

## EVALUATION OF SERUM LEVEL OF LIPIDS AND LIPOPROTEINS IN KIDNEY TRANSPLANTED PATIENTS

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*SUMMARY: The incidence of Atherosclerosis in kidney transplanted patients and its relationship to elevation of lipids and lipoproteins of plasma has been investigated. In this study the serum level of lipids (cholesterol, triglyceride and total lipid), lipoproteins [Very Low Density Lipoprotein (VLDL), Low Density Lipoprotein-Cholesterol (LDL-C), High Density Lipoprotein-Cholesterol (HDL-C) and ratio of HDL-C/LDL-C] and fasting blood sugar in 74 kidney transplanted patients (53 males and 21 females) in the range of 15-69 years and 74 control persons (53 males and 21 females) in the range of 13-70 years were measured, statistically analyzed and compared with each other. Comparison of serum lipid and lipoprotein levels in males and females and in the control group reveals remarkable difference in all parameters except for HDL-C and HDL-C/LDL-C in males. Average of serum fasting blood sugar in studied patients compared to that of the control group did not reveal a statistically important difference ( $p>0.1$ ). Through the correlation co-effective test between age, weight and duration of kidney transplanted with lipids, lipoproteins and fasting blood sugar levels only revealed direct and remarkable relationship between weight and triglycerides ( $p<0.05$ ,  $r=0.29$ ).*

*Key Words: Renal transplantation recipients, lipid, lipoprotein level.*

### INTRODUCTION

With hemodialysis or peritoneal dialysis the life of patients with chronic renal failure (CRF) in end stage can be approximately normalized. Despite this significant improvement correction of all renal functions is not accomplished. The transplanted patients with CRF in long term do live better and longer than the dialysed patients. One of the complications of renal transplantation is hyperlipidemia due to administration of immunosuppressive agents. In this study, serum level of lipids, lipoproteins and fasting blood

sugar in transplanted patients and healthy group were studied, and the results were compared.

### METHODOLOGY

This study was performed on 74 patients (53 males and 21 females) referred to Tabriz University whose ages ranged between 15 and 69 years. They were referred from the out patient department of the University. Kidney transplantation was performed in every one of these patients and the average time lapse until this study was undertaken, was 40 months.

The findings of these patients were compared with the results of the same parameters of 74 healthy control subjects also com-

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Table 1: Age distribution of transplanted patients.

Age (year)	Female (%)	Male (%)	Entire (%)
10 - 19	1 (4.8)	2 (3.8)	3 (4)
20 - 29	4 (16)	15 (28.3)	19 (25.8)
30 - 39	6 (28.6)	10 (18.9)	16 (21.6)
40 - 49	6 (28.6)	10 (18.9)	16 (21.6)
50 - 59	4 (19)	11 (20.7)	15 (20.3)
60 - 69	0	5 (9.4)	5 (6.7)
Total	21 (100)	53 (100)	74 (100)

posed of 53 males and 21 females (Table 6). Their ages ranged from 13 to 70 years (Table 5).

Upon their arrival to the clinic the age, sex, weight, duration of the dialysis, time of renal transplantation, the medication they used before and after transplantation, the underlying diseases, smoking habits etc. were recorded and they were clinically examined. Patients who also had diabetes mellitus were excluded from this study.

Blood samples were taken from the patients and from the control cases after 12 hours of fasting and the following parameters were determined: cholesterol (1), triglycerides (2), HDL-cholesterol (3), and glucose were determined with enzymatic methods by means of autoanalyzer (4). Total lipids were measured by colorimetric method (5). LDL-cholesterol was calculated by Friedwald formula (6).

Analysis of the results was done at the computer center of the Medicine Faculty of Tabriz University with spssw program, using the T-test and Pearson correlation of coefficient and linear regression analysis.

## RESULTS

The age distribution of the patients is seen in Table 1. The ages of the patients ranged between 15 and 69 while

Table 3: Distribution of patients according to cause of renal failure before transplantation.

Basis diseases	Number	%
Glomerulonephritis	15	20.3
Pylonephritis	1	1.3
Polycystic kidney	4	5.4
Hypertention	31	41.9
Idiopathic	23	31.1
Total	74	100

Table 2: Distribution of patients taking some medicines.

Kind of medicine	%	Patients	Dose
Cyclosporine (Sundimmune)	100	74	3 - 5 mg/kg/day
Prednisolone	100	74	0.15 - 0.20 mg/kg/day
Azathioprine (Imoral)	73	54	1 - 2 mg/kg/day
Antihypertensive	32	24	different

in the control group it was between 13 and 70 years. Both groups were composed of 53 males and 13 females. Thus both groups were composed of subjects quite comparable with each other.

All patients received cyclosporine (3-5 mg/kg/day) and prednisolone (0.15-1.20 mg/kg/day). 54 patients received azathioprine 1-2 mg/kg/day and 24 patients received different antihypertensive medication (Table 2).

