Dietary supplements in pregnancy

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Abstract

It is well documented that good nutrition during pregnancy is essential for the health of both the fetus and the pregnant woman. Various barriers may prevent pregnant women from consuming all the vital nutrients recommended; this can include poverty, access to food, nausea and vomiting. However, many women may unwittingly elude important nutrients by following restrictive diets, such as vegetarian or vegan diets, often believing that this is a healthy option. Fortification of food and supplementation of key micronutrients, particularly folic acid, vitamin D and iron can help to ensure optimal nutritional status in pregnant women, particularly where diets may be lacking. Globally, Governments and health organisations have issued recommendations and/or started schemes that aim to optimise micronutrient intake in pregnancy, mainly via targeted supplementation.

Keywords: Pregnancy, Diet, Nutrition, Supplements, Deficiency

Introduction

A nourishing diet during pregnancy is essential for the healthy growth and development of the fetus [1]. Contrary to popular belief, there is no need for pregnant women to 'eat for two' as only a slight increase in certain nutrients is recommended [2]. However, pregnant women with poor or overly restrictive diets may reduce fetal access to essential micronutrients during the early stages of pregnancy. Severe or prolonged vomiting during the first trimester is of particular concern for the fetus, as nutritional intake may be significantly compromised [1].

At risk nutrients

Iron

The World Health Organisation (WHO) states that iron deficiency is one of the most common nutritional deficiencies globally, with 30% of women in developed countries having insufficient iron stores; the prevalence in developing countries is even higher [3][4]. Women with poor iron stores may suffer from anaemia during pregnancy, and therefore screening and supplementation is recommended. However, most UK women following a balanced diet will not require supplementation during pregnancy. Iron-rich foods include lean meat – especially red meats, oily fish, pulses, green leafy vegetables, and dried fruits. Liver is an iron-rich food; however, its consumption during pregnancy is not advised due to the high vitamin A content [2].

During pregnancy, the body requires extra iron as the demand for haemoglobin increases with the surge in the amount of blood in the body, which can be as high as fifty per cent. During the second and third trimester, the growth of the baby and placenta will result in the body needing an increase in iron. That being said, iron demands are often met due to the absence of menstruating, reducing the loss of iron through bleeding and the body's increased ability to absorb more iron progressively during pregnancy [5]. The UK has no increased requirement for iron during pregnancy due to these physiological changes [2]. However, if the mother is severely anaemic, it could compromise the baby's iron stores at birth and increase the risk of premature birth, low birth weight, and/or neonatal death [4][6].

Women following a vegetarian or vegan diet may have limited intake of iron-rich foods, furthermore plant sources of iron are less well absorbed. A higher availability of iron can be achieved either by increasing the consumption of foods which enhance iron absorption (such as vitamin C), or by decreasing those that are inhibitors (such as foods containing phytates found in wholegrains, legumes, nuts, and seeds, and tannin found in tea). Inhibitors can bind with minerals in the gut preventing absorption. Although vegans and vegetarians tend to consume more iron than omnivores, their diet comprises largely of plant-based foods, containing more phytates, and therefore reduce the amount of iron available for the body [7][8].

Calcium

Calcium's main role is regarding the development of strong bones and teeth in the fetus and has an essential role throughout growth and in achieving peak bone mass. It also has a role in ensuring a normal heart rhythm and blood clotting abilities. Pregnant adolescents require more calcium (625 mg/day) than pregnant adults, as their bones are still growing. If there is lack of calcium in the diet during pregnancy, the fetus will draw calcium out of the mother's bones, compromising the mother's health and putting her at risk of osteoporosis in later life [9]. An optimal calcium intake also reduces the risk of pre-eclampsia and hypertension during pregnancy.

