Attachment to 427: Justification and References

Inappropriate Nutrition Practices for Women

Justification

427.1 Consuming dietary supplements with potentially harmful consequences.

The use of herbal and dietary supplements for treating many different conditions is common during pregnancy (1, 2, 3). Pregnant and breastfeeding women taking inappropriate or excessive amounts of dietary supplements, such as single or multivitamins or minerals, herbal supplements, teas, or cannabidiol (CBD) are at risk for adverse effects such as harmful nutrient interactions, toxicity, and possible birth defects (2, 4). These substances can cross the placenta and may harm the fetus. They may also be present in breast milk and have a negative impact on the infant (1).

Most nutrient toxicities occur through excessive supplementation. Vitamins A, B-6 and the minerals iron and selenium can be micronutrients that are consumed in excess during pregnancy and breastfeeding (1). Vitamin A is critical during periods of rapid growth and cell development, however excessive amounts during pregnancy can cause birth defects (1). This is especially true if taken during the first 60 days of gestation (4). Supplementation of vitamin A is usually not necessary during pregnancy and is often limited to 770 mcg per day with a tolerable Upper Intake Level (UL) of 3,000 mcg per day (1, 5). The Recommended Dietary Allowance (RDA) for vitamin B6 for pregnant women is 1.9 mg per day in the U.S. (6). Doses of 50–510 mg per day taken during the first trimester have not been associated with adverse fetal outcomes, however the UL is set at 100 mg per day (4). Vitamin B6 is sometimes taken by pregnant women to reduce nausea and vomiting in doses of 10-25 mg three to four times a day. The effectiveness of this remains unproven but these amounts remain under the UL (1). The UL in the U.S. for iron is 45 mg per day and is based on the reported side effects of gastrointestinal discomfort, nausea, and constipation at levels of 40–50 mg per day. These are common complaints in pregnant women and iron supplementation may exacerbate discomfort (4). Selenium is another mineral that could potentially be consumed in excess during pregnancy. It acts as an antioxidant and is important in reproduction but there are no recommendations for supplementation during pregnancy (7). Excess selenium intake could be of concern if women eat locally from areas where the selenium content in the soil is high or consume large amounts of Brazil nuts (70-90 mcg/nut) or supplements (7). The RDA for selenium is 60 mcg per day for pregnant women and 70 mcg for breastfeeding women with an UL of 400 mcg per day for both (7). However, there are no known cases of selenium toxicity during pregnancy or breastfeeding in the U.S. (1). The following is a table showing the RDA and UL for Vitamins A, B6 and the minerals iron and selenium during pregnancy and lactation:

Micronutrients	Pregnancy RDA	Breastfeeding RDA	Tolerable Upper Intake Level
Vitamin A	770 mcg	1,300 mcg	3,000 mcg
B6	1.9 mg	2 mg	100 mg
Iron	27 mg	9 mg	45 mg
Selenium	60 mcg	70 mcg	400 mcg

Caution should be advised with the use of all herbal and dietary supplements during pregnancy and breastfeeding because safety, purity and effectiveness are not guaranteed because they are not regulated by the Food and Drug Administration (FDA) (1). Interactions with prescribed medications can also occur (1). The potency of herbal medicines can differ within and between batches of the same product and between products from different producers (3). Many people falsely believe that because herbs are natural that they are safe (1). Some herbs may be harmful during pregnancy because the rapidly growing fetus can be vulnerable to adverse effects due to rapid cell growth and division (2, 3). Herbs can also have different concentrations depending on what form they are used in. Teas (hot water extracts of dried herbs) contain the least number of compounds while tinctures are alcohol extracts of dried herbs and should be avoided in pregnancy because they have both the highest concentration of compounds and the presence of alcohol (2). Raspberry and blackberry leaf teas can cause hypoglycemia in women with gestational diabetes (1, 2). Other herbs can cause uterine contractions and bleeding and are contraindicated in pregnancy including oregano tea, avocado leaf tea, cat's claw, sage tea, and large amounts of parsley or celery seeds (1). Regular chamomile consumption during third trimester has been found to be associated with a higher risk of pre-term delivery and lower birth weight (2). Ginger should be used in limited amounts during pregnancy because there are concerns over possible uterine stimulating effects (2). The recommended dose of ginger is 1,000 mg per day for nausea and vomiting of pregnancy (2). Fennel and peppermint tea used during pregnancy may be associated with adverse maternal and perinatal outcomes or toxicity from contaminants (2). Pregnant women should always discuss the use of herbal teas and supplements with their health care provider prior to use (1).

