



**Recommendations for
Optimizing
Maternal Nutrition
Before and During
Pregnancy**

Women's awareness of the relationship between nutrition and conception: Current situation in Hong Kong

A lack of awareness of the importance of nutrition for conception exists among women in Hong Kong

An internet-based survey involving 1,086 women prior to conception and during pregnancy, conducted in Hong Kong in 2011, revealed that a considerable proportion of women did not have balanced diets during preconception and pregnancy, due to poor eating habits and busy lifestyles (Table 1)¹

Table 1. Hong Kong women's perception on nutrition and pregnancy

	Women at preconception stage	Pregnant women
Fruits and vegetables	<ul style="list-style-type: none"> 65% of interviewees did not consume 2 portions of fruits and 3 portions of vegetables daily 	<ul style="list-style-type: none"> Only 46% of pregnant women consumed 2 portions of fruits and 3 portions of vegetables daily
Vitamin D/ calcium	<ul style="list-style-type: none"> 51% of interviewees were not aware that Hong Kong women had vitamin D insufficiency Only 32% had sunlight exposure* over 4 times a week in the past month while 8% had no sunlight exposure at all 	<ul style="list-style-type: none"> 60% of interviewees were not aware that Hong Kong women had vitamin D insufficiency Only 32% had sunlight exposure* over 4 times a week in the past month while 7% had no sunlight exposure at all Only 51% drank high-calcium, low-fat milk
Supplements	<ul style="list-style-type: none"> 40% of interviewees reported not taking any supplements Only 32% took folic acid tablets 	<ul style="list-style-type: none"> Only 57% took folic acid tablets 42% received multivitamin and mineral supplements
Fish	<ul style="list-style-type: none"> Not determined 	<ul style="list-style-type: none"> 77% ate oily fish only once a week or less

*One time of sunlight exposure is defined as exposure of limbs under sunlight between 10am and 3pm for 5 to 30 minutes.



Potential nutrient deficiencies in women

Vitamin D and calcium

According to a study of 441 non-pregnant women, aged 18 to 40 years, in Beijing and Hong Kong²:

- Mean vitamin D and calcium intakes (2.0 µg/d and 478 mg/d, respectively²) were below the levels recommended by the USA Food and Nutrition Board of the National Academy of Sciences (dietary reference intakes for women aged 19–50 years: Vitamin D 15.0 µg/d and calcium 1,000 mg/d)³
- Over 90% of women in both cities had vitamin D insufficiency (mean serum 25-hydroxyvitamin D ≤50 nmol/L; without overt clinical symptoms).² Vitamin D deficiency (mean serum 25-hydroxyvitamin D ≤25 nmol/L which may result in clinically significant consequence) was detected in 40% and 18% of Beijing and Hong Kong women, respectively.²
- According to the results of the Internet-based survey, insufficient sunlight exposure and milk consumption may contribute to vitamin D and calcium insufficiency¹
- Vitamin D promotes the absorption of calcium

Iodine

Several studies have shown that iodine intake in Hong Kong is lower than the recommended level^{4,5}:

- About 93% of the Hong Kong population had an iodine intake less than the Chinese recommended nutrient intake (RNI; 150 µg/d)⁴
- Around 59% of the population had an iodine intake below 50 µg/d, the threshold for normal thyroid function⁴
- A study of 253 healthy pregnant women also showed that:
 - 35.8% of the women had urinary iodine levels below the cut-off value for iodine deficiency (<0.79 µmol/L) suggested by the World Health Organization (WHO)
 - 7.8% had severe iodine deficiency (urine iodine level <0.16 µmol/L)

Folic acid

- Mean red-cell folate levels remained normal or high during pregnancy in Chinese women in Hong Kong⁶
- Approximately 40% and 30% of Chinese people in the North of China and approximately 6% and 4% of those in the South were deficient in plasma and red blood cell folate, respectively (plasma folate <6.8 nmol/L, red blood cell folate <363 nmol/L)⁷
- 44% and 35% of pregnant Chinese women in areas with a high prevalence of neural tube defects in China were deficient in plasma and red blood cell folic acid⁸



