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## **The Role of Health Behaviors in the Prevention and Management of Hypertension in Pregnancy: Current Guidelines and Perspectives**

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## **Abstract**

### **Introduction and purpose**

Hypertensive disorders during pregnancy are related to a greater risk of both maternal, and fetal as well as neonatal morbidity and mortality. This literature review aims to synthesize the health-promoting behaviors in daily life like diet, body mass, exercises in the prevention and management of hypertension and possible complications. Gestational hypertension occurs after 20 weeks' pregnancy and usually resolves after 6 weeks' postpartum. Diagnosis of gestational hypertension appears at values  $>140/90$  mmHg in pregnant women. It has to be confirmed in out-of-office BP measurements, and if it's not possible by two separate medical appointments. According to current European guidelines, pharmacological therapy should be introduced in pregnant women with sustained elevated blood pressure  $\geq 150/95$  mmHg and at values  $>140/90$  mmHg in pregnant women with gestational hypertension. Summarizing the current understanding of risk factors in hypertensive disorders during pregnancy seeks to enhance implementing positive health behaviors in prevention.

### **Materials and methods**

The following review of studies was based on articles obtained from the PubMed and Google Scholar databases. Key search terms included gestational hypertension, pre-eclampsia, diet, physical activity, pharmacological treatment, obesity, prevention.

### **Conclusion**

The literature review highlights the importance of BP measurements, diet restrictions, exercises of a low to moderate-intensity, pharmacological treatment during pregnancy as key factors in prevention of gestational hypertension. Greater awareness of hypertension in pregnancy encourages optimism for comprehensive research in the future.

**Key words:** gestational hypertension; pre-eclampsia; diet; physical activity; obesity;

### **Introduction**

Gestational hypertension is new hypertension (BP  $\geq 140/90$ ) first observed after 20 weeks of pregnancy without proteinuria and returning to normal values within 12 weeks after

delivery. The final diagnosis is made after delivery. This occurs in about 6-8% of all pregnancies in Poland. [1] It can lead to severe complications like pre-eclampsia (PE) which is the most dangerous as it can further lead to death of both mother and fetus. HELLP syndrome is another serious complication which stands for hemolytic anemia, elevated liver enzymes and low platelets, hypertrophy of the fetus or even a stroke of a mother. Gestational hypertension must not be mistaken with chronic hypertension which is present before pregnancy or before 20 weeks. This article draws from the newest position statement on treatment and management of gestational hypertension and chronic hypertension in pregnant women from 2019 prepared by Polish Society of Gynecologists and Obstetricians (PTGiP), Polish Society of Hypertension and Polish Cardiac Society. The approach of Polish medical professionals to hypertension in pregnancy is largely based on 2018 ESC recommendations used in most European Union countries.

## **Epidemiology**

There is no one cause of hypertension in pregnancy but a number of risk factors have been identified. Modifiable risk factors are: high body mass index, anemia and lower education. The non-modifiable factors are mother's age, nulliparity, multiple pregnancy, history of high blood pressure in a previous pregnancy, gestational diabetes, existing high blood pressure or type 2 diabetes before pregnancy, a preexisting urinary tract infection, a family history of high blood pressure, type 2 diabetes and history of pre-eclampsia. [2]

Dietary factors may predict an occurrence of gestational hypertension. A cross-sectional study showed that high intake of salt may lead to increased risk of gestational hypertension. [3] A review and analysis of multiple studies revealed that women who frequently consume processed meat, salty snacks and sweet drinks have a higher risk of developing complications such as pre-eclampsia.[3]

According to Global Burden of Disease Study and World Health Organization, the highest number of deaths caused by hypertensive disorders in pregnancy and years lived with disability occurred in the 25–29 age group, followed by the 30–34 and 20–24 age groups. However, the lowest estimated incidence rate was seen in the 25–29 age group, with higher incidence rates found in both the youngest and oldest age groups. [4]

In 2019, a positive relationship was observed between the incidence rates of gestational hypertension and both the sociodemographic index and the Human Development Index across all countries and regions. Countries and regions with lower sociodemographic and Human Development Index had higher age-standardized incidence rates. [4,5]

## **Current guidelines**

PTGiP offers in its guidelines non-pharmacological and pharmacological management of hypertension in pregnancy ( $BP \geq 140/90$ ). Lifestyle modifications such as ceasing alcohol drinking and smoking tobacco are one of the key recommendations made, especially that tobacco smoking pertains to 30% of Polish pregnant women. Dietary changes should be based on general healthy eating habits for adults, rather than following a special diet. Continuing physical exercise in moderate amounts is advised as it contributes to preterm labor reduction and lowers the chance of pregnancy hypertension. It is recommended that pregnant women with BMI within normal range (18,5–25 kg/m<sup>2</sup>) before conception, should gain 11.5-16 kilograms, whereas overweight and obese women are advised to gain between 7-11 and 5-9 kilograms respectively. [2]

