

You are what Your Mother Ate: Role of Dietary Fibers

P D Gupta

Adjunct Professor, Manipal University, Manipal, Karnataka, India.

pdg2000@hotmail.com

**Corresponding Author: P D Gupta, Adjunct Professor, Manipal University, Manipal, Karnataka, India.*

Abstract

Developing embryo draws readymade food and nutrition from mother during pregnancy through placenta. The nutritional requirements and the physiology of digestive system of a pregnant woman is different from that of a normal woman and therefore during this period the pregnant woman has to take care of her diet for proper development of the growing embryo. In this short review the role of dietary fibers and their effects on the developing embryo is stressed during pregnancy.

INTRODUCTION

During pregnancy a woman's body undergoes various normal physiological changes which in turn assist metabolism of developing embryo¹. Metabolism of the nutrients, a pregnant woman takes during pregnancy plays a prime role in well being of that particular individual throughout his/her life. Dutch-led team of researchers examined blood samples obtained from individuals whose mothers were pregnant with them during the Dutch Hunger Winter of 1944 to 1945, toward the end of World War II, and from their siblings who were born either before the six-month famine or after and found that the individuals exposed to famine *in utero* had particular methylation of the gene (*PIM3*). The individuals whose mothers were pregnant during the famine have been shown to have higher rates of obesity, dyslipidemia, diabetes, and schizophrenia. Maybe their metabolism is in a lower gear. Elmar *et al.*² suggest that *PIM3* was silenced in the fetuses in response to the starvation faced by their mothers and then never reactivated. However in rat model we found that to begin with due to starvation metabolism increases and later in longer period metabolism failed and ketone bodies are formed^{3,4}

The reproductive performance of the female depends on the quality of the uterus, "The Maternal Soil"; generally it does not change the genetics of the developing embryo, however, recent experiments have shown that its environment provides the quality for developing embryo and therefore it influence phenotypic characters². For healthy development

of child in the womb, womb has to provide healthy environment, better nutrients and proper blood supply. It all depends on what mother is eating, what sort of life-style she leads^{5,6,7}. Before pregnancy, Nature has provided a process of cleaning the uterus by having menstrual cycle every month¹, which releases bacteria from inside the reproductive system and helps the body to discharge excess iron, which can help lower the risk of cardiovascular disease. The suppression of menstruation (through birth control pills) may thwart breast and bone development as well as fertility. One of the surprising benefits of menstruation is that it cleanses the body. However, after implantation of the embryo in the womb the menstrual cycle stops, and system modifies to take care of the embryo¹.

The most important in the present context is the reduced gastric motility², which is the main cause of constipation. The indigestible portion of food always derived from plants and most plant-based foods called dietary fibers which contain a mixture of the two components⁵.

Soluble fiber. Dissolves in water, is found in oats, peas, beans, apples, citrus fruits, carrots, barley, etc. and can readily be fermented in the colon into gases and physiologically active by products (gel), which can act as prebiotic⁵. These by products slow digestion, which in turn helps lower cholesterol and blood glucose.

Insoluble fiber. This type of fiber remains unchanged all the way to the colon, making waste heavier and softer so it can shimmy through the intestines more easily promotes the movement of material through

digestive system and increases stool bulk, so it can be of benefit to those who struggle with constipation or irregular stools⁵.

Substantial epidemiological evidence documents diverse health benefits, including reduced risks of hypertension, associated with diets high in fiber. Few studies, however, have investigated the extent to which dietary fiber intake in early pregnancy and their effects on developing embryo⁵⁻⁷. In this review role of dietary fiber is stressed during pregnancy.

CONSTIPATION DURING PREGNANCY

Constipation is common during pregnancy⁸. An increase in the progesterone hormone during pregnancy causes the relaxation of body muscles including intestinal, which causes slower movements of the intestines. In addition, the uterus increases in size, putting pressure on the rectum. These combined effects can leave pregnant women looking for relief of toilet problems. The digestion also becomes slower. This can lead to constipation which is not a big issue; however, during pregnancy the number of solutions shrinks for its management. The safest remedy is to take a diet high in fiber that helps to prevent constipation⁷. Dietary fibers also supply pregnant women with vitamins and antioxidants.

