

Roles of Various Nutrients – A Review

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Abstract

Nutrients play a very important role for maintaining our health. They are not only essential for maintaining our health, rather they are also essential for the development of individual, for better metabolic activities like Breathing, Respiration, digestion, reproduction and so many physiological processes. But in this paper, we are mainly focusing on the fertility. How Various Nutrients affect fertility? Nutrients like Carbohydrates, proteins, fats, Essential Elements, Antioxidants etc. How they enhance or decline the fertility outcomes.

Keywords: Nutrients, Infertility, Elements, ROS, Antioxidants, Carbohydrates, Proteins, Fats and so on.

Introduction

There are a lot of metabolic disorders which influence human health worldwide, it includes reproductive performance, therefore affecting the quality of individual life in a great proportion (1) (2). Infertility is defined as the incapability of achieving pregnancy or producing young ones in the period of 12 months or more than 12 months of regular unprotected sexual intercourse. Some studies reveal that the fertility of individual is also affected with the metabolic as well as inflammatory diseases i.e., dietary habits. In case of females, metabolic Strategy has negative effect on overall health and also influences fertility. However, ovulation dependant female fertility is affected by a lot of diet related factors, like excessive intake of high glycemic index carbohydrates, large amount of animal protein, low saturated FA, TFA. High fat diet negatively impacts on many physiological or reproductive processes like folliculogenesis, oogenesis, embryo development or we can say that implantation. Intake of high Saturated FA may be responsible for the formation of cholesterol in your arteries or other blood vessels and also increases your LDL (Bad cholesterol) level, that increases your body weight, heart related diseases and also fertility. Evidence suggests that HFD has negative impact on fertility may be due to direct connection with reproductive, somatic and germinal cells and indirect connection with endocrine, metabolic and immune signalling. (3) (4) (5) (6)

Role of Elements in fertility

In case of females, low success of ART is also correlated with the low trace of elements of Cu, Se, Zn etc. Indicates the adequate intake of these elements which are essential for the reproductive health. Se plays a crucial role in male fertility because Se has potential for sperm viability and also provides mortality which enhances the chance of pregnancy. (7) (8) (9) Selenium neutralizes the toxicity of many elements like Arsenic, Cadmium, Thallium, Mercury etc., inorganic mercury, methylmercury and so on. Selenium along with Vitamin E, also helps to neutralize and more efficiently and effectively than Selenium. (36)

Zinc has ability to protect the sperm against the reduction of infertility. Even with high Lead, resulting as the increase level of Zinc, which protects from high Lead molecules which affects the Male's infertility. (37) (38)

In case of males, high intake of heavy metals like Cd, by the contaminated water and food, influences structurally as well as functionally testicular damage because of oxidative stress, inflammation and also by apoptosis. (10) (11) (12) (13) (14) Endocrine disruptors like BPA with HFD, cause impaired spermatogenesis.

Role of oxidative stress in fertility

Several research suggests that the oxidative stress has negative impact on fertility for both males and females. It indicates that the system's defence against ROS are overloaded, if the ROS's production is high, then cause disease conditions. OS have been play a crucial role in the pathogenesis of fertility in both males and females. There is an imbalance in between pro - oxidative molecules like ROS , NS and the antioxidant defence. (15) (16) (20)

The OS occurrence is caused by high manufacturing of ROS. OS play a crucial role in various metabolic and immune signalling pathological processes like female and male genital organs. In males , they affects the process of spermatogenesis. Imbalances between pro oxidants and antioxidants cause the various Male and female reproductive disorders. (17) (18) OS is caused by a lots of lifestyle released factors. In modern era, lifestyle is greatly influenced with processed food or canned food, lack of exercise that cause oxidative stress conditions.

How can we overcome from this problem? We have to more and more intake of antioxidant substances Which destroy the free radicals or ROS. There are various kinds of antioxidants found in our body and they play an important role. There is a misunderstanding that one antioxidant is replaced by other antioxidant which produces the same effect, because everyone has their own unique biological or metabolic properties. Unhealthy eating habits and imbalancing lifestyle may not be compensated by eating superfoods.

A lots of antioxidants are also found in our body like SOD, an enzyme that is responsible for the conversion of an anionic superoxide into hydrogen peroxide, this reaction is important for normal cellular metabolisms and many more pathological phenomenons. SOD can cause cancer, heart related disorder, neurodegenerative diseases and various metabolic activities. Antioxidant are well occur in fruits and vegetables. So, we should more intake of fruits and vegetables, that causes lower risk of chronic diseases and also infertility. Because fruits and vegetables are rich in bio active substances. Se protects the DNA of sperm against the oxidative stress. Ascorbic acid or vitamin C, Tocopherol or vitamin E are also acts as antioxidants, so, make sure, you have to intake those diets which are rich in them (19). Lycopene, an antioxidant which reduces the DNA damage that is caused by oxidative stress and also enhances the sperm count, mortality and also viability.

