

EFFECT OF ACUTE POTASSIUM REDUCTION DURING DIALYSIS ON BLOOD PRESSURE IN PATIENTS OF CHRONIC KIDNEY DISEASE

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Introduction: In developing countries like India and others, many patients of chronic kidney disease are faced with number of problems like inadequate and infrequent dialysis and are exposed to more fluctuations of urea, creatinine and potassium. However, rapid K+ reduction is known to be associated with rise of Blood pressure. This makes blood pressure control during intradialytic and interdialytic period difficult. The impact of acute reduction of potassium on blood pressure has not been studied extensively and there is not even a single study done in this regard to individualise antihypertensive treatment or modify dialysis machine settings. Even guidelines on blood pressure management has not addressed this issue.

The aim of this study: was to determine assessment of the "Effect of Acute potassium reduction on blood pressure during dialysis in patients of chronic kidney disease"

Observational Study Design

• 100 dialysis sessions on Patient with pre HD Potassium more than 5.5 were compared with 100 dialysis sessions with pre HD potassium less than 5 • Pre HD potassium, post HD potassium • Blood presure was measured Pre HD, 2 hours after initiation of HD, at end of Dialysis and 1 hour after dialysis of Other parameters were noted and compared such as - Ultrafiltration, basic disease, comorbidities, antihypertensive medications, Age, Sex, Dietary pattern • Correlation of change in BP (BP) was studied. Patients with acute coronary syndrome, sepsis and patient requiring inotropic support were excluded.

INTERPRETATION

• 100 dialysis sessions (Cases) were done on 92 patients • 100 dialysis sessions (Controls) were done on 84 patientsMean age of study subject was 47.35 + 13.7 years and that of control subjects was 49 + 11.2 years

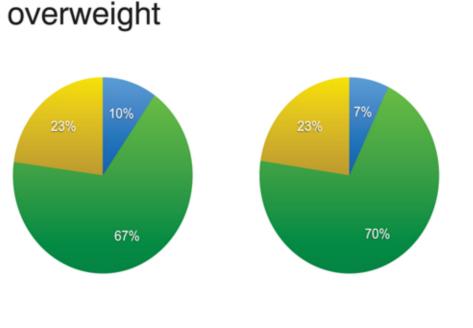
Comparison Between Cases And Control-DM(diabetes) CAD (Coronary artery disease) UF (ultrafiltrartion), VEG (vegetarian dietary pattern)

Controls 65.4:34.6 NS NS DM 24% NS CAD Hep C 2.5 + 0.8NS NS

Comparison Between Cases And Control of Difference In UF and Pre HD & Post HD Potassium

	Cases	Controls	
UF	2.3 + 0.6	2.5 + 0.8	NS
Pre HD K	6.3 <u>+</u> 1.7	4.7 <u>+</u> 0.3	S
Post HD K	3.3 <u>+</u> 0.8	3.4 <u>+</u> 0.7	NS
d K	3 + 1.2	1.3 + 0.6	S

BMI in cases and control cases-9 subject were underweight 62 normal and 21 overweight controls- 6 subjects unerweight, 59 normal and 19



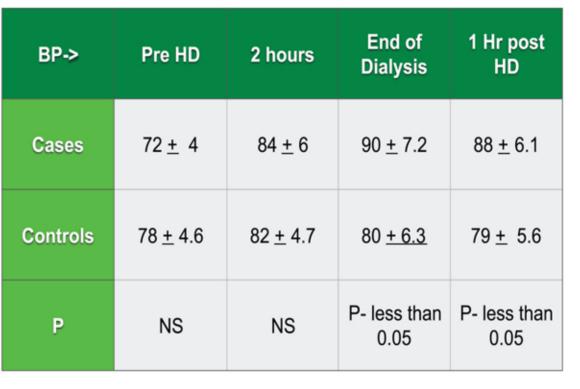
Changes in systolic bloodpressure among cases and controlssignificant rise noted at end of dialysis and 1 hour post dialysis

