

**DYSLIPIDEMIA IN CHRONIC RENAL FAILURE ASSOCIATED  
CARDIOVASCULAR DISEASE :A HOSPITAL BASED STUDY**

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**Abstract**

Lipid disorders are one of the known metabolic changes associated with chronic renal failure (CRF) The prominent features of uremic dyslipidemia are an increase in plasma triglycerides and cholesterol in nearly all lipoproteins, and a reduction in high-density lipoprotein (HDL) cholesterol. Cardiovascular disease (CVD) is a major cause of mortality in patients with chronic renal failure (CRF). One of the risk factors for cardiovascular disease is dyslipidemia as it accelerates atherosclerosis. Therefore it is essential to study uremic dyslipidemia, since optimal treatment is essential for the prevention or delay of cardiovascular complications in patients with CRF.

**Materials and Methods:** Cases of chronic renal failure associated with cardiac diseases admitted in the medical wards from Jan 2022 to Mar 2023 Dept.of cardiology ,Sri Jayadeva institute of cardiology, Kalaburagi

**Results:** Plasma triglycerides ( $174\pm 60.7$  mg/dl Vs  $97\pm 17$  mg/dl) and VLDL fraction ( $34.88\pm 12.15$  mg/dl Vs  $19.3\pm 3.49$  mg/dl) were significantly elevated in CRF patients compared to controls ( $p < 0.001$ ). There was significant decrease in plasma HDL ( $36\pm 5.1$  Vs  $48.8\pm 10.3$ ) in CRF patients compared to controls ( $p < 0.001$ ). There was no significant difference in total cholesterol ( $187\pm 43.5$  Vs  $185.2\pm 24.51$  mg/dl) in CRF and Controls ( $p > 0.05$ ). On comparing lipid profiles in CRF patients on conservative management and Hemodialysis there was significant increase in triglycerides in hemodialysis group ( $199.01\pm 70$  Vs  $155.176\pm 47$ mg/dl).

**Conclusion:** Uremic dyslipidemia is a specific Metabolic abnormality. Excess triglycerides and VLDL fraction was observed in patients of CRF both on conservative management and hemodialysis. Further, reduced level of HDL cholesterol was also observed both in conservative and hemodialysis group of CRF patients. Dyslipidemia observed in Uremic patients may contribute to accelerated atherosclerosis and further progression of chronic renal failure.

**Keywords:** Blood urea nitrogen ,Coronary heart disease ,Chronic kidney disease ,Chronic renal disease

**Introduction**

Chronic renal failure (CRF) is an irreversible deterioration of renal function, which results from diminished effective functioning of renal tissue. Ensuing impairment of excretory, metabolic and endocrine functions of the kidney leads to the development of clinical syndrome of uremia. Cardiovascular disease is a major cause of morbidity and mortality among patients with chronic renal failure<sup>1,2,3</sup>. Majority of patients die from cardiovascular system complications. The growing recognition that dyslipidemia is a major risk factor for coronary heart disease has prompted interest in the identification and management of abnormalities in plasma lipids and lipoproteins. In chronic renal failure the most prevalent

lipid disorders are hypertriglyceridemia and decreased HDL Concentration. LDL levels are usually normal or marginally increased<sup>4,5,6</sup>. Also there are reports available regarding accelerated atherosclerosis in chronic renal failure due to altered lipid metabolism. In recent years, the levels of high-density lipoproteins have gained importance in view of the fact that increasing reports are available incriminating decreased HDL levels as one of risk factors for cardiovascular disease. Chronic renal failure is a syndrome, which results from progressive and irreversible destruction of nephrons regardless of the etiology, where the kidney is no longer able to maintain the biochemical homeostasis. The syndrome is complex and the biochemical changes and clinical signs are variable and mostly non-specific. Chronic renal failure may result from any destructive and progressive condition affecting both the kidneys. It implies failure of both the glomerular and tubular functions. By convention acquired tubular defects or isolated congenital defects are not included in the consideration of chronic renal failure. Chronic renal failure may be asymptomatic or symptomatic. Kidney has a tremendous reserve capacity. About 80% of renal function will be lost before the renal failure develops. Thus the GFR usually would have fallen to about 40 ml per minute, before the blood urea nitrogen or creatinine levels raise above the upper limits of normal. Azotemia refers to the accumulation of nitrogenous waste products in the blood and is reflected as elevated blood urea nitrogen. 'Uremia' is defined as symptomatic renal failure. Stages of chronic kidney disease<sup>9</sup>.

