

The importance of preconception nutrition: nourishing the path to a healthy pregnancy.

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Abstract. Preconception nutrition of both parents plays a pivotal role in maternal and fetal health, impacting nutrient availability for fetal development, pre-pregnancy weight, genetic material quality, and the prevention of undesirable complications. The primary objective of this paper is to emphasize the importance of adopting a healthy preconception diet, thereby ensuring an adequate nutritional state at the time of conception. Scientific databases were used for searching keywords related to preconceptional nutrition and its influence on maternal-child health, as well as reproductive health. Planning for pregnancy involves initiating appropriate healthcare consultations with medical professionals, where maternal and child nutritionists play an essential role in promoting nutritional adequacy and guidance. This is especially significant, as changing dietary habits that are low in nutrients and high in sugar and fat, and eliminating harmful substances like alcohol, cigarettes, and other drugs before conception, are more appropriate, allowing for a gradual and higher-quality transformation. Implementing adequate nutrition before pregnancy helps prevent complications during gestation and childbirth, for example excessive weight gain, gestational diabetes, low birth weight, macrosomia, preterm birth, anemia, hypoglycemia, developmental issues, and even maternal mortality. Preparing for a healthy pregnancy by taking care of one's health before conception ensures a healthy body and environment for optimal fetal development.

Keywords. Pre-Pregnancy nutrition, reproductive health, maternal and child nutrition, dietary rehabilitation, pregnancy planning, semen quality.

1. Introduction

Most people know that when a woman is pregnant, she should take care of her diet. After all, the fetus will receive nutrients from the mother. However, when it comes to health, it's essential to keep in mind that it's a process, not something instantaneous. The consequences of poor nutrition, depending on its severity, can take months or years to correct. Hence the importance of establishing a healthy diet before pregnancy [1]. When it comes to pregnancy, the focus is usually on the health of the mother and the fetus, but little or nothing is said about the father's health, despite being responsible for 50% of the genetic material, and sperm quality matters [2]. Research suggests that overweight and obese men who adopt a healthy diet and exercise can improve reproductive outcomes [3].

During pregnancy, nutritional needs increase to support the baby's growth and development, as well as the mother's metabolism. Adopting a healthy lifestyle is recommended, starting before pregnancy, to optimize the mother's health and reduce the risk of complications during pregnancy and some diseases in the baby [4]. Maternal and child nutrition covers the entire preconception period (those trying to conceive), pregnancy, lactation (breastfeeding women), the baby, and children up to adolescence, playing a crucial role at this time.

Pre-pregnancy weight is also essential. Low weight, overweight, and obesity can lead to gestational complications. Furthermore, from a nutritional perspective, pre-pregnancy weight is used to determine appropriate weight gain during pregnancy to maintain the health of both the mother and the baby. Hormonal disorders, nutritional imbalances, insulin resistance, and changes in sperm quality are some of the consequences of inadequate nutritional status that can increase the time required for conception or prevent natural pregnancy. Daily habits and practices, such as alcohol consumption, smoking, physical activity, and diet, can affect reproductive health. These habits are believed to negatively interfere with sperm production, affecting its quality, quantity, and motility (ability to move) [5].

Nutritional status can have a significant impact on pregnancy development. Therefore, it is essential that both partners have an adequate physical condition at the time of conception to ensure a safe and healthy pregnancy.

2. Methodology

To conduct the research, scientific databases such as PubMed, Scopus, Google Scholar, and other relevant sources were utilized to identify scientific studies

and systematic reviews related to pre-pregnancy nutrition and its impact on maternal and child health. Keywords such as "nutrition before pregnancy," "reproductive health," "maternal and child nutrition," "dietary re-education," "pregnancy planning," or "semen quality" were employed. The aim was to analyze interferences within the nutritional status before conception that could affect pregnancy.

3. Results and Discussion

3.1 Essential Nutrients

Some nutrients stand out when it comes to a healthy pregnancy, gaining prominence before and after conception. Some of them include folic acid, iron, calcium, vitamin D, and other B-complex vitamins.

Folic acid helps in increased blood production, necessary for the fetus and the placenta. Systematically, supplementation is recommended three months before conception until three months after [6]. Evidence indicates that prophylaxis with folic acid started at least one month before pregnancy and maintained at the beginning can reduce the incidence of neural tube defects (NTDs), which are congenital malformations resulting from incorrect or incomplete closure of the neural tube between the third and fourth week of embryonic development, including anencephaly, encephalocele, and spina bifida [7]. Daily supplementation doses exceeding 5mg of folic acid reduce the incidence of neural tube defects by 75% to 91%, depending on the baseline serum concentration of folic acid and the women's age, compared to a reduction between 23% and 66% when using 0.4 to 0.8mg daily [1].

