

# A Study Oxidative Stress and its Correlation with Lipid Profile in Chronic Renal Failure Patients.

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## ABSTRACT

**Background:** Chronic Renal Failure (CRF) is characterized by gradual, progressive and permanent decrease in the renal functions. Moreover, CRF adversely effects the functioning of the various other organs. Dyslipidemia is the characteristic of the CRF, moreover lipid profile disorder appear from the onset of the CRF. However, severity of disturbance depends on the stage of CRF. MDA one of the important marker of oxidative stress is the product of lipid peroxidation, which is produced by oxidation of poly unsaturated fatty acid. Increased oxidative stress leads to destruction of bio-molecules, protein, DNA and RNA of the cells. **Methods:** This was a cross sectional type of study conducted in the TMMC & RC, Moradabad (U.P.). Total sixty patients of CRF patients > 20 years were included in the study. Lipid profile which included serum concentration of total cholesterol (TC), triglycerides (TG) and high density lipoprotein (HDL) were calculated enzymatic method CHOD-POD method, GPO-PAP method, CHOD-POD/ Phosphotungstate method respectively **Results:** There was a significant difference between the mean values of TC (< 0.001), TG (< 0.001), LDL (< 0.001), VLDL (< 0.001) of CRF patients and Control group III. MDA level was significantly high in group I and group II compare to group III. Further, the levels of MDA were significantly high in group I CRF patients on dialysis when compared to group II conservatively managed patients (p < 0.001). **Conclusion:** Findings of the present study showed that there is increased oxidative stress level as well elevated risk of CVD in CRF patients on dialysis. More of altered level of lipids induces atherosclerosis in CRF patients. Therefore, the present study suggest that management lipids and oxidative stress should be included during the treatment of CRF patients.

**Keywords:** CRF, Dyslipidemia, MDA, CVD.

## INTRODUCTION

Chronic Renal Failure (CRF) is characterized by gradual, progressive and permanent decrease in the renal functions. Moreover, CRF adversely effects the functioning of the various other organs.<sup>[1]</sup> Prevalence of CRF in India has been increases in recent years. Awareness of CRF in societies of developing country like India has highlighted during few years.<sup>[2]</sup> CRF induces various complications including cardiovascular diseases (CVD), peripheral vascular diseases and cerebrovascular diseases during its course. CRF patients are more likely to die with CVD instead of CRF. Risk of death with CCVD is 20 fold higher in CRF patients compare to general population.<sup>[3]</sup> CRF induces various metabolic and endocrinal disorders which in turn produce dyslipidaemis along with other omplications.<sup>[3,4]</sup> Patients of CRF also encountered increased oxidative stress due to decrease antioxidant levels and increased antioxidant level.<sup>[5]</sup>

Dyslipidemia is the characteristic of the CRF, moreover lipid profile disorder appear from the onset of the CRF. However, severity of disturbance depends on the stage of CRF. MDA one of the important marker of oxidative stress is the product of lipid peroxidation, which is produced by oxidation of poly unsaturated fatty acid. Increased oxidative stress leads to destruction of bio-molecules, protein, DNA and RNA of the cells.<sup>[5,6]</sup>

Increased oxidative stress along with dyslipidemia leads to increase the process of atherosclerosis as well risk of CVD. Therefore, the present study was designed to evaluate the correlation of oxidative stress and lipid profile in CRF patients. Serum MDA was measured by thiobarbituric acid (TBA) method.

## MATERIALS AND METHODS

This was a cross sectional type of study conducted in the TMMC & RC, Moradabad (U.P.). Total sixty patients of CRF patients > 20 years were included in the study. Further, CRF patients were divided into two groups. Group I consisted thirty CRF patients haemodialysis and group II included 30 CRF patients on conventional therapy. Forty patients suffering with dyslipidemia without CRF included in

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the study as control under Group III. Exclusion criteria included patients on lipid lowering medicines and antioxidants. Each and every participant of the study gave informed written consent before participating in the study. The pre-study was approved from the ethical committee of the TMMC & RC, Moradabad.

