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THE IMPACT OF NUTRITION AND LIFESTYLE ON THE REPRODUCTIVE SYSTEM (LITERATURE REVIEW)

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Abstract:
Nutrition and lifestyle have a significant impact on the human reproductive system, as these factors play a crucial role in processes such as implantation, placental development, angiogenesis, and the transfer of nutrients from mother to fetus. Global statistics indicate that many diseases, including issues related to reproductive health, arise from unhealthy lifestyles, particularly irrational or unbalanced nutrition. This article examines the impact of dietary habits and overall lifestyle on the reproductive health of men and women. Based on contemporary scientific research, it analyzes the negative consequences of poor nutrition, insufficient physical activity, stress, sleep disturbances, and harmful habits (such as smoking and alcohol consumption) on the functioning of the reproductive system. Additionally, the article highlights how a healthy lifestyle and balanced nutrition can contribute to the improvement of reproductive health.

Keywords: rational nutrition, amino acid metabolism, male and female fertility, reproductive health.

RELEVANCE OF THE TOPIC. Human reproductive health is strongly dependent not only on genetic and environmental factors, but also on lifestyle, quality of nutrition, and nutrients entering the body. In recent years, omix technologies (metabolomics, nutrigenomics) have been widely used to study the interactions between nutrients and genes. Reproductive health is directly related to a person's overall health and determines their ability to reproduce. The World Health Organization (WHO) defines reproductive health not only as the absence of diseases, but also as a state of complete physical, mental, and social well-being. Today, the increase in cases of infertility worldwide requires a deep analysis of the role and influence of lifestyle in this regard.Omics (including metabolomics and nutrigenomics) were used to inform about the effects of nutrients on physiological functions at the molecular level and to explain the effects of nutrition and specific nutrient interactions with genes, proteins, or metabolites on metabolic phenotypes and disease outcomes. New methods and compositions of nutrition, including essential nutrients for improving the neurological development of the embryo, fetus, and offspring, introducing nutritional supplements into lactation, and improving the duration of pregnancy and birth weight, have been studied. Food is essential for all living things to carry out all important processes, such as obtaining energy and reproduction. Nutrients are essential for all stages of human development, including growth, puberty, and reproduction. Reproduction is a process that reproduces new life and ensures the continuation of a living species and the preservation of offspring (related to sexual differentiation, maturation, gametogenesis, fertilization, and embryonic development). It is estimated that 15% of men and women worldwide, especially in industrially developed countries, are infertile (Sharma et al., 2013). Nutritional factors play a key role in determining reproductive health and can have both positive and negative effects on fertility in humans. This topic is concerning, as evidenced by the significant increase in the number of publications published over the past 20 years.

PURPOSE OF THE STUDY: to assess the importance of nutrition for ensuring healthy pregnancy, as well as to analyze food components that positively or negatively affect fertility. The role of amino acid metabolism, transport mechanisms in the placenta, and nutrients is examined.

RESEARCH MATERIALS, METHODS, AND RESULTS: We know that consuming plant proteins, not carbohydrates or animal proteins, significantly reduces the risk of ovulatory infertility. (Chavarro et al., 2008). Carbohydrates are essential for carrying out various biological processes and generating energy. Sugar consumption is also an important factor contributing to

