What Do Women Know About the Risks of Delayed Childbearing?

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ABSTRACT

Background: Women aged 35 and older account for an increasing proportion of births and are at increased risk of pregnancy complications and poor infant outcomes. The objectives of the study were: 1) to determine what women know about delayed childbearing, including pregnancy complications and outcomes associated with low birthweight (LBW, <2500 grams), preterm delivery (<37 weeks) and multiple birth, and 2) to assess the characteristics of women with limited knowledge of risks.

Methods: A computer-assisted telephone interview survey was conducted with 1,044 randomly selected women who delivered their first live-born infant, between July 2002 and September 2003, in two urban centres, Calgary and Edmonton, in Alberta, Canada.

Results: The proportion of women aware of specific childbearing risks associated with advanced maternal age were as follows: conception difficulties (85.3%), multiple birth (24.0%), caesarean section (18.8%), preterm delivery (21.8%), and LBW (11.2%). Knowledge of specific developmental and health-related risks of suboptimal infant outcomes ranged between 18.0% and 46.5%. Logistic regression revealed that limited knowledge of maternal age-related pregnancy risks were associated with unplanned pregnancy (OR, 1.48; 95% CI, 1.03-2.14), smoking (OR, 1.83; 95% CI, 1.29-2.60) and non-use of fertility treatment (OR, 2.15; 95% CI, 1.44-3.19). Characteristics associated with limited knowledge of the risks associated with suboptimal birth outcomes were: age 35-39 years (OR, 2.98; 95% CI, 1.35-6.58), less than post-graduate education ($\leq$ high school OR, 2.14; 95% CI, 1.20-3.82), and not currently enrolled as a student (OR, 1.75; 95% CI, 1.02-3.00).

Conclusions: Many women are generally unaware of the potential consequences of delayed childbearing. There are missed opportunities in preconception counselling and education, which should be addressed to allow for more informed decision-making about family planning.

MeSH terms: Pregnancy; reproductive behaviour; health knowledge

La traduction du résumé se trouve à la fin de l'article.

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It is increasingly common for women in developed countries to delay childbearing until they are 35 years or older as they may seek higher educational attainment, secure finances, an advanced career and relationship stability before pregnancy.¹⁻⁵ However, in addition to challenges in conceiving a pregnancy,⁶ pregnant women 35 years and older are at increased risk for medical risks,⁷⁻¹⁰ chromosomal abnormalities (Down Syndrome),^{11,12} low birthweight (LBW, <2500 grams),^{13,14} stillbirth and unexplained foetal death,¹⁵ preterm delivery (<37 weeks gestation),^{13,16} multiple birth (twins or triplets)^{13,17} and increased risk of operative delivery.¹⁸ Death during infancy, poor health, and lifelong physical and/or developmental disabilities are potential outcomes for LBW and/or preterm infants.¹⁹⁻²² Thus, the consequences of delayed childbearing may lead to unexpected associated emotional costs to the family, costs to the community and education system, and increased health care utilization.²³⁻²⁶

In the province of Alberta, Canada, the percentage of primiparous women who are aged 35 and older has increased from 4.4% in 1989 to 10.2% in 2001.²⁷ Consistent with this trend, the proportion of births to women aged 35 and greater in Canada has increased from 8.6% to 14.5% between 1991 and 2000,²⁸ and in the United States, the number of first births per 1,000 women 35 to 39 years of age increased by 36% between 1991 and 2001.²⁹ Furthermore, there has been an increase in the LBW rate among women aged 35 and older in Alberta, from 6.9% to 8.6%, between 1994 and 2001.^{6,27} Rates of preterm delivery among these women has also increased from 8.3% to 10.7%.^{27,30} Thus, more women are delaying childbirth and an increased proportion are experiencing suboptimal birth outcomes.

