things down in point form. I found it really helpful"
	"If all the information could be in one book that would be great"

images (eg, colour coding) were preferred. Women also wanted the content to reflect Canadian examples and they preferred to have one resource or consistent information among different resources (**Table 4**).

Women wanted to receive information from their HCPs during prenatal visits or at their HCPs' offices, from trusted pregnancy books, and on government websites.

DISCUSSION

These 2 complementary studies have improved our understanding of the knowledge, practices, and needs of pregnant women regarding food safety, including listeriosis, in BC.

Participants identified food safety as being important to them; however, their knowledge and practices did not demonstrate this. Participants had good knowledge of general food safety and some high-risk foods (eg, deli meats, pâté). However, some of their knowledge was incomplete (eg, smoked fish was not identified as high risk) or incorrect (eg, pasteurized soft cheese was safe to eat). In addition, participants consumed high-risk foods during pregnancy. *Listeria monocytogenes* outbreaks associated with soft pasteurized cheese have occurred in BC,[13] and a high rate of *Listeria* contamination has been identified in BC fish-processing facilities and ready-to-eat fish products.[14]

In order to improve knowledge among pregnant women, messages and resources need to provide accurate and easy-to-understand information so that women can make safe choices.[8,15] Developing one common resource with standard messages available in various formats and venues could prevent conflicting messages. The formats and venues should appeal to various demographic groups and the desire to have information early in pregnancy. Pamphlets have been recommended as a way to communicate messages about food safety to pregnant women.[6,8] Social media tools (websites, Google, and Facebook) directing people to resources are important, as the Internet was identified as a common source of information and would allow women to search for information independently.[8,16] In addition, providing information in nonstandard venues such as pharmacies and maternity stores could increase access to information early in pregnancy and before women visit their HCPs.

Health care providers have an important educational role during women's pregnancy. Similar to previous studies, participants identified their HCPs as trustworthy and important resources.[5,8,9] However, there were limitations in the type and timing of information. A study in BC demonstrated that 88% of HCPs were aware of listeriosis; however, only 35% of them routinely counseled women on the risks during pregnancy. Health care providers cited a lack of

knowledge of the risk of listeriosis as the main reason for not counseling their patients and they supported the development of resources.[10] Providing HCPs with the same resources that are developed for pregnant women is important in order to keep messages consistent and increase awareness.

Demographic features of participants and findings from our qualitative and quantitative studies were similar, suggesting internally valid results representative of the participants' population. However, the participants do not represent all pregnant women in BC, likely owing to the selection of regions and recruitment. In BC, 74% of live births are reported among women aged 20 to 34 years, which is comparable to the participants of the focus groups and slightly younger than questionnaire participants.[17] Participants in both studies had a higher level of education. Questionnaire participants had similar incomes. White and First Nations participants were overrepresented, while people of Asian ethnicity were underrepresented.[18]

The integration of qualitative and quantitative approaches has been used in other studies and offers benefits such as overcoming method limitations,[19] supportive findings,[20] and greater depth or clarity of results.[21] These benefits were seen in our work. The qualitative results were corroborated quantitatively, and by combining methods we were able to include a larger number of participants.

Limitations

This study may not be representative of all pregnant women in BC. The methods were recruited from limited geographic areas and means. However, the results between the 2 studies were supported.

Conclusion

This study demonstrated that a gap remains between the information pregnant women in BC want on food safety and listeriosis and the information currently available. This gap affects their knowledge and practices and increases their risk of food-borne illness, particularly listeriosis. These issues are important to pregnant women who are looking for information both on their own and from their HCPs in order to make the best decisions. Resources that target pregnant women have been developed in BC based on the information collected in these studies (**www.bccdc.ca/foodsafetyinpregnancy**). These resources will hopefully improve knowledge and practices related to food safety and listeriosis in order to prevent illness and serious outcomes in pregnant women and their children.

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Contributors

Ms Taylor designed the qualitative study, moderated the focus groups, collected and analyzed the qualitative data, and drafted the manuscript. **Drs Kelly** and **Nöel** designed the quantitative study and participated in the quantitative analysis and interpretation. **Ms Brisdon** participated in and provided critical feedback on the qualitative study design, the analyses, and interpretation of results, and assisted with moderating the focus groups. **Dr Berkowitz** provided statistical analysis and support for the quantitative study. **Dr Gustafson** participated in and provided critical feedback on the qualitative study design, the analyses, and interpretation of the results. **Dr Galanis** participated in and provided critical feedback on the study design, the analyses, and interpretation of the results (both qualitative and quantitative). All authors read, provided feedback, and approved the final manuscript.

Competing interests

None declared

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