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daily calorie intake, and excessive sugar consumption can lead to the development of chronic diseases such as obesity and type 2 diabetes, which negatively affects childbirth. (Malik et al., 2010; Whitworth et al., 2011). However, the imbalance of fatty acids in food and their intake, both quantitatively and qualitatively, can disrupt metabolic homeostasis and fertility in pre-menopausal women.Some microelements and dietary supplements, such as folic acid, calcium, zinc, selenium, antioxidants, iron, vitamins D, B12, E and C, have a potential effect on the health of the male and female reproductive system, especially in pregnant women. Food supplements should be taken with caution, as excessive consumption can negatively affect human health in general.Omiks approaches have been developed to identify potential biomarkers associated with several diseases in many biological domains, including human infertility. Omiks technologies determine the interaction of diet and certain nutrients with genes, proteins, and metabolites and how they affect metabolic phenotypes and disease outcomes. It explains some biological networks and nutrient identification mechanisms associated with metabolic variability.Therefore, omix approaches are important in providing a large amount of information about the biological processes involved in the reproductive system and increase the possibility of identifying biomarkers for subsequent prediction and early diagnosis of diseases. Transport of amino acids (AA) in the placenta is important during pregnancy, since impaired transport of placental amino acids reduces fetal growth, which leads to complications in the perinatal period and increases the predisposition to chronic diseases (Cleal et al., 2018). The metabolic approach studies the metabolism of food substrates, which helps in the treatment of chronic metabolic disorders. (Gibney et al., 2005; Whitfield et al., 2004). This review is aimed at determining the importance of food substrates in human reproductive health. In addition, a full understanding of various factors (including nutritional interventions, lifestyle, physical activity, and genetic changes) affecting human reproduction and fertility to prevent disorders and changes in metabolic pathways has been reported. Recent achievements of omics (including metabolomics and nutrigenomics) have addressed the impact of nutrition on human metabolic regulation and the human reproductive system. Nutrition has a great influence on the health, development, and functioning of the human reproductive system, but its specific mechanisms are not yet fully understood. Genetic differences affecting nutrient metabolism can influence fertility through nutrigenetic mechanisms (Camus et al., 2020). Male and female animals require different nutrients to display reproductive characteristics, as they play different roles in reproduction. Nutrition is an important factor influencing the neuroendocrine regulation of puberty. Although the restriction of nutrients during juvenile development causes a delay in puberty, high rates of weight gain during this period allow for puberty through the programming of hypothalamic centers that stimulate the process of puberty. In many studies, the consumption of animal food is associated with the early onset of puberty, which includes an increase in the expression of growth factor through protein. (Villamor & Jansen, 2016). Obesity negatively affects the health of both men's and women's reproductive systems, and people suffering from obesity always have a low birth rate.

Therefore, obesity requires immediate treatment. Recent studies have shown that maternal nutrition during pregnancy can also control the development of the fetal neuroendocrine axis, which ensures sexual maturation and consistent reproductive function. Nutrients necessary for increasing fertility in women. Carbohydrates, proteins, and healthy fats are essential macroelements for pregnant or breastfeeding women. Rare foods containing animal proteins and transfats should be avoided, as they lead to infertility due to various factors that trigger the production of reactive oxygen species.Carbohydrates: Sugar consumption is an important factor contributing to daily calorie intake, and if excessive, it can lead to the development of chronic diseases such as obesity and type 2 diabetes. (Malik et al., 2010), which negatively affects the birth rate (Whitworth et al., 2011).Consumption of beverages with the addition of cookies and sugar had an inverse relationship with the progressive motility of spermatozoa, which caused the risk of azoospermia (Alizadeh et al., 2017). In diabetics, a strong correlation was observed between female infertility and decreased insulin sensitivity. Among women of reproductive age, the influence of the amount and quality of carbohydrates in food on reproductive health functions is confirmed (Fontana & Torre, 2016). Male infertility is the main clinical problem, which is rapidly increasing, and male factors, such as poor sperm quality, are the cause of 25% of all infertility problems. Although oxidative stress is a major factor in male infertility, it should be noted that research on the effectiveness of antioxidant therapy is still controversial.The study revealed that oral antioxidant supplements improve seed quality assessment indicators and are associated with less DNA damage (Martin-Hidalgo et al., 2019). The most commonly used antioxidants in both monotherapy and combined supplements include vitamins E and C, carnitine, coenzyme Q10, zinc,

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selenium, folic acid, and N-acetylcysteine (Showell et al., 2011). When studying the impact of nutrition on reproductive health: food and hormonal balance on women's reproductive health The hormonal balance in women's bodies is regulated by hormones such as estrogen and progesterone. Foods with excessive fat content, high glucose intake cause insulin resistance, which increases the risk of polycystic ovary syndrome (PCOS). PCOS is one of the most common causes of infertility in women.Lack of antioxidants and micronutrients: vitamin E, C, folic acid, iron and zinc disrupts the maturation of egg cells and ovulation process. As for men's reproductive health; studies in assessing sperm quality and nutrition show that a diet rich in omega-3 fatty acids (such as fish oil), vitamins C and E, zinc and selenium increases sperm motility and number in men.Trans-fats and low-quality diet: Consumption of fast food and trans-fats leads to decreased testosterone levels and disruption of sperm morphology in men.Antioxidant supplements provide excellent benefits for male patients with low sperm parameters.

DANGEROUS EFFECTS OF SMOKING, ALCOHOL, AND CAFFEINE CONSUMPTION ON FERTILITY.