Iron

- Iron deficiency is not common in pregnant women. However, anaemic women should pay attention to their iron levels during pregnancy and try to attain an adequate level during conception

Optimal nutrition is fundamental during preconception and pregnancy



Preconception

Fertility

- Weight control and regular intake of multivitamins help reduce the risk of ovulatory infertility in women^{9,10}
- Protein intake from a varied and balanced source (eg, meat, fish and vegetables) is important in maintaining good fertility. Obtaining 5% protein from a vegetable source helps reduce the risk of ovulatory infertility¹¹
- Multivitamin supplements help reduce the risk of ovulatory infertility (relative risk [RR]: 0.88 for ≤ 2 tablets/week, 0.69 for 3–5 tablets/week, 0.59 for ≥ 6 tablets/week)¹⁰
- Women consuming iron supplements had a significantly lower risk of ovulatory infertility¹²

Small-for-gestational-age (SGA) birth (<10th percentile)/preterm birth (<34 weeks)

- High green leafy vegetable intake (≥ 3 portions/day) before pregnancy reduced the chance of an SGA birth by approximately 50% (odds ratio [OR] 0.47)¹⁵
- Low fruit consumption (<1 piece of fruit/week) during preconception increased SGA birth by approximately 50% (OR 1.5)¹⁵
- Women with periconception multivitamin use had a reduced risk of preterm birth (OR 0.29) and a marginally lower risk of SGA birth (<5th percentile; OR 0.54)¹⁶

Congenital abnormalities/ Neural tube defects

- Women receiving folic acid-containing vitamin supplements in the 3 months before conception had a lower risk of having a neural tube defect-affected pregnancy (OR 0.65; 95% confidence interval [CI] 0.45-0.94)¹³
- A randomized controlled study also showed that folic-acid containing multivitamin supplementation during preconception resulted in
 - a significant reduction in the rate of congenital abnormalities (RR 0.53, 95% CI: 0.35-0.70); and
 - an approximately 90% reduction in primary neural tube defects¹⁴



Pregnancy

Gestational diabetes mellitus (GDM)

- GDM is detected in 1–14% of pregnant women around the world¹⁷
 - In China, the incidence of gestational diabetes was 4.3%¹⁸
- GDM is more common in women who are overweight or obese pre-pregnancy (overweight: 53.4% in women with GDM vs 45.1% in non-GDM women; obesity: 21.6% in women with GDM vs 12.3% in non-GDM women)¹⁸
- Pre-pregnancy body mass index (BMI) is a strong predictor of the risk of developing GDM (OR 3.44, 95% CI 1.88-6.31 for pre-pregnancy BMI ≥ 30 kg/m² vs BMI < 25 kg/m²)¹⁹
- Other nutritional risk factors for GDM include overconsumption of fruits (Recommended intake of fruits: 2–3 portions/day; OR 2.40) and a preference for sweets (OR 1.68)²⁰
- Increased consumption of more white meat is a protective factor for the development of GDM (OR 0.62)²⁰
- Women with vitamin B12 deficiency had twice the chance of developing GDM²¹

SGA birth

- Iron supplementation during early pregnancy in women significantly reduced the number of SGA birth²²

Bacterial vaginosis

- Vitamin D deficiency is associated with bacterial vaginosis – the prevalence of bacterial vaginosis decreased as vitamin D status improved (p<0.001)²³

Possible adverse effects related to nutrient deficiency in infants and mothers

Vitamin D

- A recent study showed that women with vitamin D insufficiency (≤ 46 nmol/L) during pregnancy had a two-fold higher risk of giving birth to a child with clinically significant language difficulties versus women with vitamin D levels > 70 nmol/L²⁴
- The relationship between vitamin D levels and adverse pregnancy outcomes, such as preeclampsia, gestational diabetes, low birth weight, preterm labour, caesarean delivery and infectious diseases, remains controversial²⁵

Calcium

- Calcium supplementation reduced the risk of preterm birth, particularly in women at high risk of preeclampsia²⁶
- The risk of high blood pressure, maternal death and serious morbidity was significantly lower in women receiving calcium supplementation²⁶
- The risk of preeclampsia was also reduced by calcium supplementation, especially in women with a low baseline calcium intake²⁶