Pregnant and breastfeeding women should also speak with their health care provider before consuming products containing cannabidiol (CBD). The plant *Cannabis sativa* (cannabis), commonly known as marijuana, contains more than 100 chemical compounds that share a similar chemical structure, known as cannabinoids (8). The most common cannabinoid is the psychoactive compound tetrahydrocannabinol (THC) (9). The second most common cannabinoid in the plant is CBD which does not produce the typical known effects of marijuana (8, 9). All cannabinoids, including CBD, readily cross the placental barrier (8). CBD has been shown to help reduce inflammation, anxiety, pain, and seizures (8, 9). However, CBD products are not regulated by the Food and Drug Administration (FDA) and the FDA has approved only one CBD prescription drug to treat a rare form of epilepsy (10, 11). CBD is sold in a variety of forms including oral capsules, sublingual oils, topical creams, balms, and salves; e-liquids for vaporization; and dietary supplement forms (10). It is a molecule that dissolves easily in fats, which is why it is often in the form of an oil (9). CBD also is sold in a wide range of doses from 18-1500 mg (12). Studies of CBD products showed that only 31% were accurately labeled in regard to CBD levels and other studies have revealed the presence of potentially hazardous chemicals such as toxins or THC (10). Potential side effects of CBD use may include drug interactions, liver abnormalities, diarrhea, fatigue, vomiting, and sleepiness (11, 12).

The use of CBD has increased not only in the general population but also in pregnant women who may use it for pain, insomnia, anxiety, or nausea (9). Women report using CBD products during pregnancy to reduce severe pregnancy-related nausea (9). Though there are very few studies on the use of CBD during pregnancy, some have shown that CBD's potential negative effects may include placental changes, an effect on the functionality of the uterine lining, and inducing preterm labor (9). Animal studies are more plentiful and have shown that CBD use has caused harm to developing fetuses (11). More, larger studies are needed to determine if CBD use is safe during pregnancy in humans. Studies of CBD use during breastfeeding are also very limited. CBD has been found in breast milk after maternal marijuana use, whether by smoking or eating, but does not appear to be present after just CBD use (12). More research needs to be done to determine if CBD is found in breast milk after being consumed by the mother and its possible impact on the

infant and on maternal milk supply (11, 13). There does remain a concern about CBD products containing unlabeled THC and other contaminates such as pesticides, heavy metals, bacteria, and fungus (11). Currently, the FDA strongly advises against the use of CBD in any form during pregnancy or while breastfeeding (11).

427.2 Consuming a diet very low in calories and/or essential nutrients; or impaired caloric intake or absorption of essential nutrients following bariatric surgery.

During pregnancy, the maternal diet must provide an adequate supply of energy to support the mother's usual requirements as well as those of the growing fetus. Extra energy is required for the synthesis of new and existing tissues in the second and third trimesters (5). Pregnant women who restrict their diets may increase the risk of birth defects, suboptimal fetal development, and chronic health problems in their children (5). Calorie restriction during pregnancy may lead to decreases in neonatal birthweight (5). The pregnant adolescent who restricts her diet is of particular concern since her additional growth needs compete with the developing fetus and the physiological changes of pregnancy (1, 14).

A diet that severely restricts any macronutrient should be avoided during pregnancy. Examples include: the ketogenic diet which lacks carbohydrates, the Paleo diet which limits dairy, and any diet that consists of an excess of saturated fats. Fad diets may be especially harmful during pregnancy because of the resulting nutrient imbalance and consequent nutrient deficiencies or possible ketosis from lack of carbohydrates. Infants of mothers on a low-carbohydrate diet may be prone to gaining weight in childhood. An extreme intake of protein has been associated with low-birth-weight infants. The Paleo diet promotes consumption of excess saturated fats and restricts the consumption of dairy-based foods, which may contribute to deficiencies in calcium and vitamin D (14).