Cardiovascular disease is the leading cause of morbidity and mortality in patients with CRD at all stages. 30-45% of patients reaching ESRD already have advanced cardiovascular complications.<sup>7,8</sup> CRD at all stages constitute a major risk factor for ischemic cardiovascular disease, including occlusive coronary heart, cerebrovascular and peripheral vascular disease. CRD – related risk factors. The CRD related risk include, anemia, hyperphosphatemia, hyperparathyroidism and a state of microinflammation. The inflammatory state elicits a rise in acute phase reactants such as interleukin-6 and C- reactive protein. Other abnormalities augment myocardial ischemia. These include reduced myocardial tolerance to ischemia due to left ventricular hypertrophy and microvascular disease. Nitric oxide is an important mediator for vascular dilatation. Its availability in CRD is decreased because of increased concentrations of asymmetric dimethyl – L arginine and also because nitric oxide is scavenged by reactive oxygen species. Abnormal cardiac function secondary to myocardial ischemic disease and left ventricular hypertrophy together with salt and water retention in uremia often result congestive heart failure and pulmonary edema. A unique form of pulmonary congestion and edema may occur even in the absence of volume overload and is associated with normal or mildly elevated intracardiac and pulmonary capillary wedge pressure. It is due to increased permeability of alveolar capillary membranes. Hypertension is the most common complication of CRD and ESRD. It may develop early during the course of CRD and is associated with adverse outcome in particular, more rapid loss of renal function and development of cardiovascular disease. Administration of EPO may raise blood pressure and increase the requirement for antihypertensive drugs in CRD patients. Left ventricular hypertrophy and dilated cardiomyopathy are among the most ominous risk factors for excess cardiovascular morbidity and mortality in patients with CRD and ESRD and are thought to be related primarily to prolonged hypertension and ECFV overload. Absence of hypertension may signify the presence of salt wasting form of renal disease (e.g. medullary cystic disease, chronic tubulointerstitial disease, or papillary necrosis) or volume depletion due to gastrointestinal cause or diuretic therapy or reduced cardiac index.

## **MATERIALS AND METHODS**

Cases of chronic renal failure associated with cardiac diseases admitted in the medical wards from Jan 2022 to Mar 2023 Dept.of cardiology ,Sri Jayadeva institute of cardiology, Kalaburagi

**INCLUSION CRITERIA:**

All stable CRF Patients of chronic renal failure in all stages.

Diagnostic criteria for chronic renal failure

1. Clinical signs and symptoms of uremia
2. The presence of Chronic Kidney disease was established based on presence of kidney damage and level of kidney function (GFR). Markers of kidney damage included abnormalities in the composition of blood (elevated blood urea, serum creatinine) or urine or abnormalities in imaging tests (ultrasonogram).
3. Ultrasonographic evidence of bilateral shrunken kidney/ loss of corticomedullary differentiation.