Iodine

- Severe iodine deficiency in pregnant mothers may result in iodine deficiency disorders in their babies, including damage to the developing brain and profound mental retardation²⁷
- Supplementing iodine before or during pregnancy can potentially correct iodine deficiency and thyroid function in the foetus, and prevent iodine deficiency disorders in iodine deficient areas (eg, Zaire, Algeria and Malawi)²⁸

Iron

- Maternal iron-deficiency anaemia is associated with at least a two-fold increased risk of preterm delivery and low birth weight²⁹

Vitamin A

- Vitamin A and beta-carotene supplementation in women reduced pregnancy-related mortality by 40% and 49%, respectively ($p < 0.04$ and $p < 0.01$, respectively)³²

Zinc

- Women who have a low zinc intake have been shown to have a two-fold increase in the risk of giving birth to low-birth-weight babies³⁰
- A higher risk of preterm delivery and very preterm delivery (<37 weeks and <33 weeks, respectively) was also observed in women with low zinc intake³⁰
- The effect of zinc supplementation on pregnancy outcomes is controversial and additional studies are necessary to investigate the relationship between zinc supplementation and pregnancy³¹

Docosahexaenoic acid (DHA)

- DHA deficiency during foetal development and early infancy may have long-term consequences on brain function³⁴
- Children born to mothers receiving n-3 fatty acid supplementation during pregnancy had a better n-3 fatty acid status at birth, and better mental development in childhood versus those born to non-users^{35,36}

Folic acid

- Folic acid deficiency was observed in pregnant women in an area of China with a very high prevalence of neural tube defects in babies⁸
- Folic acid supplements taken before conception and during the early stages of pregnancy helped to reduce the rates of babies with neural tube defects^{33a}



Preconception and pregnancy weight gain



Preconception

Women who are planning to get pregnant should aim to maintain or attain a healthy weight before pregnancy. Their body mass index (BMI) should fall in the healthy weight range (Table 2)³⁷

Table 2. BMI cutoffs for Asians³⁷

	Underweight	Healthy weight range	Overweight	Obese
BMI (kg/m ²)	<18.5	18.5–22.9	23–24.9	>25

Underweight

Women who are underweight may have imbalanced production of oestrogen, which may inhibit ovulation, and have an increased chance of preterm birth and giving birth to low-birth-weight babies^{38,39}

Overweight or obese

Women who are overweight or obese may have increased risk of preeclampsia or gestational diabetes, resulting in increased strain to the heart^{18,40}



Maternal weight gain during pregnancy is required to support foetal development and maternal accretion of tissues. Recommendations for weight gain should be individualized according to the pregnant mother's pre-pregnancy BMI (Table 3).⁴¹ The increase in weight in the first 12 weeks of gestation may not be obvious. During later stages of pregnancy, however, weight gain will be greater than in the initial stage to meet the needs of the foetus³⁸

Table 3. Recommendations on pregnancy weight gain for Asian women^{38,41}

Pre-pregnancy BMI	Recommended total weight gain	Gestation week 0–12	Gestation week 13–40 (Average increase in weight per week)
<18.5	12.5–18 kg (28–40 lb)	0.9–1.8 kg (2–4 lb) in total	0.45 kg (1 lb)
18.5–22.9	11.5–16 kg (25–35 lb)		0.36 kg (0.8 lb)
23–24.9	7.0–11.5 kg (15–25 lb)		0.27 kg (0.6 lb)
>25	No more than 6.0 kg (15 lb)		0.23 kg (0.5 lb)
Twin pregnancy	16–20.5 kg (35–45 lb)		0.45–0.68 kg (1–1.5 lb)

Pregnant women should strive for an appropriate weight gain. Inadequate or excessive weight gain during pregnancy may lead to undesirable consequences (Table 4)

Table 4. Consequences of inadequate or excessive weight gain during pregnancy

Inadequate weight gain	Excessive weight gain
Low-birth-weight babies ⁴²	Increased chance of requiring caesarean section ⁴³
Increased risk of preterm birth ⁴²	Pregnancy complications (eg, hypertensive disorder of pregnancy or gestational diabetes) ⁴³
Increased risk of miscarriage ⁴⁴	Increased risk of miscarriage ⁴⁵

Nutritional recommendations for women before and during pregnancy

Recommendations on intakes of nutrients and food groups

Women who are planning to get pregnant and pregnant women should attain good nutritional status. In addition, they should have a nutritionally balanced diet and consume a sufficient amount of macronutrients and micronutrients based on the dietary reference intakes for adult and pregnant women (Table 5 and 6)

Note: The table below denotes the total recommended daily intake of the nutrients, including food sources.

