ABC of Nutrition

A STEWART TRUSWELL

NUTRITION FOR PREGNANCY

The British Way of Birth. BBC TV survey of 6000 women (1982)

Pregnancy is a time when appetite is altered and nutritional needs change. What the expectant mother eats or drinks can affect her baby's health and her own comfort. In pregnancy women develop a new interest in the consequences for health of what they eat. They are entitled to advice from their doctor.

Women intending another pregnancy who had had a baby with a neural tube defect were entered into a multicentre trial coordinated by Professor R W Smithells.¹

Only three out of 387 women given periconceptional Pregnavite Forte F (containing 0.4 mg folic acid/day, seven other vitamins, iron, and calcium) subsequently had a baby with a neural tube defect compared with 24 out of 493 in the unsupplemented group (rate 6½ times less in supplemented group). This was not a randomised or blind trial and a further MRC trial is underway.

Folate deficiency is suspected because the folate antagonist amethopterin causes neural tube defects in animals and pregnant women, and in prospective studies women who later bore babies with neural tube defects had lower red cell folate concentrations in early pregnancy.

¹ Dobbing J, ed. *Prevention of spina bifida and other neural tube defects*. London: Academic Press, 1983.

Alcohol in pregnancy

Heavy drinkers have a greatly increased risk of inducing the fetal alcohol syndrome, with characteristic underdevelopment of the mid face, small size, and mental retardation.

Women who intend to become pregnant should not sit drinking whatever the occasion: they could be two or three weeks pregnant.

Once pregnancy is established the rule should be no more than one alcoholic drink per day to be sure of preventing minor effects, chiefly growth retardation.

Before pregnancy the first advice should ideally be communicated when a woman decides to try to have a baby. Pregnancies in women who are overweight, have anorexia nervosa, or whose growth is not completed are more difficult, and the women need extra nutritional care.

A good intake of folate may be important in preventing neural tube defects in a minority of women. If so the stage when this vitamin is needed is around 28 days after ovulation—that is, supplementation has to be periconceptional. Likewise, it is the early weeks when excess alcohol intake may lead to malformations.

During pregnancy extra nutrients are required, especially from 20 weeks, for the fetus and for the placenta. Tissue is also laid down in the uterus and breasts, blood volume is increased, and, in healthy women with adequate food, adipose tissue increases by around 4 kg. This fat is deposited mostly on the hips and thighs.

Recommended dietary intakes (per day)*

	Addition for pregnancy	Non-pregnant women	Total
Protein (g)	+6	54	60
Folate (μ g total folate)	+200	200	400
Iron (mg)	1	12	13
Calcium (mg)	+700	+500	1200
Zinc (mg)	+4.5	15	19.5
Iodine (μ g)	+30	120	150

*UK figures where available. Folate, zinc, and iodine are Australian recommended intakes.

Nutrients accumulated in full term fetus	Total nutrients accumulated in fetus and mother (placenta, uterus, breasts, blood etc.)
Water (g)	2180
Fat (g)	600
Protein (g)	410
Calcium (g)	30
Iron (mg)	300
Zinc (mg)	60
Na (mmol)	250
K (mmol)	150

Good sources of folate

(total folate, μ g/100 g)

About 1000 μ g: yeast, Marmite, Bovril

About 250 μ g: liver, bran, endive

About 100 μ g: broccoli tops, spinach, Brussels sprouts, nuts, kidneys, peas, All Bran

About 50 μ g: oatmeal, avocado, boiled beetroot, egg yolk, wholemeal bread, peanut butter, oranges

Legumes contain over 100 μ g raw, but this is usually reduced to about a fifth after cooking.

The amounts of different nutrients which the mother has to put into her fetus by the time of delivery have been worked out by chemical analysis of stillbirths. These can be estimated more accurately for stable inorganic elements than for the vitamins. From these figures for nutrients accumulated and from information on whether there is any change in their turnover the extra requirements for pregnancy can be estimated.

The need for extra energy works out at 80 000 kcal for the pregnancy. This includes storage in fetal fat and protein, in maternal reproductive tissue, and in adipose tissue together with the mother's increased basal metabolic rate and the need to move a heavier body. This amounts to 300 kcal per day (excluding the first month): $\frac{80\,000}{250} = 300$. In Britain the recommended daily amount of energy during pregnancy (2400 kcal) is 250 kcal above the non-pregnant amount (2150 kcal). When actual food intakes are carefully measured there is, however, little indication of extra energy intake in Western women. It appears that pregnant women reduce their exercise if they can. Their energy metabolism may also become more efficient.