Vegan diets may also be highly restrictive and result in nutrient deficiencies (15). The percentage of people who eat a vegan diet has increased in the general population over the last years in part due to research supporting that plant-based diets are linked to improved health (1). However, strict veganism can have a low content of essential micronutrients such as iron, zinc, vitamin B 12, vitamin D, omega-3 fatty acids, calcium, and iodine (16). The most common nutrient deficiencies in vegans are vitamins D and B12 (15). Vitamin D supplements may be the best way to ensure adequate vitamin D levels as few plant foods are fortified with vitamin D (15, 16). Most studies show that vegan pregnant women are at a high risk of vitamin B12 depletion because they do not consume any animal products which are the natural sources of this vitamin (15). The breastmilk of a vegan mother can be severely deficient in vitamin B12 which if not treated could cause growth failure and permanent damage to the infant's nervous system (16). Breastfeeding women who follow a strict vegan diet should have their infant's vitamin B12 levels monitored (1). Pregnant and breastfeeding vegan women should be encouraged to take an individual B12 supplement that is dissolved on the tongue to increase absorption (1, 15). However, both pregnant and breastfeeding women following a vegan dietary pattern should consult with their healthcare provider to determine whether supplementation of vitamin D, vitamin B12 (and what form), and/or other nutrients such as iron, choline, zinc, iodine, or essential fatty acids are necessary (6).

Pregnant and breastfeeding women who have had weight loss surgeries are also at risk for nutrient deficiencies (1). Over half of bariatric surgeries are performed on women of reproductive age (17). Although pre-pregnancy weight loss from bariatric surgery may improve the chances of getting pregnant and decrease the risk of gestational diabetes and hypertension, it has the potential to make women susceptible to deficiencies in nutrients that are essential for healthy fetal development (1). The nutrients that need to be replaced depend on which bariatric surgery was performed and the nutritional status of the pregnant

woman, but the most common deficiencies include vitamins D, folate, B12, B1, and A and the minerals iron and calcium (1, 17). Women who have had gastric band surgeries may have more difficulty eating enough while gastric bypass procedures tend to cause malabsorption problems (1). Common nutrient deficiencies following bariatric surgery can also be exacerbated by pregnancy symptoms such as morning sickness or hyperemesis, gastro-esophageal reflux, and abdominal bloating (1). The American College of Obstetricians and Gynecologists recommends delaying pregnancy for 18 months after bariatric surgery. A more individualized approach is to delay pregnancy until a woman's weight has been stable for 2 years (1). However, this does not always happen, and many women become pregnant with nutrient deficiencies. Pregnant women may also be unwilling to gain the recommended weight after losing weight post-surgery. Women who have had bariatric surgery have higher risks of fetal growth restriction, preterm births, higher rates of miscarriage and neonatal mortality after surgery (1). Malabsorptive procedures (bypass) are associated with a significant increase in Small for Gestational Age (SGA) whereas restrictive procedures (banding) are not (18). This increase in adverse perinatal outcomes could be related to malnutrition, since malabsorptive procedures bypass a portion of the small intestine where many vitamins and minerals are absorbed, making these patients particularly susceptible to nutrient deficiencies that may negatively affect pregnancy (18). Women of reproductive age undergoing bariatric surgery are a high-risk group and require specialized preconception and antenatal nutritional support to achieve the best outcomes for both mothers and babies as bariatric surgeries increase (18). It is recommended that women who do become pregnant following bariatric procedures should have laboratory screening for nutritional deficiencies every trimester (17).