The best sources of folate are viscera, beans, and green leafy vegetables such as spinach, asparagus, and broccoli. Other examples of folate-rich foods include avocados, pumpkins, beef and pork meats, carrots, kale, liver, oranges, milk, apples, corn, eggs, and cheese [1].

The relevance of iron is due to the risks of anemia during pregnancy, which can impair the health and quality of life of both the woman and the fetus. Studies indicate that pregnancy anemia is associated with a higher risk of maternal morbidity and mortality, prematurity, low birth weight, perinatal mortality, and lower levels of hematocrit and hemoglobin in the newborn [1].

The increased iron requirement during pregnancy is approximately 800mg, with about 300mg used by the fetus and 500mg for the mother's total hemoglobin expansion [1]. Paying attention to the intake of vitamins such as iron and folic acid in potential future pregnant women can improve the course of pregnancy and infant health [8]. It is estimated that 41.8% of pregnant women worldwide are anemic, and it is assumed that at least half of these anemias are due to iron deficiency

[9].

Iron-rich foods include liver, heart, lean meats, poultry, fish, beans, whole grains, and dried fruits [10]. Consuming these foods along with other sources of vitamin C is beneficial because vitamin C aids in iron absorption.

During pregnancy, there is a significant increase in calcium transport from the mother to the fetus in the last trimester of gestation, a phase in which the fetus experiences the most rapid weight gain. An increase in calcium excretion in the urine can also be observed, leading to a greater need for calcium by the mother [1, 11]. If calcium intake through food is insufficient, parathyroid hormone will be released in response, acting on cells and bones, increasing the rate of calcium release into the bloodstream. Inadequate calcium reserves in bones for the demands of pregnancy can lead to hypocalcemia [1]. Studies have already linked calcium levels to blood pressure and have been able to associate calcium supplementation with a reduced risk of preeclampsia [12, 13, 14, 15].

Vitamin D aids in calcium fixation and contributes to the health of teeth and bones. It is found in fish oils, eggs, fortified margarine, and is produced through exposure to sunlight [16, 4].

Other B-complex vitamins also play an important role in fetal development, blood, neural function, neural protection, and metabolism. Pyridoxine (B6) and cobalamin (B12), water-soluble vitamins, enhance the absorption of iron and folate, aiding in the better utilization of these nutrients. B12 participates in the regeneration of the active form of folic acid, and B6 has positive effects on the APGAR score [17, 18].

Supplementation of vitamins and minerals can improve sperm quality and quantity. Folic acid contributes to increased sperm production, and zinc acts as an enhancer. Along with other antioxidant vitamins (vitamin C, vitamin A) and minerals (selenium, copper), both also seem to be useful in treating oxidative stress. Oxidative stress occurs due to an increase in reactive oxygen species (ROS), which play a role in cellular balance. ROS can damage sperm, so the father could pass defective DNA to the embryo, affecting normal embryonic development [19, 20, 21].

3.2 Healthy Weight

Pre-pregnancy weight is crucial for weight gain during pregnancy, is related to gestational outcomes, and allows for the assessment of fetal growth. The referred pre-pregnancy weight should correspond to 2 months before the start of pregnancy [1, 22].

Starting pregnancy with low weight is a risk factor because insufficient gain can result in a low birth

weight baby, intrauterine growth restriction, and premature birth. According to WHO, a baby with a birth weight of less than 2,500g is considered low birth weight, and one born before the 37th week is considered premature. Low birth weight or premature babies may present complications resulting from infections and injuries, which can lead to cerebral palsy, mental retardation, and other physical and/or neurological disorders [23].

Pre-pregnancy overweight and obesity increase the likelihood of excessive weight gain during pregnancy [24-25], deviating from the recommendations for the weekly gestational weight gain rate according to pre-pregnancy BMI [26]. This can result in gestational hypertension, gestational diabetes mellitus (GDM), postpartum weight retention, and a higher chance of needing a cesarean section [25]. Additionally, it can lead to macrosomia, where the birth weight is equal to or greater than 4,000g. Macrosomic fetuses have a higher risk of intrauterine death, shoulder dystocia, humeral and clavicular fractures, facial and brachial plexus paralysis, asphyxia, meconium aspiration, hypoglycemia, neonatal hyperbilirubinemia, hypertrophic cardiomyopathy, and the need for prolonged use of the intensive care unit [27].

