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Abstract:

Being a mother is such an unreliable moment in every woman's life but lack of adequate quantity and quality of nutrients during pregnancy can increases the risk of malnutrition. It is a silent epidemic all over the world, which is not only caused by nutrition deficiency but poor diet and improper absorption of nutrients from food. Being underweight and not maintaining optimal prenatal health are the primary reasons of malnutrition in pregnant women. Usually, when the mother consumes less calories food, the demand of energy of the body is high therefore it is essential to provide a proper dietary nutrition during pregnancy. The healthcare systems have to take a serious action and apply new terminologies against malnutrition to improve the maternal, fetal and infant health. For that reason, the field of nutraceuticals can be a better option as a remedial food for maintaining a proper balance of various nutrition and preventing the pregnant mothers and child from the malnutrition. various sources of nutraceuticals are polyphenols, dietary fibres, polyunsaturated fatty acid (PUFA), probiotics, prebiotics, antioxidants, vitamins, minerals, folic acid and iron act as a remedial herbal medicine to reduce the risk of miscarriage, fetal death, birth defects, and maternal mortality during pregnancy. Nutraceuticals providing required nutrients to the placenta and control vascularization, modify gene expression, metabolic function, deoxyribonucleic acid, methylation as well as prevent oxidative stress and inflammation. This review reveals that naturally obtained nutraceuticals are safe and healthy across the medicines and can be used as a preventive measure in malnutrition condition in pregnancy.

Keyword: Nutraceutical, Malnutrition, Impact of malnutrition, Role of nutraceutical, Feature trends of nutraceutical

1. Introduction

The World Health Organization (WHO) declared that the malnutrition is the silent epidemic all over the world. Day to day every country has to facing this serious challenge of malnutrition condition. In the low and middle-income countries, malnutrition causing most of the mother's death, sometimes physical and mental disabilities due to poor intake of dietary food and in adequate nutrients. Pregnancy is a unique moment in lifespan, which has not only influenced on maternal health but also have a remarkable effect on the next generation. Maternal and child health nutrition is the main reason among pregnancy, so it is necessary to provide dietary nutrition in adequate quantity to improve the maternal, fetal and infant health. Nutraceutical is a good source of nutrients and supplements which possess both nutritional as well medicinal value. Nutraceutical are popular as a remedial food for maintaining physical and mental health, enhancing strength, boosting immunity, thus it is useful for preventing and treating diseases. Mostly nutraceuticals are naturally obtained from plant origin so these are considered as a safe and healthy therefore it is the best option to treat and preventing malnutrition and undernutrition in pregnancy, infant and child. Generally, during fetal development, low maternal nutrition can affect the pregnancy along with that fetal requirement get also affected that is genetic expression, metabolism, maternal body composition and placental nutrient supply therefore pregnant women also have high requirements of Nutraceuticals.

This paper reveals that various sources of nutraceutical can be helpful to prevent or mitigate malnutrition condition and managing various complications occur during pregnancy and fetal development.

2. Malnutrition in Pregnancy

Malnutrition is a serious condition that happens when your diet does not contain the right amount of nutrients. According to World Health Organization, malnutrition is defined as cellular imbalance between the supply nutrition and energy and the body's demand for them to ensure growth, maintenance and specific function. Many pregnant women are suffering from malnutrition because of their diet have low quantity of calories, protein as well as nutrition which are essential for proper maintenance and growth of the babies.

Causes of Malnutrition in Pregnancy

Mostly, malnutrition is caused due to low intake of nutrients, proteins, vitamins, iron, fibers in diet. Most of the woman don't get proper nutrients rich food to eat during pregnancy either sometimes they avoid to eat during their trimester due to vomiting and nausea. Poor or unhealthy diet, Shortage of food, poor maternal health, inadequate quantity of nutrients, proteins and vitamins, morning sickness, various physical and mental conditions like depression, schizophrenia, dementia, use of certain medication that may interfere with nutrient absorption, digestive disorders, stomach conditions. Sometimes, early age of marriage, work burden, education literacy also matters. Therefore, these things are responsible to causes malnutrition in pregnancy.

Impact of Malnutrition in Pregnancy

1) Impact on mother-

During pregnancy mother get affected by malnutrition that causes various health problems in both mother and her developing baby **(Fig. No. 1)**. It can increase the risk of following-

a) **Maternal mortality-** Woman who are undernourished or does not get proper nutrients from diet before and during pregnancy as a result of high risk of dying during pregnancy or childbirth.

b) **Miscarriage-** Pregnant woman having a high risk of miscarriage due to insufficient nutrition.

c) **Preeclampsia or toxaemia-** Preeclampsia is a pregnancy complication resulting due to high blood pressure and often protein in the urine.

d) **Anemia-** Anemia causes due to deficiency of iron, having too few red blood cells than normal. Anemia in pregnancy resulting in low-birth-weight baby and postpartum hemorrhage

e) **Postpartum hemorrhage excessive bleeding during child birth** due to vitamin K deficiency can lead to excessive bleeding during child birth.

f) **Osteomalacia-** It is known as softening of the bones. This commonly occur due to deficiency of vitamin D, which are essential for calcium absorption and maintain the strength and hardness of bones.