Table 5. Recommended nutrient intakes for women before and during pregnancy^{38, 46}

* Calculated based on average pre-pregnancy weight of Chinese women (50–55 kg)

Nutrient	Recommended intake		Food source	
	Adult women	Pregnancy		
Energy (kcal)	1,400–1,500*	1st Trimester	2nd/3rd Trimester	All starchy, protein-rich, oily foods
		1,500*	1,800*	
Protein (g/d)	50	60	Animal source foods, fish, pulses/legumes, milk, soya products	
Carbohydrate (g/d)	175–190	190–225	Wholegrains, vegetables, fruits, milk	
Total fibre (g/d)	25	28	Vegetables, fruits, legumes, wholegrains	
Vitamin A (µg, retinal activity equivalents)	700	770	Liver, eggs, dark green vegetables, orange/yellow vegetables	
Vitamin B-6 (mg)	1.3	1.9	Highly fortified cereals, beef, liver, chicken, fish	
Vitamin B-12 (µg)	2.4	2.6	Meat, eggs, milk	
Vitamin C (mg)	75	85	Vegetables and fruits	
Vitamin D (µg)	15	15	Fatty fish, fish-liver oil, foods fortified with vitamin D (eg, milk)	
Vitamin E (mg, α-tocopherol)	15	15	Vegetable oil, nuts, avocado	

Note: The table below denotes the total recommended daily intake of the nutrients, including food sources.
 * Calculated based on average pre-pregnancy weight of Chinese women (50–55 kg)

Nutrient	Recommended intake		Food source
	Adult women	Pregnancy	
Folic acid (µg)	400	600	Dark green vegetables, legumes, nuts, liver
Pantothenic acid (mg)	5	6	Chicken, beef, potatoes, oat cereals, tomato products, liver, kidney, yeast, egg yolk, broccoli, and wholegrains
Biotin (µg)	30	30	Liver, meat, fruits
Calcium (mg)	1,000	1,000	Milk and milk products, dark green leafy vegetables, legumes
Phosphorus (mg)	700	700	Milk
Magnesium (mg)	310	350	Green vegetables, legumes, beans, nuts
Iron (mg)	18	27	Red meat, beans and leafy vegetables
Zinc (mg)	11	11	Organ meats, red meats, poultry, whole fish
Iodine (µg)	150	220	Seafoods, iodized salt, unsalted/unseasoned seaweed
Selenium (µg)	55	60	Meat, seafood, cereals and grains, dairy products, and fruits and vegetables
Manganese (mg)	1.8	2.0	Grain products, tea, vegetables
Molybdenum (µg)	45	50	Legumes, grain products, nuts
Chromium (µg)	25	30	Cereal, meat, poultry, fish

Important notice: Mothers-to-be should seek advice from healthcare professionals (HCPs) if there are any concerns regarding their nutritional status. HCPs should consider referring pregnant women for dietetic consultation if a regular diet does not provide sufficient nutrients

