

Preconception counseling for preventable risks

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Abstract

Question A healthy woman of reproductive age complained that when she saw me before pregnancy I did not advise her that she could check her varicella immunity and get vaccinated. She contracted chickenpox and endured unnecessary anxiety. This led me to think that it would be useful to have a summary of all the preconception counseling advice we should give to our patients to ensure the best pregnancy outcomes possible. Could Motherisk provide such a summary?

Answer Although favourable pregnancy outcomes cannot be guaranteed, when a pregnancy is planned, many risk factors can be reduced and modified to enhance pregnancy outcomes. In the summary provided we will discuss optimization of diet, weight, and exercise; discontinuation of smoking and drinking; controlling chronic medical conditions; starting supplementation with multivitamins and folic acid; and ensuring proper immunization.

Counseling préalable à la conception concernant les risques évitables

Résumé

Question Une femme en santé en âge de procréer m'a reproché de ne pas lui avoir conseillé, avant qu'elle devienne enceinte, de vérifier son immunité contre la varicelle et de se faire vacciner au besoin. Elle a contracté la varicelle et a vécu des inquiétudes inutiles. Cet épisode m'a amené à penser qu'il serait utile d'avoir un résumé de tous les conseils à donner à nos patientes avant la conception pour assurer les meilleurs résultats possibles de leur grossesse. Motherisk pourrait-il produire un tel résumé?

Réponse Bien qu'il soit impossible de garantir des résultats de grossesse favorables, lorsqu'on planifie une grossesse, il est possible de réduire et de modifier de nombreux facteurs de risque pour améliorer l'issue de la grossesse. Dans le résumé présenté ici, nous discuterons de l'optimisation de l'alimentation, du poids et de l'activité physique; de la cessation du tabagisme et de la consommation d'alcool; du contrôle des problèmes de santé chroniques; de l'amorce de suppléments de multivitamines et d'acide folique; et de l'assurance d'une immunisation appropriée.

Healthy women are generally at low risk of poor pregnancy outcomes. In fact, if pregnancies are planned, many potential risks, including biomedical, behavioural, and social risks, can be identified and managed pre-emptively, thus enhancing maternal and child health.¹ Motherisk advice for preconception interventions is summarized in **Table 1**.

Engaging in a healthy lifestyle

It is ideal to encourage patients to adopt a healthy lifestyle while they are planning to conceive, as women will have increased motivation to improve their health. They should be encouraged to eat a well-balanced diet as recommended by Health Canada,² exercise regularly, stop smoking, avoid alcohol intake, cease illicit drug use, eliminate exposure to environmental toxins, and reduce stress.

Daily aerobic exercise for 30 to 60 minutes helps maintain physical and cardiorespiratory fitness and prepares women for the physical changes of pregnancy.³ Exercise might also improve mental health, reducing stress through an increase in endorphins and a decrease in cortisol.⁴

Cigarette smoking is known to be associated with decreased fertility and adverse pregnancy outcomes including miscarriage, premature delivery, and low birth weight.⁵ Moreover, smoking is associated with increased risk of sudden infant death syndrome.⁶ These risks seem to increase in a dose-response manner, with the greatest risk associated with more than 10 cigarettes per day.^{7,8} Recently, evidence of increased risk of oral cleft with maternal smoking has been presented.⁹ As smoking is a modifiable risk factor, women should discuss strategies with their doctors to quit smoking. Even decreasing their smoking is an effective mechanism for harm reduction.

Alcohol exposure has not only been found to have a negative effect on pregnancy outcome¹⁰ but it also might lead to fetal alcohol spectrum disorder, which is characterized by prenatal and postnatal growth retardation, facial dysmorphism, microcephaly, developmental delay, and complex behavioural issues.¹¹ The adverse effects of alcohol consumption appear to be dose-dependent; heavy drinking (more than 10 to 18 g daily) has an increased risk of small size for gestational age, low birth weight, and

preterm birth.¹⁰ Although low-to-moderate alcohol consumption does not consistently result in serious adverse effects in many studies,^{10,12} methodologic weaknesses in some of these studies do not allow the authors to conclude that drinking at these levels is safe in pregnancy.¹²