As a result of the increasing proportion of births to women aged 35 years or older and the increase in associated risk,³⁰ the objectives of this study were to assess whether women were aware of the risks associated with delayed childbearing and to determine the characteristics of women with limited knowledge. Preconception counselling is intended to inform women about how to plan a healthy pregnancy and determine any potential risks.³¹ These

TABLE I

Characteristics of Participants

Characteristic	Frequency N (%)
Age (years)	
<25	163 (15.7)
25-29	234 (22.5)
30-34	276 (26.6)
35-39	329 (31.7)
40+	37 (3.6)
Education Completed	
High school	290 (27.8)
Post secondary (college or university undergraduate degree, trade certificate)	634 (60.7)
Post graduate (Master's degree or higher)	119 (11.4)
Annual Family Income (CDN\$)	
<\$30,000	91 (8.7)
\$30,000-\$50,000	140 (13.4)
\$50,001-\$72,000	194 (18.6)
\$72,001-\$100,000	281 (26.9)
>\$100,000	295 (28.3)
Married/Common Law	974 (93.3)
Ethnicity	
Caucasian	869 (83.3)
Non-Caucasian	174 (16.7)
First Pregnancy	887 (85.0)
Received information on pregnancy from physician prior to pregnancy	453 (43.4)
Smoked cigarettes 6 months prior to pregnancy	229 (21.9)
Consumed alcohol 6 months prior to pregnancy	827 (79.4)
Worked for pay 6 months prior to pregnancy	933 (89.4)
Was attending school 6 months prior to pregnancy	89 (8.5)
Used Assisted Reproductive Technology	
Fertility medications and IVF* and/or ICSI†	56 (5.4)
Fertility medications only	71 (6.8)
None	917 (87.8)

* IVF = in vitro fertilization

† ICSI = intracytoplasmic sperm injection

preconception consultations may be more effective if health care providers are aware of and address gaps in women's knowledge with regard to the risks associated with delayed childbearing. Findings from this study identify, from the women's perspective, gaps in preconception knowledge which could be addressed through clinical counselling as well as public health strategies or social marketing to allow for more informed decision-making in family planning.

METHODS

Participants and setting

Within three months of delivery, women were randomly selected from all English-speaking women who had given birth to their first live-born infant between July 2002 and September 2003 within the Calgary Health Region in Calgary and the Capital Health Region in Edmonton,

TABLE II

Questions Concerning Maternal Age-related Risks of Childbearing (N=1044)

Question	True N (%)	False N (%)	Don't Know N (%)
1. Women ≥ 35 years experience more problems getting pregnant than younger women	891 (85.3)*	59 (5.7)	94 (9.0)
2. Women ≥ 35 years are more likely to have a baby with Down Syndrome compared to younger women	899 (86.1)*	43 (4.1)	102 (9.7)
3. Women ≥ 35 years are more likely to have a baby with a congenital anomaly than younger women	550 (52.7)*	118 (11.3)	376 (36.0)
4. Women ≥ 35 years are more likely to develop medical problems during pregnancy than younger women	746 (71.5)*	110 (10.5)	188 (18.0)
5. Women ≥ 35 years are more likely to have a multiple birth than younger women (even if not using fertility treatment)	251 (24.0)*	335 (32.1)	458 (43.9)
6. Women ≥ 35 years are eligible for amniocentesis during pregnancy	864 (82.8)*	31 (3.0)	149 (14.3)
7. Women ≥ 35 years are more likely to have a caesarean section than younger women	196 (18.8)*	298 (28.5)	550 (52.7)
8. Women ≥ 35 years are more likely to have a preterm baby than younger women	228 (21.8)*	281 (26.9)	535 (51.2)
9. Women ≥ 35 years are more likely to have a low birthweight baby than younger women	117 (11.2)*	403 (38.6)	524 (50.2)
10. Women ≤ 20 years are at higher risk of having a low birthweight baby than women 20-29 years	458 (43.9)*	153 (14.7)	433 (41.5)

* indicates correct response based on current literature

Alberta, Canada. Provincial data indicated that rates of delayed childbearing were highest in these urban centres, where 17.9% and 21.8% (Edmonton and Calgary, respectively) of births in 2001 were to women aged 35 or older.²⁷ To ensure a sufficient sample size to determine if the mother's age was related to the mother's knowledge of the impact of delayed childbearing, women 35 or older were over-sampled.

Ethics approval was obtained from the University of Alberta and the Conjoint Ethics Board at the University of Calgary and the Calgary Health Region. All women provided written or verbal consent to participate.