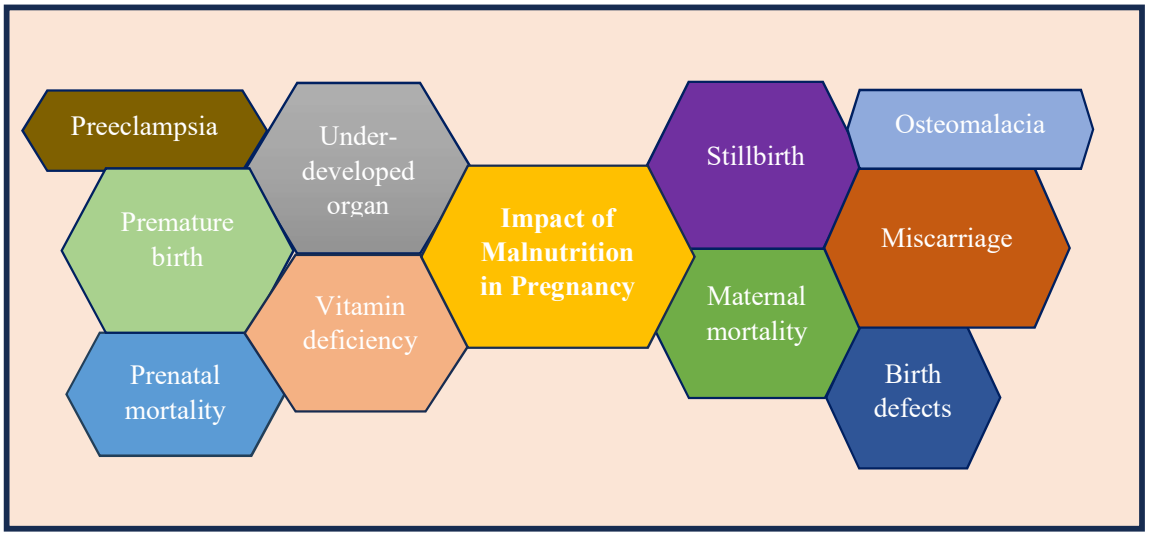

Fig No. 1: Impact of malnutrition in pregnancy

2) Impact on Baby:

Malnutrition causes adverse effect on the baby inside the womb like-

a) Stillbirth- Stillbirth generally occurring before or during pregnancy. Under this condition, baby could not grow or develop properly which may lead to death of baby in the womb.

b) Premature birth- means baby is born too early before 37 weeks of pregnancy. In this state, babies suffer from various symptoms like jaundice, breathing issues, digestive problems, bleeding in their brain, poor vision, weak muscles, organ does not develop properly, poor growth rate etc.

c) Prenatal mortality- Babies of women having a higher risk of dying in the 1st week of birth due to nutrition deficiency or malnutrition in pregnancy.

d) Underdeveloped organs during pregnancy- malnourished babies suffer from underdevelopment of an organs or tissues.

e) Birth defects- Micronutrient deficiency can adversely affect the growth of the babies are listed below-

- **Iodine deficiency-** may causes risk of miscarriage, cretinism and dwarfism, goiter, brain damage, poor neuronal development.
- **Calcium deficiency**- causes osteoporosis, osteomalacia.
- **Vitamin deficiency-** causes the risk of maternal mortality, low weight birth, rickets, scurvy, pre-eclampsia, stunted growth, cardiomyopathy etc.

3. Nutraceutical

Nutraceutical idea has been yielded from the recognition of link between food and health. Nutraceutical is defined as the substance which can be considered as a food which in addition to its normal nutritional value provides health benefits, including prevention of diseases or promotion of health. Nutraceutical are popular as a remedial food due to containing a proper balance of vitamins, protein, calcium, iron, antioxidants, polyphenols, omega fatty acids, dietary fibres, probiotics, polyunsaturated fatty acids for maintaining physical, mental health, enhancing strength, boosting immunity, thus it is useful for preventing and treating diseases. Most of the Nutraceuticals play a therapeutic role to treating the cardiovascular diseases, obesity, diabetics, cancer, chronic inflammation disorder, degenerative disease and act as an immune booster, cold and cough, depression, sleeping disorder, hypertension, osteoporosis and digestion and involved a wide variety of biological processes like activation of signal transduction pathways, antioxidant defenses, gene expression, cell proliferation, etc. Nutraceuticals are available in a variety of products and formulation that emerging from pharmaceutical industry, the herbal and dietary supplement market**,** the food industry, Agribusiness. Nowadays, worldwide Nutraceuticals markets are expanding due to potential nutritional, safety and its therapeutic effects. Nutraceuticals Increase the health value of intake diet, it helps to live longer due to healthy nutritional value, it is essential to avoid particular medical conditions and it helps to prevent and protect the health condition of pregnant woman and her fetus by providing adequate nutrients.

Sources of Nutraceuticals

Like pharmaceuticals product, Nutraceutical are also used as a medicine to cure various chronic diseases. Nutraceuticals sources are not only used as nutritional supplements but for health purposes. These are essential in prevention and curing of various diseases and improved health. Nutraceuticals are classified in to various categories are mentioned in **Fig No. 2** -

1) Dietary Fibres,
2) Polyunsaturated Fatty Acid,
3) Polyphenol
4) Probiotics,
5) Prebiotics,
6) Calcium
7) Iron
8) Iodine,
9) Vitamins,

