

PREVENTION OF PRE-ECLAMPSIA AND GESTATIONAL DIABETES MELLITUS: AN INTERVENTIONAL CONCEPT OF PATIENT COUNSELING IN PREGNANT WOMENShruti Rai^{1*}, Dr. Jalpa Soni¹, Poonam Patel¹ and Dr. I. S. Anand²¹Department of Pharmacology & Pharmacy Practice, Shri Sarvajanic Pharmacy College, Mehsana- 384001, Gujarat, India.²Professor & Head of Department, Department of Pharmacology and Pharmacy practice, Shri Sarvajanic Pharmacy College, Mehsana-384001, Gujarat, India.***Corresponding Author: Shruti Rai**

Department of Pharmacology & Pharmacy Practice, Shri Sarvajanic Pharmacy College, Mehsana- 384001, Gujarat, India.

Article Received on 10/02/2021

Article Revised on 03/03/2021

Article Accepted on 23/03/2021

ABSTRACT

In pregnancy, hypertension and gestational diabetes mellitus are major causes of various maternal and fetal complications. Pre-eclampsia (PE) is transient type of hypertensive disorder. It is a multi-system disorder which is presented as hypertension and involvement of other organ systems and/or the fetus. Mainly it includes raised BP and proteinuria as the first manifestation. Pre-eclampsia is the third leading cause of pregnancy related maternal and fetal morbidity and mortality. Gestational Diabetes Mellitus (GDM) is pregnancy induced glucose tolerance which is first recognized during pregnancy usually develops between 24th to 28th gestational weeks, but might develop sooner or later. It is more common in women who are overweight, older and less active or have a family history of diabetes. Pre-eclampsia and gestational diabetes mellitus should be prevented before its onset, to limit the maternal and fetal complications and deaths. Patient counseling is a major tool to prevent pre-eclampsia and gestational diabetes mellitus. Many studies have shown that patient counseling helps in prevention of pre-eclampsia and gestational diabetes mellitus. Interventions can be done by counseling patients about lifestyle modifications, dietary changes and physical activity.

KEYWORDS: Pregnancy, Pre-eclampsia, Gestational Diabetes Mellitus, Prevention, Patient Counseling.**INTRODUCTION**

In Pregnancy, hypertensive conditions can be chronic (secondary to renal or endocrine disease) or transient. Pre-eclampsia falls under transient type of hypertensive disorder which presents as hypertension and proteinuria which is a leading cause of both maternal and fetal morbidity and mortality.^[1] Moreover, Gestational Diabetes Mellitus (GDM) is pregnancy induced glucose intolerance which is first recognized during pregnancy. It has been proved as major risk to mother and fetus. Although great efforts have been undertaken to better understand and prevent Pre-eclampsia, little improvement in maternal and fetal outcomes has been observed^[2] This article reviews various researches on interventions that are effective at reducing obstetric outcomes such as pre-Eclampsia and gestational diabetes mellitus. It specifically focuses on interventions by providing patient counseling about lifestyle modifications, dietary changes and physical activity and preventing pre-eclampsia and gestational diabetes mellitus before its onset.

Pre-eclampsia

Pre-eclampsia is a multi-system disorder presented as hypertension and involvement of other organ systems and/or the fetus. Raised BP is commonly but not always the first manifestation. Proteinuria is also common but should not be considered mandatory to make the clinical diagnosis.^[3] Complications of hypertension are the third leading cause of pregnancy-related deaths. Pre-eclampsia is associated with increased risks of placental abruption, acute renal failure, cerebrovascular and cardiovascular complications, disseminated intravascular coagulation, and maternal death. Consequently, early diagnosis of preeclampsia and close observation are important.^[4] Around the world, Pre-eclampsia affects 3–5% of pregnancies. In India, the incidence of preeclampsia is reported to be 8-10% among the pregnant women. Of the global 830 maternal deaths that occurred daily in 2015, PE accounted for 14% of the mortalities.^[5] The causes of pre-eclampsia includes blood insufficiency to uterus, damaged blood vessels, lack of immunity, impaired genes. Impaired placentation is caused by the failure of remodeling of maternal spiral arteries which stops placental perfusion.^[6] Immunological factors like conflicts between the maternal genes and paternal genes