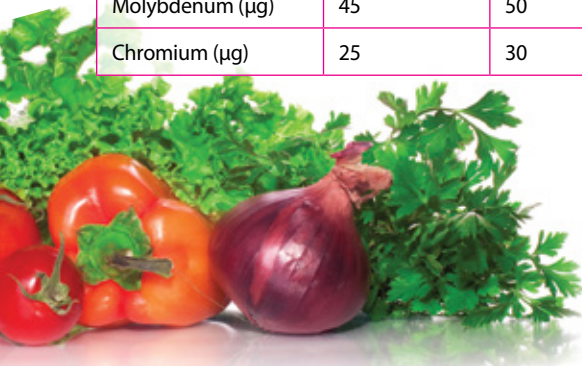


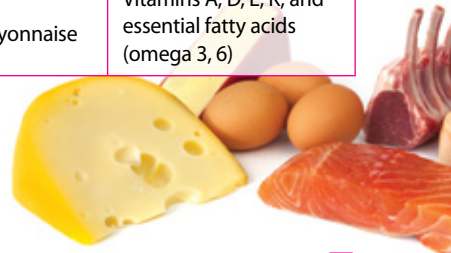
Table 6. Recommended daily intakes of food groups for women before and during pregnancy¹⁷

* Calculated based on average pre-pregnancy weight of Chinese women (50–55 kg)

Food group	Daily intake (number of servings)		Examples of one serving	Key nutrients provided
	Adult women	Pregnant women		
Grains and cereals	3–6	3–6	1 bowl of rice	Carbohydrate, fibre, vitamin B-1
Vegetables	3	4	<ul style="list-style-type: none"> • ½ bowl of cooked green vegetables, gourds or mushrooms • 1 cup of salad 	Vitamins, minerals and dietary fibre
Fruits	2	2–3	<ul style="list-style-type: none"> • 1 small or ½ big apple, pear or orange, or ½ bowl of grapes • Including 1 serving of vitamin C-rich fruit, eg, orange, kiwi fruit 	Dietary fibre, vitamins and minerals (especially vitamin C)
Meat, poultry, fish, eggs and dry beans	5–6	6–7	<ul style="list-style-type: none"> • 40 g (about 1 tael) of uncooked meat, fish or chicken • 30 g cooked meat or 1 egg • ½ bowl of red kidney beans 	Protein, vitamin B, and iron
Dairy products	1–2	2–4	<ul style="list-style-type: none"> • 1 glass of milk product • 1.5 slice low-fat cheese • 150 g low-fat yogurt • 1 cup glass of calcium-fortified soy milk 	Calcium, protein, phosphorus, vitamins A, B and D
Fluid	6–8	8	<ul style="list-style-type: none"> • 1 bowl of clear broth • 1 glass of water 	---
Fats and oil	Use sparingly	Use sparingly	<ul style="list-style-type: none"> • 1 teaspoon oil • 1 tablespoon mayonnaise 	Vitamins A, D, E, K, and essential fatty acids (omega 3, 6)

1 bowl/glass = 240 mL

Important notice: Mothers-to-be should seek advice from healthcare professionals (HCPs) if there are any concerns regarding their nutritional status. HCPs should consider referring pregnant women for dietetic consultation if a regular diet does not provide sufficient nutrients



Supplementations

Folic acid

The American Dietetic Association recommends women of child-bearing age consume 400 µg of folic acid daily and pregnant women receive 600 µg of folic acid daily from fortified foods and/or supplements, in addition to folate derived from a varied diet. Women who have had a child with a spine or skull defect should receive 4 mg of folic acid per day⁴⁶

Iron

Supplementation with 27 mg of iron daily during pregnancy is recommended. Anaemic women may need 60 mg daily instead until anaemia is resolved⁴⁶

Vitamin D

The UK National Institute for Health and Clinical Excellence (NICE) recommends pregnant women take a vitamin D supplement of 10 µg per day⁴⁸

Multivitamin and mineral supplements

Multivitamin and mineral supplements are recommended for women falling into these categories⁴⁶:

- Poor-quality diet
- Iron-deficiency anaemia
- Consumption of small amounts of foods from an animal source
- Carrying two or more foetuses
- Smoking, alcohol consumption, drug abuse

The American Congress of Obstetricians and Gynecologists (ACOG) also suggests that a prenatal vitamin supplement is recommended for most women to obtain nutrients with higher demands during pregnancy (eg, iron, folic acid)⁴⁹



Foods and substances which should be avoided

Intake of certain foods should be minimized or avoided during pregnancy and preconception as they may adversely affect the developing foetus and pregnant mother (Table 7)

Table 7. Foods and substances which should be avoided during pregnancy and preconception^{38, 46, 47}