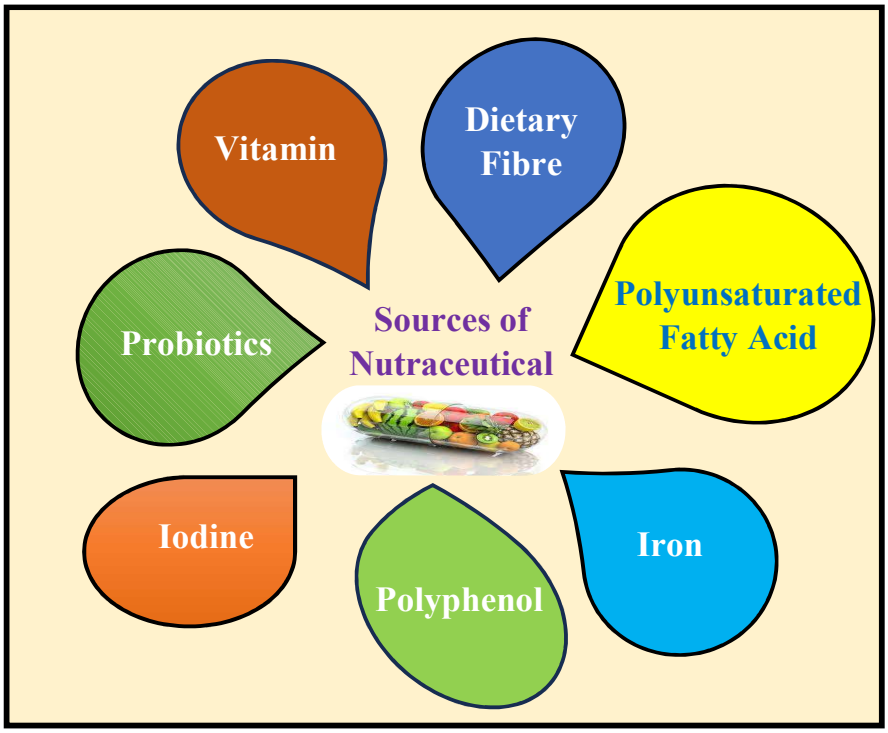

Fig. No.2 Sources of Nutraceutical

i) Dietary Fibres

Dietary fibres are those parts of the plants like leaves, stems, fruits, and seeds which cannot be digested or absorbed in the body. Dietary fibres are necessary for our body to function properly. Dietary fibres are classified in to two types that is- Water soluble Dietary fiber and Water Insoluble Dietary fibres are summarized in detail in **Table.No.1.**

Table No. 1: Classification of Dietary fibres.

Water Soluble Dietary Fibre	Water Insoluble Dietary Fibre
These fibres are dissolved in water and form a gel that binds the stool and inhibits non-propulsive contraction.	These fibres are absorbed water to certain extent and mainly contribute to bulking of stool and allow quick passage of waste through the alimentary canal.
Soluble dietary fibres include β-glucans, pectin, gums, mucilage and hemicelluloses that are fermented in the colon.	Insoluble dietary fibres include celluloses; some hemicelluloses and lignin which is fermented to a limited extend in the colon.
Use of soluble dietary fibres to reduce the risk of heart problems by lower the level and binding with cholesterol, stroke, hypertension, diabetes, obesity and Certain gastrointestinal disorders lower the blood pressure level.	Use of Insoluble dietary fibres in constipation and hemorrhoids.
Ex. Oats, dried beans, legumes, fruits (apple, orange, pineapple, apricots), vegetables (cabbage, carrot, tomato, onion)	Ex. Whole grains, cereals, whole wheat products, brown rice, banana, barly, etc.

ii) Polyunsaturated Fatty Acids (PUFA)

These are also called as **Essential fatty acids**, are very important factors in body's function. The sources of PUFA are sunflower oil, corn oil, soybean oil, mustard oil, marine fishes. Polyunsaturated fatty acid plays an important role during pregnancy as precursors of prostaglandins and as structural elements of cell membranes. Polyunsaturated fatty acids are lipids that cannot be synthesized or produced within the human body and must be ingested through the diet or from supplements. There are two types of essential fatty acids that is **Omega-3 and Omega-6,** are important for physiological functions including oxygen transport, energy storage, cell membrane function, and regulation of inflammation and cell proliferation, normal growth and maturation of many organ systems, most importantly the brain and eye are summarized in **Fig.No.3.**

A) Omega-3- fatty acid:

Omega-3-fatty acids are marine animal oils containing polyunsaturated fatty acids belonging to linoleic group. They are found in cold water fishes, flax seeds, walnuts, soybean, etc. Most of the pregnant woman required adequate omega-3 fatty acids, for that a variety of sources should be consumed like vegetable oil, low-mercury fish servings a week, and supplements (preferably high in fish oil derived Doco-Sa-Hexaenoic acid DHA).

B) Omega-6-Fatty Acid:

Omega-6-fatty acids are the natural vegetables oils containing polyunsaturated fatty acids belonging to Linoleic group, mainly consist of **Linoleic acid (LA), γ-Linoleic acid (GLA) and Arachidonic acid (AA).** Linoleic Acids occurs mainly in vegetable oils e.g., corn, safflower, soybean and sunflower. Arachidonic acid is found in animal products such as meat, poultry and eggs.