Lead to placental implantation mediated by NK cell activity and dendritic cell activity.^[6] Placental DNA released into the maternal circulation and the debris of the outer layer of trophoblast takes part in maternal inflammation.^[6] Genetic factors like the mother's and father's genes have a role in the defective formation of the placenta and subsequent preeclampsia.^[6] Pre-eclampsia is classified into mild pre-eclampsia (blood pressure $\geq 140/90$ and proteinuria $\geq 300\text{mg}/24\text{-h}$ sample)

and severe pre-eclampsia (blood pressure $\geq 160/110$ and proteinuria- $\geq 5\text{g}/24\text{-h}$ sample). It shows signs and symptoms like sudden onset of high B.P., proteinuria, vision problems, newly developed headaches, etc. with increased risk due to factors such as age ≥ 40 years, first pregnancy, family and/or previous history of PE, BMI ≥ 35 , etc. Diagnostic criteria for preeclampsia Includes new onset of elevated blood pressure and proteinuria after 20 weeks of gestation.^[4]

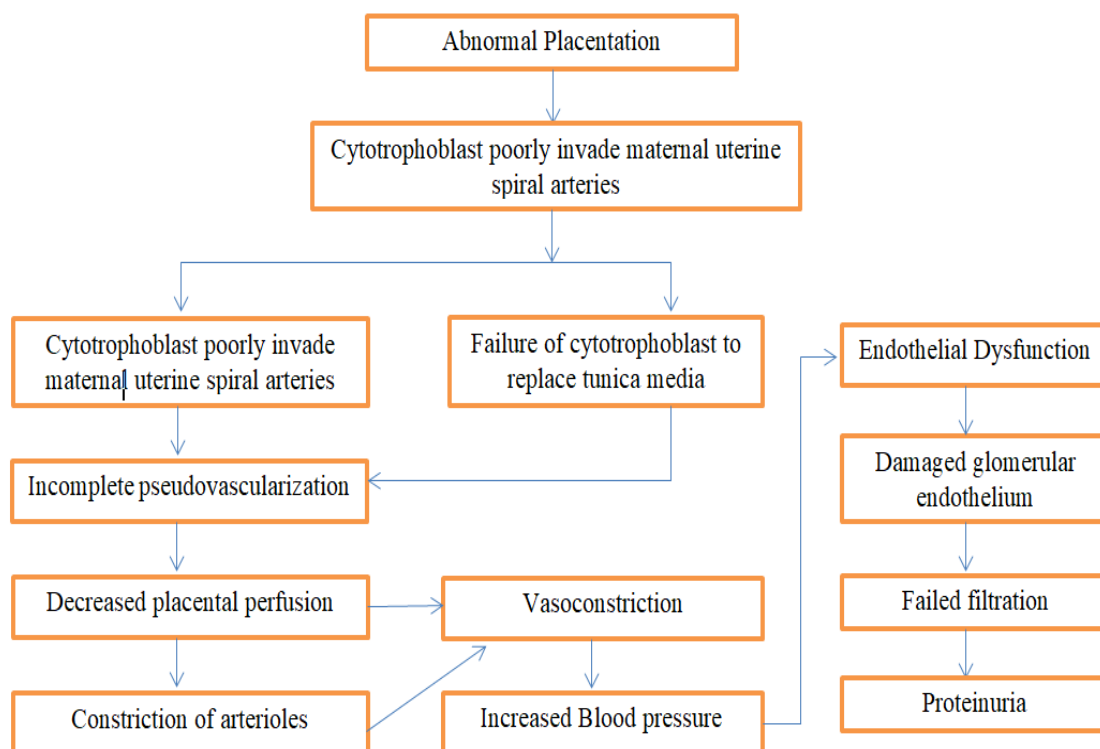


Fig. 1: Pathogenesis of Pre-eclampsia.