427.3 Compulsively ingesting non-food items (pica).

Pica refers to the persistent craving for, or eating of, non-food items usually dirt, raw starch, and ice (1). Other items may include paper, uncooked rice, baking soda, baby powder, burnt matches, cigarette ashes, or coffee grounds (1). Pica is common in pregnancy affecting 14-44% of women in the U.S. (1). The strength of the craving can be intense and has been compared to that for tobacco or alcohol (19). Pica is not limited to any race, culture, socio-economic group, or geographic area. It occurs in all areas of the world but is most common in Africa (19). Pregnant women in Ghana, where pica is common, indicated that most of them who consume non-food items do so to satisfy a craving or because they like the smell or taste (20). Some of the risk factors associated with pica include stress, cultural factors, low socioeconomic status, and an underlying mental illness (19). The cause of pica is not understood but some of the theories include that it relieves nausea and vomiting, or that it provides an essential nutrient that the woman is deficient in, most often iron or zinc (19). However, neither of these theories have been supported by research (21). It is more likely that malnutrition is the result of pica when nonfood items replace essential nutrients in the diet (1). Large intakes of non-food items can be harmful to a women's nutritional status. Substances like dirt may contain toxins like heavy metals (such as lead, cadmium, and arsenic), parasites, or other pathogens (19). Excessive consumption of dirt may also lead to intestinal obstructions or perforations (1). An emerging theory for the explanation of pica is that it serves useful immune functions by the ingested microorganisms stimulating the inborn immune system, resulting in less of a response to allergens and antigens (21). Eating dirt may be a means by which the gut diversifies its microorganism flora (21). However, pica during pregnancy can have negative consequences on the fetus (21). There have been case reports of intrauterine toxicity, lead poisoning that has caused long-term neurological disability and delayed childhood motor functions (21). Recommending stopping pica often fails since the craving is so strong but allowing the woman to smell the dirt and trading its consumption for a burned tortilla, toast or jicama may sometimes work (1).

427.4 Inadequate vitamin/mineral supplementation recognized as essential by national public health policy.

Nutrients of public health concern for women who are pregnant include iron, folate, choline, and iodine (6). Most healthcare providers recommend women who are pregnant or planning to become pregnant take a daily prenatal vitamin and mineral supplement in addition to consuming a healthy dietary pattern (1). This may be especially important to meet folic acid, iron, and iodine needs during pregnancy and iodine needs during breastfeeding (6).

The Recommended Dietary Allowance (RDA) for iron substantially increases during pregnancy from 18 mg per day to 27 mg per day (6). Iron is a key nutrient that supports fetal development (1). It is used by the body to make the extra blood that the pregnant woman and fetus need during pregnancy. This increased amount of iron is found in most prenatal vitamins (4, 22). Iron deficient anemia (IDA) is more common in economically and socially disadvantaged populations and this may independently contribute to complications in pregnancy and early childhood development (23). It is estimated that 33% of low-income pregnant women in the U.S. have IDA in their third trimester (1). IDA is associated with an increase in low birth weight, preterm delivery and increased fetal and neonatal mortality (1). The maternal effects of IDA include fatigue, light-headedness, and low prenatal weight gain (1). IDA in the first and second trimesters is associated with increased maternal morbidity (24). Iron needs for women who are breastfeeding differ from those who are pregnant. For adult women who are breastfeeding, before menstruation returns, iron needs fall to 9 mg/day and then return to pre-pregnancy levels once menstruation resumes (6). If breastfeeding women continue to take their prenatal vitamins, they may exceed their needs for iron (1). Women who are breastfeeding should not exceed the UL of 45 mg of iron per day (4). Breastfeeding women should seek guidance from a healthcare provider regarding the appropriate level of iron supplementation based on their unique needs as more than half of breastfeeding women continue to use prenatal supplements (4).

Folic acid is the synthetic form of folate, a water-soluble B vitamin. Folate occurs naturally in foods such as dark green leafy vegetables, legumes, and oranges and is fortified in enriched grains (i.e., bread, pasta, rice, and cereal) (1). Most women do not receive the recommended daily allowance of folate from diet alone (25). Adequate folic acid intake is particularly important prior to conception and during the first trimester to help prevent neural tube defects (NTDs). NTDs are major birth defects of the brain and spine that occur early in pregnancy due to improper closure of the embryonic neural tube, which may lead to a range of disabilities or death (25). The most common NTDs are anencephaly (an underdeveloped brain and an incomplete skull) and spina bifida (incomplete closing of the spinal cord) (25). Other affects associated with low maternal folate levels include miscarriages, preterm births, orofacial clefts, and congenital heart defects (1). Natural folate is less bioavailable and has not been shown to lower the risk of NTDs as synthetic folic acid (1). The RDA for folate is higher during pregnancy and breastfeeding than all other life stages (6). The United States Preventative Services Task Force (USPSTF) recommends that all women who are planning or capable of pregnancy take a daily supplement containing 400 to 800 mcg of folic acid (25). The critical period for supplementation is at least 1 month before pregnancy and during the first 12 weeks of pregnancy (22). Most prenatal supplements sold in the United States contain folic acid (4). The recommendation for folic acid supplementation is in addition to the amounts of folate in food contained in a healthy eating pattern (6). Supplementation with folic acid during preconception and early pregnancy is critical and can prevent 40–80% of neural tube defects (4). The UL for women who are pregnant, or breastfeeding is 1,000 mcg of folic acid (6).

