

Prevention of cardiovascular diseases in women planning pregnancy and during pregnancy. Expert opinion of the Section of Prevention and Epidemiology of the Polish Cardiac Society, the Polish Society of Gynecologists and Obstetricians, the Polish Society of Family Medicine, the Polish Lipid Association, and the Polish Lifestyle Medicine Society

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ABSTRACT

Pregnancy is a period of change in a woman's life and health. Adaptive mechanisms also involve the cardiovascular system. Preventing cardiovascular disease (CVD) before and during pregnancy requires a multifaceted approach, including lifestyle modification, early identification and treatment of risk factors, and comprehensive postpartum care. Key strategies include proper diet, adequate regular physical activity, maintaining a healthy weight, coping with stress, getting adequate sleep, and avoiding smoking. In addition, it is crucial to address pregnancy-related complications such as pregnancy-induced hypertension, which, if not treated properly, is associated with negative consequences for the mother and fetus. Another risk factor is lipid disorders, and their treatment in pregnant women poses a challenge for doctors. In addition to modern treatment of hypertension and lipid disorders in pregnancy, the document presents recommendations for physical activity, a balanced diet depending on comorbidities, and healthy sleep. It also contains important information on the ongoing problem of stimulants during pregnancy. In addition, it emphasizes the importance of mental health care during pregnancy and the possibilities available to family doctors in the context of CVD prevention in this group. The following document, based on current guidelines and expert experience, aims to promote knowledge about the prevention of CVD in women planning to become pregnant and during pregnancy, and to help physicians implement the recommendations in their daily practice.

Key words: cardiovascular disease prevention, pregnancy, prenatal care, women's health

INTRODUCTION

Pregnancy involves significant changes in the cardiovascular system aimed at adapting the mother's body to the growing needs of the fetus. These changes are crucial for ensuring adequate blood flow, nutrient delivery, and waste removal (Table 1).

Inadequate hemodynamic changes can lead to complications in both the mother and fetus, including pre-eclampsia and intra-uterine growth restriction (IUGR) [1]. Furthermore, the mother's inability to adapt to these physiological changes may reveal a previously hidden cardiovascular pathology, increasing the risk of cardiovascular diseases (CVD) in the future [2].

It is important to note that there are differences between men and women regarding cardiovascular risk factors. In addition to traditional risk factors (e.g., smoking, diabetes), there are factors specific to women, such as pregnancy-related complications. One such complication is gestational hypertension, which affects approximately 10% of pregnant women. This complication can be a precursor

to pre-eclampsia, which significantly increases cardiovascular risk later in life [3].

Gestational hypertension, including pre-eclampsia, is associated with metabolic disorders. These disorders can be both a risk factor for the development of hypertension and a consequence of it. Elevated levels of cholesterol, glucose, and triglycerides can persist for many years after gestational hypertension [4]. These changes can lead to endothelial dysfunction, which is particularly important in women with a history of pre-eclampsia [5].

Another significant risk factor specific to pregnant women is maternal age. Advanced maternal age (over 35 years) is associated with a higher risk of gestational hypertension and pre-eclampsia [6]. According to a report by the Central Statistical Office (*Główny Urząd Statystyczny*) from 2024, there has been an increase in the median age of women giving birth, which in 2023 was 31 years compared to approximately 26 years in the years 1990–2000. During this period, the average age of first-time mothers also increased by 6 years — in 2023 it was 29 years, and 22%

Table 1. Physiological adaptation to pregnancy

Parameter	Change (during pregnancy)
Heart rate	Increase (especially in the 1 st and 2 nd trimester)
Blood pressure	Decrease (1 st and 2 nd trimester, return to baseline in the 3 rd trimester)
Cardiac output	Increase (up to approximately 45% by the 3 rd trimester)
Stroke volume	Increase (peak between 16 th and 24 th week of gestation)
Systemic vascular resistance	Decrease (approximately 20%)
Pulmonary vascular resistance	Decrease (20%–30%)

of pregnant women in Poland were over 35 years old. Additionally, women who have experienced complications during pregnancy may also be at increased risk of CVD in the future [7]. It is also worth noting that psychosocial factors, such as stress and anxiety related to pregnancy, can lead to an increased cardiovascular risk [8].

Cardiovascular diseases in pregnant women also significantly affect fetal health, leading to various adverse outcomes, including IUGR and preterm birth [9, 10]. Hemodynamic changes occurring in pregnancy, including increased blood volume and both stroke volume and cardiac output, can exacerbate existing CVD, causing impaired placental perfusion and subsequent fetal hypoxia [11].

The clinical implications extend far beyond the course of pregnancy. The long-term consequences of CVD in pregnancy for the child's health should also be considered. Preeclampsia has been shown to be associated with an increased risk of hypertension, stroke, and metabolic disorders in offspring [12, 13]. Children born to mothers with gestational diabetes are at higher risk of obesity and CVD later in life [14]. Furthermore, fetal growth restriction, often associated with cardiovascular complications in the mother, is also correlated with long-term health risks, including CVD and metabolic syndrome in adulthood [15].

Sex differences in cardiovascular risk factors have also been documented [16]. There are risk factors specific to women that appear at certain times in their lives, particularly during pregnancy and the perinatal period (Table 2).

The occurrence of gestational hypertension and hyperglycemia in pregnancy is associated with a two-fold increase in the risk of cardiovascular events. Other complications, such as preterm delivery, recurrent miscarriage, and one or more stillbirths, are associated with a 40% increase in the incidence of CVD. The European Society of Cardiology guidelines propose assigning women with the above-mentioned pregnancy complications to the high cardiovascular risk group [16].

In summary, sex-specific risk factors are an important element of a comprehensive cardiovascular risk assessment in women. A history of cardiovascular risk factors related to pregnancy and other reproductive risk factors creates an opportunity for primary prevention. Adverse events during pregnancy affect subsequent cardiovascular risk in both the mother and child. Therefore, it is important to implement appropriate management before and during pregnancy to minimize the risk of these adverse events, as well as to eliminate or reduce standard risk factors for the subsequent health of the mother and child.

Table 2. Cardiovascular risk factors specific to women

- Hyperglycemia in pregnancy (gestational diabetes mellitus and diabetes in pregnancy)
- Gestational hypertension
- Preterm delivery
- Recurrent miscarriages
- Stillbirth

LIPID DISORDERS — PREPARATION FOR PREGNANCY AND MANAGEMENT DURING PREGNANCY

Dyslipidemia

Changes in lipid metabolism during pregnancy result from evolutionary adaptations aimed at ensuring optimal conditions for proper fetal growth and development in conditions of potential deficiency of essential nutrients. In the first trimester, lipid concentrations increase from about the 7th week and peak at the end of the second trimester. Later in pregnancy, stored lipids serve as a reserve for fatty acid synthesis in the placenta. The most significant changes in lipids occur in the second and third trimesters. The concentration of total cholesterol (TC) (as well as low-density lipoprotein cholesterol [LDL-C] — by about 25%–30%, most often not exceeding 50%) and triglycerides increases significantly through the action of placental lactogen, estrogen, and progesterone. Triglycerides increase the most, reaching 2.5-fold higher values in the third trimester than before pregnancy [17]. At the same time, the composition and size of LDL-C particles change, leading to an increase in the amount of small dense LDL (sdLDL), considered particularly atherogenic. The negative effects may be mitigated by elevated levels of high-density lipoprotein cholesterol (HDL-C) and apolipoprotein A-I (Apo A-I), which peak in the second trimester. However, the proper functionality of HDL-C depends on factors such as inflammation, obesity, diabetes, kidney disease, and hypertension [18].