Maternal substance abuse negatively affects both maternal and infant health. Pregnancy complications include increases in sexually transmitted infections, placental abruption, and stunted growth; and increases in central nervous system and autonomic nervous system signs of withdrawal (neonatal abstinence syndrome) or toxicity.¹³ Cocaine is significantly associated with preterm birth (odds ratio [OR] 3.38; 95% CI 2.72 to 4.21), low birth weight (OR 3.66; 95% CI 2.90 to 4.63), and small size for gestational age (OR 3.23; 95% CI 2.43 to 4.30).¹⁴

Numerous environmental toxins, categorized as air pollutants, heavy metals, organic solvents, and pesticides, might increase the risk of low birth weight, intrauterine growth restriction, preterm birth, and birth defects.¹⁵ While total elimination of exposure might not be possible in some situations, efforts should emphasize minimizing the risk.¹⁶ For example, women who consume high amounts of fish should be aware of the adverse effects of methylmercury on fetal brain development.¹⁷ Measurement of mercury in maternal blood or hair can direct dietary changes, if levels are above the toxic threshold.

More and more evidence suggests that psychosocial stress might negatively affect pregnancy outcomes. The results of maternal biological responses to stress, such as elevated cortisol and catecholamine levels, can adversely affect fetal growth and increase the risk of preterm delivery.¹⁸ Therefore, it is important for women with known

psychological or psychiatric conditions to seek professional help when planning pregnancy in order to select medications that are safe in pregnancy and address associated unhealthy behaviour such as drinking and smoking.¹⁹

Optimally managing chronic medical conditions

With many women today postponing starting a family, many already have chronic conditions such as diabetes, rheumatoid arthritis, and epilepsy. In numerous cases, uncontrolled maternal chronic conditions are associated with unfavourable fetal outcomes. It is important to have chronic conditions under control before conceiving, using medications known to be safe for the fetus.

Women who report very severe morning sickness in previous pregnancies are highly likely to have similar experiences in subsequent pregnancies. The option of treating morning sickness pre-emptively should be discussed with such patients.²⁰

Maintaining a healthy weight

Obesity before pregnancy increases the risk of subfertility and prolongs the time to pregnancy.²¹ Obesity in pregnancy is associated with numerous maternal and perinatal risks including miscarriage, hypertension, preeclampsia, gestational diabetes, deep vein thrombosis, and the need for cesarean section.²² Moreover, obese women are more likely to give birth to macrosomic babies and babies with congenital anomalies such as neural tube defects.²² Although less prevalent in Canada, being underweight is associated with intrauterine growth restriction.²³

Table 1. Preconception interventions for women of reproductive age

INTERVENTION	EFFECT
Eat a well-balanced diet	Prevent malnutrition, and obesity and its consequences
Exercise regularly	Prepare body for pregnancy-related changes, prevent obesity and its consequences, reduce stress
Cease smoking	Reduce risk of miscarriage, premature delivery, low birth weight, and sudden infant death syndrome
Avoid alcohol intake	Prevent fetal alcohol spectrum disorder, and reduce risk of small size for gestational age, low birth weight, and preterm birth
Cease illicit drug use	Reduce risk of sexually transmitted infections and placental abruption
Minimize environmental toxin exposure	Reduce risk of low birth weight, intrauterine growth restriction, preterm birth, and birth defects
Reduce stress	Reduce risk of preterm delivery and adversely altered fetal growth
Manage chronic medical conditions	Prevent unfavourable outcomes depending on maternal medical conditions
Identify and treat women at risk of severe morning sickness	Reduce risk of severe nausea and vomiting of pregnancy and its consequences
Maintain a healthy weight	Prevent being underweight or overweight, and prevent obesity and its consequences
Take multivitamins and folic acid	Reduce risk of neural tube defects
Get vaccinations	Reduce maternal and perinatal infection

Multivitamins containing folic acid

Folic acid in combination with multivitamin supplements taken before and during pregnancy has been shown to reduce the risk of neural tube defects and other congenital anomalies.²⁴ A minimum of 400 µg of folic acid daily is recommended to decrease the risk of neural tube defects, although women at higher risk might need up to 5 mg daily.²⁵ These include women who have previous children with neural tube defects, women taking antifolate medications, women with diabetes, smokers, and those who have poor compliance with prenatal vitamins.²⁶ Vitamin A is of special concern, as excess retinol (10 000 IU; 3300 retinol equivalents daily) might result in fetal malformation.²⁷ In this context, beta-carotene is a preferential form of vitamin A over retinol.

