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# Study of Lipoprotein (a) in Chronic Renal Failure

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## ABSTRACT

*To compare the Lipoprotein (a) levels between non- diabetics and diabetics and compare the Lipoprotein (a) levels between diabetics with normal kidney function and diabetic CRF patients. To compare the Lipoprotein (a) levels between non-diabetic and diabetic CRF patients. This study was undertaken to study the level of Lipoprotein (a) levels in Chronic renal failure patients and to compare the levels of Lipoprotein(a)in three study groups. The mean Lp (a) level was high in diabetics with normal renal function and even more in diabetic Chronic renal failure patients compared to the controls with normal FBS, HbAlc, Urea and Creatinine. The same was compared between the three study groups using One-way ANOV A test and Tukey's HSD test. The difference in Lp (a) levels among the three diabetic groups was significant (P<0.01). This suggests that the Lp (a) levels.*

**Key words:** Hyperglycaemia, Diabetes mellitus, Antioxidant, Lipoproteins

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## INTRODUCTION

Diabetes mellitus is a systemic metabolic disorder caused by various reasons like impaired insulin secretion, insulin action, or both. The disease is characterized by the hyperglycaemic status and complications due to the same. Diabetes mellitus (DM) is associated with oxidative stress which occurs as a result of imbalance between pro-oxidants and antioxidants. Chronic hyperglycaemia and high fatty acid concentrations can cause damage in different types of cells by a variety of mechanisms collectively known as glucolipotoxicity, and oxidative stress is considered to be the common link [1,2]. Lipid peroxidation of the cellular structures, a consequence of increased oxygen free radicals, is thought to play an important role in atherosclerosis and micro vascular complications of DM [3].

Acute uncontrolled diabetes results in hyperglycaemia with ketoacidosis or the nonketotic hyperosmolar syndrome. The long-term complications of diabetes are micro-vascular (retinopathy, peripheral neuropathy) and macro-vascular (cardiovascular, peripheral arterial, and cerebra-vascular disease) complications. The two broad categories of diabetes are type 1 and type 2. In type 1 diabetes there is an absolute deficiency of insulin secretion. In type 2 diabetes, which is the more prevalent category there is a combination of resistance to insulin action and an inadequate compensatory insulin secretory response. Type 2 diabetes (accounting for 90-95% of those with diabetes), previously referred to as non-insulin-dependent diabetes or adult onset diabetes, encompasses individuals from dominantly insulin resistance with relative insulin deficiency to predominantly an insulin secretory defect with insulin resistance [4,5].

Chronic renal failure (CRF) or chronic kidney disease (CKD) is a progressive loss in renal function over a period of months or years. It is differentiated from acute kidney disease in that the reduction in kidney function must be present for over 3 months. Often, chronic kidney disease is diagnosed as a result of screening of people known to be at risk of kidney problems, such as those with high blood pressure or diabetes. Chronic renal failure may also be identified when it leads to one of its recognized complications, such as cardiovascular disease, anemia. It is important to identify these risks early to reduce the development of diabetes and CRF , since CRF greatly amplifies the risk of cardiovascular events in the diabetic patient. The common causes of chronic renal failure are diabetes, hypertension and glomerulonephritis, among which diabetes is responsible for almost 30% of all CRF. Therefore, diabetes is the most common cause of CRF [6,7].

Chronic renal failure (CRF) 1s characterized by progressive loss of renal function. These patients are at risk for adverse cardiovascular outcomes. Cardiovascular disease is the leading cause for morbidity and mortality in these patients. Lipoprotein (a) (also called Lp (a)) is a lipoprotein subclass. Genetic studies and numerous epidemiologic studies have identified Lp (a) as a risk factor for atherosclerotic diseases such as coronary heart disease and stroke. Lipoprotein(a) (Lp (a)) is a

cholesterol-rich particle existing in human plasma, first described by Berg in 19634. Lp (a) is made up of a low-density lipoprotein (LDL) cholesterol particle attached to Apo lipoprotein (a), which is a plasminogen like glycoprotein 5. The prevalence of hyperlipidaemia or dyslipidaemia in CRF is much higher compared to the general population [6]. However, in patients with CRF, the impact of dyslipidemia on cardiovascular disease is uncertain [7]. Previous studies have shown that there was positive correlation between increased Lp (a) levels and CRF patients [8].