The role of lipoprotein(a) [Lp(a)] during pregnancy should also be noted. As an inflammatory lipoprotein, it can induce endothelial dysfunction in the vascular system, including the placenta. Elevated Lp(a) concentrations are observed in 20%–30% of pregnant women. According to the latest recommendations of the Polish Cardiac Society and the Polish Lipid Association (2024), its measurement should be considered during pregnancy because it may be associated with a greater risk of recurrent miscarriage, preterm delivery, and low birth weight [19].

All pregnant women experience a physiological increase in serum lipid concentrations. An additional increase is particularly important in the group with pre-existing lipid disorders because discontinuing lipid-lowering therapy during pregnancy leads to a further increase, which may result in increased exposure of arterial vessels to atherogenic lipoproteins during pregnancy. Dyslipidemia is common in women with gestational hyperglycemia and obesity, in whom abnormal lipid levels are associated with adverse pregnancy outcomes, such as fetal macrosomia and pre-eclampsia [20]. The association of dyslipidemia with gestational hypertension is also well-documented. Elevated triglyceride concentrations have been linked to conditions such as pre-eclampsia, in which endothelial dysfunction plays a key role [21].

In summary, dyslipidemia during pregnancy is a complex problem influenced by various factors, including ma-

ternal body weight, metabolic status, and the presence of gestational diabetes. It should also be noted that women are becoming pregnant at an older age, so we may observe more women with pre-existing cardiovascular risk factors or diagnosed disease, as well as familial hypercholesterolemia (FH), which requires a personalized approach to lipid disorders. Effective control of individual lipid fractions in pregnant women is essential to reduce the risk of complications. It should be remembered that pharmacotherapy for lipid disorders in pregnant women is associated with many limitations. These result from potential risks to the health of the mother and the developing fetus. Moreover, available data indicate that the most frequent 25%–30% increase in LDL-C concentration during pregnancy usually does not significantly increase cardiovascular risk in the mother or the risk of atherosclerosis development in the child [17]. Non-pharmacological methods (lifestyle modification) should always be the basis of treatment for lipid disorders.

Hypertriglyceridemia

One of the significant problems during pregnancy is severe hypertriglyceridemia, which can be life-threatening for both the mother and child due to the high risk of acute pancreatitis in the mother. Triglyceride concentrations steadily increase in each trimester, most significantly in the second and third trimesters, which creates a high risk of serious complications, especially in women who had pre-pregnancy triglyceride levels ≥ 500 mg/dl (5.6 mmol/l) [22], and particularly in women diagnosed with primary hypertriglyceridemia.

Familial hypercholesterolemia

Approximately 80% of dyslipidemia results from factors such as diet and lifestyle, but women with a genetic predisposition to these disorders, e.g., FH, are at a higher cardiovascular risk than men. Studies have shown a similar relative increase in lipid fractions during pregnancy in women with and without FH, but triglycerides increased more in the FH group (116% vs. 103.4%). Lipid levels returned to normal 3–6 months postpartum, and differences in pregnancy complications were insignificant [23]. One study analyzed 39 pregnancies of women with homozygous FH (HoFH), of whom 19 were treated with statins. Statins did not increase the frequency of complications and were safe for the mother and child in this group of patients. Eighty-four percent of cases ended in term delivery, and the rates of miscarriage and preterm birth were 8% each [24]. In another paper, the authors described 10 successful deliveries after apheresis in patients with HoFH; lack of treatment was associated with a higher risk of death [25]. Lipoprotein apheresis can also prevent complications such as pancreatitis in severe hypertriglyceridemia. The European Atherosclerosis Society recommends lipoprotein apheresis every 1–2 weeks during pregnancy for patients with HoFH, and if it is unavailable, continuation of statins from the second trimester [26]. According to the recommendations of the International

Atherosclerosis Society, continued statin therapy should be considered in women with HoFH and atherosclerosis CVD; the use of statins, ezetimibe, proprotein convertase subtilisin/kexin type 9 (PCSK9) monoclonal antibodies, or other lipid-modifying therapies should be considered, especially after the first trimester of pregnancy, particularly if the target LDL-C concentration has not been achieved and apheresis is not available or feasible [27].

Treatment of lipid disorders before pregnancy

In all patients with lipid disorders who are planning a pregnancy, a cardiovascular risk assessment is recommended, along with the measurement of lipid and Lp(a) concentrations. Monitoring of the lipid profile should be continued throughout the pregnancy. There is a lack of data on the frequency of such measurements, so they should be individualized. Before becoming pregnant, lifestyle changes are recommended, including both dietary modifications and increased physical activity. Collaboration with a dietitian to create a personalized nutrition plan may be beneficial. In patients at high cardiovascular risk (diagnosed CVD, HoFH), lipid-lowering drugs should be included in addition to lifestyle modifications. Before starting statins, ezetimibe, PCSK9 inhibitors, or other lipid-modifying therapies, all women should be offered preconception counseling. Women with HoFH or high-risk heterozygous FH planning a pregnancy should be offered an atherosclerosis CVD assessment using imaging methods (e.g., computed tomography angiography for coronary artery disease or echocardiography for aortic stenosis) [17, 27]. It is necessary to discontinue statin use at least 3 months before planned conception [21].

Treatment of lipid disorders during pregnancy

Treatment of dyslipidemia in pregnancy is difficult due to limited clinical data, which results from the exclusion of pregnant women from studies. Bile acid sequestrants, such as cholestyramine, colestipol, or colesevelam, are the safest lipid-lowering drugs during pregnancy. They work by binding bile acids in the intestine, leading to their excretion and increased production of LDL receptors in the liver. However, they are not very effective in lowering triglycerides and may lead to their increase, so they are not used in hypertriglyceridemia. Bile acid sequestrants may also cause side effects such as constipation or impaired absorption of fat-soluble vitamins [21, 28].

Treatment of gestational hypertriglyceridemia requires multidisciplinary care, the basis of which is a low-fat diet and lipid-lowering therapy regimens. Omega-3 fatty acids are safe for use in pregnancy, even in high doses, and can be used as monotherapy or in combination with fenofibrate (especially in women at high risk of acute pancreatitis) [21].

Statins, despite their benefits in preventing cardiovascular events, are currently contraindicated in pregnancy due to the potential risk of teratogenicity. However, it is worth emphasizing that information about the potential

Table 3. Treatment of lipid disorders in pregnancy

Intervention	Indications
Non-pharmacological interventions (diet, physical activity)	Recommended in every pregnancy
Bile acid sequestrants	Approved for use in pregnancy, may be poorly tolerated due to side effects
Ezetimibe	Used in situations where the benefits outweigh the risks
Fibrates (fenofibrate)	Used in situations where the benefits outweigh the risks
Omega-3 fatty acids	Approved for use in pregnancy
Statins	Contraindicated in pregnancy, to be considered only in cases of severe hypercholesterolemia (severe heterozygous familial hypercholesterolemia, homozygous familial hypercholesterolemia, and after a cardiovascular event, being at very high/extremely high cardiovascular disease risk)
PCSK9 inhibitors	Limited data, no recommendations for use
Inclisiran	Limited data, no recommendations for use
Bempedoic acid ^a	No data, no recommendations for use
Evinacumab ^a	No data, no recommendations for use
Lomitapide ^b	No data, no recommendations for use
LDL apheresis	Approved for use in pregnancy. Potential benefits and risks associated with the procedure should be considered. Available in specialized centers

^aAvailable in Poland only for targeted import. ^bLomitapide available under the B.101 program for patients with homozygous familial hypercholesterolemia

Abbreviations: LDL, low-density lipoprotein; PCSK9, proprotein convertase subtilisin/kexin type 9

mutagenicity or teratogenicity of statins comes mainly from animal data, and studies on the use of statins in women with FH or in women using statins for many weeks without realizing they were pregnant have not confirmed the risk associated with their use [21, 27]. However, statin therapy may be a therapeutic option for patients with severe hypercholesterolemia, especially in women with FH (primarily in the course of HoFH) and those at very high or extremely high risk of CVD, including a history of acute coronary syndromes or stroke [23].