BP->	Pre HD	2 hours	End of Dialysis	1 Hr post HD
Cases	131 <u>+</u> 6	136 <u>+</u> 6.4	154 <u>+</u> 8.5	152 <u>+</u> 7.8
Controls	134 <u>+</u> 5.6	132 <u>+</u> 9.6	136 <u>+</u> 11.2	133 <u>+</u> 8.9
P	NS	NS	P- less than 0.05	P- less than 0.05

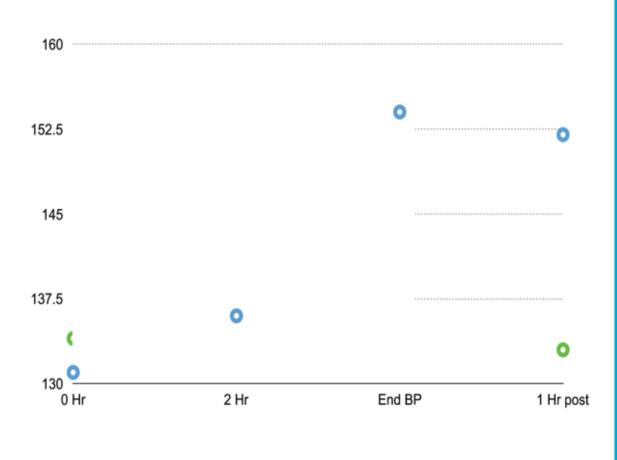
scatter chart -d K vs d

BP among Controls

Diastolic blood pressure changes among cases and controls changes in diastolic bp is less marked but significant at end and 1 hr post



Changes In Systolic Blood Pressure Among Cases Is More Marked Than In Controls

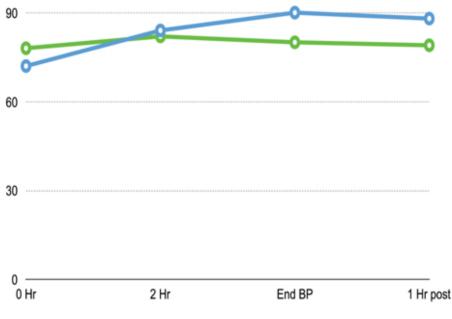


Blood pressure rise was

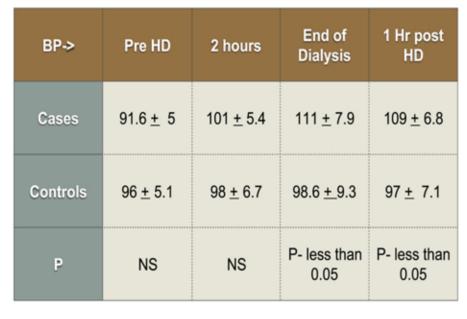
more but insignificant

among non diabetics

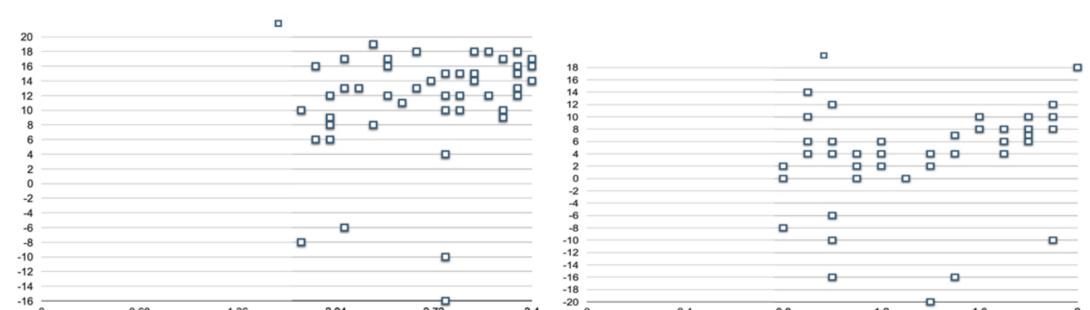
Diastolic blood pressure changes among cases and controls