DIETARY FIBER RICH FOODS

Pregnant women should try to consume 25 to 30 grams of dietary fiber each day to stay regular and healthy. Foods which are rich in dietary fibers such as, fresh fruits, vegetables, beans, peas, lentils, bran cereals, prunes, and whole-grain bread should be included in daily diet. Try to include some raspberries, apples, bananas, figs, and strawberries for a refreshing fruit salad^{9,10}. Or roast some sweet corn, Brussels sprouts, and carrots for a delightful side dish. Try breaking up your daily food intake into five or six smaller meals to help with constipation relief. This will allow the stomach to digest food without having to work overtime, and allow it to transfer food to the intestine and colon smoothly. Eating large meals can overload the stomach and make it harder for your digestive system to process what was consumed.

If you increase fluids and fiber in your diet and still have problems, then you can try a supplement, such as fiber pills (FiberCon is one example) or fiber powders (such as Metamucil) that can be mixed with liquid. These steps will relieve most pregnancy-related constipation problems¹¹.

SUITABLE FOODS FOR PREGNANCY

Maintaining a healthy diet during pregnancy is very important. During this time, your body needs additional nutrients, vitamins and minerals. In fact, you may need 350–500 extra calories each day during the 2nd and 3rd trimesters. A diet that lacks key nutrients may negatively affect the baby's development. It will also make it a lot easier to lose the pregnancy weight after baby's birth¹².

VEGETARIAN FOODS

Dairy Products

During pregnancy consume extra protein and calcium to meet the needs of the growing fetus. Dairy products contain two types of high quality protein: casein and whey. Dairy is the best dietary source of calcium, and provides high amounts of phosphorus, various B-vitamins, magnesium and zinc. Yogurt, especially Greek yogurt, is particularly beneficial for pregnant women. It contains more calcium than any other dairy product. Some varieties also contain probiotic bacteria, which support digestive health⁵. People who are lactose intolerant may also be able to tolerate yogurt, especially probiotic yogurt. Taking probiotic supplements during pregnancy may reduce the risk of complications such as preeclampsia, gestational diabetes, vaginal infections and allergies¹¹.

Vegetables

Sweet potatoes are very rich in beta-carotene, a plant compound that is converted into vitamin A in the body. Vitamin A is essential for growth, as well as for the differentiation of most cells and tissues. It is very important for healthy fetal development. Pregnant women are generally advised to increase their vitamin A intake by 10–40%. However, they are also advised to avoid very high amounts of animal-based sources of vitamin A, which may cause toxicity when eaten in excess. Therefore, beta-carotene is a very important source of vitamin A for pregnant women.

Sweet potatoes are an excellent source of beta-carotene. About 100–150 grams (3.5–5.3 oz) of cooked sweet potatoes fulfills the entire Reference Daily Intake (RDI). Furthermore, sweet potatoes contain fiber, which may increase fullness, reduce blood sugar spikes and improve digestive health and mobility.

Dark Colour and Green Vegetables

contain many of the nutrients that pregnant women need. These include fiber, vitamins C, K and A, calcium,

iron, folate and potassium. Furthermore, broccoli and leafy greens are rich in antioxidants⁶. They also contain plant compounds that benefit the immune system and digestion. Due to their high fiber content, these vegetables may also help prevent constipation. This is a very common problem among pregnant women. Consuming green, leafy vegetables has also been linked with a reduced risk of low birth weight .

Fruits

Berries are packed with water, healthy carbs, vitamin C, fiber and plant compounds. They generally contain high amounts of vitamin C, which helps the body absorb iron. Vitamin C is also important for skin health and immune function. Berries have a relatively low glycemic index value, so they should not cause major spikes in blood sugar. Berries are also a great snack because they contain both water and fiber. They provide a lot of flavor and nutrition, but with relatively few calories Avocados, are an unusual fruit because they contain a lot of monounsaturated fatty acids. They are also high in fiber, B-vitamins (especially folate), vitamin K, potassium, copper, vitamin E and vitamin C. Because of their high content of healthy fats, folate and potassium, avocados are a great choice for pregnant women. The healthy fats help build the skin, brain and tissues of the fetus, and folate may help prevent neural tube defects. Potassium may help relieve leg cramps, a side effect of pregnancy for some women. Avocados actually contain more potassium than bananas.

Dried fruit is generally high in calories, fiber and various vitamins and minerals. One piece of dried fruit contains the same amount of nutrients as fresh fruit, just without all the water and in a much smaller form. Therefore, one serving of dried fruit can provide a large percentage of the recommended intake of many vitamins and minerals, including folate, iron and potassium. Prunes are rich in fiber, potassium, vitamin K and sorbitol. They are natural laxatives, and may be very helpful in relieving constipation. Dates are high in fiber, potassium, iron and plant compounds. Regular date consumption in the third trimester may help facilitate cervical dilation and reduce the need to induce labour.