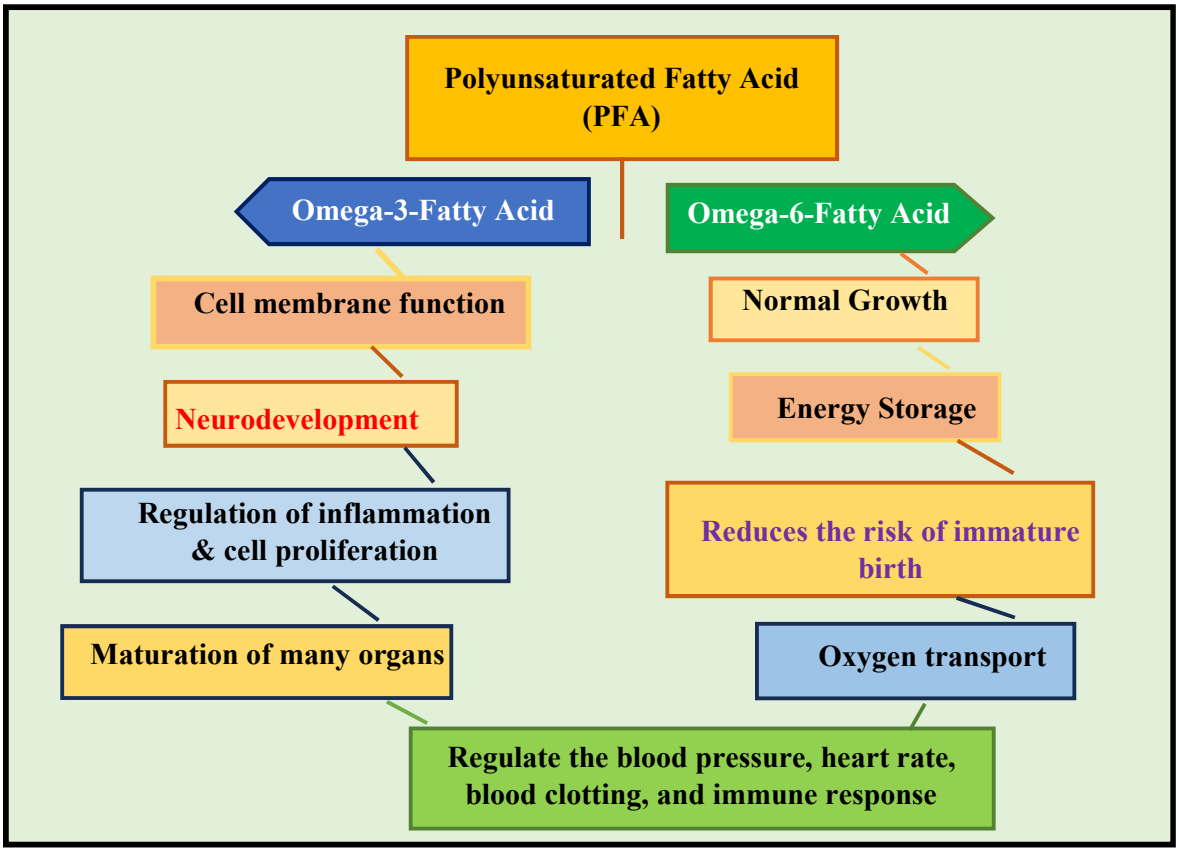

Fig. No.3 Needs of PUFA in Pregnancy

iii) Polyphenols

Polyphenols is a large group of phytochemicals, produced by plants as secondary metabolites to protect them from photosynthesis stress, reactive oxygen species. Polyphenols are categorized in different parts flavanols, flavones, flavan-3-ols, flavanones and anthocyanins. Other Polyphenols are mostly occurring in foods are flavonoids and phenolic acids. Polyphenols is a rich source of Grapes, apples, chocolates, olive oil, turmeric, berries, nuts and vegetables.

iv) Probiotics

Probiotics are the living microorganism which when taken with or without food improve the intestinal microbial balance and ultimately improve the health and functioning of large intestine. Probiotics is also known as friendly bacteria, present in dairy food like sour milk, yoghurts and some of them are present in a colon of human body. Probiotics are available in various forms as powder form, liquid form, gel or paste or granule forms, capsule forms etc.

v) Prebiotics

Prebiotics are the food substances which reach to the colon intact form, without getting depleted by gastric pH and digestive acids. Prebiotics are presents in vegetables like chicory roots, banana, tomato, and alliums are rich in fructo-oligosaccharides.

vi) Calcium

Calcium is minerals are found in milk, cheese, yoghurt, cereals, legumes, beans, spinach and bony fishes.

vii) Iron

Iron is a component of number of essential proteins including hemoglobin for transporting oxygen in the blood. The source of iron is red meat, eggs, pulses, green leafy vegetables, spinach, nuts, etc.

viii) Vitamin

During pregnancy, poor vitamin is associated with a wide range of health risk for pregnant woman and her developing fetus. Poor nutrition affects the low-birth-weight infant, which increased the risk of poor childhood growth and development, diabetes and other chronic health issues. To avoid nutrition deficiency in pregnancy must consume adequate quantity of vitamins to maintain specific body functions for developing fetus. However, it is important for woman to seek nutritional advice from health professionals about their nutrient requirements before and during pregnancy. Health practitioners may provide a good source of information about nutrient supplements for woman through diet. There are various sources of vitamins are available to fulfill the nutritional deficiency during pregnancy. Vitamin is defined as the any of a group of organic compounds which are essential for normal growth and nutrition and are required in small quantities in the diet because they cannot be synthesized by the body. Vitamin are categorized in to Fat soluble and Water-soluble vitamin are mention in **Fig. No.4**

A) Fat soluble vitamins

These are stored in the body's fatty tissues and can be stored in the body for longer periods of time to be consumed up later. Ex: Vitamin-A, D, E, K. Fat soluble vitamins are used for vision, reproduction, bone health, immune system, skin, calcium absorption, blood clotting, etc.

