
ORIGINAL RESEARCH ARTICLE**Study of Lipid Profile and Serum Electrolytes in Patients of Chronic Renal Failure***Pritee Pendkar¹ and Tushar Bansode²**Assistant Professor, Department of Biochemistry, Government Medical College, Miraj, Maharashtra, India^{1,2}*

Abstract:**Introduction:**

CRF affects multiple organs of human body like heart and brain. All these effects results due to dyslipidemia which is due to metabolic and endocrinal disturbances. Electrolyte level alterations are also observed in case of CRF patients.

Materials and Method:

This cross section study includes total 110 subjects. Out of these 60 subjects were clinically diagnosed CRF patients having age more than 20 years and remaining 50 subjects were chosen from healthy controls not having any major medical problem. Among 60 CRF cases, 30 were on maintenance dialysis for a period of 5 months to 3 years. These patients were undergoing dialysis for 3-4 hours thrice week, Other 30 patients were on conservative line of treatment. Fasting venous blood samples were collected and serum levels of Total cholesterol, Triglycerides, High density lipoprotein cholesterol, Low density lipoprotein cholesterol, Very low density lipoprotein cholesterol, Serum Na⁺ & K⁺ were measured.

Results:

It is seen that Serum K⁺, total cholesterol, triglyceride, VLDL-C and total cholesterol to HDL-C ratio were significantly increased in CRF on conservative management group as compared controls while mean level of LDL-C did not show any significant difference between these two groups i.e. controls & CRF on conservative management. The mean value of Serum Na⁺ and HDL-C was significantly decreased in CRF on conservative management as compared to control. It is also observed that Serum K⁺, total cholesterol, triglyceride, VLDL C and total cholesterol to HDL ratio were significantly increased in CRF on dialysis group as compared controls while mean level of LDL did not show any significant difference between these two groups i.e. controls & CRF on dialysis.

The mean value of Serum Na⁺, HDL-C was significantly decreased in CRF on dialysis group as compared controls.

Conclusion:

The present study indicates that due to dyslipidemia in CRF, there is increased risk of cardiovascular complications.

Keywords:

Chronic Renal failure, Dyslipidemia, Lipid Profile, Serum Electrolytes.

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Address for correspondence:

Dr. Tushar V Bansode, Assistant Professor, Department of Biochemistry, Government Medical College, Miraj-416410, Maharashtra, India , Email- drtusharbansode@gmail.com,
Mobile No:7758051952

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Introduction:

CRF is the condition resulting from permanent and progressive deterioration of renal function which can cause adverse effects on other systems. ⁽¹⁾Primary glomerulonephritis is the commonest cause of CRF in developing countries of the world. ⁽²⁾It is seen that the prevalence of CRF in India may be up to 785 people per million population. ⁽³⁾Lipid abnormalities can be detected as early as renal function begins to decline (Glomerular Filtration Rate <

50ml/min). Lipid abnormalities and enhanced oxidative stress in CRF cases, promotes the atherosclerotic process causing cardiovascular complications. Most characteristic lipid abnormality is increased serum triglycerides, very low density lipoprotein , intermediate density lipoprotein and low levels of high density lipoprotein . ^(4,5)

Electrolyte disturbances are also seen in case of CRF patients. It is due to progressive malfunction of kidney in CRF. ⁽⁶⁾

Materials and Methods:

Present study was conducted in Department of Biochemistry, Tertiary care center with the help of Medicine & Surgery Department. Institutional Ethics Committee for research work has given approval for research work. The selection of subjects is carried out from OPD & dialysis unit of Government Medical College, Nanded. A total number of 110 subjects were participated in this cross section study, out of which 60 were clinically diagnosed CRF cases having age more than 20 years and 50 were healthy controls without any major medical illness were included. Among 60 chronic renal failure patients, 30 patients on maintenance dialysis for a period of 5 months to 3 years. These patients were undergoing dialysis for 3-4 hours thrice a week. Other 30 patients were on

conservative line of therapy. Patients with diabetes mellitus, hypertension, history of familial hyper lipoproteinemias, history of hepatic dysfunction, patients on hypolipidemic drugs were excluded from study. Following biochemical parameters were determined. Total cholesterol: CHOD PAP method (end point),⁽⁷⁾ Triglycerides: GPO Trinder method (end point),⁽⁸⁾ HDL: Direct method,⁽⁹⁾ LDL: Direct method,⁽⁹⁾ VLDL = TAG/5, Serum Na⁺, Serum K⁺.⁽¹⁰⁾

Observations & Results:

The levels of Total Cholesterol, Triglycerides, High Density Cholesterol, Low Density Cholesterol, and very low density cholesterol, Serum Na⁺, Serum K⁺ were analyzed and their results were shown in the following tables and graphs.