Atherogenic lipid abnormalities are noticed m CRF patients. A study was done to show the impact of lipid abnormalities in patients with chronic renal failure, which revealed that there was increase in triglyceride, total cholesterol, and decrease in HDL-Cholesterol levels chronic renal failure patients compared to controls [9].

## MATERIALS AND METHODS

The study was conducted in 90 subjects attending Sree Balaji Medical College and Hospital totally.

### Study individuals were divided into 3 groups

Group A-30 age, sex and Body mass index matched healthy controls.

Group B-Composes of 30 Type 2 diabetic patients with normal renal function, belonging to the age group between 40 and 50 years.

Group C-Composes of 30 diabetic Chronic renal failure patients, belonging to the age group between 40 and 50 years.

This study was conducted between December 2012 and May 2014. The Institutional Research and Ethical Committee approved the study protocol. Written informed consent was obtained from all the participants before enrolment in the study. Demographic data, age, gender, height, weight, DM duration, general history and medications, were recorded. (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL), serum urea and creatinine were measured.

### Inclusion criteria

2 diabetics and diabetic CRF patients as Groups B and C respectively in the age group 40 - 50.

### Exclusion criteria

Estrogen depletion.

Severe hypothyroidism.

### Sample collection

The blood samples were collected by venepuncture under aseptic precautions.

## RESULTS

The study population comprised of a total of 90 individuals and of these, Group-A were 30 healthy controls, Group-B were 30 Diabetic study individuals with J:?Ormal renal functions and Group-C were 30 diabetics with Chronic renal failure. All the biochemical study parameters were analysed with the help of Statistical Product and Service Solutions (SPSS) 17 software (Table 1 and Table 2). Statistical tests used were Descriptives, ANOVA & TUKEY'S HSD test. The results of the various biochemical parameters for Group-A are as follows. Lp(a) concentration was 10.29 ± l.2888mg/dl (Mean and Standard deviation).The Mean and Standard of Urea, Creatinine, FBS,HbAlc,TC, HDL,TG,VLDL,LDL are 28.1 ± 8.3lmg/ dl, 0.877 ± 0.339 mg/dl,88.9 ± 11.598 mg/dl, 4.39 ± 0.5592%, 159.1 ± 21.796 mg/dl, 44 ± 10.072 mg/dl, 155.43 ± 19.611 mg/dl, 31.07 ± 3.859 mg/dl and 84.03 ± 26.538 mg/dl respectively (Table 3).

The results of the various biochemical parameters for Group-B are as follows. Lp(a) concentration was 22.12 ± 4.32 mg/dl (Mean and Standard dev i at io n ). The Mean and Standard of Urea , Creatinine, FBS, HbAlc, TC, HDL, TG,. VLDL, LDL are 28.8 ± 8.48 mg/dl, 0.897 ± 0.334 mg/dl, 150.27 ± 17.54 mg/dl, 7.94 ± 0.59 %, 242.77 ± 25.46 mg/dl, 35.03 ± 9.94 mg/dl, 209.63 ± 24.85 mg/dl, 41.93 ± 4.91 mg/dl and 165.8 ± 27.81 mg/dl respectively (Table 4). The results of the various biochemical parameters for Group-C are as follows. Lp(a) concentration was 51. l:!:11.26 mg/dl (Mean and Standard deviation). The Mean and Standard of Urea, Creatinine, FBS, HbA1c, TC, HDL, TG, VLDL, LDL are 92.1 ± 19.695 mg/dl, 4.34 ± 1.49 mg/dl, 162.73 ± 28.29 mg/dl, 7.99 ± 0.59 %, 286.43 ± 41.16 mg/dl, 25.97 ± 5.23 mg/dl, 270.83 ± 48.63 mg/dl, 54.27 ± 9.61 mg/dl and 206.2 ± 43.16 mg/dl respectively (Table 5).