Adults, aged 19-50 have an UK reference nutrient intake of 700mg of calcium a day, with no increase needed during pregnancy due to the body's increased efficiency in absorption [2]. An increase in calcium intake is recommended for breastfeeding women, with the UK dietary reference value being 1250mg per day [2]. Women following restricted diets that avoid milk and dairy products may need supplements to ensure adequate calcium intake. Vegan diets can potentially supply enough calcium by including tofu, fortified plant milks or yoghurt (such as soya or almond), green leafy vegetables such as kale, regularly in the diet [10]. The best way to ensure optimal calcium absorption from the diet is to ensure adequate vitamin D status. Dietary vitamin D can be found in oily fish, cheese, egg yolk, and fortified food products, as well as being made in the body via the action of the sunlight [2]. Combining vitamin D and calcium together in the diet, ensures that the availability of calcium will be improved. A daily supplement of 10 µg of vitamin D is recommended in the UK, for all pregnant women [11][12]. There is a wide variation for vitamin D recommendations in different European countries, ranging from 10µg to 20µg per day (Figure 1).

Figure 1 - Recommendations for Vitamin D in pregnancy and lactation (µg/d) **for different European countries** [13]

Countries	Pregnancy µg/d	Breastfeeding µg/d
UK	10 µg/d	10 µg/d
France	10 µg/d	10 µg/d
Austria	20 µg/d	20 µg/d
Belgium	20 µg/d	20 µg/d
Germany	20 µg/d	20 µg/d
Italy	15 µg/d	15 µg/d
Spain	15 µg/d	15 µg/d
Switzerland	20 µg/d	20 µg/d

Vitamin B12

The UK Department of Health advises a reference nutrient intake of 1.5µg of vitamin B12 per day for adult women, with no increment for pregnancy. This can be achieved by eating a healthy, varied diet [2]. A lack of this vitamin can cause macrocytic anaemia with symptoms of tiredness and weight loss. Vitamin B12 works with folate to rapidly divide cells such as bone marrow in the production of blood cells; it also required to maintain a healthy nervous system. A deficiency during pregnancy can increase the risk of birth defects associated with poor formation of the spine and brain including spina bifida, anencephaly, and encephalocele [14].

Vitamin B12 is not synthesised within the body and can only be sourced from food, therefore a varied, balanced diet is important. Vitamin B12 is found in almost all animal products, with the highest percentages in meat, milk, fish, and eggs [2]. Vulnerability arises for those with a restrictive diet, as B12 is not naturally found in plant foods. For vegan pregnant women, sources of B12 can be found in fortified soya milk, fortified breakfast cereals, and yeast extracts (such as Marmite). If these foods are not regularly included in the woman's diet, supplementation will be necessary [15][16].

Iodine

Iodine is needed for healthy brain development of the fetus and prevention of cretinism; even a mild deficiency can result in reduced infant IQ. Recommendations for the UK are 140 µg/day for women aged 19-50 years, with no increment for pregnancy or lactation [2]. The most reliable sources of iodine in the UK diet are fish, milk and dairy products; so anyone following a restrictive diet (avoiding fish and milk) is at greater risk of iodine deficiency. Plant-based milk alternatives are not fortified with iodine, and therefore an iodine supplement is essential to ensure sufficient intake during pregnancy. Iodine content is low in most other foods (figure 2), particularly in land-locked areas of the globe, leading to the WHO and UNICEF's universal salt iodisation as a global strategy. The need for supplements in pregnancy and lactation is only recommended in countries with a low percentage of iodised salt available (such as the UK). However, even when iodize salt is available, relying on salt as a source of iodine is not advised and salt intake should still be limited to <6g per day [17][18].

Figure 2: The iodine content of different foods [18]

Food		Portion	Average iodine/portion (µg)
Milk and dairy products	Cow's milk	200ml	50-100
	Organic cow's milk	200ml	30-60
	Yoghurt	150g	50-100
	Cheese	40g	15
Fish	Haddock	120g	390
	Cod	120g	230
	Plaice	130	30
	Salmon fillet	100g	14
	Canned tuna	100g	12
Other	Eggs	50g	25
	Meat/Poultry	100g	10
	Nuts	25g	5
	Bread	1 slice (36g)	5
	Fruit and vegetables	1 portion (80g)	3

Zinc

Zinc is an essential mineral during pregnancy; due to fetal rapid cell growth, a deficiency in pregnancy could lead to birth defects and poor fetal development. Low zinc consumption can also be linked with premature birth and low birth weight. The UK reference nutrient intake for zinc is 7mg per day, for women of child-bearing age, with no increment for pregnancy [2]. Zinc is present in animal foods such as red meat, but it is also found in nuts, grains and dairy products [2]. Vegans and vegetarians are at risk of inadequate consumption of zinc, due to low consumption of animal foods and high consumption of plant food high in phytates, which inhibit zinc absorption [19].