Table 1: Tukeys multiple comparison of Serum Na⁺, Serum K⁺ between control & CRF on conservatives management

Parameter	Control	CRF on conservative Rx	p value
SerumNa ⁺	141.7 ± 5.23	131.0 ± 6.78	< 0.05
SerumK ⁺	3.2 ± 0.38	5.16 ± 0.65	< 0.05

Table 2: Tukeys multiple comparison of lipid profile between control & CRF on conservatives management

Parameter	Control	CRF on conservative management	p value
Total Cholesterol	180.06 ± 22.3	215.8 ± 22.9	< 0.05
Triglyceride	110. ± 30.2	247 ± 36.47	< 0.05
HDL C	45.33 ± 5.0	39.10 ± 4.09	< 0.05
LDL C	113.42 ± 23.4	128.2 ± 18.41	> 0.05
VLDL C	21.6 ± 6.06	49 ± 6.62	< 0.05
TC/HDL	3.97 ± 0.69	5.51 ± 0.74	< 0.05

FIG 1: Bar diagram showing comparison of Serum Na⁺, Serum K⁺ in Control & CRF on conservative management

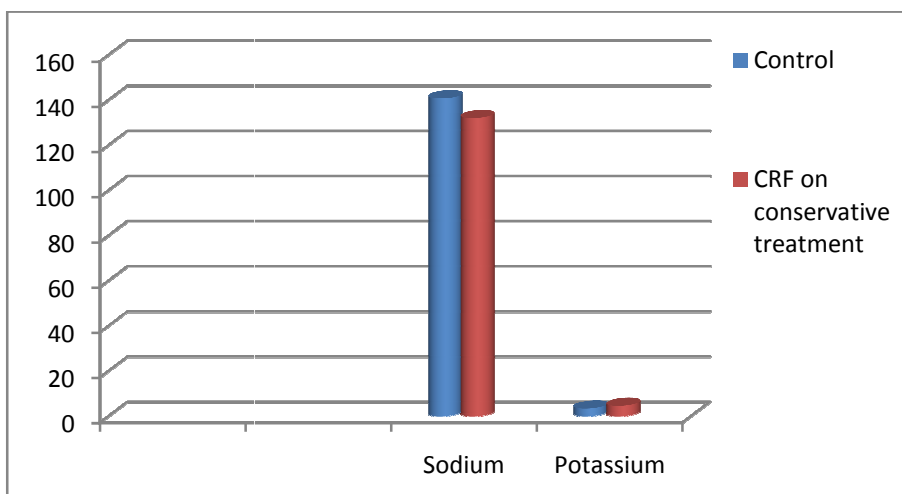


FIG 2: Bar diagram showing comparison of lipid profile in Control & CRF on conservative management