The Means of different groups of patients, namely A,B & C are unequal. The ONE-WAY ANOV A test was used to calculate the Means of each and every independent variable of the group. The Means of individual variable was compare d between and within the groups. It also indicates that the P value is significant (P<0.01) between the groups and insignificant within the same group (Table 6).

**Table 1: Master chat.**

| Group | Lp(a) mg/di | Urea mg/di | Creatinine mg/di | FBS mg/di | HbAlc % | TC mg/di | HDL mg/di | TG mg/di | VLDL mg/di | LDL mg/di |
|---|---|---|---|---|---|---|---|---|---|---|
| A | 9.6 | 18 | 0.9 | 108 | 5.2 | 180 | 34 | 172 | 34 | 112 |
| A | 10.2 | 27 | 1 | 98 | 4.4 | 165 | 42 | 145 | 29 | 94 |
| A | 8.9 | 35 | 0.3 | 81 | 4.8 | 146 | 33 | 128 | 26 | 87 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | 11.8 | 21 | 0.6 | 105 | 5.4 | 167 | 56 | 155 | 31 | 80 |
| A | 10.6 | 17 | 1.3 | 93 | 4.7 | 189 | 32 | 134 | 27 | 130 |
| A | 12.1 | 26 | 0.4 | 83 | 3.5 | 133 | 30 | 162 | 32 | 71 |
| A | 9.8 | 38 | 0.6 | 72 | 4.3 | 146 | 48 | 118 | 24 | 74 |
| A | 10.9 | 20 | 0.9 | 101 | 3.9 | 129 | 51 | 155 | 31 | 47 |
| A | 8.1 | 28 | 1.4 | 95 | 4.6 | 186 | 34 | 177 | 35 | 117 |
| A | 10.5 | 16 | 0.5 | 73 | 5.2 | 157 | 56 | 132 | 26 | 75 |
| A | 12.4 | 25 | 1.3 | 84 | 3.6 | 154 | 39 | 166 | 33 | 82 |
| A | 9.3 | 37 | 0.4 | 109 | 4.9 | 130 | 36 | 146 | 29 | 65 |
| A | 11.4 | 23 | 1.1 | 74 | 4.1 | 176 | 59 | 155 | 31 | 86 |
| A | -8.7 | 19 | 0.9 | 97 | 4.6 | 190 | 34 | 148 | 30 | 126 |
| A | 10.3 | 29 | 0.7 | 86 | 5.1 | 153 | 60 | 174 | 35 | 58 |
| A | 9.4 | 15 | 1.2 | 93 | 3.7 | 161 | 44 | 179 | 36 | 81 |
| A | 8.8 | 30 | 0.8 | 79 | 4.1 | 127 | 57 | 167 | 33 | 37 |
| A | 10.4 | 24 | 0.5 | 99 | 5.4 | 146 | 33 | 188 | 38 | 75 |
| A | 9.9 | 33 | 1.1 | 75 | 4.2 | 173 | 45 | 154 | 31 | 97 |
| A | 12.3 | 40 | 1.3 | 87 | 3.8 | 188 | 45 | 165 | 33 | 110 |
| A | 11.9 | 22 | 1 | 100 | 4.5 | 139 | 32 | 116 | 23 | 84 |
| A | 8.4 | 36 | 0.7 | 76 | 3.9 | 122 | 60 | 177 | 35 | 27 |
| A | 10.7 | 32 | 1.3 | 89 | 4.3 | 190 | 54 | 149 | 30 | 106 |
| A | 12.6 | 25 | 1.4 | 103 | 4.7 | 168 | 56 | 157 | 31 | 81 |