Foods	Recommendation	Possible adverse effects
Food with high calories but low nutritional value (eg, candy, soft drinks)	Limit	<ul style="list-style-type: none"> • May suppress one's appetite while adding extra weight to the body
Caffeine (eg, strong tea, coffee)	Limit to less than 300 mg caffeine/day (<3 cups of coffee or 6 cups of tea/day)	<ul style="list-style-type: none"> • Reduced absorption of iron and calcium • Delayed conception • Spontaneous miscarriage • Low birth weight
Alcohol	Avoid	<ul style="list-style-type: none"> • Major neurological and developmental birth defects
Tobacco	Quit smoking	<ul style="list-style-type: none"> • Carbon monoxide and nicotine increase foetal carboxyhaemoglobin and reduce placental blood flow, both of which limit oxygen supplied to the foetus • Increased risk of spontaneous abortion, placenta previa, placental abruption, ectopic pregnancy, preterm birth, foetal growth retardation and sudden infant death syndrome
Mercury-rich foods	Limit to 12 oz of deep sea fish (eg, swordfish, salmon or tuna)/week	<ul style="list-style-type: none"> • Impair neurological development in foetus
Raw foods	Avoid	<ul style="list-style-type: none"> • Gastrointestinal infections, worms, hepatitis A in pregnant mother
Very salty foods or preserved foods (eg, salted egg, salted fish, cured meat and fermented bean curd)	Limit to moderate amount	---
Spices of a strong flavour (eg, mustard, chili)	Limit to moderate amount	<ul style="list-style-type: none"> • Gastric discomfort, heartburn, acid reflux
High-risk foods (eg, mould-ripened soft cheese, pâté, unpasteurized milk)	Avoid	<ul style="list-style-type: none"> • Food-borne disease infections • Miscarriage • Diarrhoea

Frequently asked questions (FAQ)

Do multivitamin supplements cause nausea and vomiting in pregnant women?

About 70% of pregnant women suffer from nausea and vomiting, which are predominant during early pregnancy.⁵⁰ The pathophysiology of nausea and vomiting during pregnancy is obscure. The role of hormones and psychological factors remain controversial.⁵¹ Some minerals in standard prenatal supplements (eg, iron) may provoke gastric irritation and cause nausea and vomiting if taken on an empty stomach.⁵² However, there are also data showing that vomiting is associated with a lack of supplementation with multivitamins before 6 weeks of gestation.⁵³

Some practical advice which may reduce the severity of nausea and vomiting in pregnant women includes:

- Avoid some odours or foods which may trigger nausea⁵⁴
- Eat before, or as soon as, they feel hungry to avoid an empty stomach⁵²
- Take supplements with a meal or snack rather than on an empty stomach⁵²
- Take multivitamins at the time of conception (ACOG recommendations)⁵⁵

Are iron supplements associated with constipation during pregnancy?

Constipation is observed in 35–40% of pregnant women.⁵⁰ No significant difference in the frequencies of gastrointestinal symptoms, including constipation, was observed in pregnant women receiving 20 to 80 mg of iron supplements daily.⁵⁶

WHO has the following suggestions to prevent constipation in pregnant women⁵⁰:

- Drink plenty of fluid such as plain water (6–8 cups a day)
- Increase intake of fibre-rich foods (eg, brown rice, wholegrain cereals, vegetables, fruits)

Do vegetarian pregnant women need to modify their diets?

These women may continue their vegetarian diets but should plan their meals with care to ensure that they have an adequate protein intake. They will probably need to take iron, vitamin B-12 and vitamin D supplements.⁴⁹

How can pregnant women with lactose intolerance obtain enough calcium?

These women are encouraged to consume non-dairy, calcium-rich foods (eg, leafy greens, fortified juices and soy milk, tofu, broccoli, canned salmon, oranges, nuts and wholegrains).³⁸ Lactose-free milk and other dairy products may also be considered. Women who cannot consume sufficient calcium-rich foods may consider taking calcium supplements. Women are advised to consult their doctor or dietitian for dosage recommendations.

Will the developing foetus absorb calcium from the mother's teeth and worsen her dental health?