However, dried fruit also contains high amounts of natural sugar. Make sure to avoid the candied varieties, which contain even more sugar. Although dried fruit may help increase calorie and nutrient intake, it is generally not recommended to consume more than one serving at a time.

Legumes and Grains

This group of food includes lentils, peas, beans, chickpeas, soybeans and peanuts. Legumes are excellent plant-based sources of fiber, protein, iron, folate (B9) and calcium, all of which the body needs more of during pregnancy. Folate is one of the B-vitamins (B9). It is very important for the health of the mother and fetus, especially during the first trimester. However, most pregnant women are not consuming nearly enough folate . This has been linked with an increased risk of neural tube defects and low birth weight. Insufficient folate intake may also cause the child to be more prone to infections and disease later in life. Legumes contain high amounts of folate. Furthermore, legumes are generally very high in fiber. Some varieties are also high in iron, magnesium and potassium¹⁰.

Eating whole grains may help meet the increased calorie requirements that come with pregnancy, especially during the second and third trimesters. As opposed to refined grains, whole grains are packed with fiber, vitamins and plant compounds. Oats and quinoa also contain a fair amount of protein, which is important during pregnancy. Additionally, whole grains are generally rich in B-vitamins, fiber and magnesium. All of these are frequently lacking in the diets of pregnant women.

NON VEGETARIAN

Sea Foods

Pregnant women's omega-3 fatty acids requirements are high especially the long-chain omega-3 fatty acids DHA and EPA, and they are not getting enough omega-3 from their diet. Fish and fish liver oil and seafood are very rich in essential omega-3 fatty acids. These acids help in developing the brain and eyes of the fetus . However, if seafood is contaminated with mercury it would be better to avoid and take essential omega-3 fatty acids containing capsules. However, studies have shown that pregnant women who eat 2-3 meals of fatty fish per week achieve the recommended intake of omega-3 and increase their blood levels of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) Salmon is also one of very few natural sources of vitamin D, which is often lacking in the diet. It is very important for many processes in the body, including bone health and immune function ^{10,11}

Fish Liver Oil

is made from the oily liver of fish, most often cod. The oil is very rich in the omega-3 fatty acids EPA and DHA, which are essential for fetal brain and eye development. Fish liver oil is also very high in vitamin D, which many people do not get enough of. It may be highly beneficial for those who don't regularly eat seafood or supplement with omega-3 or vitamin D. Low vitamin D intake has been linked with an increased risk of preeclampsia. This potentially dangerous complication is characterized by high blood pressure, swelling of the hands and feet, and protein in the urine. Consuming cod liver oil during early pregnancy has been linked with higher birth weight and a lower risk of disease later in the baby's life. A single serving (one tablespoon) of fish liver oil provides more than the recommended daily intake of omega-3, vitamin D and vitamin A. However, it is not recommended to consume more than one serving (one tablespoon) per day, because too much preformed vitamin A can be dangerous for the fetus. High levels of omega-3 may also have blood-thinning effects.

Eggs

Eggs are the ultimate health food, because they contain a little bit of almost every nutrient needed by pregnant woman. Eggs are a great source of choline. Choline is essential for many processes in the body, including brain development and health. Low choline intake during pregnancy may increase the risk of neural tube defects and possibly lead to decreased brain function. A single whole egg contains roughly 113 mg of choline, which is about 25% of the recommended daily intake for pregnant women (450 mg).

Lean Meat

Beef, pork and chicken are excellent sources of high-quality protein. Furthermore, beef and pork are also rich in iron, choline and other B-vitamins — all of which are needed in higher amounts during pregnancy. Iron is an essential mineral that is used by red blood cells as a part of hemoglobin. It is important for delivering oxygen to all cells in the body. Pregnant women need more iron, since their blood volume is increasing. This is particularly important during the third trimester¹¹.

Low levels of iron during early and mid-pregnancy may cause iron deficiency anemia, which doubles the risk of premature delivery and low birth weight. It may be hard to cover iron needs with diet alone, especially since many pregnant women develop an

aversion to meat. However, for those who can, eating red meat regularly may help increase the amount of iron acquired from the diet. Eating foods that are rich in vitamin C, such as oranges or bell peppers, may also help increase absorption of iron from meals.