Questionnaire

Based on information from focus groups, previous surveys, and expert input, a questionnaire was designed specifically for this study. The questionnaire was pilot tested by trained interviewers with women of childbearing age who were not part of this study. Women were asked to provide feedback on the duration of the questionnaire, clarity and suitability of question content and wording. The face and content validity of the questions related to knowledge of risks was ensured through focus group testing and pilot interviews as well as through consultation with medical experts. The questionnaire contained three sections: background information (including socio-

demographic characteristics of the woman and her partner, medical and reproductive history, and family planning), knowledge of maternal age-related risks of childbearing (see items in Table II), and knowledge of the developmental and health-related risks associated with suboptimal infant outcomes (see items in Table IV). Data were collected by trained interviewers using a computer-assisted telephone interview (CATI).

Main outcome measures

Responses to each item in the two knowledge sections were coded as correct or incorrect. The percentage correct was calculated to create an overall score on knowledge for each section. Traditional scoring methods of pass versus failure have been established at 50%, so overall scores were dichotomized into two groups: those who responded correctly to $\leq 50\%$ of the questions (limited knowledge) and those who responded correctly to $> 50\%$ of the questions (reasonable knowledge).

Statistical analyses

Sample size calculations were based on anticipated differences between women less than 35 years and women 35 years and over with regard to demographic and lifestyle characteristics which may have influenced knowledge, such as education. A sample size of 600 women would allow us to detect as significant a difference

TABLE III

Adjusted* Odds Ratios (OR) and 95% Confidence Intervals (95% CI) for Characteristics of Women with Limited Knowledge vs. Reasonable Knowledge on Maternal Age-related Risks of Childbearing (N=996)

Characteristic	≤50% Correct (N=627) N (%)	>50% Correct (N=369) N (%)	OR	95% CI
Smoked Cigarettes 6 Months Prior to Pregnancy				
Yes	165 (75.7)	53 (24.3)	1.83	1.29-2.60
No	462 (59.4)	316 (40.6)	1.00	
Planned Pregnancy				
Yes	483 (60.2)	319 (39.8)	1.00	1.03-2.14
No	144 (74.2)	50 (25.8)	1.48	
Assisted Reproductive Technology Used (any combination of drugs, IVF and ICSI)				
Did not use	51 (43.2)	67 (56.8)	1.00	
	576 (65.6)	302 (34.4)	2.15	1.44-3.19

* Final model after considering all factors significant at bivariate level, including marital status, income, and discussion with physician. Interactions for smoking and planning a pregnancy were found to be insignificant.

TABLE IV

Questions Concerning the Developmental and Health-related Risks of Suboptimal Infant Outcomes (N=1044)

Question	True N (%)	False N (%)	Don't Know N (%)
1. LBW babies are more likely than normal birthweight babies to have permanent hearing problems	188 (18.0)*	109 (10.4)	747 (71.6)
2. LBW babies are more likely than normal birthweight babies to have learning difficulties, noticeable by school age	381 (36.5)*	219 (21.0)	444 (42.5)
3. LBW babies are more likely than normal birthweight babies to have behavioural problems, noticed through school years	190 (18.2)*	278 (26.6)	576 (55.2)
4. In general, multiples have more long-term health problems than single birth babies	250 (23.9)*	316 (30.3)	478 (45.8)
5. Babies born at 34-37 weeks are more likely to have long-term health problems than babies born at term	485 (46.5)*	281 (26.9)	278 (26.6)
6. Babies born at 34-37 weeks are more likely to have learning difficulties than babies born at term	244 (23.4)*	365 (35.0)	435 (41.7)

LBW = low birthweight; * indicates correct response based on current literature

TABLE V

Adjusted* Odds Ratios (OR) and 95% Confidence Intervals (95% CI) for Characteristics of Women with Limited Knowledge vs. Reasonable Knowledge on Developmental and Health-related Risks of suboptimal Infant Outcomes (N=1039)

Characteristic	≤50% Correct (N=877) N (%)	>50% Correct (N=162) N (%)	OR	95% CI
Age (years)				
<25	137 (84.0)	26 (16.0)	1.85	0.79-4.32
25-29	197 (84.2)	37 (15.8)	2.00	0.90-4.42
30-34	226 (81.9)	50 (18.1)	1.71	0.79-3.74
35-39	291 (88.4)	38 (11.6)	2.98	1.35-6.58
40+	26 (70.3)	11 (29.7)	1.00	
Education Completed				
≤ High school	251 (86.9)	38 (13.1)	2.14	1.20-3.82
Post secondary (college or university)				
undergraduate degree, trade certificate	535 (84.8)	96 (15.2)	1.74	1.07-2.83
Post graduate (Master's degree or higher)	91 (76.5)	28 (23.5)	1.00	
Attended School 6 Months Prior to Pregnancy				
Yes	67 (76.1)	21 (23.9)	1.00	
No	810 (85.2)	142 (14.8)	1.75	1.02-3.00

* Model contains all factors significant at bivariate level.

between groups in these characteristics as small as 7%. The sample size was increased to 1,000 to allow for multivariate analysis

and to allow us to control for demographic characteristics depending on the findings of the bivariate analysis.