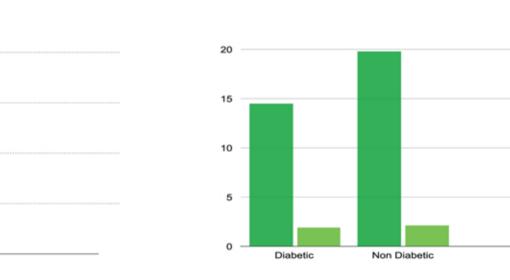
Mean arterial presure (MAP) in cases and control- significant rise



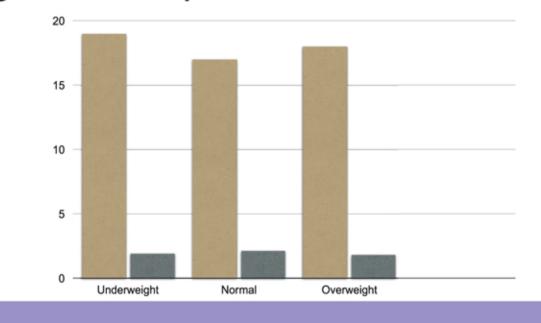
scatter chart -d K vs d BP among cases R 0.6



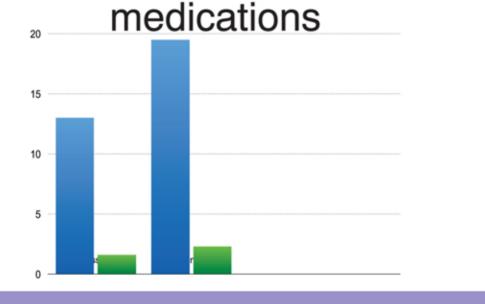
Blood pressure rise was more but insignificant among females



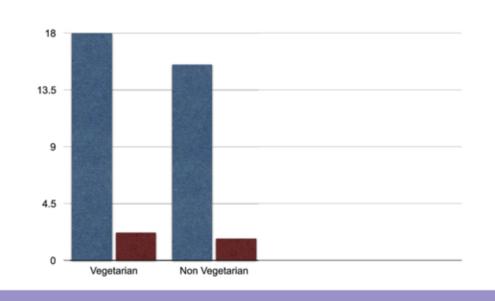
Blood pressure rise was more but insignificant among underweight as compared to normal and overweight

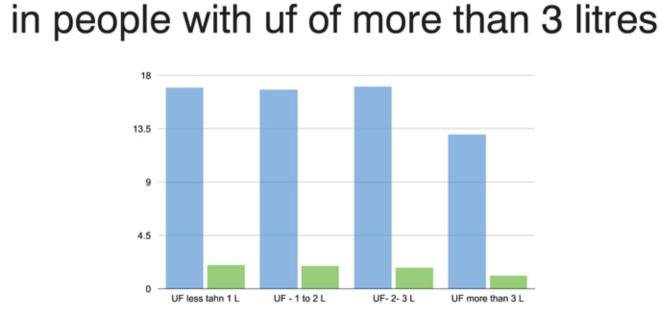


Blood pressure rise was significantly more in indiviuals taking more than 3 anti hypertensive



Blood pressure rise was more but Blood pressure rise was significantly less insignificant among vegeterians