If medication is needed to control hypertension, PTGiP recommends labetalol and nifedipine as medications of first choice, no matter if hypertension is chronic or gestational. In hypertensive urgencies hydralazine is additionally recommended to labetalol and nifedipine. The last two can be used when breastfeeding. [2]

National Institute for Health and Care Excellence (NICE), composed of groups of experts which review current medical evidence, recommends that pregnant women with chronic hypertension should be offered advice on weight management, exercise, healthy eating and lowering the amount of salt in their diet. If safe in pregnancy antihypertensive treatment should be continued in patients with existing hypertension, unless sustained BP is below 110/90 or the patient has symptomatic hypotension. Antihypertensive treatment should be offered to women who were not treated already if their sustained BP is  $\geq 140/90$ . The target BP in pregnancy hypertension is 135/85. Labetalol should be offered first for chronic hypertension in pregnancy, the next alternative should be nifedipine. Methyldopa should be considered if both medications cannot be taken as it is least effective of the three. NICE recommends basing physician's decision on any pre-existing treatment, side-effects, risks (both fetal and maternal effects) and the woman's preference. To rule out pre-eclampsia placental growth factor based testing should be offered to women with chronic hypertension identified to be at a risk of developing pre-eclampsia. For women with gestational hypertension, the same antihypertensive treatment should be offered - labetalol, nifedipine and methyldopa. After 12 weeks of gestation 75 mg to 150 mg of aspirin should be offered only to pregnant women with chronic hypertension. [6]

## **Monitoring**

BP decreases in the first three months of pregnancy as a result of vasodilation caused by locally acting factors such as prostacyclin and nitric oxide. This fall in BP primarily affects diastolic BP (DBP), with lowest recorded values at 20-24 weeks (a decrease in DBP of 8-15 mmHg), and is followed by a progressive elevation to pre-pregnancy values at 36 weeks. [7] This fluctuation in blood pressure occurs in both normotensive and hypertensive pregnant women. Pre-existing hypertensive females may experience a more significant decrease in blood pressure in the beginning of pregnancy, and as a result, the increase in blood pressure in the third trimester may be incorrectly diagnosed as gestational hypertension. Blood pressure tends to fall in the early stages after delivery and then rises gradually during the first five postnatal days, reaching a peak on the third to sixth postnatal day. It is important to highlight that 10% of maternal deaths due to hypertensive disorders of pregnancy occur in the postpartum period.

In emergency cases of hypertension, it is recommended that BP be obtained in both arms and lower limbs if there is clinical suspicion of aortic dissection. [8] Ambulatory blood pressure monitoring (ABPM) is more effective than standard blood pressure measurement in predicting pregnancy outcome. [9] It can help to eliminate white-coat hypertension, which is highly prevalent in pregnancy [10], and can detect nocturnal hypertension, a frequent finding in pre-eclampsia. [11] In combination with telemonitoring of blood pressure data, self-monitoring may be the future solution to reduce repeated office visits and hospital admissions. [12]

## **Prevention**

Exercise may reduce the risk of pre-eclampsia by 30% to 40% and any physical activity is highly recommended before the pregnancy, not only during. [13] Losing weight by overweight women decreases the risk of both chronic and gestational hypertension. [14] In the first trimester, physical activity should not be reduced unless the physician has contraindications. If a woman has not started any exercises before pregnancy and her activity level is low, a 20-30 minutes walk 3-5 times a week should be a good start. Any strength training should be at a moderate level of intensity and beginners should avoid exercises with heavy weights as they increase intra-abdominal pressure. [15] During the second trimester, any activities that may end with falling and injuries like skiing, wrestling or jumping should be avoided. Safety first, that is why any low-impact exercises are crucial. These are pilates, calm indoor cycling, swimming or yoga maximum 5 times a week for 30 minutes. [16]

According to the American College of Obstetricians and Gynecologists (ACOG) recommendations from 2020 the heart rate for pregnant women should be approximately 25-30% lower than non-pregnant ones and should not exceed 140 beats per minute (BPM). The heart rate should be measured at the peak of activity. [17] During the last trimester, all exercises from the second trimester can be done but with the lower intensity. What is more, pelvic floor exercises can help with urine leakage that happens afterbirth.