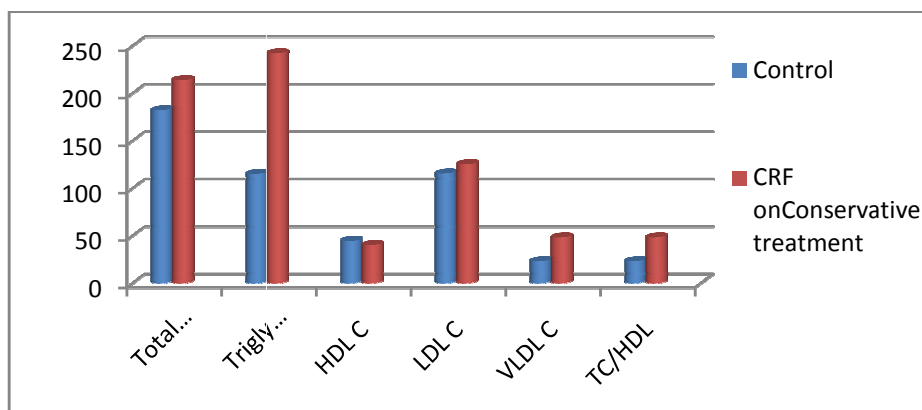


Table 1, 2 and Figure 1, 2 shows Pairwise significance of study parameters between controls and CRF on conservative management, in which mean level of Serum K⁺, total cholesterol, triglyceride, VLDL C and total cholesterol to HDL ratio were significantly increased in CRF on conservative

management group as compared controls while mean level of LDL-C did not show any significant difference between these two groups i.e. controls & CRF on conservative management. The mean value of Serum Na⁺ and HDL-C was significantly decreased in CRF on conservative management as compared to control.

Table 3: Tukeys multiple comparison of Serum Na⁺, Serum K⁺ between control & CRF on dialysis

Parameter	Controls	CRF on dialysis	p value
Serum Na ⁺	140.7 ± 5.23	134.0 ± 7.90	< 0.05
Serum K ⁺	3.4 ± 0.38	4.84 ± 0.96	< 0.05

Table 4: Tukeys multiple comparison between control & CRF on dialysis

Parameter	Controls	CRF on dialysis	p value
Total Choesterol	182.06 ± 22.3	197.6 ± 22.70	< 0.05
Triglycerides	115. ± 30.2	196.8 ± 21.9	< 0.05
HDL C	44.33 ± 5.0	32.2 ± 3.05	< 0.05
LDL C	115.42 ± 23.4	125.5 ± 22.43	> 0.05
VLDL C	22.9 ± 6.06	39.2 ± 4.37	< 0.05
TC/HDL	4.12 ± 0.69	6.2 ± 1.02	< 0.05

FIG 3: Bar diagram showing comparison of Serum Na⁺, Serum K⁺ in Control & CRF on dialysis

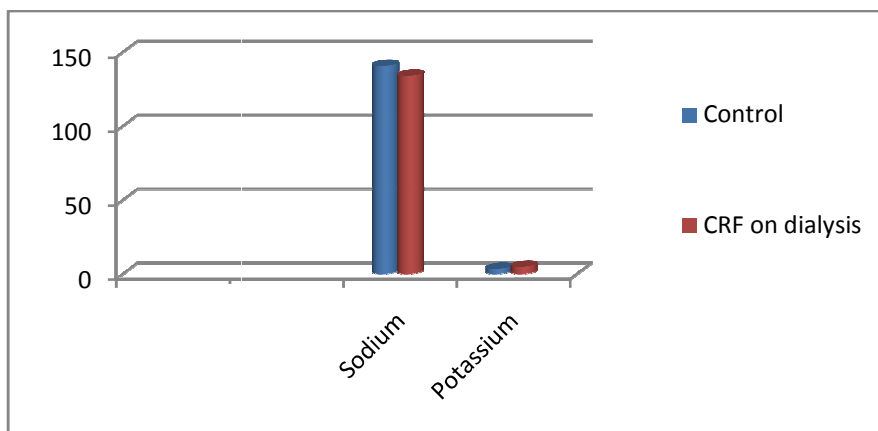


FIG 4: Bar diagram showing comparison of lipid profile in Control & CRF on dialysis

