Association of hypokalemia and preeclampsia and correlation of levels of serum potassium to blood pressure severity in preeclampsia*

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ABSTRACT

Background: Although decreased potassium levels may have a role in the etiopathogenesis of preeclampsia, small number of studies has been done to determine their relationship.

Objectives: This study was done to know whether serum potassium is significantly decreased in hypertensive disorders of pregnancy, to determine if the level of potassium correlates with the severity of hypertension, to know whether we can recommend serum potassium as part of preeclamptic work up, and ultimately, to determine if potassium supplementation can be advised to preeclamptic women during prenatal check-up. In this prospective, cross sectional study, subjects were 338, 169 of whom had uncomplicated pregnancies, while 169 had preeclampsia (72 of whom had systolic BP(SBP) 140-150mmHg, while 97 had SBP ≥160mmHg). Baseline serum potassium were taken upon admission. The mean serum potassium was significantly lower at 3.37±0.41mmol/L (p-value<0.0003) in hypertensive women (versus 3.62±0.31mmol/L in uncomplicated pregnancies). Furthermore, the serum potassium was significantly decreased in patients with SBP>160mmHg (3.31±0.46) when compared with those with SBP140-150mmHg (3.45±0.32), with p0.013. Wilcoxon Signed-Rank Test showed Z-value -5.68 (significant at $p \leq 0.05$), showing a significant difference between the level of serum potassium in normotensive compared to hypertensive patients. Chi-Square test showed X2≈45.46 (in the critical region 5.9), therefore the level of serum potassium is dependent on the level of BP. Pearson Correlation coefficient showed r -0.1135 stating a negative correlation, hence, as the BP increases, serum potassium decreases.

Conclusion: This study suggests that hypokalemia observed in preeclamptic patients may bring about altered homeostatis in serum and therefore may act as predisposing factors in pathogenesis of preeclampsia. The authors recommend the addition of serum potassium as part of the criteria of severity of preeclampsia. Hypertensive pregnant women are advised to consume diet containing adequate amount of potassium or have a potassium supplementation during prenatal check up.

Keywords: Hypokalemia, Preeclampsia

INTRODUCTION

Hypertension is still the most common medical disorder of pregnancy. The World Health Organization recorded 50,000 to 60,000 preeclampsia-related deaths worldwide[1], affecting 240,000 women with an increased by 25% in the past 2 decades in the United States alone every year.[2] Local data states that preeclampsia remains to be the 2nd most common cause of maternal deaths, with 2-5% incidence of severe preeclampsia.[3]

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Although physicians have recognized the pathogenesis of preeclampsia, relatively small number of studies has been done to determine its relationship with electrolytes, specifically potassium. Since serum potassium contributes in the normal vascular physiology of smooth muscles during pregnancy, its deficit could either cause blood pressure elevation, a complication of hypertension, or both.

In the institution where the study was conducted, electrolytes such as sodium and potassium were being measured as part of blood chemistries even though they are not part of preeclamptic work up (complete blood count with platelet count, creatinine, liver transminases, and lactate dehydrogenase). The department consequently decided to discontinue the practice but due to incidental finding of hypokalemia in patients with preeclampsia, it was agreed upon to continue it for research purposes. This study was designed to determine the relationship of potassium to preeclampsia: first, to know whether hypokalemia is associated with hypertension in pregnancy, and second, to determine if the severity of hypertension contributes to the severity of hypokalemia. Moreover, we aimed to know if we can consider including serum potassium as part of preeclamptic work up, and whether we can advise potassium supplementation during prenatal checkup to those afflicted with preeclampsia.

BACKGROUND AND REVIEW OF RELATED LITERATURE

Preeclampsia has a case fatality rate of 6.4 deaths per 10,000 cases,[4] making it one of the greatest causes of maternal and perinatal morbidity and mortality worldwide. In 2013, the American College of Obstetricians and Gynecologists (ACOG) created a Task Force[5] on Hypertension in Pregnancy to translate the current information into practice guidelines. The Task Force classified hypertension in pregnancy in basic four categories: 1) preeclampsia-eclampsia, 2) chronic hypertension (of any cause), 3) chronic hypertension with superimposed preeclampsia, and 4) gestational hypertension, but they already eliminated proteinuria as part of diagnostic criteria.