**EXCLUSION CRITERIA:**

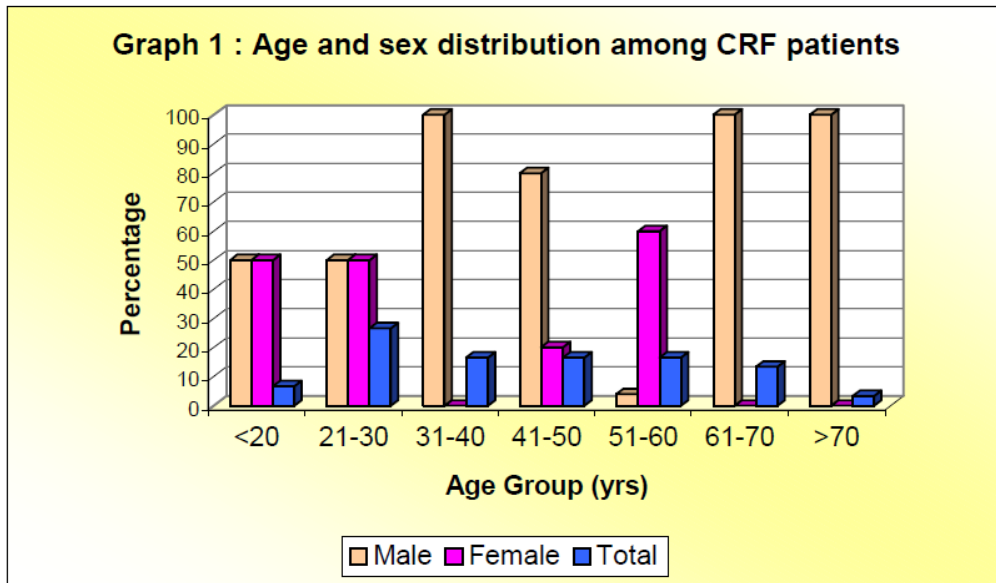
1. Critically ill patients
2. Recent worsening of renal failure
3. Acute on chronic renal failure
4. Patients on lipid lowering drugs
5. Associated co-morbid conditions such as febrile illness

**RESULTS**

Thirty patients of chronic renal failure and 25 normal subjects (controls) were taken for present study.Lipid levels like TC, TG, LDL and VLDL were estimated for both controls and CRF patients and were compared.

**TABLE 1: AGE AND SEX DISTRIBUTION AMONG CRF PATIENTS**

| Age group | Total no of cases | Percentage | Male | Percentage | Female | Percentage |
|-----------|-------------------|------------|------|------------|--------|------------|
| <20       | 2                 | 6.6        | 1    | 50         | 1      | 50         |
| 21-30     | 8                 | 26.6       | 4    | 50         | 4      | 50         |
| 31-40     | 5                 | 16.6       | 5    | 100        | 0      | 0          |
| 41-50     | 5                 | 16.6       | 4    | 80         | 1      | 20         |
| 51-60     | 5                 | 16.6       | 2    | 40         | 3      | 60         |
| 61-70     | 4                 | 13.3       | 4    | 100        | 0      | 0          |
| >70       | 1                 | 3.3        | 1    | 100        | 0      | 0          |
| Total     | 30                |            | 21   |            | 9      |            |