Prevention of Pre-eclampsia by patient counseling

Assessment of whether any intervention like patient counseling is doing more good than harm depends not only on whether it reduces the risk of pre-eclampsia but also prevents it. Many studies have shown that rest and exercise greatly affect hypertension. Certain studies have proven that potential physical activities like brisk walking, yoga, leisure time physical activity, etc. play a vital role in preventing pre-eclampsia in pregnant women. Whether a woman's level of activity has any effect on risk of pre-eclampsia is not clear yet. For women who are normotensive but are on high risk of pre-eclampsia, two relative studies suggest that resting for about four hours a day might reduce the risk of pre-eclampsia. Less data is available but it is said that more exercise may reduce the risk of pre-eclampsia and prevent it. So, preferably, a proper balance between rest & exercise depends on each individual woman's preference. Counseling of pregnant women about the potential dangers of certain activities during pregnancy, for example, contact sports, high-impact sports and vigorous racquet sports that may involve the risk of

abdominal trauma, falls or excessive joint stress, and scuba diving, which may result in fetal birth defects and fetal decompression disease helps in preventing any adverse outcomes.^[7] As far as dietary changes are concerned, it is believed that women with normal BMI are advised high energy diet. Whereas, overweight women are advised a low energy diet. Some unclear evidence says that reduction of dietary salt intake during pregnancy reduces the risk of pre-eclampsia. The women with low calcium intake are counseled to have calcium rich diet.^[8] Although, calcium rich diet is not recommended in women with normal calcium intake. According to WHO, the main dietary source of calcium is grains like wheat, maize which is based on a systemic review.^[9] In response to the threat of the globally increasing obesity among pregnant women, the main focus is on achieving healthy lifestyle to prevent pre-eclampsia. In a large cohort study, the risk of pre-eclampsia was seen to be reduced by counselling about diet rich in vegetables, fruits and vegetable oils (RR 0.72, 95% CI 0.62-0.85)^[10] Some systematic reviews^[11, 12] also reveal that patient counseling about diet and

lifestyle interventions can play a vital role in reducing the risk of pre-eclampsia. A study stated that adherence to a dietary pattern characterized by high intake of vegetables, fruits, rice, vegetable oil reduces the risk of pre-eclampsia. Whereas, adherence to a dietary pattern including high intake of processed food increases the risk of pre-eclampsia.

Gestational Diabetes Mellitus

When a pregnant woman who is not having diabetes before pregnancy has blood sugar levels above a certain level, she is called as having gestational diabetes mellitus. This usually develops between 24th to 28th gestational weeks, but might develop sooner or later.^[13] Pregnant women need more insulin than usual as pregnancy hormones work against insulin. Most women are able to produce more insulin during their pregnancy. Whereas some women cannot produce more – usually due to being overweight, having a family history of diabetes or being older. These women may develop gestational diabetes mellitus. Gestational diabetes mellitus is very common, some studies have shown 10 – 20% of women will have it. It is more common in women who are overweight, older, less active or have a family history of diabetes.^[13] In 2019, an estimated 223 million women (20-79 years) were with diabetes of which 84% were with gestational diabetes mellitus.^[14] It is caused by pancreatic dysfunction, decreased insulin secretion or stopped insulin usage as required. Prolonged

and excessive insulin production leads to β cell dysfunction which results into hyperglycemia and insulin resistance.^[15] During gestational diabetes, β cells fail to compensate for the demands of pregnancy, and, when combined with reduced insulin sensitivity, this results in hyperglycemia.^[15] It is mainly divided into two categories: (1) Type 1: abnormal OGTT but normal fasting blood glucose and 2 hours after meal, which can be treated with dietary changes and (2) Type 2: abnormal OGTT, abnormal fasting blood glucose and 2 hours after meal, which is treated with insulin and other medications.

