



## “Evaluation of serum electrolytes in preeclamptic pregnant women: A Hospital Based Study”

**Dr Prafula Kumar Mishra**

MBBS, MD, Professor & Head, Department of Biochemistry, Hi-Tech Medical College & Hospital, Rourkela, Odisha, India.

### ABSTRACT

Preeclampsia is the most common medical complication of pregnancy. It is also known as pregnancy-induced hypertension or toxemia and is one of the leading causes of maternal and perinatal mortality throughout the world. My aim was to evaluation of serum electrolytes (Na<sup>+</sup> & K<sup>+</sup>) in between cases and controls. The serum Sodium and potassium levels were within reference range for both the groups. There was not much difference between mean values of both the groups. The difference was statistically not-significant.

**KEYWORDS :** Electrolytes, Na+ & K+ and Preeclampsia.

### Introduction:

Preeclampsia is the most common medical complication of pregnancy. It is also known as pregnancy-induced hypertension (PIH) or toxemia and is one of the leading causes of maternal and perinatal mortality throughout the world.<sup>1</sup>

Pregnancy is a physiological state associated with many alterations in metabolic, biochemical, physiological, haematological and immunological processes. If there are no complications, all these changes are reversible following a few days to a few months after delivery.<sup>2,3</sup> Hypertensive disorders of pregnancy and their complications rank as one of the major cause of maternal mortality and morbidity in the world after obstetric haemorrhage, pre-existing medical disorders, sepsis and abortions.<sup>2,4</sup> In addition, as it is strongly associated with foetal growth retardation and prematurity, it also contributes largely to perinatal mortality and morbidity.<sup>2,5</sup> Hypertension during pregnancy is defined as diastolic blood pressure more than 90 mmHg on 2 occasions more than 4 hrs apart or a single reading of diastolic blood pressure more than 110mmHg.<sup>6,7</sup> Hypertensive disorders during pregnancy occur in women with pre-existing primary or secondary chronic hypertension, and in others who develop new-onset hypertension in the second half of pregnancy. If this hypertension is associated with proteinuria and oedema it is known as preeclampsia. Family history of essential hypertension is a risk factor in development of preeclampsia and there may also be relationship between preeclampsia and metabolic syndrome.<sup>6,8,9</sup> The worldwide prevalence of preeclampsia is 9% and in India it is 8-10%. Preeclampsia is mainly a disease of primigravida. The incidence is 14.1% in primigravida versus 5.7% in multigravida.<sup>6,10</sup> In preeclampsia there is marked increase in response to vasopressin, norepinephrine and to angiotensin. It is the increased responsiveness of the arterial systems to pressure substances which probably causes the generalized vasoconstriction and hypertension in preeclampsia.<sup>6</sup> Since the electrolytes sodium and potassium contribute significantly in the functioning of the vascular smooth muscles, the present study was designed to evaluate their role in the preeclampsia. My aim was to evaluation of serum electrolytes (Na<sup>+</sup> & K<sup>+</sup>) in between cases and controls.

### Material and Methods:

The present study was conducted in the Department of Biochemistry, Hi-Tech Medical College & Hospital Rourkela, Odisha, India, during the period from October 2015 to September 2016. The study protocol was approved by the Ethics committee of HMCH, Rourkela. The present study consists of total 70 subjects between the age group 20-45 years who are further subdivided into two groups;

**Group-A:** Healthy pregnant women as controls (n=35).

**Group-B:** One with preeclampsia as cases (n = 35).

Serum electrolytes were investigated in two groups of pregnant women:

Subjects were selected based on the following inclusion and exclusion criteria.

**Inclusion Criteria:** The Study group included primigravida patients > 20weeks gestation with proteinuria with BP  $\geq$ 140/90mmHg and the Control group included primigravida women > 20weeks gestation normotensive and nonproteinuric. The common inclusion criteria for both groups were: singleton pregnancy, normal foetal morphology and the absence of concomitant disease and gestation between >20 and < 36 gestational weeks.

**Exclusion Criteria:** Multiple Pregnancy, Previous History Of Abortion, Hypertension, Diabetes Mellitus, Cardiac illness, Gestational trophoblastic diseases, High grade fever or Any Concomitant illness.

The fasting blood samples were collected in plain evacuated tubes. Samples were transferred to the laboratory where serum was separated and tests were performed. Results of Preeclampsia group were compared with the results of control group of healthy pregnant women group, matched for age and gestation. Serum electrolytes were measured by ion selective electrodes on Olympus AU400 Fully automated chemistry analyzer.

### Statistical analysis:

All values were expressed as mean  $\pm$  SD. We used student t-test to find the statistical significance. A P-value <0.05 was to be considered statistically significant.