Iodine is an essential nutrient required for the synthesis of thyroid hormone, which is responsible for regulating growth, development, and metabolism (1). Iodine requirements increase substantially during pregnancy and breastfeeding (26). The RDA for iodine during pregnancy is 220 mcg and 290 mcg during breastfeeding (6). If iodine requirements are not met during these periods, the production of thyroid hormones may decrease and be inadequate for maternal, fetal, and infant needs (27). Inadequate iodine intake during pregnancy and breastfeeding could be detrimental to the growth and development of the baby's brain (6). Severe iodine deficiency during pregnancy and the neonatal period is associated with many adverse effects, including miscarriage, stillbirth, neonatal mortality, growth retardation and decreased IQ (28). Even subclinical hypothyroidism can double the risk of miscarriage and neonatal death (4). Adequate iodine levels in breastmilk are essential for the proper neurodevelopment of infants (1). The American Thyroid Association recommends that pregnant and breastfeeding women receive 150 mcg per day of supplemental iodine to meet the increased iodine needs during pregnancy and breastfeeding (1, 27). Many prenatal supplements do not contain iodine (1). Pregnant and breastfeeding women should discuss the need for supplemental iodine in their prenatal vitamin with their health care provider to ensure they are receiving an adequate amount (6).

The following is a table showing the RDA and UL for iron, folate and iodine during pregnancy and lactation:

Micronutrients	Pregnancy RDA	Breastfeeding RDA	Tolerable Upper Intake Level
Iron	27 mg	9 mg	45 mg
Folate	600 mcg	500 mcg	1,000 mcg
Iodine	220 mcg	290 mcg	1,100 mcg

427.5 Pregnant woman ingesting foods that could be contaminated with pathogenic microorganisms.

Foodborne illness is a serious public health problem. The CDC estimates that each year 1 in 6 people in the U.S. will get sick from a foodborne illness (1). The causes include pathogenic microorganisms (bacteria, viruses, and parasites) and their toxins and chemical contamination (1). Certain segments of the population are more susceptible to foodborne illnesses including pregnant women and their fetuses (29). During pregnancy a woman's immune system is weakened while the fetus's immune system is still developing, making it harder to fight off certain harmful foodborne microorganisms (29). Therefore, it is important that they avoid foods with a high risk of infection (29). For this reason, the Dietary Guidelines for Americans and government agencies such as the Centers for Disease Control and Prevention, the USDA Food Safety and Inspection Service, and the Food and Drug Administration advise pregnant women and other high-risk individuals not to consume unpasteurized (raw) juice or milk, raw sprouts, and some soft cheeses made from unpasteurized milk (6). During pregnancy, women should only eat foods containing seafood, meats, poultry, or eggs that have been cooked to recommended safe minimum internal temperatures (6).