Current clinical practice guidelines released by Philippine Obstetrical and Gynecological Society (POGS) in November 2015[6] stated that preeclampsia could either be without severe features and with severe features. Those without severe features are those with blood pressure elevation after 20 weeks age of gestation in the presence of proteinuria without other various laboratory and systemic findings which would qualify as preeclampsia with severe features: namely, thrombocytopenia (platelet count less than 100,000/microliter), impaired liver function (elevated liver transaminases twice the normal), new development of renal insufficiency (elevated serum creatinine greater than 1.1mg/dL), pulmonary edema, or new-onset visual or cerebral disturbances. BP elevation is still defined as greater than or equal to 140mmHg systolic or greater than or equal to 90mmHg diastolic on two occasions at least 4 hours apart, but in BP elevation greater than or equal to 160mmHg systolic or equal to 110mmHg diastolic, hypertension can be confirmed within a short interval to facilitate timely anti-hypertensive therapy. According to the said POGS guidelines, for women with preeclampsia with systolic BP<160mmHg and diastolic BP<110mmHg and no maternal symptoms and without any of the laboratory criteria for severity of preeclampsia listed above, $MgSO_4$ need not be administered universally for the prevention of eclampsia.

The etiopathogenesis of preeclampsia is still unknown, but several mechanisms have been proposed. The most widely known pathogenesis being the defective implantation characterized by incomplete invasion of the spiral arteriolar wall by extravillous trophoblasts which results in a small-caliber vessel with high resistance to flow.[7] Another recent proposed pathophysiology is the reversal of the normal physiologic mechanisms involved in pregnancy, such as increases in both arterial and venous capacitance; the said reversal may be partly due to hypokalemia caused by the abnormality in the transport of sodium and potassium across the vascular smooth muscle membrane, as stated in a study done by Indumati, et. al[8].

Hypokalemia, defined as plasma concentration of <3.5 mmol/L, is associated with a ten-fold increase in in-hospital mortality rates due to adverse effects on cardiac rhythm, blood pressure, and cardiovascular morbidity rates. More than 98% of total body potassium is intracellular, chiefly in the muscle, thus, buffering of extracellular potassium by this large intracellular pool plays a crucial role in the regulation of plasma potassium concentration. It can be caused by a) decreased intake, b) redistribution into cells such as in metabolic acidosis, insulin and B2-adrenergic agonists intake and increased B2-adrenergic sympathetic activity (post-myocardial infarction, head injury) by promoting Na^+,K^+-ATPase-mediated cellular uptake of K^+, leading to hypokalemia, and c) increased loss, which can be either non-renal (gastrointestinal loss), and renal (increased distal flow and Na delivery, such as those taking diuretics; increased secretion of potassium, such as in mineralocorticoid excess), and Magnesium delivery.[9] At very low levels (<1.5 mmol/L), hypokalemia may be life threatening due to the risk of cardiac arrhythmia and may present neurologically with severe muscle weakness and paralysis. Treatment of hypokalemia is dependent on the etiology but usually includes replacement of potassium through oral or IV routes as well as correcting the cause of potassium balance problems (in this study, lowering of blood pressure).[10]

In pregnancy, the concentration of potassium in maternal plasma decreases by approximately 0.5mmol/L by midpregnancy. Its deficiency develops in the same circumstances as in nonpregnant individuals. The recommended daily dietary allowance for pregnant and lactating women is 4.7g and 5.1g, respectively.[11]

Although preeclampsia has been well-studied, its association with hypokalemia has not been well recognized. When keywords "hypokalemia" and "preeclampsia" were searched in PubMed, there were only 21 results, mostly dealing with hyperaldosteronism and hypokalemia. Only few studies showed the correlation of hypokalemia and preeclampsia, and most of them dealt with few number of subjects. A study by Anjum in India in 2013 showed decreased levels of potassium in 40 preeclamptic women (3.37 ± 0.25) when compared to 40 normal pregnant women (3.54 ± 0.18).[12] Sidahmed in 2016 studied 60 Sudanese preeclamptic patients (3.08 ± 0.24) and found out that they had decreased level of potassium compared to uncomplicated pregnancies (3.55 ± 0.34).[13] One study entitled "Status of serum electrolytes in preeclamptic pregnant women of Riyadh, Saudi Arabia" by Tabassum et. al.[14], done in 2015, showed that serum potassium was negatively correlated with raised blood pressure.