| A | 9.5 | 41 | 0.8 | 71 | 4.2 | 173 | 40 | 165 | 33 | 100 |
| A | 8.5 | 34 | 0.6 | 89 | 3.7 | 168 | 41 | 143 | 29 | 98 |
| A | 10.1 | 39 | 1.2 | 77 | 4 | 133 | 56 | 178 | 36 | 41 |
| A | 11.5 | 18 | 0.6 | 101 | 4.4 | 172 | 36 | 177 | 35 | 101 |
| A | 9.3 | 31 | 1.1 | 78 | 4.9 | 130 | 42 | 162 | 32 | 56 |
| A | 10.8 | 44 | 0.4 | 91 | 3.6 | 182 | 35 | 119 | 24 | 123 |
| B | 16.8 | 41 | 1.2 | 189 | 7.9 | 210 | 30 | 184 | 37 | 143 |
| B | 22.1 | 20 | 0.8 | 142 | 8.4 | 208 | 55 | 230 | 46 | 107 |
| B | 27.CJ | 27 | 1.4 | 129 | 7.4 | 247 | 33 | 243 | 49 | 165 |
| B | 15.5 | 31 | 1.2 | 169 | 8.6 | 238 | 50 | 223 | 45 | 143 |
| B | 18.3 | 42 | 0.7 | 139 | 7.5 | 233 | 31 | 184 | 37 | 165 |
| B | 20.7 | 36 | 1.1 | 150 | 8.7 | 226 | 49 | 190 | 38 | 139 |
| B | 19.2 | 16 | 0.4 | 144 | 7.3 | 283 | 51 | 194 | 39 | 193 |
| B | 26.9 | 28 | 0.6 | 174 | 8.1 | 249 | 32 | 211 | 42 | 175 |
| B | 21.5 | 35 | 1.4 | 125 | 7.7 | 209 | 54 | 186 | 37 | 118 |
| B | 16.7 | 21 | 0.9 | 154 | 8.1 | 271 | 48 | 251 | 50 | 173 |
| B | 28.6 | 30 | 0.5 | 140 | 7.6 | 283 | 33 | 234 | 47 | 203 |
| B | 19.2 | 18 | 0.8 | 132 | 7.1 | 213 | 44 | 180 | 36 | 133 |
| B | 27.3 | 44 | 1 | 171 | 8.5 | 215 | 40 | 188 | 38 | 137 |
| B ..... | 19.4 | 29 | 0.9 | 152 | 7.2 | 243 | 36 | 194 | 39 | 168 |
| B | 26.5 | 22 | 0.4 | 137 | 7.5 | 223 | 31 | 222 | 44 | 14 8 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| B | 20.9 | 34 | 1 | 160 | 8.4 | 273 | 29 | 193 | 39 | 205 |
| B | 28.1 | 19 | 1.3 | 127 | 7.2 | 219 | 23 | 205 | 41 | 155 |
| B | 23.1 | 38 | 0.6 | 156 | 8.8 | 230 | 38 | 231 | 46 | 146 |
| B | 19.7 | 25 | 0.4 | 143 | 7.9 | 220 | 27 | 192 | 38 | 155 |
| B | 16.1 | 32 | 1.1 | 178 | 8.3 | 263 | 39 | 255 | 51 | 173 |
| B | 21.3 | 40 | 0.9 | 135 | 7.6 | 288 | 25 | 200 | 40 | 223 |
| B | 14.9 | 23 | 1.1 | 129 | 8.8 | 240 | 22 | 195 | 39 | 179 |
| B | 25.7 | 17 | 0.3 | 163 | 8 | 222 | 26 | 206 | 41 | 155 |
| B | 27.4 | 37 | 1.3 | 176 | 7.3 | 256 | 18 | 205 | 41 | 197 |
| B | 23.6 | 26 | 0.9 | 131 | 7.8 | 268 | 28 | 199 | 40 | 200 |
| B | 19.5 | 19 | 0.8 | 157 | 8.9 | 287 | 33 | 282 | 56 | 198 |
| B | 18.9 | 24 | 1.2 | 146 | 7.4 | 265 | 31 | 203 | 41 | 193 |