Prevention of Gestational Diabetes Mellitus by patient counseling

According to a Finnish study, counseling of pregnant women includes dietary counseling, lifestyle modifications like controlling gestational weight gain and physical activity counseling. Counseling for total gestational weight gain mainly includes recommendation of 12-18 kg of gestational weight gain for women with pre-pregnancy BMI 18.5-19.9 kg/m², 11.5-16.0 kg for women with BMI- 20.0-26.0 kg/m², and 7.0-11.5 kg for women with BMI \geq 26kg/m².^[16] Counseling on gestational weight gain is important because controlling gestational weight gain helps reduce the risk of gestational diabetes mellitus and other maternal complications.

Table 1: Total and rate of weight gain recommendations during pregnancy.

Pre-pregnancy body weight status (BMI in kg/m ²)	Total weight gain (ranges in kg)	Rates of weight gain in second and third trimester [mean (range) in kg/week]
Underweight (<18.5 kg/m ²)	12.5-18.0	0.51 (0.44-0.58)
Normal weight (18.5-24.9 kg/m ²)	11.5-16.0	0.42 (0.35-0.50)
Overweight (25.0-29.9 kg/m ²)	7.0-11.5	0.28 (0.23-0.33)
Obese (\geq 30 kg/m ²)	5.0-9.0	0.22 (0.17-0.27)

Dietary counseling can be done by adopting various models or as per different patterns. The goal of dietary counseling is to help participants attain a healthy diet which consists of \leq 10% unsaturated fat, 5-10% polyunsaturated fat, 25%-30% total fat, <10% sachharose of total energy intake and 25-35g/d fiber.^[17] According to the finnish nutritional guidelines, “the plate model” mainly focuses on counseling about diet which includes half a plate with raw or cooked vegetables, one quarter with starchy carbohydrates like potato, rice, etc. and the one quarter with different sources of protein like beans. A healthy diet consists of 4-5 servings of green vegetables, iron rich foods such as brown rice, fresh wholesome foods – whole fruits instead of juices, whole grains/ multigrain flours instead of refined flours, adequate intake of fluids – 2 litres/day unless advised a lower amount, a minimum of 650 ml milk or alternate to meet calcium needs, eat less junk foods, bakery products, fried foods, salted foods, use less oil in cooking.^[12] A total of 1600-1800 kcal a day is usually recommended. Total energy intake may be divided as 40-50% from

carbohydrates, 30-40% from fats and 20-25% from protein. Dietary counseling to increase intake of vegetables, legumes, fruits and berries; whole grain and fiber; low fat dairy products and vegetables shows great effect on reduction of risk of gestational weight gain. Reduction in intake of sugar-rich foods is advised.^[18] Primary objective of physical activity counseling is to reduce the risk of gestational diabetes mellitus and prevent it. Secondary objectives are to increase leisure time physical activity (LTPA) of women not fulfilling recommended level of physical activity and to maintain LTPA for those women who fulfil recommended level of physical activity for health and fitness.^[16] The minimum weekly LTPA recommended is 800 MET minutes. Recommended physical activity is minimum 30 minutes of moderate intensity exercise five times a week or 50 minutes three times a week. Counseling may include an advice of covering 10,000 steps a day.^[18] Types of exercise recommended for pregnant women are brisk walking, swimming, low impact aerobics and modified yoga.^[19]

Summary

Various studies give evidence that intervention by patient counseling including lifestyle modifications, dietary counseling for achieving healthy diet, physical activity counseling for achieving optimal recommended physical activity, counseling for controlling excessive weight gain plays a crucial role in decreasing the risk and prevention of pre-eclampsia and gestational diabetes mellitus.