Cochrane database had no data on association of hypokalemia and preeclampsia. However, when Herdin was searched for local publications, only one study emerged when both hypokalemia and hypertension in pregnancy/ preeclampsia were searched. Bataclan, et. al.[15] in 1962 showed that the fourteen newly delivered mothers whose blood pressure readings were abnormal did not show any significant differences in their serum sodium and potassium levels compared to the newly delivered women whose blood pressure readings were normal. There was no recent study found. Another local study was done in 1996 by Carandang et. al.[16], but it did not involve preeclampsia. In the study, 35 non-pregnant and 20 pregnant were included and showed that the mean potassium level was increased in the pregnant group, but there was no significant difference when compared to the non-pregnant group. They also found out that the serum potassium does not vary with changes in age of gestation.

OBJECTIVES

a. General: To determine if there is an association between hypokalemia and hypertension in pregnancy

b. Specific:

a. To determine whether serum potassium is significantly decreased in hypertensive disorders of pregnancy
b. To know if the level of potassium correlates with the severity of hypertension
c. To know whether we can recommend serum potassium as part of preeclamptic work up
d. To determine if potassium supplementation can be advised to preeclamptic women during prenatal check up

METHODOLOGY

a. Study Design: Analytic, Observational, Prospective, Cross-sectional

b. Target Population: Patients who are admitted at the institution, both who are uncomplicated (no comorbidities) and those who have preeclampsia (with and without severe features) from September to December 2017.

c. Inclusion Criteria: 1st arm: Pregnant patients without any co-morbidities; 2nd arm: Clinically diagnosed Preeclampsia

d. Exclusion Criteria: Those with severe underlying comorbidity, preexisting renal insufficiency (creatinine levels >1.3mg/dL), acute kidney injury (creatinine levels >0.5mg/dL or 50% of the baseline level), or those who had received drugs that may have interfered with the serum potassium balance (such as angiotensin-converting enzyme inhibitors, angiotensin II blockers, nonsteroidal anti-inflammatory agents, and diuretics). Those with history of diarrhea and any gastric losses near the date of admission and those with prior intake of B2-adrenergic agonists such as Insulin and bronchodilators are also excluded.

e. Definition of Terms

Uncomplicated/ Low-risk pregnancy – denotes single gestation, no known maternal co-morbidities, and maternal age is >17 years old and <35 years old, without the presence of inclusion criteria for high-risk pregnancy such as history of medical conditions (e.g. hypertension, heart disease, diabetes, thyroid disorders, obesity, moderate-severe asthma, pre-eclampsia, epilepsy, renal disease, bleeding disorders).

Preeclampsia without severe features - those with blood pressure elevation after 20 weeks age of gestation in the presence of proteinuria without other various laboratory and systemic findings which would qualify as preeclampsia with severe features: namely, thrombocytopenia (platelet count less than 100,000/ microliter), impaired liver function (elevated liver transaminases twice the normal), new development of renal insufficiency (elevated serum creatinine greater than 1.1mg/dL), pulmonary edema, or new-onset visual or cerebral disturbances.

Preeclampsia with severe features – those with BP elevations (>160/110) after 20 weeks age of gestation with other various laboratory and systemic findings which would qualify as preeclampsia with severe features as stated above.