Data were analyzed using SPSS/PC version 12.0. Alpha was set at $p < 0.05$. Frequencies of responses to selected questions were determined. Characteristics of women who answered ≤50% of questions correctly were compared to women who answered >50% of questions correctly using Chi-square tests. Unconditional logistic regression, using the forward method, was used to develop models that described the independent characteristics of women who had limited knowledge about delayed childbearing. Confounding and interaction were evaluated by bivariate logistic regression. Two final models were developed: one for limited knowledge about maternal age-related risks of childbearing, and another for limited knowledge about developmental and health-related risks of suboptimal infant outcomes. Goodness of fit was tested for the models using the Hosmer and Lemeshow test.

RESULTS

Participants

The survey was completed by 1,044 women, with a response rate of 72%. Respondents tended to be Caucasian, married, employed, well educated and of higher income (Table I). Prior to conception, 43.4% of women received information concerning pregnancy from their physician.

Knowledge about maternal age-related risks of childbearing

Table II provides details on the responses to the questions about maternal age-related risks of childbearing. Less than 25% of women knew that women aged 35 or older were at increased risk of caesarean section delivery, multiple birth, low birthweight or preterm delivery.

Overall, only 37% ($n=369$) of respondents scored greater than 50% on items about maternal age-related risks (Table III). When variables found to be significant at the bivariate level were considered for regression (Table III), smoking, not planning a pregnancy and non-use of assisted reproduction significantly predicted limited knowledge about maternal age-related issues. There were no interaction effects. The fit of this model was acceptable (Hosmer and Lemeshow significance = 0.916).

Women who gave birth to multiples were significantly more likely to answer the maternal age-related questions correctly and to have required assistance with conception. There was no difference in response patterns for women who delivered low birthweight or preterm infants.

Knowledge about developmental and health-related risks associated with suboptimal infant outcomes

Compared to normal birthweight or full-term delivery, only 36.5% of respondents recognized that low birthweight was a risk factor for learning difficulties and 46.5% recognized that preterm infants were at increased risk for health problems (see Table IV). Fewer than 25% of women identified other potential developmental and health-related risks of low birthweight, preterm delivery, or multiple births.

Overall, only 15.6% (n=162) of respondents scored 50% or higher on questions about risks associated with suboptimal infant outcomes (Table V). Those who scored high were significantly ($p<0.05$) more likely to be older (40 years and older), to have a post-graduate education, or to be enrolled as a student 6 months prior to pregnancy. When these three variables were considered for a final model using forward selection, all remained significant. The fit of this model was acceptable (Hosmer and Lemeshow significance = 0.871).

There was no difference in response patterns for women who delivered multiples, low birthweight or preterm infants.

DISCUSSION

These findings indicate that among an urban sample of women delivering their first live-born child, a few risks of delayed childbearing (i.e., conception difficulties and Down Syndrome) are recognized while many others are not. Women planning a pregnancy or seeking fertility support were more informed about age-related risks. However, women overall were unaware of important potential consequences of delayed childbearing, such as preterm delivery and the associated developmental and health-related risks for the child. This indicates that the majority of women are making family-planning decisions in the absence of sufficient information.

It may be that the scope of information surrounding pregnancy and risk is either not in a useful format for patients, or that time is a barrier to discussion with clients.³² Although the Society of Obstetricians and Gynaecologists of Canada (SOGC) guidelines encourage physicians to discuss preconception topics such as smoking and alcohol use, given demands on family physicians, it is possible that office visits are restricted to presenting needs.^{31,33}

Current media messages about delayed childbearing are mixed and highly influenced by the North American entertainment industry where celebrities are postponing first-time motherhood into their late 30s and beyond.³⁴ Popular literature, including magazine and newspaper articles, typically focusses on conception and overcoming conception difficulties (fertility treatment) rather than the risks and potential consequences of delayed childbearing for both mother and child. Furthermore, these articles may inadvertently emphasize the positive birth outcomes or 'miracles', with less attention paid to those who experienced preterm delivery, infant mortality or low birthweight outcomes. For instance, Canadian magazines have included "Get-pregnant guides"³⁵ and include stories with titles such as "Middle-aged moms"³⁶ and "Kids vs. Career".³⁷ While these stories examine some of the medical risks of pregnancies at later ages, they generally focus on issues related to career development and parenting. Given the broad circulation of these magazines, there are potential opportunities to include more comprehensive articles that would facilitate more informed decision-making by families.

