



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

PREECLAMPSIA INDUCED HYPERNATREMIA, HYPOKALAEMIA, HYPOCALEMIA & HYPOMAGNESEMIA.

MOPIDEVI.MEGHANA¹, SHAIK REEHANA², J. AMOS BABU*

PHARM-D STUDENTS, Department of pharmacy practise, A.M Reddy Memorial College Of pharmacy, Petlurivaripalem, Narasaraopet, Guntur 522601, Andhra Pradesh.

Corresponding author – J. AMOS BABU Associate Professor, Department of Pharmacology, A.M Reddy Memorial College Of pharmacy, Petlurivaripalem, Narasaraopet, Guntur 522601, Andhra Pradesh.

ABSTRACT

Preeclampsia is hypertensive complication that occur during pregnancy where elevated blood pressure in mother and baby. Generally, it occurs during 3rd trimester of gestational period, it is characterised by vasospasm, vasoconstriction, elevated blood pressure by the increased sensitivity of substances like aldosterone, endothelin, prostaglandinE2, angiotensin-II, TRMP6 genes which causes electrolytes imbalances in maternal body. Conditions like hypernatremia, hypokalaemia, hypomagnesemia, hypocalcaemia are mostly commonly associated with preeclampsia. So, during this therapy potassium, calcium & magnesium are given, while sodium is restricted to minimize further progression of preeclampsia.

INTRODUCTION

Usually, hypertensives syndromes that occur during pregnancy, mainly like Preeclampsia, which result in risk for both maternal and child. These syndromes are causal factors related to maternal health and serious problem resulting from associated prematurity. Hypertensive disorders are a common complication of pregnancy that put women and their foetus at disproportionate risk. These hypertensive disorders of pregnancy and in particular preterm preeclampsia is also associated with substantial risk for cardiovascular disease (CVD) and cerebrovascular disease. Normally during gestation hypertension is diagnosed only after 20 weeks of gestation. During the delivery the most of the symptoms are resolved, only certain complication cases the preeclampsia can be persist after delivery also.

Preeclampsia induced maternal complications includes increase maternal cardiovascular, Metabolic, cerebrovascular disease premature mortality. Preeclampsia induced neonatal complications includes secondary iatrogenic preterm delivery, increase risk of fetal growth restriction, placenta abruption, respiratory distress syndrome, bronchopulmonary dysplasia, retinopathy of prematurity, necrotizing enterolitis, neurodevelopmental delay, fetal or neonatal death.

Pathophysiology includes due to poor placentation secondary to abnormal trophoblast invasion and spiral artery remodelling which leads to placental ischemia and leads to activation of maternal immune -mediated response and release of anti-angiogenic factors and leads to angiogenic imbalance, immune mediated exaggerated, inflammatory response, endothelial cell dysfunction

Pregnant women are prone to high volume losing electrolytes more rapidly

Electrolytes	Normal ranges		
	1 st trimester – 1 st week – end of 12 th week	2 nd trimester – 13 th week – end of 26 th week	3 rd trimester – 27 th week – end of pregnancy
Sodium	135 – 139 mEq/L	131 – 136 mEq/L	134 - 137 mEq/L
Potassium	3.6 – 5.0 mEq/L	3.3 – 5.0 mEq/L	3.3 – 5.1 mEq/L
Magnesium	1.6 – 2.2 mg/dL	1.5 – 2.2 mg/dL	1.5 – 2.2 mg/dL
Calcium	8.8 – 10.6 mg/dL	8.2 – 9.0 mg/dL	8.2 – 9.7 mg/dL

ROLE OF SODIUM, POTASSIUM, MAGNESIUM & CALCIUM

SODIUM

- ✚ It maintains a normal balance of fluids and minerals in the body
- ✚ It helps in development of nervous in premature babies
- ✚ Monitoring of sodium intake during severe morning sickness and hyperemesis gravidarum

POTASSIUM

- ✚ It maintains Muscle communication, electrolyte balance, optimal fetal growth
- ✚ It works with sodium to maintain proper fluid balance
- ✚ Foods like sweets potatoes, tomatoes, kidney beans, bananas, dried fruits, yogurt, spinach, broccoli should be included in diet.

MAGNESIUM

- ✚ It maintains proper Mood, sleep, bone health, hydration.
- ✚ It maintains normal blood pressure, protein synthesis, muscle and nerve functions & bone strength in babies
- ✚ It reduces risk of still birth, fetal growth restrictions & preeclampsia.
- ✚ Foods like nuts, seeds, grains, green leafy vegetables and beans should be included in diet.

CALCIUM

- ✚ It supports musculoskeletal nervous (teeth and bone development in babies) & circulatory systems (reduces risk of hypertensive disorders, risk of preterm delivery, risk of postpartum haemorrhage)
- ✚ It also maintains normal heart rhythm & blood clotting abilities in babies
- ✚ During 2nd and 3rd trimester the calcium requirement is high
- ✚ Foods like fishes (salmon, sardines), dairy products, leafy vegetables, legumes and seeds should be included in diet.

MECHANISM

Electrolytes imbalance	Causes	Mechanism
Hypertnatremia	Water and electrolytes imbalance	Increased sensitivity of vasopressor substances like aldosterone decreased cyclic GMP endothelin and PGE2 leads to sodium retention and potassium depletion
Hypokalaemia	Vomiting, diarrhoea, excess you use for diuretics	Increased sensitivity of aldosterone leads to potassium depletion
Hypocalcaemia	Hypoparathyroidism Calcium deficiency	Disrupted calcium homeostasis can lead to altered vasoconstriction and decreased intracellular calcium in smooth muscle cells resulting increased sensitivity of angiotensin-II leads to vasoconstriction and hypertension
Hypomagnesemia	Little intake of magnesium Excessive loss of magnesium through kidneys and gastrointestinal tract Mutations of TRPM6 genes	Increased sensitivity of TRMP6 at 12 weeks gestation leads to magnesium depletion.