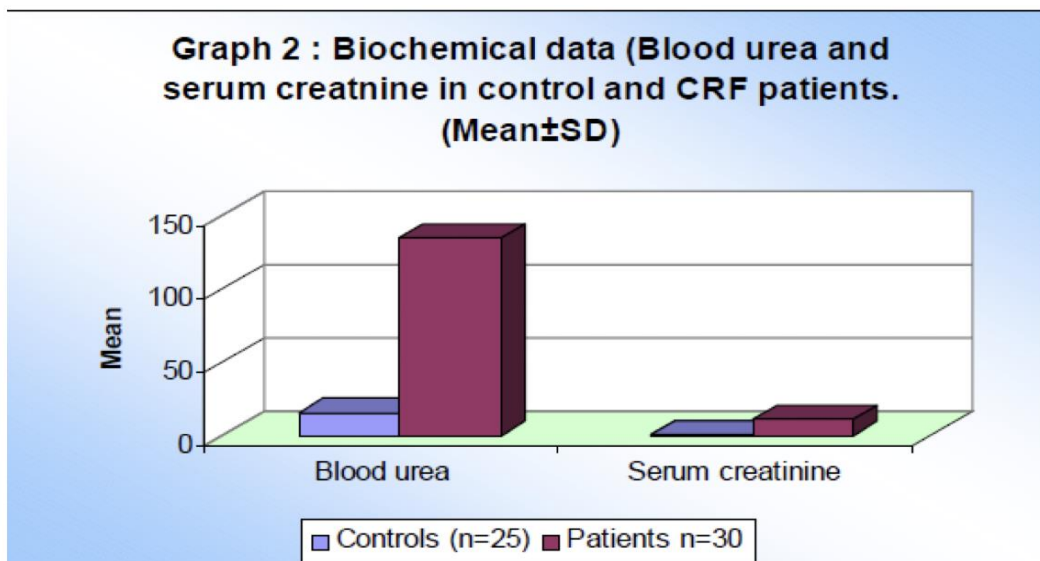


In the present study, 30 patients of CRF were included, out of which 21 patients (70%) were male and 9 patients (30%) were females. On decade wise grouping, we found maximum number of patients between 21-30 years (26.6%) . The mean age for the total number of patients was 42.7. The mean age for the male patients was 45.3. The mean age for female patients was 36.6. Male to female ratio in the study group was 2:3:1

**TABLE 2: BIOCHEMICAL DATA IN CONTROLS AND CRF PATIENTS. (MEAN±SD)MG/DL.**

| Groups          | Blood urea   | Serum creatinine |
|-----------------|--------------|------------------|
| Controls (n=25) | 15.7±5.3     | 0.82±0.33        |
| Patients n=30   | 135.23±41.64 | 10.96±4.73       |
| t-value*        | 14.235       | 10.681           |
| Significance    | <0.001       | <0.001           |

\*Student’s t-test (unpaired) P<0.001 highly significant

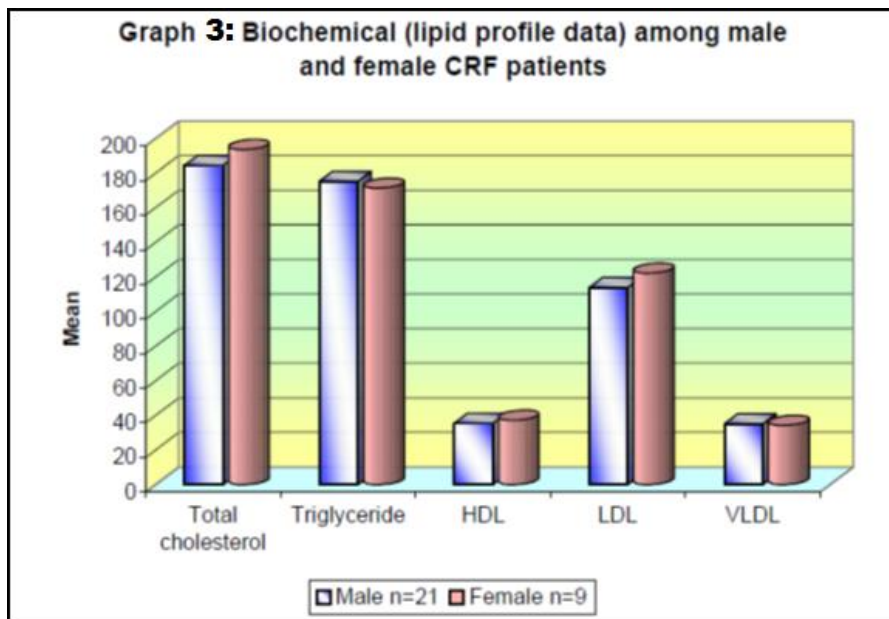


In Table 2 Mean values for urea in controls and patients showed a considerable difference, which was found to be highly significant ( $P < 0.001$ ). Creatinine levels in CRF patients were very high as compared to controls. This difference was statistically significant ( $P < 0.001$ ).  
 Table 3 : Biochemical (lipid profile) data in controls and CRF patients (Mean  $\pm$  SD)mg/dl.