The developing foetus absorbs the majority of calcium it needs from its mother's daily diet and a small proportion of calcium from her bones.³⁸ Therefore, the pregnant mother's teeth condition would not be affected in this way.

To keep the teeth healthy, pregnant mothers should maintain good dental hygiene (especially after vomiting), limit the intake of sour foods and drinks, and avoid chewing hard foods.



The Child Nutrition Advisory Group

The **Child Nutrition Advisory Group** is a group of local specialist healthcare professionals with an interest in child nutrition. The Advisory Group, comprised of paediatricians, obstetrician-gynaecologists, dietitians and midwives, aims to discuss key nutrition and dietary issues from conception to pregnancy to infancy and childhood – including breastfeeding, supplementary feeding and complementary feeding – and raise awareness of these issues amongst Hong Kong healthcare providers and parents.

Dr Henry AU YEUNG, Specialist in Paediatrics

Mr Leslie CHAN, Dietitian

Dr Nancy FOK, Specialist in Obstetrics-Gynaecology

Ms Sylvia LAM, Dietitian

Dr David LEE, Specialist in Paediatrics

Ms Shuit-Mui LIU, Midwife

Mr Terry TING, Dietitian

Dr Kai-Man YU, Specialist in Obstetrics-Gynaecology



References

1. Nutrition survey for women during preconception stage and pregnancy. ESDlife. 2011.
2. Woo J, et al. *Br J Nutr* 2008;99:1330-1334.
3. National Academy of Sciences. Institute of Medicine. Food and Nutrition Board. Dietary Reference Intakes: RDA and AI for Vitamins and Elements 2011. Available at: http://iom.edu/Activities/Nutrition/SummaryDRIs~/media/Files/Activity%20Files/Nutrition/DRIs/RDA%20and%20AIs_Vitamin%20and%20Elements.pdf. Accessed 29 March 2011.
4. Risk Assessment Studies Report No. 45: Dietary Iodine Intake in Hong Kong Adults Centre for Food Safety, Food and Environmental Hygiene Department. The Government of the Hong Kong Special Administrative Region.
5. Kung AW, et al. *Clin Endocrinol(Oxf)* 1997;46:315-319.
6. Tso SC and Wong RL. *Int J Gynaecol Obstet* 1980;18:290-294.
7. Hao L, et al. *J Nutr* 2003;133:3630-3635.
8. Ren A, et al. *Public Health Nutr* 2007;10:762-768.
9. Chavarro JE, et al. *Obstet Gynecol* 2007;110:1050-1058.
10. Chavarro JE, et al. *Fertil Steril* 2008;89:668-676.
11. Chavarro JE, et al. *Am J Obstet Gynecol* 2008;198:210e211-217.
12. Chavarro JE, et al. *Obstet Gynecol* 2006;108:1145-1152.
13. Shaw GM, et al. *Epidemiology* 1995;6:219-226.
14. Czeizel AE. *Birth Defects Res A Clin Mol Teratol* 2009;85:260-268.
15. McCowan LM, et al. *BJOG* 2010;117:1599-1607.
16. Catov JM, et al. *Am J Epidemiol* 2007;166:296-303.
17. ADA. *Diabetes Care* 2004;27 Suppl 1:S88-90.
18. Yang H, et al. *Diabetologia* 2009;52:1099-1104.
19. Radesky JS, et al. *Paediatr Perinat Epidemiol* 2008;22:47-59.
20. Jing X, et al. *Wei Sheng Yan Jiu* 2010;39:209-211, 227.
21. Krishnaveni GV, et al. *Diabetologia* 2009;52:2350-2358.
22. Chan KK, et al. *BJOG* 2009;116:789-797.
23. Bodnar LM, et al. *J Nutr* 2009;139:1157-1161.
24. Whitehouse AJ, et al. *Pediatrics* 2012;129:485-493.
25. Urrutia RP and Thorp JM. *Curr Opin Obstet Gynecol* 2012;24:57-64.
26. Hofmeyr GJ, et al. *Cochrane Database Syst Rev* 2010;CD001059.
27. Skeaff SA. *Nutrients* 2013;5:265-273.
28. Delange F. *Bull World Health Organ* 1996;74:101-108.