In turn, fibrates and ezetimibe can be used in individual cases where the benefits outweigh the risks, especially (fenofibrate) at very high triglyceride concentrations (>500 mg/dl), particularly from the second trimester [21].

So far, a small number of studies have been conducted on the use of PCSK9 modulators in pregnancy — both monoclonal antibodies and small interfering RNA (inclisiran) [21]. In the case of evolocumab, studies have shown a decrease in T-cell-dependent responses after KLH (key-hole limpet hemocyanin) immunization in monkeys [21, 29]. However, other available reports indicated that the administration of PCSK9 inhibitors had no effect on fetal growth and development in monkeys. Nevertheless, data from human studies are lacking or insufficient. Therefore, due to the lack of an established safety profile, there were expectations that observational studies would provide data. However, two observational studies on evolocumab were prematurely terminated in December 2020, and a similar decision was made regarding the alirocumab registry during pregnancy in November 2020 due to changes in the requirements after the drug was placed on the market [29]. For inclisiran, due to its method of administration (twice a year), it would seem reasonable to administer it before pregnancy and then immediately after delivery, expecting as much as a 30%–40% LDL-C reduction, but there is still a lack of data confirming the safety and effectiveness of this

approach [29]. A non-interventional study is also currently underway in Switzerland (EUPAS42905) to assess its safety in pregnant women (Table 3).

HYPERTENSION BEFORE AND DURING PREGNANCY

Epidemiology

Hypertension affects approximately 10% of pregnant women worldwide and is a major cause of complications in the mother, fetus, and newborn. Maternal risks include pre-eclampsia, eclampsia, placental abruption, stroke, pulmonary edema, thromboembolic complications, multi-organ failure, and disseminated intravascular coagulation. Fetal risks include IUGR (25% of pre-eclampsia cases), prematurity (27% of pre-eclampsia cases), and intrauterine fetal demise (4% of pre-eclampsia cases) [30]. Newborns of mothers with hypertension are also at risk of preterm birth, low birth weight, and perinatal death. The occurrence of hypertension in pregnancy is also associated with a 60%–80% increased risk of heart failure in the future [16, 30].

Hypertension in pregnancy — classification

Table 4 presents the classification of hypertension in pregnancy.

Hypertension in pregnancy — diagnosis

The threshold blood pressure (BP) value in pregnancy for the diagnosis of hypertension is BP $\geq$ 140/90 mm Hg. To diagnose hypertension, it is recommended that it be confirmed outside the office (home or ambulatory continuous BP monitoring) or at least one repeated BP measurement in the office during the next visit. The diagnosis of hypertension in pregnant women must be confirmed by measurements outside the doctor's office within seven days in the first trimester and up to three days in the second and third

Table 4. Classification of hypertension in pregnancy

Diagnosis	Diagnostic criteria
Pre-existing hypertension	Occurrence before pregnancy or before the 20 th week of gestation
Gestational hypertension	Develops after the 20 th week of gestation and usually resolves within 6 weeks postpartum. Not accompanied by proteinuria or biochemical abnormalities
Pre-eclampsia	Hypertension in pregnancy accompanied by newly diagnosed: (a) proteinuria (>0.3 g/day or ≥30 mg/mmol albumin to creatinine ratio), (b) dysfunction of other maternal organs, including acute kidney injury (serum creatinine ≥1 mg/dl), liver dysfunction (elevated aminotransferase activity >40 U/l), neurological complications (seizures, altered mental status, sudden vision loss, stroke, severe headache, and persistent visual disturbances), or hematological complications (platelet count <150 000/μl, disseminated intravascular coagulation, hemolysis), or (c) uteroplacental dysfunction (intrauterine growth restriction, abnormal umbilical artery blood flow, or stillbirth)
Eclampsia	Tonic-clonic seizures combined with loss of consciousness, not preceded by pre-eclampsia in 40% of cases; treated as eclamptic if at least 2 of 4 symptoms occur within the next 24 hours: hypertension, proteinuria, thrombocytopenia, ↑ aspartate aminotransferase
HELLP syndrome (hemolysis, elevated liver enzymes, low platelets)	Coagulation disorders, liver damage, thrombocytopenia

Table 5. Laboratory tests in a patient with hypertension in pregnancy [31]**Basic laboratory tests in a patient with hypertension in pregnancy**

- Urinalysis
- Complete blood count with hematocrit
- Liver enzyme activity (ALT, AST, LDH), liver function assessment (INR, bilirubin concentration, albumin concentration)
- Serum creatinine and electrolytes
- Fasting glucose, and in case of risk factors for gestational hyperglycemia, 75 g oral glucose tolerance test (75 g OGTT)
- Lipid profile
- TSH

Abbreviations: ALT, alanine aminotransferase; AST, aspartate aminotransferase; INR, prothrombin time (expressed as international normalized ratio); LDH, lactate dehydrogenase; OGTT, oral glucose tolerance test; TSH, thyroid-stimulating hormone

trimesters. Hospitalization is indicated in pregnant women with BP ≥160/110 mm Hg and/or symptoms indicating pre-eclampsia [31, 32].

Table 5 shows a panel of laboratory tests to be performed in a patient with hypertension in pregnancy.

Pre-eclampsia

Women at high risk of pre-eclampsia should be advised to take 100–150 mg of acetylsalicylic acid (ASA) daily (at bedtime). ASA therapy should be initiated between the 11th and 16th week of gestation and continued until the end of the 36th week of gestation. In addition, moderate physical activity (a total of at least 140 minutes per week) is recommended as part of pre-eclampsia prevention. Salt intake should also be limited in patients with pre-existing hypertension [16, 32].

Treatment of hypertension in pregnancy

It is recommended that antihypertensive treatment be initiated in all pregnant women with confirmed BP ≥140/90 mm Hg, to limit progression to severe hypertension and the associated risk of pre-eclampsia. In women with chronic and gestational hypertension, it is recommended that systolic BP is lowered to below 140 mm Hg and diastolic BP to 80–90 mm Hg. There is a lack of evidence confirming target BP values at 120–129/70–79 mm Hg in the case of

pregnancy, although such evidence exists in the case of non-pregnant patients taking antihypertensive drugs.

Labetalol and alpha-methyldopa are first-line drugs in BP control in women with pre-existing hypertension. An alternative drug is extended-release nifedipine. Due to the limited availability of nifedipine, metoprolol and amlodipine are used in practice. Despite limited data regarding the widespread use of these drugs during pregnancy, they are effective in controlling BP and do not show harmful effects on the fetus [31].