Omega-3 fatty acids

Essential long chain polyunsaturated fatty acids - EPA and DHA play an important role in fetal development. The body requires EPA and DHA for the development of a baby's heart, nervous system, brain and eyes alongside the health of the mother during pregnancy. Essential fatty acids can have many positive effects on pregnancy, reducing the risk of preeclampsia, postnatal depression and premature labour [20]. The International Society for the Study of Fatty Acids and Lipids (ISSFAL) suggests pregnant women should consume at least 500 µg of omega-3 fatty acids with 200 µg being DHA per day [21]. Omega-3 fatty acids can only be obtained from the diet with the best sources being the inclusion of one or two portions of oily fish per week – such as salmon, tuna, sardine and anchovies. There is some concern regarding mercury and other toxins in certain fish (such as tuna, swordfish and marlin – which the UK department of health recommends avoiding in pregnancy)[22]. Although flaxseeds would seem an alternative source of omega-3 for pregnant women following a vegan or vegetarian diet, the flaxseed contains the short chain fatty acid, ALA (not EPA or DHA). Often conversion from ALA to EPA and DHA is insufficient, so it is advisable to include a daily consumption of walnuts, walnut oil or rapeseed oil otherwise women will require omega-3 supplementation.

Recommended supplementation in pregnancy

A balanced diet, consisting of all the main food groups will supply the best sources of vitamins and minerals to pregnant women and those breastfeeding. Vitamin D (10 µg per day) and folic acid (400 mg per day – prior to conception and up to 12 weeks gestation) supplements are recommended alongside a good diet for all UK pregnant women [2]. Following a vegan or vegetarian diet may also require supplementation of vitamin B12, among other supplements (such as iron, calcium, iodine and/or omega 3 fatty acids – depending on level of restriction. A high consumption of vitamin A during pregnancy can result in birth defects, and therefore the consumption of liver and liver products and supplementation is not advised. Pregnant women who purchase over the counter multi-vitamin supplements during pregnancy, need to ensure that they are suitable for pregnancy (free from retinol) [24][25]

The UK Government's approach to vitamin supplements comprises firstly of universal recommendations and advice to all women from midwives during the first antenatal clinic visit and secondly, the provision of free key vitamin supplements for pregnant women and children from low income backgrounds, called the 'Healthy Start' scheme. Those entitled to the Healthy Start scheme, also receive vouchers in exchange for food and supplements. If women are on benefits, such as income support or if aged under 18, the vouchers can be used in exchange for cow's milk or infant formula, fresh or frozen fruit, and vegetables. Healthy Start vitamins for women contain 400 µg folic acid, 10 µg vitamin D3, and 70 µg vitamin C [1]. The supplements are available from registered outlets such as NHS outlets, supermarkets, and pharmacies. Pregnant women and children over the age of one and under the age of four are entitled to vouchers currently worth £3.10 per week, and women with children under the age of one can receive two £3.10 vouchers per week [26]. Of those eligible, 80% claimed the Healthy Start vouchers and 90% were redeemed, showing that the scheme is popular and well-used in the UK [27].

However, access to Healthy Start has been reported to be a barrier in some communities, with some of those eligible having a low level of awareness of the policy. The scheme aims to reduce health inequalities and to successfully establish long-term healthy eating habits in at-risk women and children. The rising cost of food in recent years, could compromise the aims of the scheme if the value of the vouchers does not keep up to inflation, especially regarding the cost of fresh fruit and vegetables [28][29].