**TABLE 3: SHOWING THE ELECTROCARDIOGRAPHIC CHANGES**

| Particulars | Frequency | Percentage |
|-------------|-----------|------------|
| LVH         | 18        | 60 %       |
| NO LVH      | 12        | 40 %       |
| Total       | 30        | 100 %      |

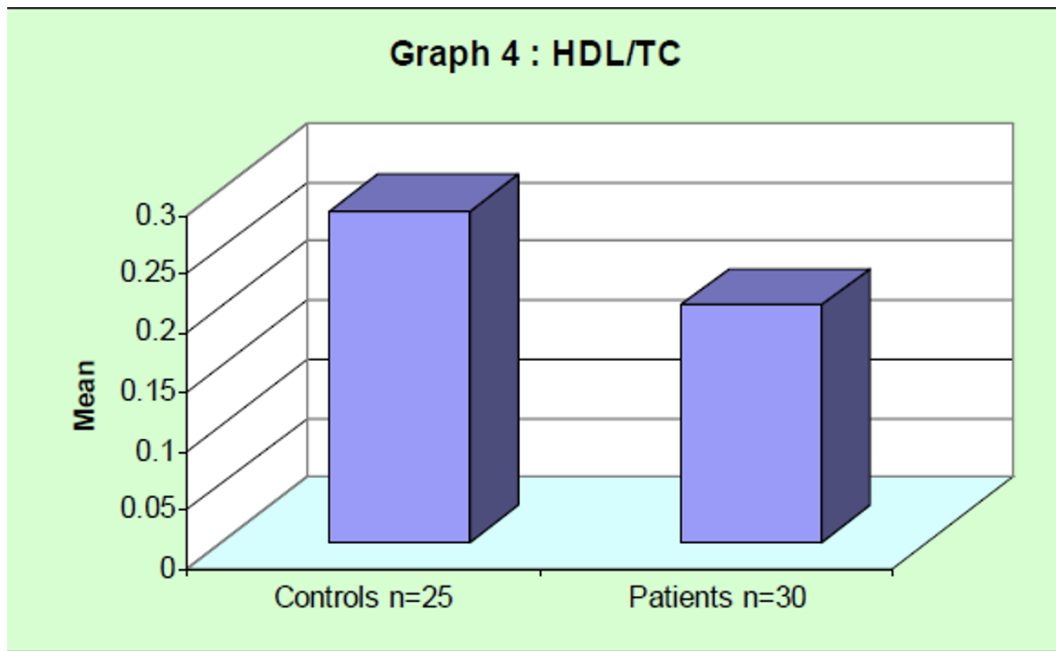
In the present study, out of the 30 patients with CRF, 18 patients (60%) had Left Ventricular Hypertrophy and 12 patients (31%) had no signs of left ventricular hypertrophy.



**TABLE 4: SHOWS COMPARISON OF BIOCHEMICAL MEAN VALUES OF TC, TG, HDL, AND HDL/TC**

(Mean  $\pm$  SD)mg/dl.

| Groups            | Conservative treatment n=17 | Dialysis n=13       | t-value | p-value    |
|-------------------|-----------------------------|---------------------|---------|------------|
| Total cholesterol | 192.529 $\pm$ 50.17         | 180.385 $\pm$ 32.66 | 0.7595  | N.S        |
| Triglycerides     | 155.176 $\pm$ 47            | 199.01 $\pm$ 70     | 2.052   | Sig P<0.05 |
| HDLc              | 36.1 $\pm$ 5.76             | 35.7 $\pm$ 5.20     | 0.1964  | N.S        |
| LDLc              | 125.38 $\pm$ 44.3           | 104.87 $\pm$ 25.10  | 1.492   | N.S        |
| VLDLc             | 31.27 $\pm$ 9.525           | 39.82 $\pm$ 14      | 1.991   | N.S        |
| HDL/TC            | 0.20 $\pm$ 0.053            | 0.202 $\pm$ 0.0405  | 0.1130  | N.S        |