**Cause of renal failure:** 15 patients had glomerulonephritis, 31 patients hypertension, 1 patient had pyelonephritis and 4 suffered of polycystic kidney disease which caused to the renal disease ultimately leading to renal failure and to transplantation. The cause of the renal failure was not identified and named as idiopathic in 23 cases (Table 3).

Of the 74 renal transplantation cases only 1 was of more than 10 years duration, 15 were between 5-9 years, 52 were between 1-4 years post operative and 1 was 1 year after transplantation (Table 4).

**Cholesterol levels:** Cholesterol level of the transplanted patients ranged between 122 mg/dl and 377 mg/dl. The mean  $\pm$  standard deviation was  $222 \pm 95$  mg/dl. In the con-

Table 4: Time elapsed after the transplantation to the study.

Transplant duration	Number	%
< 1	6	8.1
1- 4	52	70.3
5 - 9	15	20.2
> 10	1	1.4
Total	74	100

Table 5: Comparison of age average between the two groups.

Parameter Groups	Age (year)				
	number	minimum	maximum	x ± SD	p values
Patients	74	15	69	39.15 ± 12.89	> 0.1
Control	74	13	70	35.82 ± 12.32	> 0.1

trol series the same parameter ranged from 135 to 265 mg/dl and the mean ± standard deviation were 87.5 ± 38 mg/dl. The difference between the two groups was very significant ( $p < 0.001$ , Table 7).

**Triglycerides:** The means of triglycerides were 217.7 ± 95 and 140.7 ± 57 mg/dl in the transplanted patients and the control cases, their differences were also highly significant ( $p < 0.001$ ).

**Total lipids:** The mean level of the total lipids in patients serum was 694.4 ± 171 mg/dl and of the control group was 520.7 ± 132 mg/dl. The difference between the two was also highly significant.

**High density lipoproteins:** The mean level of HDL-C was 38.7 ± 11 in the patients serum compared to 34.2 ± 8 mg/dl in that of the control subjects serum. Their difference was not statistically significant ( $p > 0.1$ ) (Table 8).

**Low density lipoproteins:** Concentration of LDL-C of the transplanted patients serum was 138.9 ± 43 mg/dl and that of the control group 119.2 ± 35. Their difference was significant ( $p < 0.025$ ) (Table 8).

Results of ratio of HDL-C/LDL-C were 0.29 ± 0.1 in transplanted patients serum and 0.31 ± 0.1 that of control cases. Their difference was not significant ( $p > 0.10$ ).

Very low density lipoprotein levels of the same groups were 45.7 ± 24 and 28.1 ± 20 respectively. The difference between the two was significant ( $p < 0.025$ ).

The levels of serum cholesterol, triglycerides and total lipids between transplanted patients and the female subjects of the control group were also highly significant for all three parameters ( $p < 0.001$ , Table 11).

A similar comparison between the HDL-C of the male

transplanted group and that of the control group revealed no significant difference ( $p > 0.05$ ). LDL-C and VLDL results however gave highly significant differences ( $p < 0.001$ , Table 12).

HDL-C / LDL-C ratios were not significantly different between the last two groups. Likewise comparison of the results of transplanted patients and that of the control group of fasting blood sugar were not found significantly different.

Interestingly comparison of coefficient test between age, weight and duration of transplantation with measured parameters did not reveal significantly different results (Table 14).

## DISCUSSION

In this study serum level of lipids and lipoproteins in renal transplanted patients and those of the control group were determined and compared. Serum level of lipids (cholesterol, triglyceride, total lipids), lipoproteins (HDL-C, LDL-C, VLDL, HDL-C / LDL-C) and fasting blood sugar (Table 13) were analyzed. Comparison of serum lipid (Table 9) and lipoprotein levels in males (Table 10) and females in the transplanted group and the same parameters of the control group revealed remarkable difference in all parameters except for HDL-C and HDL-C / LDL-C in males. The fasting blood sugar level in the transplanted patients comparing with those of the control group did not reveal a significant difference.

Table 6: Comparison of the number of transplanted patients and control group according to sex.

Groups Sex	Control group		Transplanted patients	
	number	%	number	%
Male	53	72.6	53	72.6
Female	21	27.4	21	27.4
Total	74	100	74	100

Table 7: Comparison of serum lipids in transplanted patients and control group.

Parameters (mg / dl)	Transplanted Patients			Control Group			P values
	min.	max.	x ± SD	min.	max.	x ± SD	
Cholesterol	122	377	222.1 ± 52	135	265	87.5 ± 38	< 0.001
Triglyceride	50	400	219.7 ± 95	62	285	140.7 ± 57	< 0.001
Total Lipid	405	1150	694.4 ± 171	385	890	520.7 ± 132	< 0.001

Table 8: Comparison of serum lipoprotein levels in transplanted patients and control group.