There is increased efficiency in the metabolism of protein and absorption of iron in pregnancy.

For most nutrients like *protein* the small extra amounts required are covered adequately by a normal diet. But intakes are more critical for the other five nutrients in the table.

Folate is the only vitamin and calcium the only nutrient element whose requirement doubles in pregnancy. Serum and red cell folate concentrations decline in pregnancy and, if looked for, some degree of megaloblastic change can be found in substantial minorities of women in late pregnancy. Such changes have been reported in 6-25% of women not taking supplements in Britain. The word folate comes from the Latin *folia* (leaf) because it was first found in spinach, but food sources are not the same as for vitamin C. Liver and kidneys, whole grain cereals, nuts, and legumes are good sources of folate, whereas fruits are fairly poor (about 5 μ g/100 g).

The folate content of vegetables varies from about 10 μ g/100 g in potatoes and carrots up to 300 μ g in endive; the vitamin is largely destroyed by prolonged boiling.

With *calcium* absorption is likely to become more efficient. Without any change of vitamin D intake or exposure to the sun plasma concentrations of calcitriol (the active form of the vitamin converted in the kidney) are increased. The easiest way of obtaining the extra calcium needed for pregnancy and lactation is from milk; $\frac{1}{2}$ litre supplies about 600 mg calcium (as does 60 g Cheddar cheese).

The *iron* contents of the fetus (about 300 mg), placenta (50 mg), and average postpartum blood loss (200 mg) add up to some 550 mg. The red cell mass also increases after 12 weeks by an amount which corresponds to about another 500 mg of iron, but this is a temporary internal borrowing from stores and causes no extra demand provided the stores are sufficient. Against these extra needs there is the saving from no menstruation (some 200 mg) and improved intestinal absorption.

Iron in pregnancy

There is no universal policy. Some doctors are more interventionist than others. Iron tablets can cause indigestion or constipation. The following is generally agreed.

- Women should be advised to eat meat regularly (unless vegetarian). This is the best absorbed source of iron in the diet.
- A woman with a history of anaemia, menorrhagia, poor diet, or repeated pregnancies should be given iron supplements or an iron-folate preparation.
- Haemoglobin should be checked and iron given if it is below 11 g/dl (with a low mean cell volume).
- For prophylactic purposes one iron tablet per day is adequate.

Oysters are very rich in zinc. Good sources are red meat, liver, kidneys, whole grain cereals, crustaceans, nuts, and cheese. Moderate sources are chicken and legumes. Phytate, soya, and iron reduce zinc absorption.

Maternal haemoglobin concentration declines by about 10% because of physiological haemodilution; and serum iron concentration, transferrin saturation, and ferritin concentration all go down. These changes can be partly—but only partly—prevented by iron supplementation.

The plasma *zinc* concentration falls by about 30% in pregnancy and the hair zinc concentration may decline a little too. Many pregnant women are found to eat less than the current recommended dietary intakes. The zinc concentration in cord blood is usually about double that in the puerperal mother. There is, of course, haemodilution in pregnancy and the plasma zinc concentration falls when oral contraceptives are taken so these observations do not prove deficiency. But white cell zinc concentration falls in pregnancy too (this correlates with muscle zinc), and white cell zinc was significantly lower in mothers who had small for dates babies in a London study. More research is still needed, but zinc is worth watching in pregnancy.

The increased need for *iodine* may be taken for granted in Britain, but in areas where goitre is endemic there is a risk of cretinism so expectant mothers should be given an injection of iodised oil, preferably before conception.

Weight gain

The amount of weight gained from before conception to shortly before delivery ranges considerably in normal women—from about 6 to 24 kg. A good average to try and keep close to is 12.5 kg (26½ lb). This might be made up by about 115 kg (¼ lb)/week for first 10 weeks and 300 g (⅔ lb)/week for the remaining 30 weeks. A mother's height, her weight for height at the start of pregnancy, and her weight gain can all influence the size of her fetus.

In Third World countries, where mothers often start thin and gain little weight because of restricted and bulky food and heavy physical work, birth weights have been increased by providing food (calorie) supplements during pregnancy in controlled trials. Average gains in eight different trials have been 40 to 300 g on to the birthweight.

Obesity in pregnancy increases the chances of a heavier and fatter baby and also of hypertension and gestational diabetes. Since 4 kg of the usual 12 kg weight gain is fat, obese women should try to put on only 7 to 8 kg overall during their pregnancy.