DISCUSSION

Link between potassium and blood pressure is well known. According to JNC7 guidelines, high potassium diet lowers blood pressure (1) and in various alternative medicines like Ayurveda high potassium diet is advised to control blood pressure. But the question is that whether acute potassium lowering increases blood pressure. Epidemiological data suggest a role for potassium depletion as a co-factor in the development and severity of hypertension, while dietary potassium inversely correlates with blood pressure (2,3,4). In animal models, an acute decrease in serum potassium concentration produces vasocostriction mediated by the vascular endothelium and an increase in myocardial contractility; the opposite effect is observed if it increases (5,6,7). Potassium softens vascular endothelium and increases nitric oxide release (8). An acute increase of potassium in the physiological range swells and softens the endothelial cell and increases the release of nitric oxide. In animal models, an acute decrease in serum potassium concentration produces vasoconstriction mediated by the vascular endothelium and an increase in myocardial contractility; the opposite effect is observed if it increases. Experimental data suggested that physiological changes during haemodialysis patients with intradialytic hypertension is primarily related to endothelin and nitric oxide which may be modified by potassium fluctuations (9). However in one clinical study significant changes in BP was not found with different levels of potassium in dialysate, however at the end of dialysis there was rebound hypertension with lower potassium dialysate concentration (10). In another study evaluating 11 patients significant rise in BP was noted (11). In one another study involving 24 patients and 288 sessions, there was actually hypotension (12). However such dialysis protocol is not usually followed in clinical practice. Our study clearly indicates potassium reduction as cause of significant intradialytic hypertension. This could be because of potassium fluctuation being more pronounced in our patients.

CONCLUSIONS

• Rapid Potassium reduction in dialysis leads to significant increase in blood pressure at end of dialysis • Changes in systolic pressure is more than diastolic pressure • This increase in BP persists at least for 1 hour post HD • BP rise was more (not significant) in females, non diabetics, vegetarians. BP rise was significantly more in people taking more than 3 group of antihypertensives •BP rise was less in people with more than 3 litres • Uncontrolled K may be one reason for uncontrolled BP in intradialytic and post dialytic period

BIBLIOGRAPHY

- 1. The Seventh Report Of The Joint National Committee On Prevention, Detection, Evaluation, And Treatment Of High Blood Pressure
- 2. Morris RC Jr, Sebastian A, Forman A, Tanaka M, Schmidlin O: Normotensive salt sensitivity: effects of race and dietary potassium. Hypertension 1999, 33:18-23, PMID: 9931076.
- 3. Stamler J, Rose G, Elliott P, Dyer A, Marmot M, Kesteloot H, Stamler R: Findings of the International Cooperative INTERSALT Study. Hypertension 1991, 17:19-15, PMID: 1987018.
- 4. Whelton PK, He J, Cutler JA, et al: Effects of oral potassium on blood pressure: meta-analysis of randomized controlled clinical trials. JAMA 1997, 277:1624-1632, PMID: 9168293.
- 5. Amberg GC, Bonev AD, Rossow CF, Nelson MT, Santana LF: Modulation of large conductance, Ca2+ activated K+ channels in vascular smooth muscle during hypertension. J Clin Invest 2003,112:717-724,
- 6. Haddy FJ, Vanhoutte PM, Feletou M: Role of potassium in regulating blood flow and blood pressure. Am J Physiol Regul Integr Comp Physiol 2006, 290:546-552,
- 7. Prasad K, Koob R: Cardiovascular function in dogs with acute hypokalemia. Angiology 1978, 29:589-600,
- 8. Oberleithner et al. Potassium softens vascular endothelium and increases nitric oxide release. Proc Natl Acad Sci U S A. 106(8):2829-34 (2009).
- 9. Kidney International (2006) 69, 1833–1838 Physiological changes during hemodialysis in patients with intradialysis hypertension K-J Chou, P-T Lee, C-L Chen, C-W Chiou, C-Y Hsu, HM Chung
- 10. Dolson GM, Ellis KJ, Bernardo MV, Prakash R, Adrogué HJ: Acute decreases in serum potassium augment blood pressure. Am J Kidney Dis 1995, 26:321-326,
- 11. Am J Kidney Dis. 1995 Aug;26(2):321-6. Acute decreases in serum potassium augment blood pressure. Dolson GM1, Ellis KJ, Bernardo MV, Prakash R, Adrogué HJ.
- 12. Gabutti et al. BMC Nephrology 2011, 12:14



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