PHYSICAL ACTIVITY IN PREGNANCY**Importance of physical activity in pregnancy**

Regular physical activity reduces the risk of hypertensive conditions and gestational diabetes. In addition, it has a beneficial effect on mental health (counteracts perinatal depression), and it positively affects cognitive function and sleep [33]. Physical activity also plays an important role in maintaining a normal body weight and preventing obesity [34]. Pregnant women who regularly engage in sports are much more likely to give birth vaginally and less likely to experience problems with urinary incontinence. Systematic exercise during pregnancy increases cardiorespiratory fitness and joint mobility, and enables the maintenance of motor skills. Movement also prepares a woman's body for the effort required during childbirth and after the birth of the child. Workouts reduce symptoms that appear during pregnancy, such as back pain, varicose veins, edema, and constipation [35]. It is believed that active women return to form faster after childbirth and have an easier postpartum period [36].

Exercise in pregnancy — general recommendations

Pregnant women with normal pregnancies are advised to undertake at least 150 minutes per week throughout the pregnancy of moderate-intensity physical activity (e.g., brisk walking, swimming, resistance training/exercises shaping individual parts of the body, gardening) spread over 3 or more days a week. If the above assumptions

Table 6. Proposals for adjusting training volume in pregnant women

Trimester	Volume adjustment
First trimester	Up to 80% of pre-pregnancy values
Second trimester	Up to 90% of pre-pregnancy values
Third trimester	Up to 50% of pre-pregnancy values

cannot be met, patients should be encouraged to engage in any physical activity every day to minimize time spent sitting. Moderate-intensity physical activity undertaken during pregnancy is not associated with the following: pregnancy loss, miscarriage, premature birth, premature rupture of membranes, neonatal death, low birth weight, peripartum injuries in the parturient, or a greater risk of labor induction [37].

An exercise program for women who were not physically active before pregnancy should initially include low-intensity activities such as walking or swimming in short sessions (e.g., 15-minute sessions). These should be gradually extended until the minimum level of physical activity recommended for pregnant women is reached. Women who were physically active before pregnancy can continue their existing exercises, provided that the pregnancy is uncomplicated and does not cause discomfort during exercise [37] (Table 6). It has been shown that performing 3–5 submaximal running intervals with an intensity of up to 90% of maximum peak oxygen uptake (VO_{2max}) did not negatively affect heart rhythm disturbances in the fetus. Exercises with an intensity above 90% of the mother's maximum heart rate may cause bradycardia in the fetus. Average blood flow in the uterine artery decreased by 25%–60% during intense exercise [38]. According to clinical data, the training intensity of pregnant athletes (in each trimester) not exceeding >90% of maximum exercise capacity during pregnancy is safe for the mother and fetus [39].

Exercise in pregnancy — safety principles

Pregnant women are not advised to participate in new and technically difficult sports. Women who practice disciplines involving the risk of falling or contact sports before pregnancy should modify their training plan to minimize the possibility of injury. During strength training, especially pressing exercises, there is a significant increase in blood pressure — systolic up to 300 mm Hg and diastolic up to 150 mm Hg — and an increase in intra-abdominal pressure of 150 mm Hg [40]. There are few data indicating the extent to which such pressure changes may affect the well-being of a pregnant athlete and the course of pregnancy, and whether they pose a potential risk. A pregnant woman continuing competitive sports should be aware of the lack of data regarding the safety of intense physical activity for both the well-being of the fetus and the condition of the newborn or the further development and health of the child. In the event of any symptoms of premature birth,

Table 7. Symptoms requiring immediate cessation of exercise and medical attention

• Chest pain • Unexplained shortness of breath before exercise • Dizziness or headache, feeling faint • Muscle weakness • Calf pain, also with swelling and possible redness • Sudden swelling of the ankles, hands, or face • Bleeding or amniotic fluid leakage from the genital tract • Worse perception of fetal movements • Uterine contractions, pain in the lumbar region (symptoms indicating premature labor)
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bleeding from the genital tract, or placental insufficiency, the pregnant woman should significantly reduce the level of physical activity [38]. Table 7 summarizes the symptoms for which a pregnant woman should immediately stop training and urgently consult a physician.

According to current medical knowledge based on facts, a routine bed rest regimen is not recommended in the general population of patients. Attention is drawn to the negative health consequences of this practice, such as the risk of thromboembolic disease, bone demineralization, and deterioration of the pregnant woman's condition, as well as negative psychosocial effects affecting not only the mother but the entire family. There are no research results indicating improved outcomes in women at risk of premature birth who are subjected to activity restriction, including bed rest. Based on available evidence from Cochrane reviews, it is believed that recommending bed rest to treat pregnancy complications may be considered unethical [41].

Postpartum activity

Due to the high probability of pelvic floor muscle dysfunction, including stress urinary incontinence in particular, participation in activities with low biomechanical load is recommended in the first 4–6 weeks after childbirth, such as: walking, Nordic walking, dancing, roller skating, cycling (after the perineum has healed), or resistance exercises. The return to more dynamic forms of movement containing running or jumping, such as jogging, running, tennis, or team games, should be adapted to the course of postpartum convalescence, including the return of full pelvic floor muscle function, abdominal muscles, full healing of the wound after cesarean section, episiotomy, or other perineal injuries. After returning from the hospital, a woman in proper confinement can gradually return to resistance exercises from before pregnancy. It is recommended that sessions of a minimum of 5–10 minutes be performed from 3 to 5 times a week. Sessions should be performed alternately (it is inappropriate to perform, for example, only exercises on the abdominal muscles). Exercises should be performed in series, starting with 1–2 series of, for example, 4–6 repetitions, increasing to 2–3 series of, for example, 12–16 repetitions. The progression of difficulty and volume of exercises depends on the characteristics of physical ac-

Table 8. Interventions to improve sleep quality in pregnancy

Intervention
• Regular sleep schedule to stabilize the circadian rhythm • Comfortable sleep environment — dark, quiet, and cool room • Avoiding the use of electronic devices one hour before bed • Using relaxation techniques (breathing exercises, yoga) • Avoiding consumption of caffeine and heavy meals before bed • Regular physical activity, as well as avoiding intense exercise just before bed • If the above techniques are not effective, medical consultation is necessary

tivity during pregnancy and the woman's well-being and individual needs [38, 42].

IMPORTANCE OF ADEQUATE SLEEP DURING PREGNANCY

Adequate sleep during pregnancy is crucial for the well-being of both the mother and the developing child. During pregnancy, women experience many hormonal changes that can lead to sleep disorders such as insomnia, restless legs syndrome, or obstructive sleep apnea. These disorders can have serious health consequences for both the mother and the child [43, 44]. They are often associated with other diseases, such as gestational hypertension. Studies indicate that women with gestational hypertension may be more prone to sleep disorders, which in turn may worsen their health and lead to complications such as pre-eclampsia [43].

Sleep is also important for the mental health of pregnant women. High levels of anxiety and stress, which often accompany pregnancy, can lead to sleep disorders, which in turn can affect the development of postpartum depression [44, 45]. Women who experience sleep disorders may have difficulty coping with emotions and stress, which can negatively affect their ability to care for a newborn [46].

Recommendations for sleep during pregnancy include creating a sleep-friendly environment, such as a dark, quiet, and cool room, as well as avoiding caffeine and heavy meals before bed [47]. Regular physical activity, as well as breathing exercises, may also be helpful in improving sleep quality [48] (Table 8). In the case of serious sleep disorders, such as obstructive sleep apnea, it may be necessary to implement appropriate medical interventions. Treatment of these disorders is crucial to minimize the risk of health complications [43]. Cooperation between specialists is necessary to provide comprehensive care for pregnant women.