Up-to-date vaccinations

Immunization status should be assessed before getting pregnant, as several vaccine-preventable diseases can harm both the mother and the fetus. In the absence of vaccination or infection history, antibodies can be checked to inform the physician on the need for subsequent vaccination in nonimmune women. Recommended vaccines include measles, mumps, and rubella; varicella; diphtheria, tetanus, and pertussis; and influenza. Rubella or varicella infections in pregnancy might result in serious congenital malformation. If a woman receives these live-attenuated vaccines, she should be advised to avoid conception for at least 4 weeks after vaccination owing to the theoretical risk of live virus reaching the fetus.³ Vaccination against influenza reduces the risk of complications in the mother if she is infected during pregnancy and provides passive protection to the newborn.²⁸ The concept of “cocooning” the newborn by vaccinating the mother also applies to pertussis, which has increased in prevalence and has a high morbidity and mortality in newborns.²⁹ Similarly, the tetanus vaccine substantially reduces the rate of tetanus related to parturition, although this condition is very rare in Canada.

Conclusion

Planning and preparation before starting pregnancy helps manage modifiable risk factors, leading to more favourable pregnancy outcomes.

Competing interests

None declared

References

1. Johnson K, Posner SF, Biermann J, Cordero JF, Atrash HK, Parker CS, et al. Recommendations to improve preconception health and health care—United States. A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *MMWR Recomm Rep* 2006;55(RR-6):1-23.
2. Health Canada. *Eating well with Canada's Food Guide*. Ottawa, ON: Health Canada; 2011. Available from: www.hc-sc.gc.ca/fn-an/alt_formats/hpb-fgpdf/food-guide-aliment/print_eatwell_bienmang-eng.pdf. Accessed 2013 Mar 20.
3. Berghella V, Buchanan E, Pereira L, Baxter JK. Preconception care. *Obstet Gynecol Surv* 2010;65(2):119-31.
4. Rimmele U, Seiler R, Marti B, Wirtz P, Ehler T, Heinrichs M. The level of physical activity affects adrenal and cardiovascular reactivity to psychosocial stress. *Psychoneuroendocrinology* 2009;34(2):190-8. Epub 2008 Oct 15.
5. Practice Committee of the American Society for Reproductive Medicine. Smoking and infertility: a committee opinion. *Fertil Steril* 2012;98(6):1400-6. Epub 2012 Sep 6.