Role of Carbohydrates in Fertility

Meals or diets that have high glycemc load also cause metabolic conditions like diabetes, dyslipidemia and also oxidative stress that affects the fertility. Hyperglycemia, affects the sperm viability and also promotes hormonal and immune disorders. Food with high glycemc index and Low dietary fibres has a strong correlation with the inflammation that affects the fertility of both sexes. Monosaccharide like fructose is strong pro inflammatory substance (25). Intake of sweetened and carbonated beverages has

negative impact on fertility and ART. Intake of sweetened and carbonated beverages affects sperm motility and viability, in case of males; mensuration, ovulation, conceiving, implantation, in case of females. Some studies reveals that gluten is one of the carbohydrate product, also affects the fertility. Therefore, gluten free meals has lower nutritional value comparatively traditional meals. So, you have to eat less fibre and saturated FA. (21) (22)

Role of Protein in Fertility

Proteins also play an important role in fertility. Meal that is low proteinaceous have biggest risk factor for fertility in males, causes reduces the weight of testicles, seminal vesicle, epididymis and also declined the testosterone level. Therefore, sufficient amount of protein intake cause carbohydrate insulin balance, which play an important role in the treatment of anovulatory infertility in females. Several studies reveals that replacing animal protein sources particularly chicken or red meat with vegetable protein sources, decrease the risk of infertility which occurs by anovulation. Intake of protein, particularly animal protein is negatively correlated with the concentration of testosterone in healthy females, that shows that androgens play a crucial role in the development of ovarian functions and thus fertility. Consumption of high protein from dairy products, cause decrease the number of antral follicles ,i.e., biomarker analysing the number of primary ovarian follicles. Vegan products have potential to increase the number of sperm, motility and also viability. However, high intake of plant protein as compared to animal protein is most important in fertility. (23) (24) (25) (26)

Role of Fats in Fertility

FA play an important role in fertility. It is unlike from other nutrients, fat consumption must be in equal amount, neither high amount, nor low amount. The proportion of FA is very crucial for the fertility. In ovulation disorders, FA should be taken qualitatively, not quantitatively of fatty acid. Trans FA shows largely negatively impact on fertility(27). Trans FA affects negatively during ovulation in females, encouraging insulin resistance, increase the susceptibility of type 2 diabetes. Trans FA affects negatively on semen quality and also on the process of spermatogenesis. Some research suggests that trans FA from processed food, junk food, fried and baked food or ready made confectionery products are inversely related with totals sperm count. Moreover, trans FA in semen reduces the sperm quality and also number of sperms in ejaculation. (28)

Saturated FA also shows negative impact on ovulation in females. Saturated FA that is abundantly present in red meat independently associated to lower sperm concentration in men(29).

Avocados play an important role in the fertility because it contains the lots of variety of nutrients like Potassium and folate, which is normally low amount in mother's meal(30) (31). Avocados has antioxidant properties, fibre rich in MUFAs, for better pregnancy results. Studies reveals that meals which are sufficient amount of MUFA & PUFA has positive sign on fertility. On the other hand, trans FA and saturated FA has negative sign on infertility(32) (33). Soy and their products are acts as the toxicants for reproductive health and cause decline the rate of fertility (34) (35).

Conclusion

Dietary inventions may indicates the most promising and invaluable strategy that restricts metabolic as well as inflammatory responses. Anti-inflammatory diets which are rich in MUFA & PUFA, vitamin D, vitamin E folic acid, iron, iodine, flavonoids and poor in processed food, red meat, Mediterranean diet,

also improves the fertility and also ART success in case of females. You should intake high amount of plant protein than animal protein for the fertility, also take vegan products and dairy products in your meal for maintaining the better outcomes of fertility. Take fruits and vegetables, less fibre diet and saturated FA for the best ways of maintaining the pregnancy, ART success in females and also improves fertility in males.

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Abbreviations

DNA : Deoxyribonucleic Acid
LH : Leutenzing Hormone
FSH : Follicle Stimulating Hormone
FA : Fatty Acid
MUFA : Monosaturated Fatty Acids
PUFA : w – 3 Polysaturated Fatty Acids
OS : Oxidative Species
NS : Nitrogen Species
ROS : Reactive Oxygen Species
ART : Assisted Reproductive Technology
NAFLD : Non Alcoholic Fatty Liver Disease
BPA : Bisphenol A
SOD : Superoxide dismutase
HDL : High Density Lipid
LDL : Low Density Lipid
TFA : Trans Fatty Acids
HFD : High Functioning Depression
Cd : Cadmium
Se : Selenium
Zn : Zinc

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