OPTIMAL DIET BEFORE AND DURING PREGNANCY WITH CONSIDERATION OF LIPID AND CARBOHYDRATE METABOLISM DISORDERS

Pregnancy is associated with a series of anatomical, metabolic, and physiological adaptations that occur in a pregnant woman's body. These include increased tissue resistance to insulin, additional accumulation of adipose tis-

sue, a hypercoagulable state, and numerous hemodynamic changes. Although they are part of the natural process, they can lead to the development of pregnancy complications such as hyperglycemia in pregnancy (gestational diabetes mellitus [GDM] and diabetes in pregnancy [DIP]), hypertension, thromboembolic complications, or dyslipidemia, and these in turn increase the risk of developing CVD during pregnancy and later after its completion [2]. Epidemiological data indicate an increasing trend in the development of CVD in pregnant women due to the higher incidence of risk factors even before pregnancy, especially diabetes, hypertension, and obesity. An appropriately composed nutritional approach can be the basis or an element of prevention and treatment of cardiovascular risk factors and CVD in the period before and during pregnancy [30].

Nutritional recommendations for pregnant women

The diet during pregnancy requires appropriate balancing to cover the increased demand for energy, nutrients, and fluids. It is recommended that a varied diet be maintained, based on healthy eating recommendations. Dietary recommendations for pregnant women must first and foremost be characterized by a high safety profile for both the mother and child; hence, the use of nutritional interventions without clear medical indications that carry the risk of deficiencies is contraindicated (e.g., slimming diets or diets with an alternative distribution of macronutrients [low-carbohydrate diet, low-fat diet]) as well as diets that have not been fully assessed for safety in this group (e.g., ketogenic diet) [49].

Weight control

All pregnant women are advised to regularly monitor their body weight and enter measurements on a pregnancy card. The greatest weight gain occurs after the 20th week of pregnancy. The recommended weight gain is assessed taking into account the mother's nutritional status before pregnancy, determined using the body mass index (BMI) (Table 9). BMI can be an easy screening test to assess the risk of developing pregnancy complications that increase cardiovascular risk, such as hypertension and GDM. Women planning a pregnancy should be offered lifestyle change interventions aimed at achieving normalization of body weight [49].

Demand for energy and nutrients

The demand for energy in the first trimester of pregnancy increases slightly; Table 10 presents the norms for additional energy above the basic energy demand in pregnancy calculated taking into account body weight before pregnancy. These norms apply to women who had a normal body weight before becoming pregnant. In women with overweight and obesity, the additional demand for energy during pregnancy is lower. The energy value of their diet should not promote excessive weight gain and should be

Table 9. Recommendations of the Institute of Medicine (2009) regarding optimal weight gain during pregnancy [3, 31]

BMI before pregnancy	BMI interpretation	Recommended weight gain	
		Total	kg/week (2 nd and 3 rd trimester)
<18.5 kg/m ²	Underweight	12.5–18.0	0.51 (0.44–0.58)
18.5–24.9 kg/m ²	Normal weight	11.5–16.0	0.42 (0.35–0.50)
25.0–29.9 kg/m ²	Overweight	7.0–11.5	0.28 (0.23 – 0.33)
≥30.0 kg/m ²	Obesity	5.0–9.0	0.22 (0.17–0.27)

Table 10. Standards for additional energy demand for pregnant women and an example meal supplementing the demand [50]

Trimester	Additional daily energy requirement	Example of a meal supplementing the requirement
I	+85 kcal	1 medium apple (170 g)
II	+285 kcal	Cocktail of natural yogurt 2% (220 g) with strawberries (100 g) and 1 teaspoon of ground flaxseed (5 g)
III	+475 kcal	Sandwiches made of whole-grain bread (2 slices, 70 g) with cottage cheese (80 g), avocado (1/2 piece, 70 g), and fresh vegetables (approx. 100 g)

determined individually under the supervision of a doctor and dietitian [50].

According to the World Health Organization's position, the basic source of nutrients in pregnancy should be a well-balanced diet, and the routine use of multivitamin preparations in all pregnant women is not recommended. The guidelines of the Polish Society of Gynecologists and Obstetricians (PTGiP, 2020) recommend supplementation throughout the entire pregnancy with vitamin D, omega-3 acids (in the form of DHA), and folic acid, and to control iron metabolism and supplement in case of deficiencies [51].

The role of diet in CVD prevention and treatment during pregnancy

The results of previous studies indicate that the implementation of dietary interventions based on the recommendations of the so-called healthy diet is associated with a lower incidence of excessive weight gain, and a lower risk of developing hypertension and GDM. The guidelines of the European Society of Cardiology regarding the management of CVD during pregnancy indicate that in women with CVD, lifestyle change interventions should be implemented as part of preconception counseling, including modifications to the way of eating, which to allow the patient to prepare for pregnancy and to be part of the therapeutic management plan during pregnancy [30].

Diet composition in the prevention and treatment of CVD during pregnancy

So far, an optimal diet recommended in the prevention and treatment of CVD for women in the preconception period and during pregnancy has not been developed. A significant part of the guidelines on healthy eating during pregnancy overlaps with the dietary recommendations in the prevention and treatment of CVD. **Table 11** summarizes the evidence-based components of a cardioprotective diet that can be implemented in women planning pregnancy and in pregnant women [49, 52]. **Table 12** contains

Table 11. Components of a cardioprotective diet that can be implemented in the preconception period and during pregnancy [52]

Follow a diet with an optimal energy intake to maintain a healthy body weight (before pregnancy) or optimal weight gain (during pregnancy)
 Eat plenty of fruit (approx. 200 g/day) and vegetables. Recommended portion of vegetables >400 g/day, ½ portion preferably raw
 Choose whole-grain cereal products (whole meal bread, coarse groats, whole meal pasta, natural cereal flakes), avoid refined cereal products (white bread, fine groats, light pasta)
 Choose healthy sources of protein:

- dairy products with reduced fat content (e.g., fermented dairy products, cottage cheese),
- fish (preferably fatty sea fish),
- lean meat (<10 g total fat/100 g, <5 g saturated fats/100 g), e.g., poultry, lean beef and pork, avoid processed meat,
- plant protein (e.g., legumes and nuts)

Replace animal fats rich in saturated fatty acids (butter, lard) with plant fats rich in unsaturated fatty acids (vegetable oils, nuts, avocado)
 Avoid products rich in trans fats, e.g., fast-food, ready-made confectionery, hard margarines, instant products
 Choose food with the lowest degree of processing, avoid highly processed products
 Avoid consuming beverages and food products with added sugar
 Choose and prepare dishes with a low salt content
 Absolutely do not consume alcohol

recommendations for a diet with a controlled content of fatty acids, which is used in the dieto-prophylaxis of CVD in Polish conditions [53]. Practical tools are useful in changing the way of eating; **Table 13** contains healthier substitutes for traditional food products. The choice of an appropriate nutritional scheme in pregnant women with diagnosed CVD should be in accordance with the recommendations for patients with CVD, while taking into account the limitations related to pregnancy. In the case of high cardiovascular risk, a pregnant woman should consult a clinical dietitian, who can develop individual dietary recommendations [54, 55].