| B | 22.8 | 39 | 0.4 | 168 | 8.2 | 244 | 27 | 186 | 37 | 180 |
| B | 8.3 | 33 | 0.9 | 133 | 9 | 236 | 30 | 222 | 44 | 162 |
| B | 6.7 | 18 | 1.4 | 159 | 7.1 | 221 | 38 | 201 | 40 | 143 |
| C | 19.5 | 92 | 3.4 | 214 | 7.9 | 289 | 22 | 289 | 58 | 209 |
| C | 15.8 | 110 | 4.1 | 135 | 8.9 | 290 | 19 | 303 | 61 | 210 |
| C | 2.3 | 67 | 3.2 | 189 | 8.3 | 302 | 33 | 189 | 38 | 231 |
| C | 17.6 | 125 | 5.3 | 139 | 7 | 322 | 30 | 289 | 58 | 234 |
| C | 4.8 | 78 | 2.7 | 145 | 7.5 | 319 | 28 | 321 | 64 | 227 |
| C | 9.3 | 94 | 4.9 | 194 | 7.8 | 249 | 23 | 209 | 42 | 184 |
| C | 8.7 | 108 | 4.1 | 127 | 8.2 | 302 | 22 | 287 | 57 | 223 |
| C | 7.4 | 62 | 2.7 | 150 | 7.4 | 344 | 27 | 193 | 39 | 278 |
| C | l6.8 | 90 | 2.4 | 127 | 7.6 | 340 | 30 | 321 | 64 | 246 |
| C | 8.5 | 76 | 3.8 | 204 | 8.7 | 311 | 33 | 198 | 40 | 238 |
| C | 9.4 | 97 | 5.2 | 155 | 8.1 | 372 | 25 | 276 | 55 | 292 |
| C | 1.6 | 114 | 6.5 | 210 | 7.9 | 342 | 23 | 253 | 51 | 268 |
| C | 3.8 | 88 | 5.9 | 125 | 7.7 | 302 | 28 | 298 | 60 | 214 |
| C | 8.9 | 65 | 3.6 | 175 | 8.5 | 293 | 30 | 254 | 51 | 212 |
| C | 1.5 | 105 | 6 | 129 | 8 | 255 | 26 | 336 | 67 | 162 |
| C | 5.7 | 75 | 2.7 | 140 | 7.2 | 290 | 24 | 300 | 60 | 206 |
| C | 5.1 | 99 | 4.3 | 201 | 8.4 | 302 | 17 | 274 | 55 | 230 |
| C | 39.8 | 116 | 7.1 | 130 | 7.5 | 250 | 22 | 260 | 52 | 176 |
| C | 44.6 | 68 | 2 | 150 | 8.7 | 283 | 28 | 312 | 62 | 193 |
| C | 36.9 | 86 | 4.8 | 168 | 8.6 | 321 | 30 | 219 | 44 | 247 |
| C | 65.4 | 101 | 5.4 | 194 | 7.1 | 202 | 18 | 204 | 41 | 143 |
| C | 43.9 | 72 | 3.6 | 165 | 7.9 | 235 | 29 | 288 | 58 | 148 |
| C | 69.2 | 118 | 6.4 | 139 | 8.8 | 301 | 20 | 198 | 40 | 241 |
| C | 45.1 | 127 | 7.3 | 135 | 8.5 | 283 | 22 | 200 | 40 | 221 |
| C | 52.3 | 81 | 2.9 | 197 | 7.1 | 244 | 38 | 273 | 55 | 151 |
| C | 61.2 | 103 | 4.1 | 160 | 7.3 | 239 | 33 | 300 | 60 | 146 |
| C | 56.3 | 69 | 3.2 | 149 | 8.9 | 220 | 18 | 304 | 61 | 141 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| C | 47.5 | 123 | 6 | 179 | 8.6 | 306 | 31 | 291 | 58 | 217 |
| C | 3S.4 | 85 | 3.7 | 187 | 7.4 | 221 | 27 | 322 | 64 | 130 |
| C | 6 5.6 | 70 | 2.8 | 170 | 8.1 | 264 | 23 | 364 | 73 | 168 |