REFERENCES

1. VN, JTF. Role of nutrition in the prevention of preeclampsia. Review of the literature. *J Nurse Midwifery*, 1990; 35(5): 282–91.
2. Dhariwal NK, Lynde GC. Update in the Management of Patients with Preeclampsia. *Anesthesiol Clin*, 2017; 35(1): 95–106.
3. Edward K, Hospital M Hypertension in pregnancy : Medical management. *King Edward Meml Hosp Obstet Gynecology*, 2019; 1–26.
4. Wagner LK. Diagnosis and management of preeclampsia. *Am Fam Physician*, 2004; 70(12): 2317–24.
5. Preeclampsia, National Health Portal, India , <https://www.nhp.gov.in/disease/gynaecology-and-obstetrics/preeclampsia>
6. Khalil G. Preeclampsia: Pathophysiology and the Maternal-Fetal Risk. *J Hypertens Manag*, 2017; 3(1): 1–5.
7. NICE, Overview, Antenatal care for uncomplicated pregnancies. Clinical Guideline [CG62]. This guideline replaces [CG6]. *Natl Inst Health Care Excell*, 2019, at <https://www.nice.org.uk/guidance/cg62>
8. Duley L, Meher S, Abalos E. Management of pre-eclampsia. *Br Med J*, 2006; 332(7539): 463–8.
9. Mol BWJ, Roberts CT, Thangaratinam S, Magee LA, De Groot CJM, Hofmeyr GJ Pre-eclampsia. *Lancet*, 2016; 387(10022): 999–1011.
10. Brantsæter AL, Haugen M, Samuelsen SO, Torjusen H, Trogstad L, Alexander J, et al. A dietary pattern characterized by high intake of vegetables, fruits, and vegetable oils is associated with reduced risk of preeclampsia in nulliparous pregnant Norwegian women. *J Nutr*, 2009; 139(6): 1162–8.
11. Thangaratinam S, Rogozińska E, Jolly K, Glinkowski S, Roseboom T, Tomlinson JW, et al. Effects of interventions in pregnancy on maternal weight and obstetric outcomes: Meta-analysis of randomised evidence. *BMJ*, 2012; 344(7858): 1–15.
12. Allen R, Rogozinska E, Sivarajasingam P, Khan KS, Thangaratinam S. Effect of diet- And lifestyle-based metabolic risk-modifying interventions on preeclampsia: A meta-analysis. *Acta Obstet Gynecol Scand*, 2014; 93(10): 973–85.
13. International Diabetes Federation. Management of Gestational Diabetes in the Community: Training Manual for Community Health Workers. *Int. Diabetes Fed*, 2011; 1–20, at <https://www.idf.org/e-library/guidelines/96-management-of-gestational-diabetes-in-the-community.html>
14. Care and prevention of Gestational Diabetes, International Diabetes Federation <https://www.idf.org/our-activities/care-prevention/gdm>
15. Plows JF, Stanley JL, Baker PN, Reynolds CM, Vickers MH. “The pathophysiology of gestational diabetes mellitus”. *Int J Mol Sci*, 2018; 19(11): 1–21.
16. Luoto RM, Kinnunen TI, Aittasalo M, Ojala K, Mansikkamäki K, Toropainen E, et al. Prevention of gestational diabetes: Design of a cluster-randomized controlled trial and one-year follow-up. *BMC Pregnancy Childbirth*, 2010; 10.
17. Luoto R, Kinnunen TI, Aittasalo M, Kolu P, Raitanen J, Ojala K, et al. Primary Prevention of Gestational Diabetes Mellitus and Large-for-Gestational-Age Newborns by Lifestyle Counseling: A Cluster- Randomized controlled Trial. *PloS Med*, 2011; 8(5).
18. Rönö K, Stach-Lempinen B, Klemetti MM, Kaaja RJ, Pöyhönen-Alho M, Eriksson JG, et al. Prevention of gestational diabetes through lifestyle intervention: Study design and methods of a Finnish randomized controlled multicenteric trial (RADIEL). *BMC Pregnancy Childbirth*, 2014; 14(1): 1-11.
19. Govt. of India. National guidelines for Diagnosis & Management of Gestational Diabetes Mellitus, Ministry of health and family welfare Govt. of India. *Natl Guid Govt India*. 2014; 1(1): 1-100, at http://www.nhm.gov.in/New_Updates_2018/NHM_Components/RMNCH_MH_Guidelines/Gestational-Diabetes-Mellitus.pdf