The effects of a number of environmental agents and lifestyle factors have a negative impact on reproductive health, including poor nutrition, obesity, smoking, recreational drugs (such as cannabis, opioids, cocaine and anabolic steroids) and alcohol consumption. Caffeine and alcohol consumption are undoubtedly the most studied nutritional factors as potential birth disruptors.Smoking. Cigarette smoke represents a well-established combination of reproductive toxins for women and men. Despite the link between the harmful effects of tobacco use on overall health and birth rates, smoking remains widespread worldwide. Worldwide, tobacco consumption among girls aged 13-15 is rapidly increasing (Watson, 2015).The main component of tobacco smoke is nicotine and its metabolite, cotin, which causes significant damage to sex cells. Smoking at an early age leads to infertility, menopause, early ovarian insufficiency, and spontaneous abortion. In addition, smoking during pregnancy leads to thickening of the villous membrane and a decrease in the absorption of nutrients distributed through the placenta. Therefore, pregnant smokers have a high risk of eating due to improper nutrition and low vitamin levels (Gustavson et al., 2017). Nicotine and other toxic substances have a negative effect on the ovaries and testes. In women, menopause can begin early, while in men, DNA-damaged spermatozoa appear. Smoking causes oxidative stress in the testes, affects spermatogenesis and steroidogenesis, and is also found to have a negative effect on spermatozoa.In conclusion, it is shown that in the pathogenesis of human infertility, not only the composition of tobacco smoke, but also its composition is mutagenic and an anevgen of spermatozoa. In addition, genetic mutations are observed not only in the spermatogonal stem cells of smokers, but also in their offspring.

Alcohol. Excessive alcohol consumption has a negative impact on human health, including a high risk of many cancers, heart failure, stroke, and death (Voelker, 2013; Wood et al., 2018). Alcohol consumption during pregnancy negatively affects multiple organ systems of the fetus and leads to poor childbirth, significant complications of pregnancy, and negative fetal development in both women and men (Tan et al., 2015). Alcohol toxicity reduces sperm quality and leads to disruption of the hypothalamic-pituitary-testicular axis (Sadeu et al., 2010).According to the study of lifestyle effects on the reproductive system: Moderate physical activity (running, swimming, yoga) improves blood circulation, reduces stress, and maintains hormonal balance. These conditions support the functioning of the reproductive system.Excessive physical activity: Among professional athletes, for women, a state of the "triad of female athletes" (osteoporosis, amenorrhea, and low energy consumption) can reduce reproductive health. Role of sleep: Sufficient sleep (7-8 hours) plays an important role in hormone production and the body's recovery process. Insomnia increases the production of the hormone cortisol, disrupting the hormonal system.Stress and mental health: Prolonged stress reduces the production of hormones through the hypothalamic-pituitary tract, which inhibits ovulation in women and reduces sperm quality in men.Scientific articles published in 2010-2020 were analyzed, and the influence of nutrition on the reproductive system was studied based on statistical and omic approaches. Studies show that: Carbohydrates - excessive sugar consumption leads to obesity and type 2 diabetes, reducing fertility. Proteins - plant proteins, not animal proteins, reduce the risk of ovulatory infertility. Fats - some fatty acids can cause metabolic disorders in pre-menopausal women.Vitamins and microelements - folic acid, vitamin D, zinc, selenium, and other antioxidants improve reproductive health, but excessive intake can have a negative effect. Antioxidants - can be effective in fighting male infertility (for example, vitamins E, C, CoQ10, selenium). Smoking negatively affects spermatogenesis in men and pregnancy in women, leading to severe complications in fetal

CONCLUSION: Reproductive health is the key to a healthy generation, and attention to it has not only

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personal but also social significance. Eating habits, lifestyle, mental state, and harmful habits directly determine the functioning of this system. Nutrition plays a key role in ensuring reproductive health. Rational nutrition (in quantity, quality, and regime), rejection of harmful habits, and improvement of a healthy lifestyle are important factors in preventing infertility problems. The literature on the relationship between nutrition and human fertility has expanded significantly over the past decade, resulting in several clear patterns being identified. Recent advances in "omic" approaches allow for the search for fertility biomarkers, which can be used to predict the fertility potential of young men before puberty or to screen existing men for artificial insemination programs.Omic approaches allow for the detection and early diagnosis of fertility-related problems. Future research should focus on a comprehensive study of male and female nutrition. Therefore, every person must consciously approach their health.

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