### Results and Discussion:

The estimation of serum electrolytes in PIH provides a very useful index for the study of physiological and pathological changes during pregnancy.

**Table 1: Demographic Information of Subjects:**

Parameters	Controls (n=35) Mean $\pm$ S.D.	Cases (n=35) Mean $\pm$ S.D.
Age in years	26.23 $\pm$ 4.21	24.01 $\pm$ 2.89
Gestational age in weeks	32.1 $\pm$ 3.02	32.02 $\pm$ 4.09

The serum Sodium and potassium levels were within reference range for both the groups. There was not much difference between mean values of both the groups. The difference was statistically not-significant (table-2). Preeclampsia has been labeled as a dreaded disease affecting women and their pregnancy right from ancient times.<sup>2,11,12</sup> The numerous complications associated with it have triggered a phobia in pregnant women and aroused the interest of Obstetricians everywhere.<sup>11</sup> Preeclampsia is a pregnancy specific condition that increases maternal and infant morbidity and

mortality.<sup>13,14</sup> It is proposed to be a two stage disease, stage I is characterized by reduction in perfusion and stage II is a maternal syndrome. A predominant pathophysiological factor is critically reduced perfusion of all the organs, may be due to vasoconstriction, microthrombi formation and reduced circulating plasma volume.<sup>13,15</sup>

**Table 1: Comparison of Serum Electrolytes between cases and Controls:**

Variabes	Controls (n=35) Mean±S.D.	Cases (n=35) Mean±S.D.	P-value
Sodium (Na <sup>+</sup> ) mEq/L	136 ± 4.03	139 ± 2.3	0.33
Potassium (K <sup>+</sup> ) mEq/L	3.7±1.02	4.1± 3.05	0.25

(\*Statistically not significant)

Preeclampsia is a multifactorial process and involves multiorgan dysfunction with no individual factor strictly essential or sufficient for causing it.<sup>6,11</sup> Thus estimation of electrolytes in preeclampsia provides a very useful index for the study of physiological and pathological changes during pregnancy.<sup>11,16</sup> Primary hypertension results from the interplay of internal derangements (primarily in the kidney) and the external environment.<sup>17,18</sup>

Numerous studies show an adverse effect of serum sodium on arterial pressure.<sup>17,19,20,21,22</sup> In present study I found Sodium levels within reference range for both the groups. There was not much difference between mean values of both the groups. The difference was statistically not significant. My results were in accordance with Singh H J et al<sup>23</sup>, Khan MY et al<sup>24</sup>, Obembe O et al<sup>25</sup> and Beras S et al<sup>26</sup> which showed no significant change in serum sodium in preeclampsia. My results were not in accordance with the studies conducted by Indumati K et al<sup>16</sup>, Anjum K Sayyed et al<sup>11</sup>, T Sunitha et al<sup>6</sup> and Magna Manjareeka et al.<sup>27</sup> Of these Indumati et al<sup>16</sup>, Searcy et al<sup>28</sup> and Pitkin RM et al<sup>29</sup> found decrease in serum sodium levels whereas Anjum K Sayyed et al<sup>11</sup>, T Sunitha et al<sup>6</sup> and Magna Manjareeka et al<sup>27</sup> found increase in serum sodium levels in preeclampsia. So we do not found any significant change in serum sodium levels in preeclampsia. In present study I found serum potassium levels within reference range for both the groups. There was not much difference between mean values of both the groups. The difference was not statistically significant. My results were in accordance with the studies conducted by Singh H J et al<sup>23</sup>, Khan MY et al<sup>24</sup>, Obembe O et al<sup>25</sup> and Beras S et al<sup>26</sup> which showed no significant change in serum potassium in preeclampsia. My results were not in accordance with the studies conducted by Indumati K et al<sup>16</sup>, Anjum K Sayyed et al<sup>11</sup> and Magna Manjareeka et al.<sup>27</sup> Indumati et al, Anjum K Sayyed et al and Magna Manjareeka et al found decrease in serum potassium levels in preeclampsia. So we do not found any significant change in serum potassium levels in preeclampsia.

### Conclusion:

In conclusion, I do not found significant difference in the Serum electrolyte status i.e. serum sodium and serum potassium levels in preeclampsia patients and normotensive controls. The serum electrolytes were within reference range in preeclampsia cases.