B) Water soluble vitamin

These vitamins cannot be stored in the body as they are excreted out in the urine by the excretory system and need to be taken regularly. Water soluble vitamins are dissolved in the water. ex. Vitamin B and C. water soluble vitamins are helpful in the DNA synthesis, brain function, blood formation, act as active forms involved in biochemical processes. These vitamins must be supplied to our bodies with regular diet

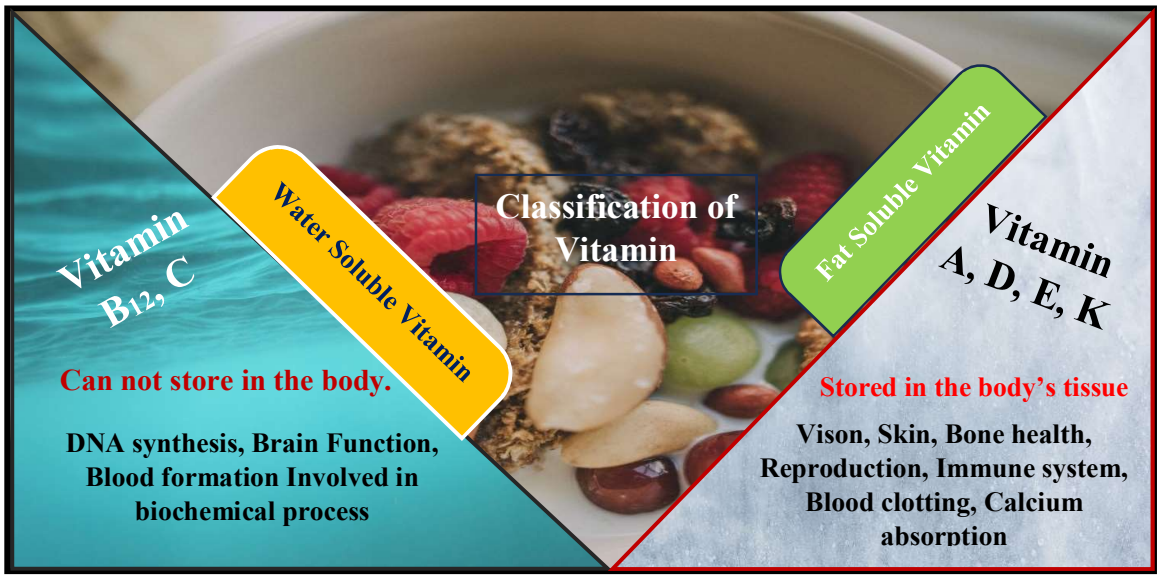

Fig. No. 4 Classification of Vitamin

ix) Iodine

Iodine is a functional constituent in thyroid hormones. Iodine is present in the body in an organic form that is bound to thymoglobulin. Iodine is found in fish and shellfish, sea food, iodized salt, dairy product.

4. Role of Nutraceutical Sources in Malnutrition condition in Pregnancy

Poor maternal nutritional status causes the malnutrition condition in pregnant woman and in fetal or infants which may increases the risk of miscarriage, fetal death, birth defects, and maternal mortality, stillbirth, low birth weight, preterm birth, Preeclampsia. Therefore, to overcome this condition it is essential to provide a good nutritional supplement, healthy diet in pregnancy. Following different sources of nutraceuticals not only guarantee growth and development of fetus but also preventing or mitigate malnutrition condition and managing many complications occurs during pregnancy.

i) Role of Dietary Fibres in Pregnancy

Dietary fibres are the food material, more precisely the plant material that is not hydrolyzed by enzymes secreted by the digestive tract but digested by microflora in the gut. Dietary fibres divided on the basis of water solubility that is water soluble dietary fibres and water insoluble dietary fibres as mention in **Table No.1.** These dietary fibres are playing an important role as following-

- Dietary fibres used to lower the hypertension, diabetes, increases immunity, improve digestion problems, obesity, and therefore include dietary fibres in a diet to small children, adults, pregnant woman.
- Constipation is a common Pregnancy problem which can be reduced by the use dietary fibres used in meal during pregnancy.
- It may help to keep weight gain under control during period of pregnancy because in pregnancy, there is no need to gain too much weight; therefore High- fibre foods are advised by physician to feel fuller for longer, with fewer calories. This may help you manage your pregnancy weight gain more effectively.
- Dietary fiber helps to regulate blood sugar level during pregnancy.
- Dietary fiber reduces the risk of cardiovascular disease during pregnancy. Certain types of fibre help lower low-density cholesterol (the bad type) by trapping cholesterol-rich bile acids in the digestive

system, which helps prevent this cholesterol from being absorbed. High cholesterol can lead to complications such as atherosclerosis, heart attack, and stroke.

- Daily intake of dietary fibres can help to minimize the risk of preeclampsia.
- Intake of dietary fibres can help to minimize the lower the blood pressure during pregnancy.
- It is an essential to consumption of dietary fibres throughout pregnancy both for mother and fetus health, which increases of fibres content in the diet during pregnancy, should be gradual and start with soluble fiber to avoid bloating and flatulence.
- Dietary fibres intake reduces the stroke, hypertension, diabetes, obesity and certain gastrointestinal disorders, increase in the intake of high fiber food improves serum lipoprotein improves blood glucose level.

ii) Role of Polyunsaturated Fatty Acid in Pregnancy

Polyunsaturated fatty acid is essential for the body's functions and are introduced externally through the diet. PUFA are divided in two subdivisions that is Omega 3 fatty acid and Omega 6 fatty acid. The important role of omega -3-fatty acids to reduce LDL and VLDL Levels, reduction of thromboxane formation and increased fibrinolysis, due to anti-inflammatory action used in arthritis, helps in suppression of smooth muscles cell proliferation and migration. Omega-3-types are PUFA precursor for Eicosapentaenoic acid (EPA), Doco-Sa-Hexaenoic acid (DHA). These are help to reduce the risk of sudden death due to cardiovascular diseases. As mention in **Fig. No.5**. The Arachidonic Acid and Doco-Sa-Hexaenoic acid are essential for the development of fetus and also during the first six months after birth. The human body has enzymatic ways to synthesize DHA through the use of alpha-Linoleic acid (ALA), a metabolic precursor. In male, the conversion of Alpha Linoleic acid to DHA is low and almost impossible because the human body has limited ability to produce polyunsaturated fatty acid with long- chain therefore the conversion of ALA to EPA and DHA has to be extended. Mortality rate is severe in many counties due to low consumption of omega-3-fatty acids. Among population, about 80% of the woman does not take the required amount of EPA and DHA in daily diet as recommended by the physician or nutritionist. Unfortunately, it is impossible for pregnant women to fulfill the requirements of omega-3-rich vegetable oils and two servings of seafood a week. Two servings of fish per week only provide about 100 to 250 mg per day of omega-3 fatty acids, of which 50 to 100 mg is from DHA. Apart from this polyunsaturated fatty acid plays a major role-