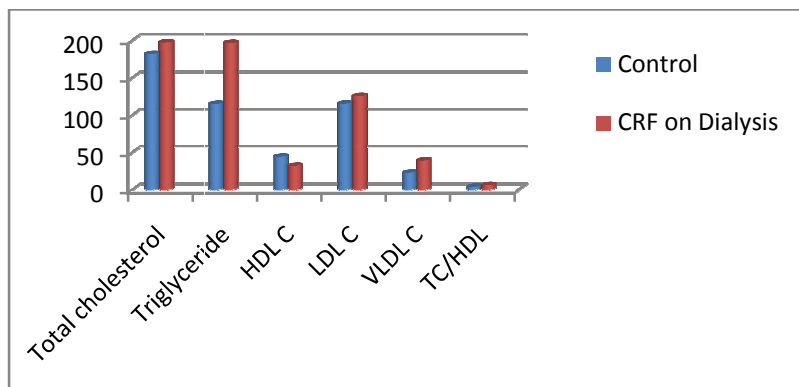


Table 3, 4 and Figure 3, 4 shows Pairwise significance of study parameters between controls and CRF on dialysis, in which mean level of Serum K^+ , total cholesterol, triglyceride, VLDL-C and total cholesterol to HDL ratio were significantly increased in CRF on dialysis group as compared controls while mean level of LDL did not show any significant difference between these two groups i.e. controls & CRF on dialysis. The mean value of Serum Na^+ , HDL-C was significantly decreased in CRF on dialysis group as compared controls.

Discussion:

Chronic renal failure is one of the leading causes for increased morbidity and mortality in general population. Its incidence is estimated to be 785 per million of population. Deaths due to cardiovascular complications in CRF patients were 20 times higher when compared to other causes. Patients with CRF display a clinical picture of early atherosclerosis. Disorders of lipoprotein metabolism during uremia and dialysis are important mechanisms of atherogenesis in CRF.⁽⁶⁾

The mean value of Serum K^+ was significantly increased in CRF on conservative treatment as well as CRF on dialysis as

compared to controls. The mean value of Serum Na^+ was significantly decreased in CRF on conservative treatment as well as CRF on dialysis as compared to controls. CRF is characterized by gradual decrease in nephron number and function. Decrease in the concentrating ability of kidney leads to accumulation of electrolytes.⁽¹¹⁾

CRF is associated with hypercholesterolemia which is due to associated proteinuria and renal insufficiency per se. Proteinuria leads to alteration in gene expression for HMG -CoA reductase which results in increased activity of HMG-CoA reductase leading to hypercholesterolemia. It is also known that LDL receptor mediated cholesterol uptake plays an important role in cholesterol homeostasis. Renal insufficiency or in combination with heavy proteinuria leads to acquired LDL receptor deficiency which plays a central role in the genesis of the associated hypercholesterolemia in CRF.⁽¹²⁾

Hypertriglyceridemia is a common feature of CRF. It may be due to increased synthesis and / or diminished clearance from the circulation. CRF is associated with insulin resistance which can promote hepatic VLDL production leading to increased plasma triglycerides. Presence of insulin resistance in

renal failure activates hormone sensitive lipase causing increased FFA. The increased FFA availability, stimulate the production of apoB-100 containing lipoproteins like VLDL leading to increased triglyceride level.^(12,13,14)

The cause for decreased concentration of HDL-C in CRF is not clear. It might be due to low activities of LPL, hepatic triglyceride lipase (HTGL), LCAT and increased concentration of CETP and decreased apolipoprotein concentrations. LPL generates precursor of HDL during lipolysis of TG rich lipoproteins and HTGL promotes conversion of HDL₂ to HDL₃, thereby they maintain the normal HDL-C concentration. In CRF patients, activities of both the enzymes are decreased leading to decreased HDL-C concentration. LCAT is the key enzyme which keeps the chemical gradient of cholesterol from cells to plasma. LCAT activity is also decreased in patients with CRF. Reduction of plasma LCAT activity may be due to reduced hepatic production and its inhibition by an unknown uremic toxin leading to decreased HDL-C concentration.⁽¹²⁾

CRF are associated with impaired clearance of VLDL and chylomicrons. This is due to dysregulation of LPL, hepatic lipase, VLDL receptor, hepatic ACAT and LRP

expression / activities and impaired HDL metabolism leading to increased level of VLDL-C.⁽¹²⁾

The cause for the low TC/HDL-C ratio is due to decreased lipoprotein concentrations which could be due to removal of lipoproteins by repeated dialysis and decreased peripheral resistance to insulin after starting dialysis.⁽¹⁵⁾

Conclusion:

The altered concentration of serum lipoproteins leads to accelerated atherosclerosis in CRF patients. Hence by correcting the abnormalities of lipid profile associated complications would be avoided.

Conflict of interest: None to declare

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