Pregnant women are 10 times more likely to get *Listeria*, the bacteria that causes Listeriosis, than other U.S. adults (30). *Listeria* is a soilborne bacteria that grows in cool, moist environments (30). Infection occurs from eating contaminated foods including unpasteurized (raw) juice or milk, raw sprouts, or some soft cheeses made from unpasteurized milk (6). Deli and luncheon meats and hot dogs should be reheated to steaming hot or 165°F to kill *Listeria* (6). Listeriosis during pregnancy can cause miscarriage, stillbirth, or a preterm delivery. Infections are more likely in the third trimester (96%) than the first (3%), but the

consequences are more severe with the earlier infections (1). *Salmonella*, *Campylobacter jejuni*, *E. coli,* and Toxoplasmosis are other foodborne pathogens that are of concern for pregnant women (1). *Salmonella* is more likely to cause an infection in the mother rather than the fetus (31). *Salmonella* infections occur from eating contaminated foods such as raw or undercooked eggs, unpasteurized milk, raw or undercooked seafood or meat or unwashed fruits and vegetables (31). Symptoms include vomiting, diarrhea, abdominal pain, and flu-like aliments (31). *Campylobacter infections* are caused by consuming raw or undercooked poultry or another food that has been contaminated by raw or undercooked poultry (32). *Campylobacter* can cross the placenta and infect the fetus causing miscarriage, stillbirth, or preterm labor (32). *E. coli* can also affect pregnant women when they consume contaminated food or water, or unpasteurized milk (33). The symptoms can vary with each person but often include severe stomach cramps, diarrhea, vomiting, and sometimes a fever (33). If pregnant women are exposed to *E. coli*, dehydration is the main risk (1).

Toxoplasmosis is caused by a parasite (*Toxoplasma gondii)* that infects more than 40 million people in the U.S. (1). A woman can become infected with Toxoplasmosis by eating unpasteurized milk, raw vegetables, undercooked meat (especially pork, lamb, and venison), shellfish, and food contaminated with knives and cutting boards that have been in contact with raw meat or shellfish. Infection can also be caused by drinking contaminated water, after accidental ingestion of the parasite when in contact with cat feces (31). The risk of infection is higher during pregnancy and can lead to severe neurological damage, injury to various organs, miscarriage, premature birth, or stillbirth (1). Informing pregnant women and postpartum mothers about food safety issues through trained health professionals is crucial for the consistency of messages and increasing food safety awareness among vulnerable consumer groups (34).

References

1. Raymond, J. and Morrow, K. Krause and Mahan's Food & the Nutrition Care Process, 15th edition: 2021 pages 269, 298, 890-891, 894-896, 901-903, 905 906. 969-971.
2. Terzioglu Bebitoglu B. Frequently Used Herbal Teas During Pregnancy - Short Update. Medeni Med J. 2020;35(1):55-61. doi: 10.5222/MMJ.2020.69851.
3. Bernstein N, Akram M, Yaniv-Bachrach Z, Daniyal M. Is it safe to consume traditional medicinal plants during pregnancy? Phytother Res. 2021 Apr;35(4):1908-1924. doi: 10.1002/ptr.6935.
4. Brown B, Wright C. Safety and efficacy of supplements in pregnancy. Nutr Rev. 2020 Oct 1;78(10):813-826. doi: 10.1093/nutrit/nuz101.
5. Mousa A, Naqash A, Lim S. Macronutrient and Micronutrient Intake during Pregnancy: An Overview of Recent Evidence. Nutrients. 2019 Feb 20;11(2):443. doi: 10.3390/nu11020443.
6. Phillips JA. Dietary Guidelines for Americans, 2020-2025. Workplace Health Saf. 2021 Aug;69(8):395. doi: 10.1177/21650799211026980.
7. National Institutes of Health- Office of Dietary Supplements. [Internet]. Selenium- Fact Sheet for Professionals. Available at: Selenium - Health Professional Fact Sheet (nih.gov). Accessed June 2022.
8. Crippa JA, Guimarães FS, Campos AC, Zuardi AW. Translational Investigation of the Therapeutic Potential of Cannabidiol (CBD): Toward a New Age. Front Immunol. 2018 Sep 21;9:2009. doi: 10.3389/fimmu.2018.02009.

9. Sarrafpour S, Urits I, Powell J, Nguyen D, Callan J, Orhurhu V, Simopoulos T, Viswanath O, Kaye AD, Kaye RJ, Cornett EM, Yazdi C. Considerations and Implications of Cannabidiol Use During Pregnancy. Curr Pain Headache Rep. 2020 Jun 10;24(7):38. doi: 10.1007/s11916-020-00872-w.