Hypokalemia – defined as plasma concentration of <3.5 mmol/L

Mild Hypokalemia – defined as plasma concentration of 3.0 – 3.5 mmol/L

Moderate Hypokalemia – defined as plasma concentration of <2.5 to 2.9 mmol/L

Severe Hypokalemia – defined as plasma concentration of <2.5 mmol/L

f. Definition of Procedures and Measurement of Outcomes

The protocol was sent for review by the Ethics Committee and was approved on August 2017. The authors reviewed newly admitted patients' charts between September to December 2017 at the institution.

Sampling method was **systematic probability testing.**

For patients who are uncomplicated/ low-risk, an informed consent form was explained and signed by the patient and about 2mL of venous blood was collected from the antecubital vein by taking aseptic precautions. The samples were analysed for serum potassium. Likewise, for patients who have preeclampsia (with or without severe features), informed consent form was also explained and signed by the patient and about 2mL of venous blood was collected from the antecubital vein by taking aseptic precautions. The samples were analysed for serum potassium, but this time, together with the laboratories which are part of preeclamptic workup, according to the POGS clinical practice guidelines.

The primary outcome measure was the level of serum potassium at the time of admission. The serum potassium levels of patients without hypertension will be compared to those with hypertension.

Likewise, serum potassium levels of those with preeclampsia, with systolic blood pressure (SBP) of 140-150 will be compared to the levels in patients with systolic blood pressure of more than 160, to know whether the level of blood pressure is associated with severity of hypokalemia.

g. Sampling Scheme

i. Computation of sample size

Since the institution has around 2800 deliveries in the recent past four months (~700 deliveries per month), we entered the value (2800) in the computation of sample size as correction factor. (Table 1).

169 patients were needed for each arm of patients who are uncomplicated and those who have preeclampsia, for a total of 338. (Figure 1).

Table 1. Computation of Sample Size

Population size(for finite population correction factor or fpc)(N):	2800
Hypothesized % frequency of outcome factor in the population (p):	50%+/-5
Confidence limits as % of 100(absolute +/- %)(d):	5%
Design effect (for cluster surveys-*DEFF*):	1
Sample Size(n) for Various Confidence Levels	
ConfidenceLevel(%)	**Sample Size**
95%	338
80%	156
90%	247
97%	404
99%	537
99.9%	782
99.99%	983

Equation

Sample size $n = [DEFF*Np(1-p)]/ [(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]$

Results from OpenEpi, Version 3, open source calculator--SSPropor

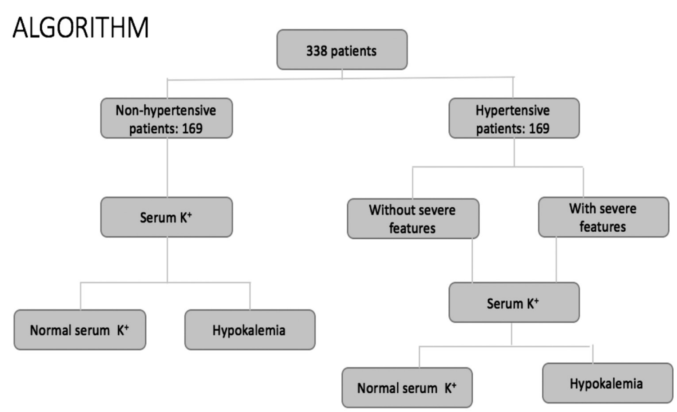

Figure 1. Algorithm of Procedure

ii. Statistical Approach

The means of the demographics and biochemical variables of both uncomplicated and preeclamptic patients were calculated and t-test was applied to find out significance level.

The Wilcoxon Signed-Rank Test was used to know whether hypokalemia exists only in preeclamptic patients and not with uncomplicated pregnancies, at 0.05 level of significance.

Chi-square was calculated to test the independence between the level of BP and level of serum potassium, while the Pearson Correlation Coefficient was measured to test the strength of the linear relationship between the level BP and the level of serum potassium, and whether they are negatively or positively associated.

RESULTS

All 169 patients for the first arm fulfilled the criteria for uncomplicated pregnancy. Likewise, all 169 patients fulfilled the criteria for preeclampsia, with 72 patients having a systolic BP of 140 to 150mmHg, while 97 patients had SBP of 160mmHg and above.