### References:

- Chesley LC. Hypertensive Disorders in Pregnancy. Appleton-century Crofts, New York, 1978, 2.
- Sonagra AD, Dattatreya. K, Murthy JDS. Serum LDH, ALP and uric acid in hypertensive disorders of pregnancy. IJPBS 2012;2(3):201-9.
- Maternal physiology. Cunningham F, Lenevo K, Bloom S, Hauth J, Gilstrap L, Wenstrom K (eds). In Williams Obstetrics, 23rd edn. Mc Graw Hill, New York 2011:107-31.
- Park K. (ed.) Preventative medicine in obstetrics, pediatrics & geriatrics. In Park's textbook of preventive and social medicine, 21st edn. M/s Banarasidas Bhanot publishers 2011:514-17.
- Datta D. (ed.) Hypertensive disorders in pregnancy. In: DC Datta's Textbook of obstetrics. 7th edn. New Central book agency (P) Ltd, Kolkata 2011:219-40.
- Sunitha T, Sameera K, Umaramani G. Study of Biochemical changes in Preeclamptic women. International Journal of Biological & Medical Research. 2012;3(3):2025-28.
- Davey DA, MacGillivray I. The classification & definition of the hypertensive disorders of pregnancy. Am J Obstet Gynecol. 1988;158(4):892-98.
- Packer CS. Biochemical markers and physiological parameters as indices for

- identifying patients at risk of developing preeclampsia. J. Hypertens. 2005;23(1):45-6.
- Islam NAF, Chowdhury MAR, Kibria GM, Akhter S. Study of serum lipid profile in preeclampsia & eclampsia. Faridpur Med. Coll. J. 2010;5(2):56-9.
- Hallak M, James DK, Steer PJ, Weiner CP, Ganik B. High risk pregnancy: Management options 2nd ed. 2000:639.
- Sayyed AK, Sontakke AB. Electrolyte Status in Preeclampsia. Online International Interdisciplinary Research Journal. 2013;3(3).
- Bell M. A historical overview of Preeclampsia- Eclampsia. J Obstet Gynecol Neonatal Nurs. 2010;39(5):510-18.
- Bhaskar N et al. Ionic changes in pre-eclamptic women: An overview. Jour. of Adv. Res. in Bio. Scie. 2011;3(1(a)-0975-3923):52-7.
- Roberts JM, Balk JK, Bodnar LM, Belizan JM, Bergel E. Nutrient involvement in preeclampsia. J Nutr. 2003;133:16845-925.
- Roberts JN, Carper DW. Pathogenesis and genetics of preeclampsia. Lancet. 2001;357:53-6.
- Indumati K, Kodliwadmath MV, Sheela MK. The Role of serum Electrolytes in Pregnancy induced hypertension. Journal of Clinical and Diagnostic Research 2011;5(1):66-9.
- Adewolu OF. Serum sodium, potassium, calcium and magnesium in women with pregnancy induced hypertension and preeclampsia in Oredo local Government, Benin Metropolis: A pilot study. Afr J Med Health Sci. 2013;12:1-5.
- Yussif MN, Salih R, Sami AZ, Mossa MM. Estimation of serum zinc, sodium and potassium in normotensive and hypertensive primigravide pregnant women. Tikrit Med J 2009;15:13-8.
- Franx A, Steegers EA, de Boo T, Thien T, Merkus JM. Sodium-blood pressure inter relationship in pregnancy. J Hypertens. 1999;13:159-66.
- Adrogué HJ, Madias NE. Sodium and potassium in the pathogenesis of hypertension. N Engl J Med 2007;356:1966-78.
- Williams GH, Hollenberg NK. Non-modulating hypertension. A subset of sodium-sensitive hypertension. Hypertension 1991;17:81-5.
- O'Shaughnessy KM, Karet FE. Salt handling and hypertension. J Clin Invest 2004;113:1075-81.
- Singh HJ, Digher VC, Singh R, Othman N. Serum levels and urinary excretion of magnesium, calcium and electrolytes in mild pregnancy-induced hypertension. Hypertension in Pregnancy. 1993;12(1):113-20.
- Khan MY, Naqvi SHA, Dahot MU. Relation of maternal serum electrolyte, traces elements and other biochemical parameters in third trimester of pregnancy. Sindh University Research Journal (Science Series) 2011;4(3):245-8.
- Obembe O, Antai AB. Effect of Multiparity on Electrolyte composition and blood pressure. Nigerian Journal of Physiological Sciences 2008;23 (1-2):19-22.
- Beras S, Siuli RA, Gupta S et al. Study of electrolytes in pregnancy induced hypertension. Journal of Indian Medical Association. 2011;109 (8):546-8.
- Manjareeka M, Nanda S. Serum electrolyte levels in preeclamptic women: a comparative study. IJPBS. 2012;3(2).
- Searcy RL. Diagnostic Biochemistry, New York: McGraw-Hill Book Company. 1969:469-76.
- Pitkin RM et al. Maternal nutrition: A selective review of clinical topics. Obstet. Gynecol. 1972;40:7730-85.