Dietary models recommended in the prevention and treatment of CVD during pregnancy

The best-studied dietary models that contain components of a cardioprotective diet include the Mediterranean diet, the DASH diet (Dietary Approaches to Stop Hypertension),

Table 12. Recommendations of a diet with a controlled content of fatty acids used in dieto-prophylaxis and treatment of cardiovascular diseases (own work)

Product groups	Recommended products	Products recommended for elimination or significant limitation
Cereal products	Whole-grain cereal products (whole meal bread, whole-grain pasta, natural rice, coarse groats, natural cereal flakes)	Refined cereal products (white flour bread, baked goods with added sugar, fine groats, light pasta, white rice, corn flakes, sweet breakfast flakes)
Vegetables	Almost all (50% recommended raw)	Vegetables with a large amount of mayonnaise, cream, yolks, sugar, fried
Fruits	Almost all (limit avocado, bananas, grapes, dates, dried fruit)	Fruits in syrups, with added sugar
Milk and dairy products	Skimmed milk, lean and semi-fat cottage cheese, kefir, butter-milk, natural yogurt	Milk and products with a high fat content: yellow cheese, mold cheeses, processed cheeses, cream, ice cream, sweetened milk beverages
Meat, poultry, cold cuts, fish, eggs	Lean meat: veal, young beef, lamb, rabbit, chicken, lean poultry cold cuts, sirloin Sea and freshwater fish: pollack, hake, trout, bream, sprat, salmon, herring, cod Whole eggs	Fatty types of meat: pork, beef, mutton, goose, offal, duck; fatty meat products (bacon, meat preserves, salami, sausages, frankfurters) Fish preserves, low-quality fish: pangas, tilapia Egg yolks in large quantities
Fat	Vegetable oils: olive oil, rapeseed oil, linseed oil, avocado, nuts (walnuts, hazelnuts, cashews), and seeds (sunflower seeds and pumpkin seeds)	Butter, lard, bacon, suet, hard margarine in cubes
Sugar, sweets/ desserts	Fruit salads, homemade sweets sweetened with fresh or dried fruits	Honey, jams, marmalades, chocolate, all desserts with sugar, e.g., ready-made jellies, bars, cakes, milk desserts
Beverages	Mineral waters, vegetable juices without sugar, green tea, red tea, grain coffee	Alcoholic beverages, sweetened beverages (e.g., Coca-Cola), fruit juices, natural cocoa, strong coffee, fruit and cream drinks, carbonated drinks, sweetened fruit juices

Table 13. Practical tools for working on changing the way of eating with a proposal of healthier alternatives to traditional food products (own work)

Replace...	With...
Butter	Cottage cheese with a fat content of approx. 10%, avocado paste, hummus, vegetable pastes, olive oil
Lard	White bean paste
Cream	Natural yogurt, Greek yogurt, vegetable cashew cream
Sweets	Fresh fruit, fruit-based desserts with vegetables, dried fruit
Mayonnaise/ready-made sauces and dips	Natural yogurt-based dips, tomato salsa, guacamole
Salt	Herbs, magnesium-potassium salt
Sugar	Ripe fruit, sweet vegetables, xylitol, erythritol, maple syrup
Flavored waters	Water with mint, ginger, or fresh fruit

and balanced vegetarian diets. These models can be implemented in pregnant women.

Mediterranean diet

The Mediterranean diet is recommended by the World Health Organization as a dietary model with prophylactic effects in the development of CVD. It is characterized by high nutritional density by being based on plant products with a low degree of processing. The diet is based on a high consumption of vegetables, legumes, fruits, seeds and nuts, whole-grain cereal products, fish, and monounsaturated fats (from vegetable oils, including primarily olive oil), with simultaneously low consumption of saturated fats, mainly from products such as red meat and processed meat products. The main 3 meals during the day should contain three basic elements: whole-grain cereal products (1–2 servings/meal), vegetables (min. 1 serving/meal), and fruits (1–2 servings/meal). The diet is supplemented with dairy products with a lower fat content, fats (mainly in the form of olive oil), nuts and seeds, and products that are a healthier source of protein: fish (>2 servings per week), lean meat (2 servings per week), or eggs (4 servings per week) [56].

DASH diet

The DASH diet was developed as a dietary model aimed at reducing hypertension, although several studies have shown its positive effect on reducing the overall risk of CVD. The composition of the diet is similar to the Mediterranean diet model. It is based on a high consumption of fruits, vegetables, low-fat dairy products, whole-grain cereal products, poultry, fish, and nuts with a simultaneous limitation of the consumption of saturated fats, sugar, red meat, and sodium. In this way, it provides food rich in calcium, potassium, magnesium, fiber, and plant protein. It should be noted that when using the DASH diet during pregnancy, the recommendations regarding a significant limitation of sodium consumption should be modified, due to the lack of data confirming the safety of such a dietary approach in pregnant women [31]. Optimally, dietary sodium intake should be approx. 1.5–2.3 g per day, which corresponds to 4–5 g of table salt. This diet can be recommended to pregnant women after excluding hyperglycemia in pregnancy (GDM and DIP, as well as pre-pregnancy diabetes).

Table 14 summarizes the recommendations for composing a DASH diet.

Table 14. Recommendations for composing a DASH diet with an energy demand of 2000 kcal

Food group	2000 kcal	Serving size
Cereal products	6–8 servings/day	1 slice of whole-grain bread 30 g of cereal flakes ½ cup of cooked groats, pasta
Vegetables	4–5 servings/day	1 cup of green leafy vegetables ½ cup of chopped raw or cooked vegetables 1 cup of vegetable juice
Fruits	4–5 servings	1 medium fruit ¼ cup of dried fruit (unsweetened) ½ cup of fresh, frozen or fruit juice
Dairy products with reduced fat	2–3 servings/day	1 cup of milk/yogurt with reduced fat 45 g of cheese with reduced fat
Lean meat, poultry, and fish	6 servings or less	30 g of cooked lean meat or fish 1 egg
Nuts, seeds, and legumes	4–5 servings/week	45 g of nuts (unsalted) 2 tablespoons of peanut butter 2 tablespoons or 15 g of seeds ½ cup of cooked legumes
Fats	2–3 servings/day	1 teaspoon of soft margarine 1 teaspoon of vegetable oil 2 tablespoons of salad dressing
Sweets	5 servings/week	1 tablespoon of jelly or jam ½ cup of sorbet - Cup of lemonade

Balanced vegetarian diets

In recent years, the growing popularity of diets with a limitation of animal products has caused vegetarian diets to become the subject of many studies. The effectiveness of this dietary model in reducing the risk of developing CVD has been demonstrated. However, due to the risk of nutritional deficiencies associated with the use of the diet (including protein, calcium, zinc, iron, long-chain omega-3 acids, vitamin D, and vitamin B12), they should be used with caution during pregnancy and only on the condition of appropriate balancing and control of the realization of the demand for energy and nutrients [57].

Dietary management in selected diseases and risk factors for CVD

Hypertension

Currently, there is no recommended standard of dietary management in the treatment and prevention of hypertension in pregnant women. Among the studied nutritional models, the DASH diet seems to be an effective dietary approach in controlling blood pressure in pregnant women [30]. In the study by Courtney et al. [58] the DASH diet was associated with lower blood pressure in pregnant women without diagnosed hypertension. It should be noted that due to the lack of a clear position regarding the recommended amount of sodium in the diet of pregnant women with hypertension, the use of the DASH diet in this period should not include a significant limitation of salt consumption [31].

Lipid disorders

In the treatment of hypercholesterolemia, the greatest impact on reducing total cholesterol and the low-density cholesterol fraction is by reducing the consumption of saturated fats and trans fats from food. In the case of an intervention aimed at reducing triglyceride concentrations in pregnant women, the greatest role is played by controlling body weight and reducing the consumption of simple sugars. The best effects in reducing plasma TG concentrations are achieved using food products with a low glycemic index (e.g., raw fruits, vegetables, coarse groats, oat bran, cottage cheeses, fish). Another treatment option during pregnancy is the use of omega-3 fatty acids, which can be safely supplemented during pregnancy. The effectiveness of omega-3 fatty acids depends on the dose and has an impact on the initial lipid values. However, it should be remembered that omega-3 fatty acids may slightly increase the risk of giving birth to a child with a high body weight in relation to gestational age. In addition, conclusions from studies on a group of patients with lipid disorders indicate an increased risk of developing atrial fibrillation during supplementation. In the REDUCE-IT study, such a relationship was observed at a dose of 4 g [54].