- ✓ For the development of the retina rods and brains of the fetus during pregnancy period.
- ✓ Regulate the blood pressure, heart rate, blood clotting, and immune response.
- ✓ Help to reduce cholesterol formation or deposition and prevents thromboxane formation in arthrosclerosis.
- ✓ DHA plays an important role to reduced rate of intrauterine growth restriction.
- ✓ Doco-Sa-Hexaenoic acid (DHA) when supplied in high amount through breast milk is beneficial for fetus and infant development as well as essential role in psychomotor and neurodevelopment in first month of pregnancy.
- ✓ Omega-3-fatty acid has a great impact on maternal health and also has the capability to reduce the risk of immature birth.
- ✓ Taking DHA during pregnancy may lead to more lean body mass in most of the children at the age of five and improve the health.
- ✓ Physician gives compulsory suggestion for intake of DHA during pregnancy until age two due to essential during breastfeeding.
- ✓ Omega-3-fatty acid is necessary consuming during pregnancy period for mother and child wellbeing.
- ✓ DHA in particular is found in the membranes of neuronal synapses and of photoreceptor outer segments, where it performs an array of membrane-associated functions.
- ✓ Polyunsaturated fatty acid like Arachidonic acid and Doco-Sa-Hexaenoic acid, both are important structural fatty acids in neural tissue.

- ✓ During the last trimester of pregnancy, fetal requirements for Arachidonic acid and DHA are especially high because of the rapid synthesis of brain tissue.

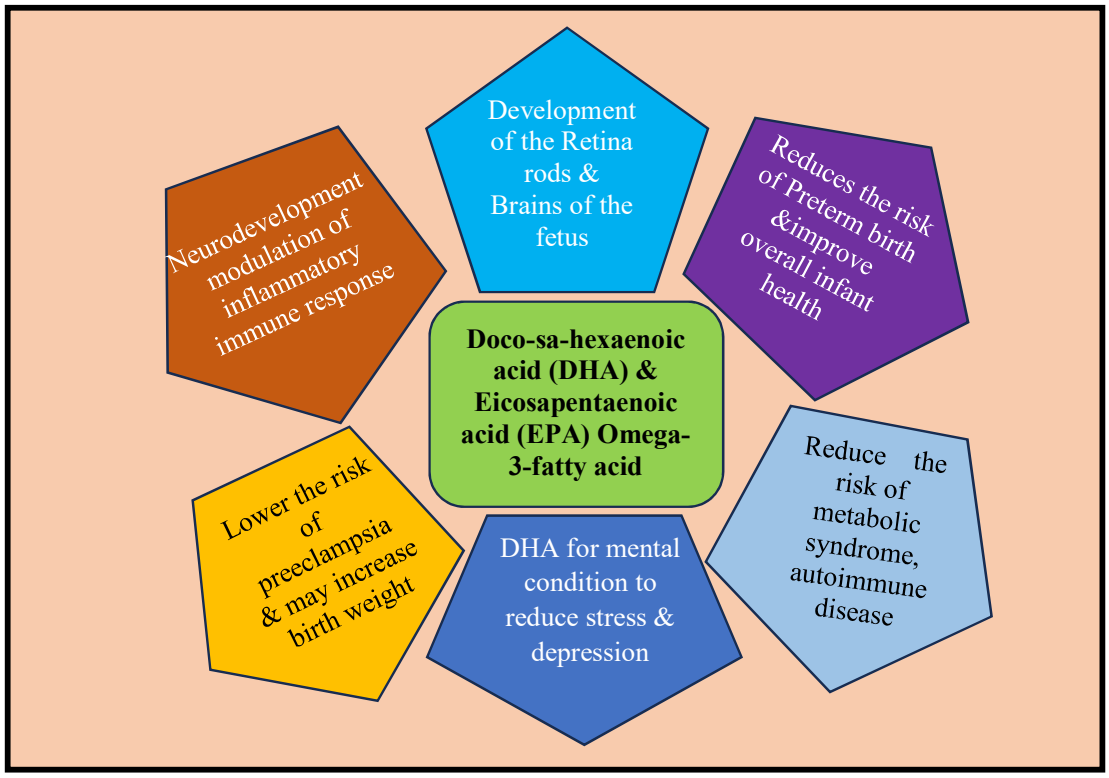

Fig. No. 5. Therapeutic use of DHA & EPA Omega-3-Fatty Acid

Deficiency of PUFA in Pregnancy

- PUFA deficiency may result in poor development of the fetus and also causes premature birth of underweight babies.
- Low intake of DHA and EPA may cause a risk of depression in mother during the pregnancy period.
- Inadequate consumption of PUFA may cause the risk of miscarriage, Fetal death and hypertension during the pregnancy.

iii) Role of Polyphenols in Pregnancy

- ➢ Polyphenols are playing vital role in the prevention of neurodegenerative diseases, diabetes mellitus, act as an anti-inflammatory agent, antimicrobial agent, cardio protective activities.
- ➢ It improves the antioxidant defense system and increases the plasma antioxidant capacity therefore they can improve the placental oxidative stress stage.
- ➢ It helps in the supply of nutrients and oxygen to the fetus and modify development and metabolic traits of the offspring with lifespan consequences.
- ➢ Polyphenols enhancing placental development and function with adequate maternal nutrition.

iv) Role of Probiotics in Pregnancy

Probiotics generally include the following categories of bacteria: -

- ✓ Lactobacilli such as L. acidophilus, L.casei, L.delbrueckii subsp. bulgaricus, L.brevis, L.cellobiosus.
- ✓ Gram-positive cocci such as Lactococcus lactic, Streptococcus salivarius subsp. thermophilus, Enterococcus faecium.