Some study limitations are of note. Although women were asked to respond to the questionnaire with respect to their level of knowledge prior to pregnancy, the potential exists that women could not separate knowledge gained through pregnancy from what was known prior to pregnancy, and responses could have been biased. If this had occurred, we would have overestimated the level of knowledge women had prior to pregnancy, suggesting an even greater need for preconception counselling or knowledge dissemination. Furthermore, delivery of a low birthweight or preterm infant may also have influenced women's responses to questions related to risks asso-

ciated with infant outcomes. However, we examined the data and found that such birth outcomes had no effect on knowledge of the developmental and health-related risks associated with suboptimal infant outcomes, suggesting that either respondents answered the questions based on their level of knowledge prior to pregnancy, or that birth outcome did not impact knowledge related to potential sequelae. Finally, these data represent a sample of urban, mainly Caucasian women, and findings may not be generalizable to all populations.

An increasing proportion of childbearing women are delaying pregnancy, and this study indicates that many women are uninformed about the potential risks associated with this decision. Thus, there are opportunities to improve public knowledge and awareness of risks associated with delayed childbearing to allow for informed family planning. Public health campaigns may be more effective if they include multilevel approaches, such as clinician-delivered preconception counselling, public education and/or social marketing strategies.³⁸ These data also provide baseline information against which knowledge gains could be measured in the future.

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RÉSUMÉ

Contexte : Une proportion croissante de bébés naissent de femmes de 35 ans et plus, lesquelles risquent davantage d'avoir des complications durant la grossesse et d'accoucher de nourrissons d'un poids sous-optimal. Notre étude visait : 1) à déterminer ce que les femmes savent au sujet de la procréation tardive, notamment des complications de la grossesse et des résultats associés à l'insuffisance de poids à la naissance (IPN, <2 500 g), à l'accouchement prématuré (<37 semaines) et à l'accouchement multiple, et 2) à évaluer les caractéristiques des femmes qui connaissent mal ces risques.

Méthode : Nous avons mené un sondage téléphonique assisté par ordinateur auprès de 1 044 femmes, sélectionnées au hasard, ayant accouché d'un premier enfant vivant entre juillet 2002 et septembre 2003 dans deux centres urbains de l'Alberta (Calgary et Edmonton).

Résultats : Les femmes connaissaient les risques de la procréation à un âge avancé dans les proportions suivantes : difficultés à concevoir (85,3 %), accouchement multiple (24 %), accouchement par césarienne (18,8 %), accouchement prématuré (21,8 %), et IPN (11,2 %). Entre 18 % et 46,5 % des répondantes connaissaient les risques développementaux et sanitaires auxquels est exposé un nouveau-né de poids sous-optimal. Une analyse de régression logistique a montré que la connaissance limitée des risques de la grossesse à un âge maternel avancé était associée à la grossesse non planifiée (RC = 1,48; IC de 95 % = 1,03-2,14), au tabagisme (RC = 1,83; IC de 95 % = 1,29-2,60) et au fait de ne pas avoir subi de traitement de l'infertilité (RC = 2,15; IC de 95 % = 1,44-3,19). Les caractéristiques associées à la connaissance limitée des risques de l'IPN étaient les suivantes : avoir entre 35 et 39 ans (RC = 2,98; IC de 95 % = 1,35-6,58), ne pas avoir fait d'études postsecondaires (moins qu'un diplôme d'études secondaires : RC = 2,14; IC de 95 % = 1,20-3,82), et ne pas être inscrite en tant qu'étudiante (RC = 1,75; IC de 95 % = 1,02-3,00).

Conclusions : Nombre de femmes ont peu conscience des répercussions possibles de la procréation tardive. Il y aurait des lacunes à combler sur le plan du counselling et de l'éducation avant la grossesse pour favoriser une prise de décisions plus éclairée en matière de planning familial.