Parameters (mg / dl)	Transplanted Patients			Control Group			P values
	min.	max.	x ± SD	min.	max.	x ± SD	
HDL-C	18	80	38.7 ± 11	28	67	34.2 ± 8	> 0.1
LDL-C	64	257	138.9 ± 43	32	180	119.2 ± 35	< 0.025
HDL - C/LDL-C	0.12	0.83	0.29 ± 0.1	0.22	0.93	0.31 ± 0.1	> 0.1
VLDL	10	80	45.7 ± 24	12.4	54	28.1 ± 20	< 0.025

Table 9: Comparison of serum lipid levels between transplanted patients and control males.

Parameters (mg / dl)	Male Transplanted Patients			Male Subjects of the Control Group			P values
	min.	max.	x ± SD	min.	max.	x ± SD	
Cholesterol	122	310	206 ± 39	135	265	181.1 ± 41	< 0.05
Triglyceride	50	400	211.3 ± 97	62	285	164.4 ± 92	< 0.05
Total Lipid	405	1130	655.2 ± 149	385	890	598.8 ± 140	< 0.05

Table 10: Comparison of serum lipoproteins average between transplanted and control males.

Parameters (mg / dl)	Male Transplanted Patients			Male Subjects of the Control Group			P values
	min.	max.	x ± SD	min.	max.	x ± SD	
HDL-C	18	80	37.5 ± 10	28	56	35.5 ± 7	> 0.1
LDL-C	64	206	140.6 ± 30	32	180	123.2 ± 34	< 0.05
HDL - C/LDL-C	0.12	0.83	0.32 ± 0.13	0.22	0.78	0.27 ± 0.14	> 0.1
VLDL	10	80	47.3 ± 23	13	57	32.8 ± 21	< 0.05

Table 11: Comparison of the average serum lipid levels between female patients and control group.

Parameters (mg / dl)	Female Transplanted Patients			Control Group			P values
	min.	max.	x ± SD	min.	max.	x ± SD	
Cholesterol	181	377	266.8 ± 39	154	234	191.2 ± 80	< 0.001
Triglyceride	115	390	240.8 ± 84	62	273	111.8 ± 80	< 0.001
Total Lipid	580	1150	793.6 ± 118	390	740	520.8 ± 109	< 0.001

Table 12: Comparison of the average serum lipoprotein levels between male patients and control group.

Parameters (mg / dl)	Male Transplanted Patients			Control Group			P values
	min.	max.	x ± SD	min.	max.	x ± SD	
HDL-C	28	65	43.5 ± 12	28	67	35.5 ± 7	> 0.05
LDL-C	91	257	178.1 ± 32	72	172	120.8 ± 40	< 0.001
HDL - C/LDL-C	0.15	0.62	0.21 ± 0.11	0.22	0.93	0.35 ± 0.19	> 0.05
VLDL	23	78	45.2 ± 27	12	55	21.6 ± 12	< 0.001

Table 13: Comparison of the average fasting blood sugar (FBS) levels between transplanted patients and control group.

Parameters (mg / dl)	Transplanted Patients			Control Group			P values
	min.	max.	x ± SD	min.	max.	x ± SD	
FBS	54	132	89.6 ± 13	66	120	87.9 ± 11	> 0.1
	54	132	89.7 ± 13	66	120	89 ± 12	> 0.1
	87	107	90 ± 12.8	66	107	85.2 ± 10	> 0.1

Table 14: Comparison of coefficient test between age, weight and duration of transplantation with measured parameters in patients.

Renal Transplanted Patients						
Parameters (mg / dl)	Age		Weight		Duration of Transplanted	
	r	p	r	p	r	p
Cholesterol	0.12	> 0.1	- 0.05	> 0.1	- 0.6	> 0.1
Triglyceride	0.13	> 0.1	0.29	< 0.05	- 0.13	> 0.1
Total Lipid	0.16	> 0.1	0.16	> 0.1	0.08	> 0.1
HDL-C	-0.15	> 0.1	- 0.17	> 0.1	- 0.04	> 0.1
LDL-C	0.08	> 0.1	- 0.09	> 0.1	- 0.14	> 0.1
VLDL	0.11	> 0.1	0.17	> 0.1	0.14	> 0.1
FBS	0.07	> 0.1	0.17	> 0.1	0.11	> 0.1

Total cholesterol was significantly higher in transplanted patients than in the general population for both genders in all age groups ( $p < 0.01$ ). Female patients had higher total cholesterol levels compared to the males, and HDL-C, followed the same pattern. Triglycerides on the other hand were equally elevated in both genders (7). The values obtained in the transplanted population were significantly elevated for cholesterol, TG, LDL and VLDL compared to controls (8).

Immunosuppressive therapy in renal transplant patients leads to accumulation of triglyceride enriched VLDL and LDL. Triglyceride enrichments in LDL indicates the accumulation of small, dense LDLs, which are known to bear enhanced atherosclerotic risk (9).

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