Hyperglycemia in pregnancy (GDM and DIP)

Hyperglycemia in pregnancy is an additional cardiovascular risk factor. The composition of the diet is mainly based on modifying the amount and type of carbohydrates. It should provide approximately 40%–50% of the total energy demand — carbohydrate products with a low glycemic index (GI <50) are preferred, i.e., whole-grain cereal products (whole meal bread, coarse groats, whole meal pasta, and natural rice), raw non-starchy vegetables, and fruits with a lower sugar content. Due to very restrictive target glycemia values in pregnant women, carbohydrates should be distributed regularly throughout the day in meals at relatively constant times to be able to adjust insulin doses (if included) and avoid both hyperglycemia and hypoglycemia. Carbohydrates with a low GI, i.e., below 50, are preferred. Knowledge of the concept of glycemic load is useful, which takes into account not only the type of carbohydrates in the product, but also their amount in a portion of food.

Various factors affect the glycemic index and load:

- cooking time (al dente cooked products will have a lower GI);
- degree of processing (a whole fruit has a lower GI than when mixed to a mushy consistency);
- the presence of products that are a source of protein and fat (combining sources of carbohydrates with products rich in protein (e.g., cottage cheese, natural yogurt, legumes) or fats (e.g., nuts, seeds, kernels) in one meal affects the reduction of the glycemic load of the meal [59].

Table 15. Effects of smoking during pregnancy

Increased risk of placental pathology (placenta previa, premature placental abruption)
Increased risk of premature birth
Low birth weight
Increased risk of sudden infant death syndrome
Neurological developmental disorders

Table 16. Effects of alcohol consumption during pregnancy

Fetal alcohol syndrome
Fetal alcohol spectrum disorder
Low birth weight
Increased risk of congenital fetal defects
Fetal growth disorders
Neurological developmental disorders

Table 17. Complications of obesity during pregnancy

Maternal complications
Hypertension
Gestational diabetes and diabetes in pregnancy
Obstructive sleep apnea
Increased risk of infection
Placental dysfunction
Mental disorders

MANAGEMENT OF RISK FACTORS IN WOMEN PLANNING PREGNANCY AND DURING PREGNANCY — SMOKING, ALCOHOL

For women planning pregnancy and pregnant women, lifestyle modification is key, including quitting stimulants. Smoking and alcohol consumption have a proven negative impact on the health of the mother and the development of the fetus (Tables 15 and 16).

Smoking during pregnancy is associated with many adverse health outcomes. Studies have shown that smoking women have a higher risk of premature birth, low birth weight, and congenital fetal defects [60]. Nicotine and other chemicals contained in tobacco smoke can affect the development of the fetal nervous system, leading to long-term problems such as attention disorders and concentration problems [61]. Therefore, it is recommended that women planning pregnancy and pregnant women completely stop smoking. Support programs and interventions aimed at helping pregnant women to quit smoking should be available to minimize the risk to the health of their children [62].

Alcohol consumption during pregnancy is another significant risk factor that can lead to serious developmental disorders in the fetus, known as fetal alcohol syndrome and fetal alcohol spectrum disorder [63]. Alcohol is one of the most common teratogens, and its effect on the developing fetus can lead to brain damage, heart defects, and the development of tumors [64]. Studies have shown that even small amounts of alcohol can have a negative impact on fetal development; therefore, total abstinence from alcohol during pregnancy is recommended [65]. In the case of women planning pregnancy, education about the effects of alcohol consumption and access to support programs can help avoid this risk [66].

It is important for doctors and public health specialists to conduct information campaigns that emphasize the importance of a healthy lifestyle before and during pregnancy. Women should be encouraged to have regular check-ups with a physician to monitor their health and obtain support in the area of a healthy lifestyle, including quitting smoking

and avoiding alcohol [67]. Cooperation with a partner and family also plays a key role in creating an environment that promotes the health of pregnant women [63]. Education, support, and access to intervention programs can significantly affect the improvement of health outcomes of both mothers and their children.

OVERWEIGHT AND OBESITY IN WOMEN PLANNING PREGNANCY AND DURING PREGNANCY

Overweight and obesity in women during pregnancy, as well as those planning it, are important public health problems due to their association with numerous adverse outcomes for the mother and fetus. The incidence of overweight and obesity among women of reproductive age has reached alarming levels, and it is estimated that approximately 50% of women in this demographic group are overweight or obese [68, 69]. Obesity during pregnancy, similarly to non-pregnant women, is defined as a BMI ≥ 30 kg/m² before the first visit during pregnancy or in the first trimester. This condition is associated with an increase in the risk of developing hyperglycemia during pregnancy (GDM and DIP), hypertension, and peripartum complications [68, 70]. Maternal obesity has been linked to various metabolic changes that can negatively affect fetal development. Numerous studies have shown that maternal obesity can lead to macrosomia and metabolic disorders in adulthood [71, 72]. The mechanisms underlying these connections include maternal insulin resistance and gestational hyperglycemia, which induce increased insulin secretion by the fetus [73]. Fetal hyperinsulinemia is precisely the factor inducing metabolic disorders in the fetus.

Maternal obesity has a significant impact on fetal development. Studies indicate that it is associated with placental hypertrophy and altered nutrient transport, which can exacerbate fetal growth and lead to complications such as fetal hypoxia [74, 75]. In addition, the increased production of pro-inflammatory cytokines in pregnant women with obesity may contribute to placental dysfunction [70, 76].

Interventions aimed at reducing body weight before and during pregnancy are necessary to improve the health of the mother and fetus. Evidence suggests that lifestyle modifications, including changes in diet and increased physical activity, can help reduce risk factors associated with obesity during pregnancy [76]. For example, dietary interventions and lifestyle modification have been shown to reduce the incidence of GDM and improve proper fetal

growth in pregnant women with overweight and obesity [77]. Furthermore, regular physical activity during pregnancy is associated with improved maternal metabolic health and reduced risk of complications [76]. Obese women (BMI ≥ 30 kg/m²) should be advised to avoid weight gain of >6.8 kg [30].

The use of glucagon-like peptide-1 (GLP-1) receptor agonists, especially tirzepatide and liraglutide, has attracted the attention of researchers in the context of treating obesity and reproductive health in women planning pregnancy. Tirzepatide, a dual agonist of GLP-1 and glucose-dependent insulintropic peptide, has shown significant effectiveness in reducing body weight, which is important for increasing fertility in obese women, especially those with conditions such as polycystic ovary syndrome [78]. The reproductive effects of GLP-1 agonists are not well understood. Although it has been suggested that GLP-1 receptors are present in the reproductive system, so far there are no clinical data in humans describing the effect on fertility [79]. A single prospective study involving 27 participants reported an improvement in the embryo implantation rate after initial treatment with liraglutide before *in vitro* fertilization. Researchers hypothesized that the anti-inflammatory properties of this drug may positively affect the endometrium [80].