Baseline demographics of normotensive versus all hypertensive patients

The mean age in years of normotensive group was 25.9 ± 6.5, while for those who are hypertensive, the mean age was significantly higher at 31.38 ± 7.19 (p <0.00001). The mean age of gestation in weeks was 38.06 ± 1.93 for hypertensive, and significantly decreased at 36.97 ± 2.98 for hypertensive (p <0.000087). The mean weight for normotensive patients was 58.86 ± 9.97, while for hypertensive patients, it was significantly elevated at 64 ± 10.29 (p <0.00001). The systolic blood pressure (SBP) and diastolic blood pressure (DBP) in normotensive and hypertensive was 103.96 ± 10.24, 159.18 ± 19.56 and 80 ± 10.06, 64 ± 10.29, respectively. Both SBP and DBP were significantly higher for the hypertensive group than for the normal pregnant group (both at p <0.00001). (Table 2)

The mean serum level of potassium in normal pregnant women was 3.62 ± 0.31 mmol/L, whereas in hypertensive, the level was significantly lower at 3.37 ± 0.41 with p-value of less than 0.5 (<0.0003). (Table 2).

Table 2. Baseline demographics of normotensive versus all hypertensive patients

Parameters	Group I: Control (n=169)	Group I: Control (n=169)	p-value
Age (years)	25.9 ± 6.5	31.38 ± 7.19	<0.00001
AOG (weeks)	38.06 ± 1.93	36.97 ± 2.98	<0.000087
Weight (kg)	58.86 ± 9.97	64 ± 10.29	<0.00001
Systolic (mmHg)	103.96 ± 10.24	159.18 ± 19.56	<0.00001
Diastolic (mmHg)	80 ± 10.06	99.29 ± 11.98	<0.00001
Serum K (mmol/L)	3.62 ± 0.31	3.37 ± 0.41	<0.0003

Baseline demographics of hypertensive patients with SBP 140-150 versus hypertensive patients with SBP >160

When the baseline demographics of all preeclamptic patients were further classified into subgroup of SBP 140-150mmHg and SBP>160mmHg, it was found out that there was no significant difference in the mean age, age of gestation, weight, hemoglobin, platelet, SGOT, SGPT, LDH, and creatinine between the two groups. However, the serum potassium was significantly decreased in those patients with SBP >160mmHg (3.31 ± 0.46 mmol/L) as compared with those with SBP 140-150mmHg (3.45 ± 0.32 mmol/L), with p 0.013. (Table 3)

Table 3. Baseline demographics of hypertensive patients with SBP 140-160 versus hypertensive patients with SBP >160

Parameters	Group I: Systolic BP 140-150mmHg	Group II: Systolic BP >160mmHg	p-value
Age (years)	31.4 ± 6.9	31.36 ± 7.44	0.96
AOG (weeks)	37.27 ± 2.80	36.75 ± 3.11	0.13
Weight (kg)	63.07 ± 10.47	64.72 ± 10.14	0.15
Systolic (mmHg)	143 ± 5.04	170.93 ± 17.97	<0.00001
Diastolic (mmHg)	92.5 ± 6.66	104 ± 12.58	<0.00001
Hb	121.56 ± 15.15	126.05 ± 16.61	0.074
Platelet	259.43 ± 71.87	252.95 ± 74.54	0.286
SGOT	26.12 ± 11.59	26.55 ± 11.58	0.813
SGPT	19.67 ± 9.39	21.89 ± 8.73	0.058
LDH	226.35 ± 77.47	252.64 ± 108.86	0.05
Creatinine	57.29 ± 13.48	59.37 ± 23.64	0.251
Serum K (mmol/L)	3.45 ± 0.32	3.31 ± 0.46	0.013

Wilcoxon Signed-Rank Test

The value of potassium in normotensive and preeclamptic patients were compared using Wilcoxon Signed-Rank Test, with the null hypothesis that the level of serum potassium in normotensive patients is equal to those who are preeclamptic. The Z-value is -5.68, which is significant at p≤0.05, therefore there is significant difference between the level of serum potassium in normotensive patients compared to hypertensive patients. (Table 4)