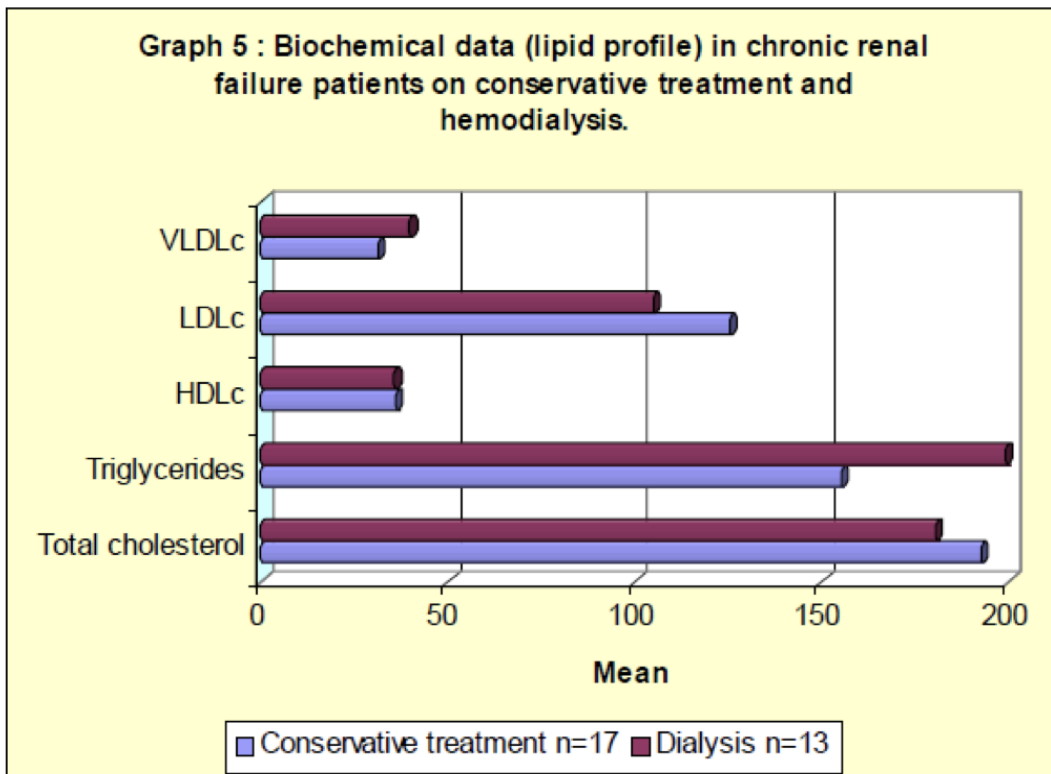


Mean total cholesterol in patients on conservative treatment was  $192.529 \pm 50.17$  mg/dl and for patients on Hemodialysis it was  $180.38 \pm 32.66$  and this difference was statistically not significant ( $P > 0.05$ ). TG- Mean triglycerides in patients of CRF on conservative treatment and Hemodialysis group are  $155.176 \pm 47$  and  $199.01 \pm 70$  mg/dl respectively. This difference was statistically significant ( $P < 0.05$ ). HDLc: Mean HDL value in conservative treatment group and those on Hemodialysis are  $36.1 \pm 5.76$  mg/dl and  $35.7 \pm 5.20$  respectively and this difference was statistically not significant. LDL:- Mean LDL value in CRF patients on conservative group and Hemodialysis group are  $125.38 \pm 44.3$  mg/dl and  $104.87 \pm 25.10$  respectively and this difference was statistically not significant. VLDL:- Mean VLDL values for conservative and Hemodialysis group are  $31.27 \pm 9.525$  mg/dl and  $39.82 \pm 14$  mg/dl respectively and this difference was statistically not significant. HDL/TC:- The difference in mean values of HDL/TC in both conservative treatment and Hemodialysis group was also statistically not significant.