Diet and discomforts of pregnancy

Morning sickness is not always experienced in the morning. Some women have it in the evenings. There has been no controlled trial of simple management. One opinion is that it is related to a low blood glucose concentration and that a dry biscuit or similar light snack before getting up may help.

Constipation and its complication haemorrhoids are very common in pregnancy. All pregnant women should be advised to eat more wholemeal bread, bran, or bran cereals to loosen and increase the bulk of their faeces.

Heartburn should improve if the woman eats smaller meals and avoids foods which she finds indigestible. The common meal pattern of tiny breakfast, small lunch, and large dinner becomes unsuitable in late pregnancy. It is a good plan for her to have four, five, or even six small meals throughout the day.

<u>Vegans</u>	Must take vitamin B12 supplements
<u>Other vegetarians</u>	May need to improve their intakes of iron and protein – for example by eating plenty of legumes and nuts

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Cravings and aversions—At some stage in pregnancy most women experience a distortion of their usual range of likes and dislikes of foods. Women may develop a nine month aversion to foods they usually like—for example, meat, fried foods, coffee, tea. Contrariwise and at the same time they may experience a craving for certain foods. These are often sweet foods, such as fruits and chocolate ice cream, but some remarkable non-foods—coal, soap, soil—have been recorded.

Vegetarians who are pregnant may need extra dietary advice. There are several types of vegetarian. Those most at risk are vegans. It is essential for them to take a supplement of vitamin B12 for normal cerebral development of the fetus. Other lacto-ovo vegetarians, especially if they are prosperous and belong to a traditional vegetarian group, usually manage well enough but may want or need advice to optimise their protein and iron intakes. Legumes and nuts are an important part of a balanced vegetarian diet.

Philosophical Medical Ethics

Justice and allocation of medical resources

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In my last article I indicated the wide range of issues concerning justice that are relevant to medical ethics. Even within the sphere of distributive justice the range is dauntingly broad. At one end of the range are what economists call microallocation decisions, of which the most dramatic deal with the allocation of scarce lifesaving resources such as haemodialysis between competing claimants. At the other end are macroallocation decisions taken at a governmental level on the division of the national "cake" between, for instance, health, other welfare, education, arts, and defence budgets. In between are varieties of what one might call mesoallocation decisions. These include decisions on how to distribute the allocated national health budget—the subject matter of the Black report,¹ which showed so clearly and so shockingly the statistical correlations throughout the nation between poverty and low social status on the one hand and adverse health outcomes on the other. (In doing so it also showed the inadequacy of assuming that overtly "health care" decisions are the only or even the most important ones in determining the nation's health.) They also include decisions on how to allocate medical resources at health authority level between the competing medical and other health care claims and decisions within a hospital on how to allocate between competing specialties and firms. More specific still are decisions for allocation among the different members of a hospital firm or health centre; and then come the microallocation decisions of each doctor or health worker distributing his or her available resources among particular patients. Although this range of decisions is exceedingly broad and disparate, all are based on some moral assessment of how competing

claims can be fairly adjudicated. They are thus all explicitly or implicitly based on some theory of justice.

Preliminary distinctions

In the application of such a theory to problems of resource allocation it is worth making some preliminary distinctions. The first is between the formal and substantive contents of the theory. As I indicated in my last article, Aristotle's formal principle (equals should be treated equally, unequals unequally in proportion to the relevant inequality) and the impartiality and fairness it entails are widely accepted in different theories of justice whose substantive contents vary considerably. Among the substantive claims of a theory of justice (the function of which is fair adjudication between competing claims) it is important to distinguish its method for justifying itself and dealing with competing claims for other theories of justice (for we know that such conflicting claims are likely to occur). That method itself should meet Aristotle's formal requirements. A democratic voting structure, for example, affords a method of justly choosing between, among other things, the theories of justice preferred by different members of that democratic society. Finally, it is important to distinguish between the theory of justice itself and the equally important practicalities of applying it. Justice is not achieved simply by basing a scheme for resource allocation on a good theory of justice. Its decisions must be implemented.

Given the wide agreement about Aristotle's formal theory it is worth noting that its acceptance, even before any substantive aspects of a theory of justice are agreed, has important practical implications for resource allocation. Firstly, it requires resource allocation decisions to be made on moral grounds and it rules out partiality and other arbitrary methods of allocation. For instance, neither doctors nor governments can decide that they prefer blondes or whites and justly allocate their resources accordingly, because

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