Water

Symptoms of mild dehydration include headaches, anxiety, tiredness, bad mood and reduced memory. During pregnancy, blood volume increases by up to 1.5 liters. Therefore, it is important to stay properly hydrated. The fetus usually gets everything it needs, but if you don't watch your water intake, you may become dehydrated. Furthermore, increasing water intake may help relieve constipation and reduce the risk of urinary tract infections, which are common during pregnancy. General guidelines recommend drinking about 2 liters of water per day, but the amount you really need varies by individual.

Since calorie and nutrient needs are increased, it is very important that during pregnancy choose nutrient-dense, fiber rich healthy foods. In recent study it is shown that gut microbiota¹² also different in pregnant women, since microbial environment has changed and therefore food should also be changed accordingly. This will influence if proper balance is not kept between beneficial and harmful bacteria. Gaining weight during pregnancy is normal¹³, but it is important to gain it the healthy way. This benefits growing baby also.

CLINICAL IMPLICATIONS

For a healthy pregnancy and child birth the mother's diet needs to be balanced and nutritious. Since calorie and nutrient needs are increased, it is very important that during pregnancy choose nutrient-dense, fiber rich healthy foods should be consumed. In recent study it is shown that composition of gut microbiota¹² changes in pregnant women, and the changed microbial environment needs changed die to keep proper balance between beneficial and harmful bacteria.

Blood volume has to be increased; therefore the system absorbs iron more efficiently, so she has to consume more iron to make sure that both she and her baby have an adequate oxygen supply. This benefits growing baby also. Gaining weight during pregnancy is normal¹³, but it is important to gain it the healthy way.

You are what Your Mother Ate: Role of Dietary Fibers

Too much exposure to alcohol and caffeine can seriously undermine the baby's development. One should limit the intake of these. Now it is well established that diet before birth modifies gene expression and therefore healthy diet results in getting healthy baby.

REFERENCES

- [1] Gupta P D (2010) *Mothering a Cause*. Capricorn Publishing House, Jaipur, India
- [2] Tobi E W., Sliker R C., Luijk R, Dekkers K F, Stein A D., Xu, K M., Slagboom P. E, van Zwet, E W. Lumey L H. and Heijmans, B T. (2018): DNA methylation as a mediator of the association between prenatal adversity and risk factors for metabolic disease in adulthood *Science Advances* 4,(1) 4364 DOI: 10.1126/sciadv.aao4364
- [3] Sapir, D. G., Owen, O. E., Cheng, J. T. Ginsberg, R. Boden, G. Walker W. G. (1972) The effect of carbohydrates on ammonium and keto acid excretion during starvation, *J. Clin. Investig.* **51**, 2093–2102.
- [4] Waheed, A.A., Yasuzumi F, Gupta P.D. (1998) Lipid and fatty acid composition of brush border membrane of rat intestine during starvation. *Lipids* 33 (11), 1093-1097
- [5] Bell S J (2011) A review of dietary fiber and health: focus on raisins. *J Med Food*.14 (9): 877-83.
- [6] Sawicka B, and Gupta P. D. (2018) Resistant starch in potato *Acta Sci. Pol. Agricultura* 17(3),1-17
- [7] Sawicka, B. and Gupta, P.D. (2018) Importance of dietary fiber and starch in the prevention of selected civilization diseases: a review. *J Cell & Tissue Res* 18 (2) 6485-6489
- [8] Johnson P, Mount K, and Graziano, S (2014) Functional bowel disorders in pregnancy: effect on quality of life, evaluation and management. *Acta Obst Gyne (Scandinavica)*. 93(9), 874–879
- [9] Eswaran S1, Muir J, Chey WD (2013) Fiber and functional gastrointestinal disorders. *Am J Gastroenterol*. 108(5):718-27.
- [10] Gupta. P. D. and Ballal, H. S. (2010) *Childhood Cancer*, Manipal University Press, Manipal, India
- [11] Gates D and Schatz L (2006) *The Body Ecology Diet: Recovering Your Health and Rebuilding Your Immunity*, Hay House Inc USA.
- [12] Sara, M. Solveig, E, Cunningham, A. Dunlop, A L. and Corwin, E J. (2017) The Maternal Gut Microbiome during Pregnancy *MCN Am J Matern Child Nurs*. 42(6): 310–317.
- [13] Pushkala, K. and Gupta, P.D. (2013) Epigenetic Effect of Food for Cancer Management. *Int. J. Med. Sciences and Biotechnology*.1: 1-11.

Citation: P D Gupta. *You are what Your Mother Ate: Role of Dietary Fibers*. *Archives of Reproductive Medicine and Sexual Health*. 2019; 2 (1): 30-34.

Copyright: © 2019 P D Gupta. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.