Collection of sample- Fasting blood samples (5ml) were collected in sterile tubes. After that samples were centrifuged to separate serum for the biochemical analysis.

**Biochemical estimation**

Lipid profile which included serum concentration of total cholesterol (TC), triglycerides (TG) and high density lipoprotein (HDL) were calculated enzymatic method CHOD-POD method, GPO-PAP method, CHOD-POD/ Phosphotungstate method respectively. Serum concentration of low density lipoprotein (LDL) and VLDL were measured used by using Friedewald’s formula. Serum MDA was measured by thiobarbituric acid (TBA) method.<sup>[8]</sup>

Statistical analysis – All the results were expressed as mean ± SD. A p value <0.05 was considered as significant. Unpaired t test was used to evaluate the result of the study.

**RESULTS**

**Table 1: Comparison of serum lipid profile between Group I and Group III**

| Parameter          | TC mg/dl                 | TG mg/dl      | HDL -C mg/dl | LDL-C mg/dl | VLDL-C mg/dl |
|--------------------|--------------------------|---------------|--------------|-------------|--------------|
| Total CRF patients | Mean ± SD<br>204.5± 23.7 | 223.18± 27.82 | 34.4± 6.3    | 126.4± 18.4 | 44.6 ± 6.7   |
| Group III          | Mean ± SD<br>182.1± 22.3 | 115.0± 0.2    | 44.3± 5.0    | 115.4± 23.4 | 22.4 ± 5.1   |
| t value            | 5.29                     | 15.75         | 8.27         | 2.38        | 15.53        |
| p value            | < 0.001                  | < 0.001       | < 0.001      | < 0.05      | < 0.001      |

**Table 2: Comparison of serum lipid profile between Group I and Group II**

| Parameters | TC mg/dl                  | TG mg/dl      | HDL -C mg/dl | LDL-C mg/dl  | VLDL -C mg/dl |
|------------|---------------------------|---------------|--------------|--------------|---------------|
| Group I    | Mean ± SD<br>197.6 ± 22.7 | 196.8 ± 21.83 | 32.2± 3.1    | 125.5 ± 22.4 | 39.2± 4.4     |
| Group II   | Mean ± SD<br>213.8 ± 22.9 | 242.4 ± 36.5  | 40.0± 4.1    | 125.2 ± 18.4 | 48± 7.7       |
| t value    | 2.74                      | 5.95          | 8.3          | 0.041        | 5.71          |
| p value    | <0.05                     | <0.001        | <0.001       | >0.05        | <0.001        |

[Table 1] shows there was a significant difference between the mean values of TC (< 0.001), TG (< 0.001), LDL (< 0.001), VLDL (< 0.001) of CRF patients and Control group III.

[Table 2] shows that there was a significant difference in lipid profile of group I CRF patients on dialysis in comparison of group II CRF patients on conservative treatment. Lipid profile of the group I CRF patients was significantly low compare to group II CRF patients.

[Table 3] shows that MDA level was significantly high in group I and group II compare to group III. Further, the levels of MDA were significantly high in group I CRF patients on dialysis when compared to group II conservatively managed patients (p < 0.001).

**Table 3: Comparison of serum MDA Group I, Group II and Group III.**

|                   | Group I              | Group II              | Group III             |
|-------------------|----------------------|-----------------------|-----------------------|
| Serum MDA nmol/ml | 6.6 ± 1.0            | 4.8 ± 1.0             | 3.0 ± 0.5             |
|                   | Group I vs Group III | Group II vs Group III | Group II vs Group III |
| P value           | <0.001               | <0.001                | <0.001                |

[Table 4] reveals that there was a positive correlation of MDA with TC, TG, LDL and VLDL whereas there was a negative correlation of MDA with HDL.