Hypertnatremia induced preeclampsia – water and electrolytes leading to sodium retention and potassium depletion which leads to peripheral vascular resistance hypertension, hypomagnesemia, hypocalcaemia.

Hypokalaemia induced preeclampsia – during vomiting conditions eliminates acid, and causes metabolic alkalosis, and leads to potassium loss.

Hypocalcaemia induced preeclampsia – calcium plays a crucial role in the function of vascular smooth muscles. Alternation of plasma calcium concentration leads increase in Blood pressure.

Hypomagnesemia induced preeclampsia – magnesium act as a co-factor of many enzymes Na^+ , K^+ ATPase involved in peripheral vasodilation.

Ca^+ , Mg^+ which acts relaxants effect on blood vessel of pregnant women.

Both magnesium and sodium are known to decrease intracellular calcium which leads to smooth muscle contraction. Leads to elevated blood pressure.

PHARMACOTHERAPY

Non-pharmacological therapy

- ✚ Regular exercise to be done
- ✚ Drink 5-8 glasses of water daily
- ✚ Eat healthy food (leafy vegetables & fruits)
- ✚ Avoid fried foods and junk food
- ✚ Elevate your feet during the day several times
- ✚ Avoid alcohol, caffeine etc.,

Pharmacological therapy- General treatment include Anti-Hypertensive, Anti-Convulsant & Corticosteroids to patients

Magnesium sulphate which is mostly commonly used in preeclampsia which shows a relaxant effect on umbilical arterial tone leading to vasoconstriction effect on angiotensin-II and endothelin-I in foetal placental vasculature in mother

According to FDA class of drugs like category-A, B, C are given to preeclampsia patients while D & X are avoided drugs.

Symptoms	Treatment
Increased BP	<ul style="list-style-type: none"> ✚ Hydralazine (increased risk of maternal hypotension) ✚ Labetalol ✚ Nicardipine ✚ Sodium nitroprusside (emergency condition, but cyanide crosses placenta fatal toxicity)
Proteinuria	<ul style="list-style-type: none"> ✚ Eat less protein ✚ Decreased salt intake ✚ Eat more fibre ✚ Physical exercise ✚ Regularly checking blood sugar & GFR blood tests
Thrombocytopenia	✚ Platelet Transfusion
Increased liver enzymes	✚ Ursodeoxycholic acid (15mg/kg/day)
Severe headache	<ul style="list-style-type: none"> ✚ Practise good sitting posture ✚ Some amount of rest & relax ✚ Eat well balanced diet ✚ Ice pack on head ✚ Drink plenty of water ✚ Get enough sleep
Shortness of breath	<ul style="list-style-type: none"> ✚ Nasal saline sprays/ prescription nasal steroids ✚ Practising good posture ✚ Sleeping with pillows and supporting the upper back ✚ Practising breathing technique
Nausea & vomiting	✚ Anti-emetics drugs
Edema particularly in your face & hands	<ul style="list-style-type: none"> ✚ Avoid standing for long periods ✚ Wear comfortable shoes and socks ✚ Try to rest with your feet up ✚ Drink plenty of water ✚ Decreased salt intake ✚ Anti-diuretics drugs
Changes in vision	<ul style="list-style-type: none"> ✚ Start eating healthy foods ✚ Regular exercise ✚ Get enough sleep, rest to eyes ✚ Lubricating drops ✚ It improves after giving birth

CONCLUSION

Hypnatremia, Hypokalaemia, Hypocalcaemia & Hypomagnesemia are mainly electrolytes imbalance in preeclampsia condition. Constant monitoring of serum electrolytes should be done to preeclampsia patients. So, supplementation like potassium, calcium, magnesium and control restriction on sodium should done to decrease progression of preeclampsia.

REFERENCES

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9108779/>
2. <https://www.researchgate.net/publication/322925340> Electrolyte Status in Preeclampsia
3. <https://www.ijcbr.in/htmlarticle/14349#:~:text=In%20preeclampsia%20water%20and%20electrolyte,peripheral%20vascular%20resistance%20and%20hypertension>
4. <https://www.nhp.gov.in/disease/gynaecology-and-obstetrics/preeclampsia>
5. <https://www.ahajournals.org/doi/10.1161/HYPERTENSIONAHA.119.12924>
6. <https://empendium.com/mcmtxtbook-sae/chapter/B78.II.2.20.4.1.?rfmcm>
7. <https://www.tandfonline.com/doi/epdf/10.1080/2331205X.2017.1376898?needAccess=true&role=button>
8. <https://pubmed.ncbi.nlm.nih.gov/24411827/>
9. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6038016/>
10. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3354840/>
11. <https://medcraveonline.com/MOJWH/concentration-of-sodium-potassium-chloride-and-calcium-across-trimester-of-pregnancy.html>
12. <https://www.uptodate.com/contents/image/print?imageKey=OBGYN%2F89016>
13. <https://pubmed.ncbi.nlm.nih.gov/35880174/>
14. <https://pubmed.ncbi.nlm.nih.gov/30792480/>
15. <https://pubmed.ncbi.nlm.nih.gov/31480243/>
16. <https://pubmed.ncbi.nlm.nih.gov/29684104/>