However, it should be remembered about the adverse effects of GLP-1 agonists. Nutritional deficiencies during weight loss may have a harmful effect on the course of pregnancy. BMI before conception should be monitored, and thoughtful nutritional advice should be provided to ensure adequate nutrition for patients taking this drug before conception. Currently, there are no studies on the use of GLP-1 agonists in pregnant patients. Animal studies (i.e., in rats and rabbits) have shown harm to fetal development when maternal weight loss occurred [81]. It is necessary to discontinue the use of these drugs before conception. An assessment of the possible consequences of weight regain in the early stages of pregnancy, as well as an immediate assessment of carbohydrate metabolism parameters, should then be performed. Psychological and dietary care is essential to achieve long-term weight control [82].

It is also important to consider the psychological aspects of managing overweight and obesity in women planning pregnancy and during pregnancy. Women may experience stigmatization and mental health challenges related to their weight, which can affect their overall well-being and pregnancy outcomes [69]. Therefore, providing comprehensive support that addresses both physical and mental health needs is key for women in this group [69].

Overweight and obesity in pregnant women are significant public health problems that require targeted interventions. The associated risks to maternal and fetal health underscore the importance of preconception counseling, lifestyle modifications, and ongoing support during pregnancy.

MENTAL HEALTH CARE DURING PREGNANCY

Pregnant women are often exposed to stressors that can lead to various mental health problems, including anxiety and depression. The prevalence of these conditions is alarming — studies indicate that approximately 20% of women suffer from stress-related mood disorders during and after pregnancy, making them some of the most common complications during this period [83]. It has been shown, among other things, that higher levels of stress experienced by the mother are associated with adverse pregnancy outcomes, such as premature birth and low birth weight [84, 85]. Moreover, the mother's mental state can significantly affect fetal development, and prenatal stress is associated with long-term neurodevelopmental problems in offspring, including an increased risk of mental disorders [86].

The timing of exposure to stress during pregnancy also plays a key role. Stress in early pregnancy is associated with a higher risk of miscarriage, while stress experienced later in pregnancy is more likely to contribute to low birth weight and developmental problems in children [87]. This temporal aspect highlights the need for targeted interventions at different stages of pregnancy to limit stressors and associated risks.

Moreover, the psychosocial environment surrounding a pregnant woman significantly affects her mental health. Factors such as support from a partner and socio-economic status can affect stress levels during pregnancy. One study emphasized that women with a strong social support network reported lower levels of pregnancy-related stress, suggesting that strengthening it may be a viable strategy for improving maternal mental health [88]. On the other hand, a lack of support can lead to anxiety and even depression [89].

In addition to social factors, the importance of a pregnant woman's lifestyle is essential. Emerging evidence suggests that certain dietary components, such as omega-3 fatty acids, may help alleviate stress and improve mood during pregnancy [90]. On the other hand, unhealthy eating patterns and insufficient physical activity have been linked to higher levels of stress and depressive symptoms [91]. Thus, promoting a healthy lifestyle among pregnant women could serve as a preventive measure against mental health problems.

The impact of stress on maternal health is not only psychological but also physiological. Chronic stress can lead to dysregulation of the hypothalamic-pituitary-adrenal axis, which can affect both maternal and fetal health [92]. For example, elevated cortisol levels during pregnancy are associated with an increased risk of gestational hypertension and pre-eclampsia [83].

Interventions aimed at reducing stress and improving the mental health of pregnant women are necessary. Practices such as mindfulness training, yoga, and cognitive-behavioral therapy have been shown to be effective in

alleviating stress and improving mental well-being during pregnancy [93]. In addition, healthcare providers should consider implementing routine mental health assessments as part of prenatal care to identify individuals at risk and provide prompt support.

WOMEN PLANNING PREGNANCY AND DURING PREGNANCY IN THE CONTEXT OF CARDIOVASCULAR PREVENTION IN THE FAMILY DOCTOR'S OFFICE

The family doctor plays an important role in cardiovascular prevention in women planning pregnancy and during pregnancy. Appropriate management during this period can significantly affect the long-term health of the mother and child. The literature emphasizes that pregnancy is a unique opportunity to introduce health interventions that can reduce the risk of CVD in the future [94, 95]. Therefore, family doctors should be well prepared to identify risk factors and provide health education in this area.

Regular monitoring of blood pressure, glycemia, lipid profile, renal and liver function parameters, as well as promoting physical activity among pregnant women are essential [96, 97]. Studies have shown that regular physical activity can help maintain a healthy body weight, which is key for preventing obesity and associated CVD [98]. However, many women face barriers to engaging in physical activity, such as a lack of support from family or concerns about the safety of exercise during pregnancy. Therefore, it is necessary for doctors to encourage patients to engage in exercise and offer support in overcoming these barriers.

Paying attention to the eating habits of pregnant women and providing nutritional education are also key issues. An appropriate diet, rich in nutrients, is very important for the health of the mother and child. Studies show that women who follow a healthy diet have a lower risk of cardiovascular problems [99].

An important element of cardiovascular prevention is also stress management. Pregnant women often experience increased levels of stress, which can negatively affect their mental and physical health. Family doctors should be able to identify symptoms of stress and depression and offer appropriate psychological support or refer patients to specialists if necessary [100].

In the context of cardiovascular prevention, risk factors such as smoking cannot be forgotten. It is important for doctors to promote smoking cessation programs and offer support for women who want to reduce or quit smoking.

In summary, family doctors play a key role in cardiovascular prevention in women both before and during pregnancy. By monitoring health status, promoting physical activity, promoting healthy eating — especially in families with obesity and hypertension — managing stress, and supporting smoking cessation, they can significantly affect the health of mothers and their children.

VACCINATIONS

Vaccinations are an important issue for women planning pregnancy and during pregnancy. Before becoming pregnant, it should be ensured that vaccinations against chickenpox, measles, mumps, and rubella (live vaccines) have been carried out. Live vaccines are not recommended during pregnancy because there is a theoretical risk of transmitting the vaccine microorganism to the fetus. Vaccinations against influenza, diphtheria, tetanus and pertussis, COVID-19 (coronavirus disease 2019), and RSV (respiratory syncytial virus) are recommended during pregnancy. Vaccination against RSV is recommended for pregnant women between 24–36 weeks of gestation, optimally between 32 and 36 weeks, to protect the child from RSV until 6 months of age. Vaccination against RSV does not interfere with other vaccinations, e.g., against influenza.

CONCLUSIONS

Prevention of CVD is an extremely important element of ensuring the health of both the mother and child. In the context of pregnant women, it is essential to understand the risk associated with CVD and implement appropriate preventive strategies. One of the basic activities is promoting a healthy lifestyle, which includes a balanced diet, regular physical activity, and maintaining sleep hygiene. In addition, it is necessary to remember about psychological support, because exposure to stress during pregnancy increases the risk of maternal-fetal complications. Another important element of prevention is identifying patients at high risk of pre-eclampsia and early implementation of appropriate management. It is also important that women who have experienced complications during pregnancy are regularly monitored postpartum. Women with gestational hypertension should be advised to visit a gynecologist-obstetrician 6 weeks after childbirth and to have regular check-ups in a cardiology clinic (3 and 12 months after childbirth, then every year) [31]. It is recommended that such patients be covered by programs that include regular assessment of general health, blood pressure measurements, blood glucose measurements, and lipid profile parameters. In addition, it is worth emphasizing the role of the family doctor in monitoring risk factors. It is to them, in addition to the gynecologist, that pregnant patients report most often. They can implement appropriate diagnostic and therapeutic strategies and, if indicated, refer the patient to a specialist. In summary, the prevention of CVD in women planning pregnancy and during pregnancy requires a multifaceted approach. Such actions can significantly improve the health of women and their children and reduce the risk of CVD in the future.

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