**Table 5: Biochemical (lipid profile) data among male and female CRF patients**

| Lipid patients mg/dl | Male (n=21) Mean $\pm$ SD | Female (n=9) Mean $\pm$ SD | t'     | p-value |
|----------------------|---------------------------|----------------------------|--------|---------|
| Total cholesterol    | $184.47 \pm 46.8$         | $193.7 \pm 33.57$          | 0.533  | N.S     |
| Triglyceride         | $175.38 \pm 55.03$        | $171.44 \pm 72.16$         | 0.1637 | N.S     |
| HDL                  | $35.3 \pm 5.45$           | $37.2 \pm 3.94$            | 0.9416 | N.S     |
| LDL                  | $114.01 \pm 41.72$        | $122.27 \pm 28.01$         | 0.5412 | N.S     |
| VLDL                 | $35.13 \pm 11.03$         | $34.29 \pm 14.43$          | 0.1743 | N.S     |

**Table 5** :Shows Biochemical (lipid profile) data among male and female CRF patients. On comparing Mean values of TC, TG, HDL, LDL, VLDL values between male and female patients, there was increase in TG and decrease in HDL in male patients and there was increase in TC and LDL in female patients. However these differences were statistically not significant ( $P < 0.05$ ).



**DISCUSSION**

The results of the study on the lipid disorders in patients with chronic renal failure show that there are significant alterations in the lipid profiles of these patients as compared to controls.

**Table 6 : Comparative study of lipid profiles in chronic renal failure with previous studies:**

| Lipids | Avasthi et al <sup>9</sup> Mean ±SD | Present study Mean ±SD | Controls Mean ±SD |
|--------|-------------------------------------|------------------------|-------------------|
| TC     | 204±50.54                           | 187±43.5               | 185±24.5          |
| TG     | 181±21.8                            | 174±60.7               | 97±17             |

Avasthi et al studied 20 patients of chronic renal failure. During investigation all the patient were placed on conservative treatment for renal failure They reported mean triglyceride levels of 181±21.87 and total cholesterol of 204±50.54 mg/dl respectively.

**Table 7: sex distribution:**

| Avasthi et al <sup>9</sup> |        |       | Present study |        |       |
|----------------------------|--------|-------|---------------|--------|-------|
| Male                       | Female | M:F   | Male          | Female | M:F   |
| 13                         | 7      | 1.8:1 | 21            | 9      | 2.3:1 |

In study conducted by Avasthi et al male to female ratio was 1.8:1

**Table 8: Lipid profile data(mean ±SD)**

| S M Alam et al <sup>10</sup> |            |            | Present study |              |             |
|------------------------------|------------|------------|---------------|--------------|-------------|
| Lipid                        | Uremia     | H.D        | Uremia        | H.D          | Controls    |
| TC                           | 232.3±56.4 | 160.8±56.4 | 192.5±50.17   | 180.38±32.66 | 185.2 ±24.2 |
| TG                           | 243.7±119  | 145.4±24.3 | 155.176±47    | 199.01±70    | 97±17       |
| HDLc                         | 19.0±6.1   | 12.17±5.1  | 36.1±5.76     | 35.7±5.20    | 48.8±10.3   |
| LDLc                         | -          | -          | 125.38±44.3   | 104.87±25.10 | 116.8±26.78 |
| VLDLc                        | -          | -          | 31.27±9.525   | 39.82±14     | 19.3±3.49   |

H.D = Heamodylisis, S.M. Alam et al Studied serum lipid and lipoprotein fractions in ESRD patients (35 patients), twenty patients were being treated conservatively and 15 were being hemodialyzed twice weekly. The mean TG, HDLc of this study are shown in Table 13. Serum triglycerides were elevated in conservatively managed group. It was also noted that HDLc was markedly decreased in both conservative and hemodialysis is group.

**Table No 9: Sex distribution:**

| S. M. Alam et al <sup>10</sup> |        |       | Present study |        |       |
|--------------------------------|--------|-------|---------------|--------|-------|
| Male                           | Female | M:F   | Male          | Female | M:F   |
| 22                             | 13     | 1.7:1 | 21            | 9      | 2.3:1 |

Table 14 Shows comparison of sex distribution in study conducted by SM Alam et al with present study.