Testing independence using Chi-Square Test

To test the independence between the level of BP and level of serum potassium, we calculated the chi-square, where the null hypothesis states that the level of serum potassium is independent from the level or severity of BP, with the calculated degrees of freedom of 2. Since the calculated X2 ≈ 45.46 is in the critical region (5.9), the null hypothesis is rejected. Hence, the level of serum potassium is dependent on the level of BP. (Table 5)

Table 4. The Wilcoxon Signed-Rank Test
The Z-value is -5.68, which is significant at p≤0.05, therefore there is significant difference between the level of serum potassium in normotensive patients compared to hypertensive patients.

Results Details

W-value: 3509
Mean Difference: 0.32
Sum of pos. ranks: 10687
Sum of neg. ranks: 3509

Z-value: -5.6842
Mean (W): 7098
Standard Deviation (W): 631.4

Sample Size (N): 168

Table 5. Testing independence using Chi-Square Test with the calculated degrees of freedom of 2. Since the calculated X2 ≈ 45.46 is in the critical region (5.9), the null hypothesis is rejected. Hence, the level of serum potassium is dependent on the level of BP.

	Normotensive	**BP 140-150mmHg**	**SBP >160mmHg**	**Total**
Normal K level	53	34	72	159
Serum K < mol/L	116	38	25	179
Total	169	72	97	338

Pearson Correlation Coefficient

We also measured the strength of the linear relationship between the level BP and the level of serum potassium. Since we hypothesized that the level of serum potassium decreases as the level of BP increases, we expected a negative correlation (r is closer to -1). In this case, the value of r is -0.1135. hence, as the BP increases, the value of serum potassium decreases. (Table 6)

Outcomes of the study

Out of 169 uncomplicated patients, 108 had normal serum potassium levels, while 55 and 6 had mild and moderate hypokalemia, respectively. None had severe hypokalemia.

Of the 72 hypertensive patients whose SBP was between 140-150mmHg, 36 had normal potassium levels, 31 had mild hypokalemia, while 5 had moderate hypokalemia. None of them had severe hypokalemia.

While for the 97 hypertensive patients whose SBP was above 160mmHg, 26 had normal potassium levels, while 55 had mild hypokalemia, 12 had moderate hypokalemia, and 4 had severe hypokalemia, with potassium levels as low as 2.4 mmol/L.

Table 6. Pearson Correlation Coefficient. The value of r is -0.1135. hence, as the BP increases, the value of serum potassium decreases.

<u>Result Details & Calculation</u>

X Values
$\Sigma = 26750$
Mean = 159.226
$\Sigma(X - M_x)^2 = SS_x = 64199.405$

Y Values
$\Sigma = 562.9$
Mean = 3.351
$\Sigma(Y - M_y)^2 = SS_y = 39.549$

X and Y Combined
$N = 168$
$\Sigma(X - M_x)(Y - M_y) = -180.923$

R Calculation
$r = \Sigma((X - M_y)(Y - M_x)) / \sqrt{((SS_x)(SS_y))}$

$r = -180.923 / \sqrt{((64199.405)(39.549))} = -0.1135$

Meta Numerics (cross-check)
r = -0.1135

<u>Key</u>

X: X Values
Y: Y Values
M_X: Mean of X Values
M_Y: Mean of Y Values
$X - M_X$ & $Y - M_Y$: Deviation scores
$(X - M_X)^2$ & $(Y - M_Y)^2$: Deviation Squared
$(X - M_X)(Y - M_Y)$: Product of Deviation Scores

The adverse consequences of hypokalemia were not included in the study.

DISCUSSION

Management of hypertension in pregnancy has always been a challenge despite the numerous efforts by obstetricians. The identification of pathophysiology is needed because management of preeclampsia not only involves control of blood pressure but also of its complications. The changes in levels of electrolytes, specifically potassium, complicates the management, as it can both cause hypertension and can also be the effect of the blood pressure elevation.