In Germany, recommendations for supplementation include the 'Healthy Start – Young Family Network'. This scheme is aimed at developing coordinated recommendations for all healthcare professionals and organisations when distributing advice to expecting parents. Germany's action plan is to promote healthy eating and physical activity and concentrates on the quality of women's diets to provide the increase in vitamins and minerals needed. Similarly to the UK, Germany recommends 400 µg of folic acid, but also 100-150 µg of iodine and an increase in iron consumption, with supplementation determined on individual requirements [30]. German recommendations for iodine could be because of increased land-locked areas, compared to the island nation of the UK.

Supplement Use

UNICEF recognises the importance of micronutrient supplementation during pregnancy, as nutritional deficiencies can have serious consequences such as increased risk of poor fetal

development, still birth, birth defects and even death. In some developing countries incidents of poor micronutrient intakes is high, therefore UNICEF are promoting multiple supplements for pregnant women including iron, folic acid and zinc to combat this. Mass fortification is another strategy often used to prevent deficiency; this involves placing nutrients in foods or condiments consumed on a regular basis (fortification). Examples of this are flour (fortified with calcium in the UK), sugar, cooking oils (fortified with fat-soluble vitamins) and salt (often fortified with iodine). For vulnerable groups of pregnant women such as women following a restrictive diet; vegan or vegetarian diets for example, and those in developing countries, with restricted access to optimal nutrition; these strategies can help minimise micronutrient depletion and reduce deficiencies [31].

It is reported that over 90% of UK women surveyed had taken supplements before, during, and after their pregnancy [32]. The most commonly consumed was folic acid, followed by multivitamins, and iron supplements. The most common reason for not taking supplements was forgetting; other reasons included the expense, illness from consumption, and not understanding what the tablets were for [31]. In the UK, supplements are available to buy from pharmacies or via prescription from family doctors (GPs). 'Pregnacare' is a brand often endorsed by midwives as it follows the UK Department of Health recommendations, containing 19 vitamins and minerals (such as iron, zinc, vitamin B12, 10 µg vitamin D and 400 µg folic acid), plus the addition of omega 3 fatty acid. Many multi-vitamin preparations, including UK healthy start vitamins are suitable for vegetarians, but not vegans. An alternative for vegan women can be found on The UK Vegan Society's website called VEG1. This contains folic acid, vitamin B2, B6, B12, vitamin D3, iodine and selenium in suitable doses for pregnancy. It can be bought in orange or blackcurrant flavour and is available in either a three month or six month supply. VEG1 provides many of the identified at risk nutrients, but additional supplements for omega 3 fatty acids and possibly calcium will still be required, depending on dietary intake and inclusion of fortified foods.

Conclusion

A healthy, varied diet alongside appropriate dietary supplementation during pregnancy is necessary for the healthy development of the fetus. Pregnant women, including vegan and/or vegetarian women, who follow a varied diet may perceive their diet to be sufficient, providing all the vitamins and minerals needed for baby's development - however, folic acid and vitamin D can be difficult to obtain in sufficient quantities from the diet alone. Women who follow more restrictive diets (especially vegan or some strict religious diets) have increased risk of nutritional deficiencies, but may not seek professional advice regarding diet or supplements during pregnancy and may unwittingly risk their baby's health. Deficiencies of key micro-nutrients during pregnancy can have significant harmful effects on fetal development and may also impact on maternal health, depleting nutrient stores and increasing risk of maternal deficiency, if diet and supplements are insufficient. Although European governments offer advice and have implemented schemes regarding supplement use during pregnancy, there is evidence that not all at-risk women access optimal supplementation. Where purchased, supplements can be expensive and this may result in poor compliance. Lack of awareness may be another barrier associated with poor compliance; particularly regarding free schemes, (such as the UK Healthy Start scheme), leading to high-risk, low-income women missing out on essential nutrients.

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Note:

Supplements recommended by UK Vegan Society

https://www.vegansociety.com/shop/veg-1-supplements