**Table 2: Groups.**

| Group | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Group A | 30 | 33.3 | 33.3 | 33.3 |
| Group B | 30 | 33.3 | 33.3 | 66.7 |
| Group C | 30 | 33.3 | 33.3 | 100 |
| Total | 90 | 100 | 100 | |

**Table 3: Descriptive statistics-Group A.**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Lipoprotein (a) | 30 | 8.1 | 12.6 | 10.29 | 1.2888 |
| Urea 111g/dl | 30 | 15 | 44 | 28.1 | 8.31 |
| Creatinine mg/dl | 30 | 0.3 | 1.4 | 0.877 | 0.339 |
| FBSmg/dl | 30 | 71 | 109 | 88.9 | 11.598 |
| HbAl c¾ | 30 | 3.5 | 5.4 | 4.39 | 0.5592 |
| TC mg /dl | 30 | 122 | 190 | 159.1 | 21.796 |
| HDLm g/dl | 30 | 30 | 60 | 44 | 10.072 |
| TG mf /dl | 30 | 116 | 188 | 155.43 | 19.611 |
| VLDLn1g/dl | 30 | 23 | 38 | 31.07 | 3.859 |
| LDLm g/dl Valid N (listwi se) | 30 | 27 | 130 | 84.03 | 26.538 |

**Table 4: Descriptive statistics-Group B.**

| | | Minimum | Maximum | Mean | Std.Deviation |
|---|---|---|---|---|---|
| Lipoprotein (a) mg/di | 30 | 14.9 | 28.6 | 22.12 | 4.3154 |
| Urea mg/di | 30 | 16 | 44 | 28.8 | 8.475 |
| Creatinine mg/dl | 30 | 0.3 | 1.4 | 0.897 | 0.3347 |
| FBS mg/dl | 30 | 125 | 189 | 150.27 | 17.544 |
| HbAlc % | 30 | 7.1 | 9 | 7.943 | 0.5911 |
| TCmg/dl | 30 | 208 | 288 | 242.77 | 25.461 |
| HDL mg/di | 30 | 18 | 55 | 35.03 | 9.936 |
| TG mg/dl | 30 | 180 | 282 | 209.63 | 24.848 |
| VLDL mg/di | 30 | 36 | 56 | 41.93 | 4.913 |
| LDL mg/di | 30 | 107 | 223 | 165.8 | 27.805 |
| Valid N (listwise) | 30 | | | | |

**Table 5: Descriptive Statistics-Group C**

| | N | Minimum | Maximum | Mean | Std.Deviation |
|---|---|---|---|---|---|
| Lp(a) mg/dl | 30 | 31.6 | 69.3 | 51.097 | 11.2604 |

| | | | | | |
|---|---|---|---|---|---|
| Urea mg/dl | 30 | 62 | 127 | 92.13 | 19.695 |
| Creatinine mg/dl | 30 | 2 | 7.3 | 4.337 | 1.4827 |
| FBS mg/dl | 30 | 125 | 214 | 162.73 | 28.285 |
| HbAlc % | 30 | 7 | 8.9 | 7.987 | 0.5888 |
| TC mg/dl | 30 | 202 | 372 | 286.43 | 41.155 |
| HDL mg/dl | 30 | 17 | 38 | 25.97 | 5.229 |
| TG mg/di | 30 | 189 | 364 | 270.83 | 48.632 |
| VLDL mg/dl | 30 | 38 | 73 | 54.27 | 9.609 |
| LDL mg/dl | 30 | 130 | 292 | 206.2 | 43.164 |
| Valid N (listwise) | 30 | | | | |