10. Britch SC, Babalonis S, Walsh SL. Cannabidiol: pharmacology and therapeutic targets. Psychopharmacology (Berl). 2021 Jan;238(1):9-28. doi: 10.1007/s00213-020-05712-8.

11. Food and Drug Administration. [Internet]. Consumer Updates. Available at: What You Should Know About Using Cannabis, Including CBD, When Pregnant or Breastfeeding | FDA. Accessed November 2022.

12. Moss MJ, Bushlin I, Kazmierczak S, Koop D, Hendrickson RG, Zuckerman KE, Grigsby TM. Cannabis use and measurement of cannabinoids in plasma and breast milk of breastfeeding mothers. Pediatr Res. 2021 Oct;90(4):861-868. Doi: 10.1038/s41390-020-01332-2.

13. Huestis MA, Solimini R, Pichini S, Pacifici R, Carlier J, Busardò FP. Cannabidiol Adverse Effects and Toxicity. Curr Neuropharmacol. 2019;17(10):974-989. doi: 10.2174/1570159X17666190603171901.

14. Marshall NE, Abrams B, Barbour LA, Catalano P, Christian P, Friedman JE, Hay WW Jr, Hernandez TL, Krebs NF, Oken E, Purnell JQ, Roberts JM, Soltani H, Wallace J, Thornburg KL. The importance of nutrition in pregnancy and lactation: lifelong consequences. Am J Obstet Gynecol. 2022 May;226(5):607-632. doi: 10.1016/j.ajog.2021.12.035.

15. Sebastiani G, Herranz Barbero A, Borrás-Novell C, Alsina Casanova M, Aldecoa-Bilbao V, Andreu-Fernández V, Pascual Tutusaus M, Ferrero Martínez S, Gómez Roig MD, García-Algar O. The Effects of Vegetarian and Vegan Diet during Pregnancy on the Health of Mothers and Offspring. Nutrients. 2019 Mar 6;11(3):557. doi: 10.3390/nu11030557.

16. Baroni L, Goggi S, Battaglino R, Berveglieri M, Fasan I, Filippin D, Griffith P, Rizzo G, Tomasini C, Tosatti MA, Battino MA. Vegan Nutrition for Mothers and Children: Practical Tools for Healthcare Providers. Nutrients. 2018 Dec 20;11(1):5. doi: 10.3390/nu11010005.

17. Akhter Z, Rankin J, Ceulemans D, Ngongalah L, Ackroyd R, Devlieger R, Vieira R, Heslehurst N. Pregnancy after bariatric surgery and adverse perinatal outcomes: A systematic review and meta-analysis. PLoS Med. 2019 Aug 6;16(8):e1002866. doi: 10.1371/journal.pmed.1002866.

18. Slater C, Morris L, Ellison J, Syed AA. Nutrition in Pregnancy Following Bariatric Surgery. Nutrients. 2017 Dec 8;9(12):1338. doi: 10.3390/nu9121338.

19. Ardeshirian KA, Howarth DA. Esperance pica study. Aust Fam Physician. 2017;46(4):243-248. doi: RACGP - Esperance pica study.

20. Konlan KD, Abdulai JA, Konlan KD, Amoah RM, Doat AR. Practices of pica among pregnant women in a tertiary healthcare facility in Ghana. Nurs Open. 2020 Jan 28;7(3):783-792. doi: 10.1002/nop2.451.

21. Al Nasser Y, Muco E, Alsaad AJ. Pica. 2022 May 1. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022. Bookshelf ID: NBK532242.

22. The American College of Obstetricians and Gynecologists. [Internet]. Nutrition During Pregnancy. Available at: Nutrition During Pregnancy | ACOG. Accessed June 2022.

23. Means RT. Iron Deficiency and Iron Deficiency Anemia: Implications and Impact in Pregnancy, Fetal Development, and Early Childhood Parameters. Nutrients. 2020 Feb 11;12(2):447. doi: 10.3390/nu12020447.

24. Georgieff MK. Iron deficiency in pregnancy. Am J Obstet Gynecol. 2020 Oct;223(4):516-524. doi: 10.1016/j.ajog.2020.03.006.