6. Mitchell EA, Milerad J. Smoking and the sudden infant death syndrome. *Rev Environ Health* 2006;21(2):81-103.
7. Wisborg K, Kesmodel U, Henriksen TB, Olsen SF, Secher NJ. A prospective study of smoking during pregnancy and SIDS. *Arch Dis Child* 2000;83(3):203-6.
8. Dominguez-Rojas V, de Juanes-Pardo JR, Astasio-Ariza P, Ortega-Molina P, Gordillo-Florencio E. Spontaneous abortion in a hospital population: are tobacco and coffee intake risk factors? *Eur J Epidemiol* 1994;10(6):665-8.
9. Lie RT, Wilcox AJ, Taylor J, Gjessing HK, Saugstad OD, Aabyholm F, et al. Maternal smoking and oral clefts: the role of detoxification pathway genes. *Epidemiology* 2008;19(4):606-15.
10. Patra J, Bakker R, Irving H, Jaddoe VW, Malini S, Rehm J. Dose-response relationship between alcohol consumption before and during pregnancy and the risks of low birthweight, preterm birth and small for gestational age (SGA)—a systematic review and meta-analyses. *BJOG* 2011;118(12):1411-21. Epub 2011 Jul 6.
11. Pruett D, Waterman EH, Caughey AB. Fetal alcohol exposure: consequences, diagnosis, and treatment. *Obstet Gynecol Surv* 2013;68(1):62-9.
12. Henderson J, Gray R, Brocklehurst P. Systematic review of effects of low-moderate prenatal alcohol exposure on pregnancy outcome. *BJOG* 2007;114(3):243-52.
13. Shankaran S, Lester BM, Das A, Bauer CR, Bada HS, Lagasse L, et al. Impact of maternal substance use during pregnancy on childhood outcome. *Semin Fetal Neonatal Med* 2007;12(2):143-50. Epub 2007 Feb 20.
14. Gouin K, Murphy K, Shah PS; Knowledge Synthesis Group on Determinants of Low Birth Weight and Preterm Births. Effects of cocaine use during pregnancy on low birthweight and preterm birth: systematic review and metaanalyses. *Am J Obstet Gynecol* 2011;204(4):340.e1-12. Epub 2011 Jan 22.
15. Grason HA, Misra DP. Reducing exposure to environmental toxicants before birth: moving from risk perception to risk reduction. *Public Health Rep* 2009;124(5):629-41.
16. Chalupka S, Chalupka AN. The impact of environmental and occupational exposures on reproductive health. *J Obstet Gynecol Neonatal Nurs* 2010;39(1):84-100.
17. Koren G, Bend JR. Fish consumption in pregnancy and fetal risks of methylmercury toxicity. *Can Fam Physician* 2010;56:1001-2.
18. Hobel CJ, Goldstein A, Barrett ES. Psychosocial stress and pregnancy outcome. *Clin Obstet Gynecol* 2008;51(2):333-48.
19. Littleton HL, Bye K, Buck K, Amacker A. Psychosocial stress during pregnancy and perinatal outcomes: a meta-analytic review. *J Psychosom Obstet Gynecol* 2010;31(4):219-28.
20. Maltepe C, Koren G. Preemptive treatment of nausea and vomiting of pregnancy: results of a randomized controlled trial. *Obstet Gynecol Int* 2013;2013:809787.
21. Ramlau-Hansen CH, Thulstrup AM, Nohr EA, Bonde JP, Sørensen TI, Olsen J. Subfecundity in overweight and obese couples. *Hum Reprod* 2007;22(6):1634-7.
22. Furber CM, McGowan L, Bower P, Kontopantelis E, Quenby S, Lavender T. Antenatal interventions for reducing weight in obese women for improving pregnancy outcome. *Cochrane Database Syst Rev* 2013;(1):CD009334.
23. Fishman SM, Caulfield LE, de Onis M, Blössner M, Hyder AA, Mullany L, et al. Childhood and maternal underweight. In: Ezzati M, Lopez AD, Rodgers A, Murray CLJ, editors. *Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors*. Vol 1. Geneva, Switz: World Health Organization; 2004. p. 39-161.
24. Goh YI, Bollano E, Einarson TR, Koren G. Prenatal multivitamin supplementation and rates of congenital anomalies: a meta-analysis. *J Obstet Gynaecol Can* 2006;28(8):680-9.
25. De-Regil LM, Fernández-Gaxiola AC, Dowswell T, Peña-Rosas JP. Effects and safety of periconceptional folate supplementation for preventing birth defects. *Cochrane Database Syst Rev* 2010;(10):CD007950.
26. Kennedy D, Koren G. Identifying women who might benefit from higher doses of folic acid in pregnancy. *Can Fam Physician* 2012;58(4):394-7.
27. Wilson RD, Johnson JA, Wyatt P, Allen V, Gagnon A, Langlois S, et al. Pre-conceptional vitamin/folic acid supplementation 2007: the use of folic acid in combination with a multivitamin supplement for the prevention of neural tube defects and other congenital anomalies. *J Obstet Gynaecol Can* 2007;29(12):1003-26. Erratum in: *J Obstet Gynaecol Can* 2008;30(3):193.
28. Fiore AE, Uyeki TM, Broder K, Finelli L, Euler GL, Singleton JA, et al. Prevention and control of influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP), 2010. *MMWR Recomm Rep* 2010;59(RR-8):1-62.
29. Kretsinger K, Broder KR, Cortese MM, Joyce MP, Ortega-Sanchez I, Lee GM, et al. Preventing tetanus, diphtheria, and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine recommendations of the Advisory Committee on Immunization Practices (ACIP) and recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee (HICPAC), for use of Tdap among health-care personnel. *MMWR Recomm Rep* 2006;55(RR-17):1-37.

MOTHERISK

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Do you have questions about the effects of drugs, chemicals, radiation, or infections in women who are pregnant or breastfeeding? We invite you to submit them to the Motherisk Program by fax at 416 813-7562; they will be addressed in future Motherisk Updates. Published Motherisk Updates are available on the Canadian Family Physician website (www.cfp.ca) and also on the Motherisk website (www.motherisk.org).