29. Scholl TO and Hediger ML. *Am J Clin Nutr* 1994;59:492S-500S.
30. Scholl TO, et al. *Am J Epidemiol* 1993;137:1115-1124.
31. Jackson AA and Robinson SM. *Public Health Nutr* 2001;4:625-630.
32. West KP Jr, et al. *BMJ* 1999;318:570-575.
33. Wilson RD, et al. *J Obstet Gynecol Can* 2003;25:959-973.
34. Innis SM. *J Nutr* 2007;137:855-859.
35. Helland IB, et al. *Pediatrics* 2003;111:e39-44.
36. van Houwelingen AC, et al. *Br J Nutr* 1995;74:723-731.
37. WHO IATSoO. International Obesity TaskForce. The Asia-Pacific Perspective: Redefining obesity and its treatment. Health Communications Australia Pty Ltd; 2000.
38. Cheung L, et al. Dietitians' recipes for women during pregnancy and lactation. Cross border book; 2009.
39. Han Z, et al. *Int J Epidemiol* 2011;40:65-101.
40. Sohlberg S, et al. *Am J Hypertens* 2012;25:120-125.
41. Wong W, et al. *J Am Diet Assoc* 2000;100:791-796.
42. Tsai IH, et al. *Asia Pac J Clin Nutr* 2012;21:82-87.
43. Mamun AA, et al. *BMC Pregnancy Childbirth* 2011;11:62.
44. Helgstrand S and Andersen AM. *Acta Obstet Gynecol Scand* 2005;84:1197-1201.
45. Metwally M, et al. *Fertil Steril* 2008;90:714-726.
46. Kaiser L and Allen LH. *J Am Diet Assoc* 2008;108:553-561.
47. Nutrition for pregnant women and breastfeeding mothers. Department of Health, Hong Kong SAR. Available at: http://www.fhs.gov.hk/english/health_info/class_topic/ct_woman_health/wh_atenatna_a5.html. Accessed 19 March 2012.
48. National Institute for Health and Clinical Excellence. Making sure pregnant and breastfeeding women receive vitamin D. Available at: <http://www.nice.org.uk/newsroom/features/MakingSurePregnantAndBreastfeedingWomenReceiveVitaminD.jsp>. Accessed 18 April 2012.
49. Nutrition during pregnancy FAQ. American Congress of Obstetrician and Gynecologists. Available at: <http://www.acog.org/~media/Fox%20Patients/faq001.pdf?dmc=1&ts=20120319T0616006816>. Accessed 19 March 2012.
50. WHO. Healthy eating during pregnancy and breastfeeding: booklets for mothers. 2001.
51. Quinla JD and Hill DA. *Am Fam Physician* 2003;68:121-128.
52. Smith JA, et al. Treatment and outcome of nausea and vomiting of pregnancy. Wolters Kluwer and UpToDate Web Site. Available at: <http://www.uptodate.com/contents/treatment-and-outcome-of-nausea-and-vomiting-of-pregnancy>. Accessed 20 March 2012.
53. Emelianova S, et al. *Clin Invest Med* 1999;22:106-110.
54. Niebyl JR. *N Engl J Med* 2010;363:1544-1550.
55. ACOG. *Obstet Gynecol* 2004;103:803-814.
56. Millman N, et al. *Acta Haematol* 2006;115:53-57.



Child Nutrition Advisory Group
兒童營養顧問小組



Please visit www.childnutritionhk.org for more information
Sponsored as a service to the community by Wyeth Nutrition.

Editorial development by MIMS MedComms. The opinions expressed in this publication are not necessarily those of the editor, publisher or sponsor. Any liability or obligation for loss or damage howsoever arising is hereby disclaimed.

© 2013 MIMS (Hong Kong) Limited. All rights reserved.

No part of this publication may be reproduced by any process in any language without the written permission of the publisher.

Wyeth® is the registered trademark of Wyeth LLC. Used under license.

MIMS (Hong Kong) Limited
27th Floor, OTB Building,
160 Gloucester Road, Wan Chai,
Hong Kong
T +852 2559 5888
F +852 2559 6910
enquiry.hk@mims.com
www.mims.com