- ✓ Bifidobacteria such as B.bifidun, B.adolescentis, B.infantis, B.longum, B. thermophilum.
- ✓ This Lactobacillus acidophilus reduces vaginal infections.
- ✓ Bifidobacteria may help in fighting against wide range of harmful food poisoning bacteria like E. coli.
- ✓ Bifidobacteria and Streptococcus thermophilus both are found in yoghurt and are useful for prevention of diarrhea in young children.
- ✓ Probiotics are also reducing food allergies and supports to digestive system to work efficiently during pregnancy.
- ✓ Probiotics help to prevent the cancer, intestinal tract function, immune function, allergy, stomach health, urogenital health, cholesterol lowering and hypertension.

v) Role of Prebiotics in Pregnancy

- The benefits of Prebiotics include improved lactose tolerance, antitumor properties, neutralization of toxins, and stimulation of intestinal immune system, reduction of constipation, blood lipids and blood cholesterol levels.
- The Prebiotics consumption generally promotes the Lactobacillus and Bifidobacterial growth in the gut, thus helping in metabolism.
- Prebiotics help to reduce the risk of preterm birth or other infant and maternal adverse pregnancy outcomes.
- Prebiotics include improved lactose tolerance, antitumor properties, neutralization of toxins, and stimulation of intestinal immune system, reduction of constipation, blood lipids and blood cholesterol levels

vi) Role of Calcium in Pregnancy

- Calcium reduces the risk of developing hypertensive disorders during pregnancy.
- It is essential for pregnant woman to reduce the risk of pre-eclampsia, preterm birth.
- Calcium helpful for the mother and her infant to improve the bone health.
- It is most important in many diverse mechanisms and reaction such as muscle contraction, bone formation, enzyme and hormone functioning.
- Calcium is playing an important role to prevent the postpartum hemorrhage which leads to maternal morbidity.

Deficiency of Calcium

- Deficiency of calcium causes Osteoporosis which may lead to thinning and weak of bones which can be easily broken.
- Calcium deficiency can increase the risk of high blood pressure during pregnancy.

vii) Role of Iron in Pregnancy

During pregnancy, body can use iron to make extra blood (hemoglobin) for mother and her fetus.

- Iron helps to move oxygen from mother lungs to rest of the body as well as to baby in the womb.
- Iron makes red blood cells for both mother and fetus.

Deficiency of Iron

Iron deficiency can cause anemia in pregnant woman which resulting in premature birth, low birth weight baby, postpartum depression and sometimes it causes severe risk of infant death before or after immediately birth.

viii) Role of Vitamins in Pregnancy

Table No.2: Essential of Vitamins in Pregnancy

Vitamins	Sources of Vitamin	Role of Vitamins	Deficiency of Vitamins
FAT SOLUBLE VITAMINS			
VITAMIN A (Retinol)	Eggs, Fish, Dark colored vegetable such as spinach as well as yellow vegetable such as squash, pumpkin and carrots and different milk products.	▪Regulates cell growth and protects fertility and the immune system. ▪During pregnancy, Vitamin A essential for eye development and different parts of eye including Conjunctiva, cornea, photoreceptor rod cells, cones cell in the embryo. ▪In regulating and development of the spinal cord, vertebrae, limbs, heart and ears of the embryo.	*Keratomalcia (night blindness), which is most common in pregnant woman. *During pregnancy, vitamin A deficiency also causes Iron deficiency anemia, maternal mortality, premature birth, low weight birth, intrauterine growth retardation *Bleeding during pregnancy due to premature detachment of the placenta from the wall of the womb
VITAMIN D (Calciferol)	Fatty fish like salmon, milk, yogurt, cheese, cereal and sunlight is a good source of vitamin D.	▪During pregnancy, it is important nutrient for optimal immune function, maintaining healthy skin and muscle strength. ▪Reduces the risk of Pre-eclampsia during pregnancy. ▪Essential to reduce the low weight birth and preterm birth of fetus. ▪Helps body's nerves, muscles and immune system work.	*In a pregnant woman, vitamin D deficiency causes a risk for the development of osteoporosis later in life. *In the fetus, it can cause rickets (a disease which retards skeletal development and causes weak bones).

VITAMIN E (Tocopherol)	Wheat, Nuts, Margarine, Oil, Corn etc.	▪ In the early development of an embryo's nervous system, eyes and head. ▪ Improves the blood circulation in the mother. ▪ Helps in the production of prostaglandin which reduces the production of prolactin which increases at the time of ovulating. ▪ Balances the level of prolactin which helps to the female reproductive system to function properly. ▪ Reduce the chances of a miscarriage in early stage of pregnancy. ▪ Helps in the formation of RBC (red blood cells) and increases immune system. ▪ Vitamin E oil use for stretch marks.	*Causes Complications during pregnancy such as pre-eclampsia and the baby being born small. *Causes poor outcomes in the pregnancy for baby and mother. *In fetus, vitamin E deficiency causes a risk of stunted growth of the embryo, neurological disorders, muscle deterioration, or cardiomyopathy.
VITAMIN K (Phylloquinonne)	Green leafy vegetables and Milk	▪ Regulating blood clotting. ▪ Essential to regulates both coagulation (thickening of the blood) and anticoagulation (thinning of the blood).	*Bleeding disorder which increases clotting time and this is dangerous during the time of delivery.
WATER SOLUBLE VITAMINS			
VITAMIN B (Cobalamins)	Rich source of red meat, chicken, egg, dairy product	▪ DNA synthesis as well as maintaining normal blood and neurological (Brain) function.	