Hypokalemia in preeclampsia is serious because it can cause severe muscle weakness or rhabdomyolysis, which could cause respiratory muscle weakness, which can be severe enough to result in respiratory failure and death. It could also cause involvement of gastrointestinal muscles, resulting in ileus and its associated symptoms of distension, anorexia, nausea, and vomiting. Moreover, it can cause cardiac arrhythmias and multiple structural and functional changes in the kidney. Hypokalemia could also reduce insulin secretion, which could cause diabetes.

One unpopular theory is the abnormality in the Na^+/K^+ ATPase pump, involved in the transport of sodium and potassium across the vascular smooth muscle cell membrane, which is responsible for blood pressure regulation.17 The said pump is accountable for the sequestration of potassium intracellularly, and since in normal pregnancy, the level of potassium remains very near the normal range except for the slight decrease in second trimester due to expanded blood volume18, hypokalemia is unlikely and may be an early sign of blood pressure elevation as a consequence of Na^+/K^+ ATPase pump abnormality.

Another study in 2005 by Dhanjal et. al.19 revealed that the R563Q mutation of the β-subunit of the epithelial sodium channel (ENaC) in the distal renal tubule and collecting duct of the kidney (the final site for regulation of sodium balance in which constitutive reabsorption of sodium happens), leads to hypertension, low plasma levels of renin and aldosterone and, in some cases, hypokalemia.

Serum electrolytes have been studied by various authors.12,13,14 In this study, using larger sample of 338 (169 per arm), we noted that the mean serum level of potassium was significantly lower at 3.37 ± 0.41 mmol/L in preeclamptic women as compared to those in normal pregnant women was 3.62 ± 0.31 mmol/L, with p-value of less than <0.0003. Also, the Z-value using Wilcoxon Sign-rank test is -5.68, is significant at $p \leq 0.05$, therefore level of serum potassium in hypertensive patients is decreased as compared to that of normotensive patients.

This is also the first study evaluating the correlation of increasing blood pressure to decreasing serum potassium levels. When the serum potassium of patients with SBP >160mmHg was compared with those with SBP 140-150mmHg, it was revealed that the former had lower levels at 3.31 ± 0.46 mmol/L, compared to the latter with levels at 3.31 ± 0.46 mmol/L, which was statistically significant at p 0.013. Hence, as blood pressure increases, levels of potassium also decreases. This dependence of the serum potassium on the level of blood pressure was also confirmed by Chi-Square test at $X2 \approx 45.46$ which is in the critical region (5.9), accepting the alternative hypothesis that the level of serum potassium is dependent on the level of BP. Pearson Correlation coefficient also confirmed this finding with r at -0.1135 stating a negative correlation, hence, as the BP increases, the value of serum potassium decreases. This may be due to the possible role of hypokalemia in the etiopathogenesis of preeclampsia.

Because of above results, the authors are recommending serum potassium determination during prenatal check up of hypertensive patients. Moreover, since hypokalemia may also be a predisposing factor in the development of preeclampsia, hypertensive patients are also advised to either have a diet with adequate amount of potassium or have a potassium supplementation.

CONCLUSION

The present study concludes that in preeclamptic pregnant women in the institution, there is reduction in serum potassium. Decreased potassium levels may have a possible role to play in the etiopathogenesis of preeclampsia. Hence, since they are correlated, the authors recommend the addition of serum potassium as part of the criteria of severity of preeclampsia. This study also showed that as the level of blood pressure increases, the level of potassium decreases. On the basis of the results, hypertensive pregnant women are advised to have a baseline serum potassium and to consume diet containing adequate amount of potassium or have a potassium supplementation during prenatal check up.

LIMITATION

This study did not include signs and symptoms of hypokalemia in preeclampsia. We also did not determine potassium level after Magnesium sulfate administration since it could affect the cellular movement of potassium.

RECOMMENDATION

The authors recommend including the signs and symptoms of hypokalemia and correlating it with the severity of hypertension. Moreover, correlating the level of serum potassium before and after Magnesium sulfate administration to determine if those who were administered with the drug would need less potassium correction since magnesium increases serum potassium theoretically.

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