**Table 6: One-way analysis of variance (One-way anova).**

| | | Sum of Squares | Df | Mean Square | F | Significance |
|---|---|---|---|---|---|---|
| Lp(a) | Between Groups | 26447.802 | 2 | 13223.901 | 269.73 | 0 |
| | Within Groups | 4265.305 | 87 | 49.026 | | |
| | Total | 30713.106 | 89 | | | |
| Urea | Between Groups | 81118.689 | 2 | 40559.344 | 230.106 | 0 |
| | Within Groups | 15334 .967 | 87 | 176.264 | | |
| | Total | 96453.656 | 89 | | | |
| lLe | Between Groups | 238.056 | 2 | 119.028 | 147.234 | 0 |
| | Within Groups | 70.333 | 87 | 0.808 | | |
| | Total | 308.389 | 89 | | | |
| FBS | Between Groups | 93726.467 | 2 | 46863.233 | 113.163 | 0 |
| | Within Groups | 36028.433 | 87 | 414.12 | | |
| | Total | 129754 .900 | 89 | | | |
| HbAl | Between Groups | 255.641 | 2 | 127.82 | 380.114 | 0 |
| | Within Groups | 29.255 | 87 | 0.336 | | |
| | Total | 284.896 | -89 | | | |
| Total Choles | Between Groups | 251206.667 | 2 | 125603 .333 | 133.759 | 0 |
| | Within Groups | 81695.433 | 87 | 939.028 | | |
| | Total | 332902.1 | 89 | | | |

## DISCUSSION

The study was done on Type 2 Diabetic patients with normal renal function and Diabetic Chronic renal failure patients. Age, Sex and BMI matched healthy individuals were taken as controls. Between the two study groups and the control group, the routine biochemical parameters, fasting blood sugar (FB S), glycated haemoglobin (HbA1C), serum urea, serum creatinine and lipid profile differed significantly [10].

Serum Lipoprotein (a) was also estimated in patients under, all the three groups to show the significance of athe rosclerotic pathogenic effect of the same. The fasting plasma sugar was done to assess the short term glycaemic control. The difference in short term glyclemic control (FBS) values between the two study groups was statistically significant (P< .001). To assess the long term glycaemic control HbA 1C levels were measured. The difference in mean values between two study groups was also statistically significant (P<0.001). This shows that long term glycaemic control was significantly proportional to the Lp(a) levels in controls of Group A, Group B-diabetics with normal renal function and Group C-diabetics with CRF [11]. This suggests that long term glycaemic control is directly related to the complications of diabetes . This study also observed that there is significant elevation of total cholesterol, LDL, VLDL, triglycerides and significant lowering of HDL in diabetics

with normal renal function when compared to healthy controls. The levels of Lp (a) were significantly increased in Group C Diabetic CRF patients which is evident from the Mean and Standard Deviation of 51.097 ± 11.26. The Lp (a) levels were 10.29 ± 1.29 and 22.12 ± 4.32 among Group A and B respectively. The significance is also shown by the One- way ANOVA test and TUKEY'S HSD test with P<0.001 [12-15].

The studies conducted shows the genetically importance of apoA isoforms and the level of Lp(a) depending on the apoA isoform. There are also other studies based on the genetic relationship between apoA and Lp (a), the isoforms and the gene polymorphism [16-21]. These studies suggest that despite significant correlation between APOA kringle 4 size polymorphism and Lp (a) levels, there sequence variations either in the APOA gene or closely linked genes may account for relatively higher Lp (a) levels. Various other studies conducted showed the decreased levels of Lp (a) among the patients using atorvastatin [22,23]. There are also other studies based on the treatment modalities for increased Lp (a). Unlike the above mentioned studies, our study shows significantly increased levels among the patients on statin therapy. These unique features of Lp (a) justifies the elevation in the level of Lp (a) in Diabetics and Diabetic CRF causing generation of clots and atherosclerosis [24-27].

## CONCLUSION

The results of this study and previous studies provide ample evidence that the levels of Lp (a) are increased in patients with type 2 diabetes mellitus and also in patients with diabetic CRF. The present study observed that there is positive correlation of Lp (a) levels with the duration of diabetes and is progressive with the diabetic complications. As in the general population, Lp (a) is a risk factor for cardiovascular events in CRF patients.

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## ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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