**Table 4: Correlation between lipid profile and oxidative stress parameters.**

|                   |         | T.C mg/dl | T.G mg/dl | HDL mg/dl | LDL mg/dl | VLDL mg/dl |
|-------------------|---------|-----------|-----------|-----------|-----------|------------|
| Serum MDA nmol/ml | r value | 0.294     | 0.339     | -0.681    | 0.217     | 0.554      |
|                   | P value | <0.001    | <0.001    | <0.001    | <0.05     | <0.001     |

**DISCUSSION**

Dyslipidemia along with increased oxidative stress leads increased risk of atherogenesis in CRF patients. Results of the present study shows TG was significantly high in CRF patients compare to control subjects which are consistent with the prior studies of S M Alam et al,<sup>[10]</sup> Bharat Shah et al,<sup>[11]</sup> P Lee et al,<sup>[12]</sup> and Ziad A Massy.<sup>[13]</sup> Increased level of TG in CRF patients may be due to lipoprotein lipase and hepatic lipase leads to defective metabolism of lipoprotein rich TG.<sup>[14-16]</sup>

Further, results revealed TC was significantly increased in total CRF patients when compared to group III controls. The finding of the current study is very similar to the findings of the previous studies of M.M. Avram et al,<sup>[17]</sup> P.O Attman et al and Mayumi Tsumura et al.<sup>[18,19]</sup> Contrary to it B.S Das et al.,<sup>[20]</sup> reported decreased levels of TC in CRF patients. The reason for this decrease of TC in CRF patients was

not clear. This increase of TC in CRF patients may be due to associated renal insufficiency and proteinuria. Proteinuria causes alteration in gene expression which in turn leads to increased activity of HMG-CoA reductase results in increased level of TC.<sup>[14]</sup> Present study showed that HDL-C was significantly de-creased in CRF patients in comparison to controls which is consistent with the previous studies of Ziad A Massy et al,<sup>[13]</sup> BS. Das et al and Tetsuo Shoji et al as they observed the similar results.<sup>[20,21]</sup> The cause of decreased HDL in CRF patients is not clear yet. However, it may be due to decreased activities of hepatic triglyceride lipase and increased concentration of cholesterol.<sup>[14]</sup>

Findings of the current study showed that TC, TG, LDL, VLDL were significantly high in conservatively managed CRF patients in comparison of CRF patients on dialysis. However, HDL was significantly low. These results are in accordance with the previous studies of SM Alam et al,<sup>[10]</sup> Bharat Shah et al,<sup>[11]</sup> and Mayumi Tsu-mura et al.<sup>[19]</sup> This decrease of lipids in CRF patients on dialysis may be due to decreased peripheral resistance to insulin as well as removal of lipids via dialysis.<sup>[11]</sup>

Reactive oxygen species cause oxidation of poly unsaturated fatty acid results in production of MDA. MDA is one of the important markers of lipid peroxidation. Furthermore, findings of the current study revealed that serum MDA level was significantly increased in CRF patients on dialysis in comparison of CRF patients on conservative treatment. Finding of the present study are consistent with the results of the previous studies of C.M Loughrey et al,<sup>[22]</sup> A. Marjani and Talia Weinstein et al.<sup>[23,24]</sup> However, dialysis leads to decrease of various biochemical parameters; nevertheless increase of oxidative stress may be due to bio incompatibility of dialysis membrane. There is increase production of reactive oxygen species due to cells which come in contact with the dialyzer membrane induce sensitization of cell membrane and results in increased lipid peroxidation.<sup>[23,24]</sup>

## CONCLUSION

Findings of the present study showed that there is increased oxidative stress level as well elevated risk of CVD in CRF patients on dialysis. More of altered level of lipids induces atherosclerosis in CRF patients. Therefore, the present study suggest that management lipids and oxidative stress should be included during the treatment of CRF patients.

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