Studies around the world found that a diet rich in fruits, vegetables, and low-fat dairy products was linked to a 51-82% lower risk of developing pre-eclampsia. [18] Most women with a healthy weight before pregnancy do not need additional calories during the first trimester but they need about 340 extra calories per day during the second trimester and around 450 extra calories per day during the third trimester. [19] The Polish population lacks vitamin D and supplementing with minimum 600 IU/day of vitamin D3 plays a significant role in reducing a risk of pre-eclampsia. [20] PTGiP recommends that all pregnant women supplement vitamin D3 at a dose of 1500-2000 IU per day. In obese women, this dose may be increased to 4000 IU. However, it is not recommended to take larger amounts due to side effects.[30]

Magnesium is found in cereal products, legumes, nuts, potatoes, bananas and dark chocolate. Decrease in pregnancy complications such as gestational hypertension and preeclampsia was observed in a randomized controlled trial, women who received both 200 mg effervescent magnesium tablet and 100 mg magnesium multimineral tablet a day until the end of pregnancy. [21] Prepregnancy calcium supplementation at 500 mg/day benefited women with a history of preeclampsia. Recent evidence suggests that supplementation of calcium 500mg/day shows statistically significant reduction in preeclampsia and is recommended by the World Health Organisation (WHO) to women at risk. In populations with low dietary calcium intake, WHO recommends supplementation of 1.5-2g/day. [22]

As gestational hypertension can overlap with chronic hypertension, females suffering from the chronic hypertension should note that it is recommended to use 100–150 mg of acetylsalicylic acid in one dose in the evening. It is necessary to start the therapy before the 16th week of pregnancy and continue taking the medicine until the 36th week of pregnancy. [2] It may decrease the risk by 10% to 20%. [23] All antihypertensive medicines are found in breast milk, most of them in extremely low concentrations. Labetalol, nifedipine and enalapril are generally considered safe and are recommended in most guidelines. In contrast, ACE inhibitors are not recommended if there is a chance of premature birth or renal failure of the newborn. [27][28]

## Complications

The most severe complication of chronic hypertension in pregnancy and gestational hypertension is PE which is persistent high blood pressure during pregnancy, labor or postpartum and is characterized by high levels of proteins in the urine that indicate kidney damage; seizures and decreased blood platelets. PE can lead to eclampsia which is characterized by generalized seizures and if not treated usually proves fatal. [24][29] Eclampsia develops in 3% of PE. [25]

Other complications are shown in the table below:

Maternal complications	Fetus complications
cesarean section	intrauterine growth restriction (IUGR)
intracerebral bleeding, stroke	intrauterine fetal death
HELLP syndrome	hypoxia
kidney and liver failure	prematurity
DIC	oligohydramnios
left ventricular heart failure and pulmonary edema	premature separation of the placenta

Based on 2019 PTGiP guidelines

Recent 2023 meta-analysis showed that a history of gestational hypertension can have a positive correlation with the coronary heart disease, stroke, heart failure and diabetes mellitus in the future. [26]

## Birth

When it comes to labor, the rules are quite similar for women with gestational hypertension to those for pregnant women with chronic hypertension. Vaginal delivery is preferred but if there is a case of severe hypertension not responding well to treatment, a cesarean section is necessary and the pregnancy should not last more than 38 weeks. Any pregnancy complicated with preeclampsia should be ended after the 37th week of pregnancy - the delivery method



depends on the maternal and fetal health. In patients with eclampsia pregnancy should be terminated no matter the gestational age. [2]

## **Conclusions**

Gestational hypertension is associated with an increased risk of developing pre-eclampsia. These women should be on low dose aspirin from week 12 to week 36 to 37. The same prevention is advised for all high-risk pregnant women, such as those with hypertension in a previous pregnancy, chronic kidney disease, auto-immune disease or with diabetes. Aspirin in a low dose should also be given to women at moderate risk of pre-eclampsia.

Calcium is recommended for the prevention of pre-eclampsia only in those women with a low level of dietary calcium intake (<600 mg per day). Vitamin D is also suggested for the protection of pre-eclampsia.

For women with preexisting hypertension, a low-salt diet is recommended, and otherwise a regular healthy diet without salt restriction is advised. Exercise of a low to moderate-intensity during pregnancy is beneficial in decreasing the risk of developing gestational diabetes and gestational hypertension. Obese women are advised not to gain weight.

Vaginal labor is preferred in women with hypertension in pregnancy, as long as there are no obstetric considerations for cesarean section. Inducing labor after 37 weeks is related to a better prognosis than expecting in women with gestational hypertension or with minor pre-eclampsia. Postpartum pre-eclampsia can also develop and should be considered if an increase in blood pressure is associated with symptoms such as headache, abdominal pain, visual disturbances, shortness of breath, swelling of the face, hands or feet, or seizures.

## **Disclosure**

### **Author's contribution**

Conceptualization: Rafał Makuch and Adam Kucharski; Methodology: Alicja Wawrzyniak; Software: Alicja Chrościcka; Check: Andrzej Czajka and Kamil Gała; Formal analysis: Konrad Pilarski and Martyna Dewicka; Investigation: Paweł Lenard and Sara Michalska; Resources: Kamil Gała; Data curation: Alicja Chrościcka; Writing - rough preparation: Adam Kucharski and Rafał Makuch; Writing - review and editing: Alicja Wawrzyniak and Konrad Pilarski; Visualization: Martyna Dewicka; Supervision: Sara Michalska; Project administration: Rafał Makuch and Paweł Lenard; Receiving funding - no specific funding.

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### **Conflict of interest**

The authors deny any conflict of interest.

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