Men should also be concerned about weight because a healthy lifestyle with exercise and a balanced diet improves sperm quality. Research has shown a relationship between genetics and predisposition to obesity, with amenities associated with the development and/or progression of this metabolic disease [28].

3.3 Harmful Substances

Maternal smoking, alcohol use, and illicit drug use cause intrauterine growth retardation (IUGR) due to a decrease in nitric oxide, a regulator of placental perfusion dependent on L-arginine transporters.

Alcohol consumption during pregnancy results in fetal development problems, with the main concern being fetal alcohol syndrome (FAS), which includes growth deficits, developmental delays, microcephaly, and changes in ocular, craniofacial, cardiac, cutaneous, and muscular areas [1]. There are no contraindications for alcohol consumption before pregnancy; however, it is advisable to completely stop alcohol intake throughout pregnancy [29]. Therefore, if you are trying to conceive or suspect pregnancy, it is prudent to stop alcohol intake.

Substances present in cigarettes, such as nicotine and carbon monoxide, cross the placental barrier. Smoking can be responsible for IUGR, prematurity, fetal hypoxemia, affect lung development, contribute to the development of congenital heart diseases, inhibit innate immunity, and cause the mother to eat less, affecting appropriate weight gain [1-30]. In men, smoking results in decreased sperm

count, a higher percentage of abnormal morphology, lower motility, as well as DNA damage associated with inadequate embryo development [2].

The use of illicit drugs is related to prematurity, low birth weight, sleep disorders, smaller head circumference, and impaired development. For example, cocaine, like nicotine, crosses the placental barrier and can affect the central nervous system (CNS), causing IUGR, low birth weight, physical and fetal injuries, abnormal heartbeats, withdrawal syndrome, and even death. Another example is marijuana, which interferes with oxygen transport in red blood cells [1].

Considering that many of these harmful substances are addictive, quitting them when already pregnant can be more complicated [31]. Quitting these substances before pregnancy contributes to risk reduction and may prevent adverse obstetric outcomes. The longer the absence of contact with these substances, the less their influence on the body and, consequently, on maternal and fetal health [32]. Smoking results in decreased sperm count, a higher percentage of abnormal morphology, and lower motility in men [2]. Therefore, the father's abandonment of these substances before pregnancy improves sperm quality and, during pregnancy, serves as support, preventing the mother from being exposed to passive smoking, which contributes to the health of all [32].

3.4 Healthcare Professional/Nutritionist consultation

Nutritional monitoring is one of the important elements in preventing perinatal morbidity and mortality, promoting the health of women and children in the short and long term [4,33].

For those planning to become pregnant, it is essential to consult with specialized healthcare professionals, including maternal and child nutritionists, who will assess the nutritional status of the prospective parents. The nutritionist will check the nutritional status to identify possible nutritional needs and correct them, as well as provide general and specific nutritional guidance [34]. The parents' lifestyle influences the child's quality of life from before conception. Therefore, it is relevant to prepare a healthy environment to receive the embryo, promoting better development and preventing complications [10,35].

The nutritionist will provide guidance on achieving the appropriate weight, supplementation of necessary nutrients such as iron and folic acid, and a specific diet. They will also alert to the need to abandon harmful and addictive substances such as alcohol and tobacco, reduce caffeine consumption, and avoid high-sugar and high-fat foods [1, 2, 24].

Changing habits requires effort and time, and the process of re-education is not linear but composed

of ups and downs. Dismantling harmful habits and modifying behaviors takes time [36]. Therefore, seeking proper assistance before pregnancy is the best way to establish a healthy pregnancy from the beginning, allowing time to correct possible nutritional deficiencies and reduce or eliminate the influence of harmful substances in the body, providing the embryo with the most suitable environment for its complete and complication-free development [37].

4. Conclusion

Proper nutrition before pregnancy is essential because it impacts the availability of nutrients for the fetus, pre-pregnancy weight, genetic material quality, and prevents undesirable complications. When planning to become pregnant, it is crucial to start monitoring with appropriate healthcare professionals, with maternal and child nutritionists playing an essential role in promoting nutritional adequacy and providing guidance. Changing habits before conception is more appropriate, as it is a process that can be carried out calmly and with better quality. Implementing proper nutrition before pregnancy helps prevent complications during pregnancy and childbirth, such as excessive weight gain, gestational diabetes, low birth weight, macrosomia, premature birth, anemia, hypoglycemia, developmental problems, and even maternal mortality. Taking care of health before conception helps ensure a healthy body and environment for the optimal development of the future child.

5. References

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