		involved in converting folic acid to the form in which it can be absorbed by the body, known as methyl-tetrahydrofolate. ▪ During pregnancy, vitamin B12 required for the fetus growth.	Anemia, palpitation, fatigue, Sensory disturbances, Motor disturbance, memory loss, mood change, visual disturbances, impaired bowel and bladder control.
VITAMIN C (Ascorbic Acid)	Citrus fruits such as oranges, soft fruit including black currants and kiwi fruit Leafy green vegetables including sprouts and broccoli. *Humans and Animal cannot produce in their body but obtain from the dietary sources.	▪ Very good source for dental health for the pregnant woman and her fetus and it plays an important role in the development of healthy gums. ▪ Reduces the risk of anemia in pregnancy. ▪ For the production of collagen (component of skin) bones, cartilage, muscle and blood vessels.	*Increases maternal complications including pre-eclampsia (hypertension during pregnancy) and abruption placenta (premature detachment of the placenta from the womb). *Affect fetal brain and may be brain damage occurred after birth. *Deficiency causes scurvy

ix) Role of Iodine in Pregnancy

- Iodine is essential in the formation of thyroid hormone.
- In pregnancy, iodine is important for the production of maternal and fetal thyroid hormones that regulate the development of the fetal brain and nervous system.
- Thyroid hormone plays an important role for normal neuronal migration, myelination, and synaptic transmission and plasticity during fetal and early postnatal life**.**
- Iodine plays a key role in the formation, growth and development of tissues and organs.
- Iodine is essential for oxygen consumption and body energy production.

Deficiency of Iodine

- Iodine deficiency may cause an increase in the size of the thyroid gland (goiter) and an increase in the concentration of thyroid-stimulating hormone.
- During pregnancy, Iodine deficiency may cause risk of abortion, birth defects, neurological disorders and prenatal death.
- Iodine deficiency disorder may cause miscarriage, mortality rate of infants, neurological cretinism and dwarfism.
- Iodine deficiency in fetus causes poor neuronal development and brain damage.

5. Future Trends of Nutraceutical

- ✓ Nutraceutical are safe and healthy without side effects and having various therapeutic uses to cure various diseases, may beneficial to treat complications occurs during pregnancy.
- ✓ Nutraceutical and pharmaceuticals both are used to treat the diseases but nowadays, peoples are mostly preferred nutraceutical as a medicine due to its safety, potential and therapeutic content.
- ✓ Nutraceutical are mostly preferable for pregnant woman and fetus by reducing the risk of miscarriage, preterm birth, pre-eclampsia, intrauterine growth retardation in fetus, fetus death, birth defect, mortality rate in woman, therefore, physician always advice to take Nutraceuticals in daily diet.
- ✓ Nutraceuticals are effective and safe in use, therefore, many pharmaceutical industries move towards the Nutraceutical and taking interest in research work on Nutraceutical.
- ✓ Various sources of nutraceutical beneficial in any age, and helpful to reduces the risk of chronic diseases like diabetes, cancer, hypertension, Crohn's diseases, diarrhea, poor metabolism, severe anemia, cardiac disorders, central nervous system disorders, etc.
- ✓ Nowadays, the Nutraceutical market grows and physician mostly advice nutraceuticals in place of medicine, and most of the people are popularly preferred for nutraceutical as an option due to its more therapeutic use and low side effects.
- ✓ In malnutrition epidemic, nutraceuticals are the best remedy to treat the undernutrition condition in most of the countries.
- ✓ Nutraceuticals fulfill the requirements of all nutrition required for body to growth, development of bones, for healthy skin, red blood cell formation, boost immunity system, etc.
- ✓ Nutraceuticals are mostly found in plant source, easily available and affordable to every people and by using, they can fulfill the nutritional requirement as well as can rises their immunity system.

6. Conclusion

Along with low nutritional diet, the ever-changing lifestyle, poverty, low income, early age of marriage, excessive work burden, education illiteracy, mental status all these socio-economic factors are also responsible to causes the risk of malnutrition in before or after pregnancy. Malnutrition happens when intake of mother's diet can't fulfill the energy needs of both mother and the baby. Day to day, malnutrition has become critical because of increases the risk of maternal mortality, fetal death, fetal intrauterine growth retardation, pre-eclampsia, premature of birth, miscarriage, postpartum hemorrhage occurs in pregnancy. Therefore, it is necessary, to consumption of nutritional rich diet from the preconception period to ensure maternal wellbeing and favorable outcome of pregnancy. Consequently, to provide healthy and adequate nutrition to mother and her child, Nutraceuticals are the best remedial medicine to overcome the malnutrition condition in pregnant woman as well as many chronic diseases. Hence, it is concluded that, to prevent malnutrition, woman who plan to conceive should take nutraceutical rich diet with various source of supplements and vitamins for safe and healthy pregnancy.

Hence, on the basis of, it is concluded that, the consumption of various sources of nutraceutical is the safest and healthy remedial medicine to reduce the risk of malnutrition condition by providing various nutrition to pregnant woman and her child. Furthermore, Nutraceuticals through its various sources providing adequate quantity of nutrition for protecting them from malnutrition and severe disorders.

7. References

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