25. U.S. Preventive Service Task Force. [Internet]. Folic Acid for the Prevention of Neural Tube Defects: Preventive Medication. Available at: Recommendation: Folic Acid for the Prevention of Neural Tube Defects: Preventive Medication | United States Preventive Services Taskforce (uspreventiveservicestaskforce.org). Accessed June 2022.

26. Petersen E, Thorisdottir B, Thorsdottir I, Gunnlaugsson G, Arohonka P, Erlund I, Gunnarsdottir I. Iodine status of breastfed infants and their mothers' breast milk iodine concentration. Matern Child Nutr. 2020 Jul;16(3):e12993. doi: 10.1111/mcn.12993.

27. Harding KB, Peña-Rosas JP, Webster AC, Yap CM, Payne BA, Ota E, De-Regil LM. Iodine supplementation for women during the preconception, pregnancy and postpartum period. Cochrane Database Syst Rev. 2017 Mar 5;3(3):CD011761. doi: 10.1002/14651858.CD011761.pub2.

28. Toloza FJK, Motahari H, Maraka S. Consequences of Severe Iodine Deficiency in Pregnancy: Evidence in Humans. Front Endocrinol (Lausanne). 2020 Jun 19;11:409. DOI: 10.3389/fendo.2020.00409.

29. American Academy of Dietetics. [Internet]. Foodborne Risks for Moms-to-Be. Available at: Foodborne Risks for Moms-to-Be (eatright.org). Accessed June 2022.

30. Food Safety and Inspection Service. [Internet]. Listeria monocytogenes. Available at: Listeria Monocytogenes | Food Safety and Inspection Service (usda.gov). Accessed June 2022.

31. International Forum for Wellbeing in Pregnancy. [Internet]. Foodborne Infections in Pregnancy: Salmonella and Toxoplasma. Available at: Foodborne infections in pregnancy: Salmonella & Toxoplasma - International Forum for Wellbeing in Pregnancy (ifwip.org). Accessed June 2022.

32. Centers for Disease Controls and Prevention. [Internet]. Information for Health Professionals. Campylobacter. Available at: Information for Health Professionals | Campylobacter | CDC. Accessed June 2022.

33. Centers for Disease Controls and Prevention. [Internet]. E. coli Homepage. Symptoms. Available at: Symptoms | E. coli | CDC. Accessed June 2022.

34. Jevšnik M, Česen A, Šantić M, Ovca A. Food Safety Knowledge and Practices of Pregnant Women and Postpartum Mothers in Slovenia. Foods. 2021 Oct 12;10(10):2412. doi: 10.3390/foods10102412.

Websites for Additional Information

427.1 References - Supplements/Herbs

- Over-the-counter medicine, supplements and herbal products during pregnancy (marchofdimes.org)

- Vitamin and Mineral Supplement Fact Sheets (nih.gov)
- Dietary Supplements | FDA

427.2 References - Highly Restrictive Eating/Nutrient Malabsorption

- http://www.eatright.org
- Weight-loss (Bariatric) Surgery | NIDDK (nih.gov)

427.3 References - Non-Food Ingestion

- Pica | National Eating Disorders Association
- Pica Cravings During Pregnancy | American Pregnancy Association

427.4 Inadequate vitamin/mineral supplementation

- General Information About NTDs, Folic Acid, and Folate | CDC
- Recommendation: Folic Acid for the Prevention of Neural Tube Defects: Preventive Medication | United States Preventive Services Taskforce (uspreventiveservicestaskforce.org)

427.5 References – Food Borne Illnesses

- Food Safety | Food Safety | CDC
- Safe Food Handling | FDA
- http://www.foodsafety.gov
- https://www.fightbac.org/
- fightbac.org/kids/
- People at Risk: Pregnant Women | FoodSafety.gov
- Food Safety For Pregnant Women, Their Unborn Babies, and Children Under Five (fda.gov)
- What Is Foodborne Illness? Food Safety for Moms to Be | FDA
- Listeria Monocytogenes | Food Safety and Inspection Service (usda.gov)
- About Toxoplasmosis | Toxoplasmosis | CDC
- E. coli (Escherichia coli) | E. coli | CDC
- Campylobacter (Campylobacteriosis) | Campylobacter | CDC