**Table 10 : shows comparison of distribution of patients in conservatively managed group and Hemodialysis group in study conducted by SM Alam et al with present study.**

| Group        | S. M. Alam et al <sup>10</sup> |        |       | Present study |        |       |
|--------------|--------------------------------|--------|-------|---------------|--------|-------|
|              | Male                           | Female | Total | Male          | Female | Total |
| Conservative | 13                             | 7      | 20    | 11            | 6      | 17    |
| Hemodialysis | 9                              | 6      | 15    | 10            | 3      | 13    |

**Table 11: Lipid profile data(mean ±SD)**

| John D. Bagdade et al <sup>11</sup> |        |         | resent study |              |             |
|-------------------------------------|--------|---------|--------------|--------------|-------------|
| Lipid                               | Uremia | H.D     | Uremia       | H.D          | Controls    |
| TC                                  | 209±44 | 196±31  | 192.5±50.17  | 180.38±32.66 | 185.2 ±24.2 |
| TG                                  | 209±91 | 210±127 | 155.176±47   | 199.01±70    | 97±17       |
| HDLc                                | 35±23  | 38±18   | 36.1±5.76    | 35.7±5.20    | 48.8±10.3   |

John D. Bagdade et al Studied lipid profile in 27 patients of CRF, 13 patients not on dialysis, 14 patients on dialysis who had stable chronic uremia. The results of this study is shown in table 16. Triglycerides were found to be elevated in both non – dialysed and dialysed CRF patients and HDLc was found to be decreased (<40 mg/dl) in both dialysed and undialysed groups.

|                          | John D . Bagdade et al <sup>11</sup> | Present study |
|--------------------------|--------------------------------------|---------------|
| Serum creatinine (mg/dl) | 12.1±3.3                             | 10.96±4.73    |



Mean serum creatinine values in study conducted by John D Bagdaded et al was 12.1±3.3 mg/gl and it was 10.9±4.73 in present study .

**Table 12: Lipid profile data (mean ±SD)**

| LS Ibels et al <sup>12</sup> |         |         | Present study |              |             |
|------------------------------|---------|---------|---------------|--------------|-------------|
| Lipids                       | Uremia  | H.D     | Uremia        | H.D          | Controls    |
| TC                           | 236±24  | 216±57  | 192.5±50.17   | 180.38±32.66 | 185.2 ±24.2 |
| TG                           | 273.±57 | 237±112 | 155.176±47    | 199.01±70    | 97±17       |
| HDLc                         | 22±6    | 24±9    | 36.1±5.76     | 35.7±5.20    | 48.8±10.3   |
| LDLc                         | 131±42  | 116±34  | 125.38±44.3   | 104.87±25.10 | 116.8±26.78 |
| VLDLC                        | 55±40   | 47±28   | 31.27±9.525   | 39.82±14     | 19.3±3.49   |

LS Ibels et al studied serum lipoprotein fractions in patients of CRF of Conservatively managed group, those on short term and long term maintenance hemodialysis .

## CONCLUSIONS

In this study alteration in different lipoprotein fractions in chronic renal failure patients were studied and also difference in lipid profile in chronic renal failure patients on conservative treatment and hemodialysis were also studied. There is significant increase in triglyceride and VLDL concentration in chronic renal failure patients. The HDL-cholesterol level was found to be significantly lower in CRF patients compared to control group .Total cholesterol and LDL was not significantly raised in patients of CRF compared to controls.The HDL/TC ratio was significantly reduced in CRF patients.On comparison of chronic renal failure patients on hemodialysis and patients on conservative treatment, there is significant increase in triglyceride levels. However total cholesterol and LDL levels were not significantly increased in Hemodialysis patients as compared to patients on conservative treatment.The significant increase of triglyceride, VLDL and reduction in HDL and HDL/TC ratio in chronic renal failure patients is the cause for increase in cardiovascular abnormalities in CRF patients. Significant reduction in HDL and HDL/total cholesterol ratio are the important predictive indices for the risk of developing coronary artery disease in all group of patients with chronic renal failure. This may be major contributory factor for enhanced atherogenesis in these patients. The present study shows that patients with chronic renal failure have higher left ventricular mass index and higher prevalence of left ventricular hypertrophy (LVH), which is more marked in patients with severe renal failure.

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