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Haemodialysis effects on lipids Profile in patients with advanced renal disease

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Abstract:

This study attempts to investigate lipid profile (cholesterol, triglyceride, high density lipoprotein – cholesterol (HDL-C), low-density lipoprotein-cholesterol (LDL-C) and very low-density lipoprotein-cholesterol (VLDL-C)) would be induced potential due to haemodialysis program.

The study included hundred and thirteen (113) samples. Eighty-three (83) patients with end stage renal disease on haemodialysis program including (47) males and (36) females with a mean age of (43.3±18.0) years and range from (20-65) years. All the patients had been on dialysis twice per week for two hours each time. In addition, thirty from healthy volunteers as control.

All subjects were under obligation fasting for twelve hours and the samples were drowning before and 30 minutes after haemodialysis. Evaluation of serum concentrations of cholesterol, triglyceride, HDL-C, by enzymatic method while LDL-C and VLDL-C were calculated by the Friedewald formula.

This study revealed that the changes of lipid profile (cholesterol, triglyceride, HDL-C, LDL-C and VLDL-C) were varied from small changes that statistically not significant between patients up to the highly significant changes between cholesterol and LDL-C before haemodialysis when compared to control. Significant changes are noticed between triglyceride and VLDL-C with control whereas high-density lipoprotein cholesterol didn't change. In male patient's cholesterol and low LDL-C showed highly significant difference however the rest showed no significant difference. As well as pre and post haemodialysis when compared to control whereas in female lipid profile didn't show any change. According to age group (20-35) there was a highly significant difference between pre and post haemodialysis compared to control in cholesterol, triglyceride and LDL-C but not in HDL-C. The other two age groups the lipid profile did not show any changes.

Keywords: Renal diseases, Haemodialysis, Cholesterol, Triglyceride.

Introduction:

Dialysis is the process of cleaning wastes from the blood artificially. Two major forms of dialysis are haemodialysis and peritoneal dialysis. Haemodialysis utilization an extraordinary channel known as a dialyzer that capacities as a counterfeit kidney should clean a person's blood. The dialyzer may be a canister associated with the haemodialysis machine. Throughout treatment, the blood goes through tubes under the dialyzer, which filters crazy wastes, additional salt, Furthermore additional water. Then the cleaned blood

streams through an additional situated about tubes over under the figure. Those haemodialysis machine screens blood stream and removes wastes from that dialyzer. Haemodialysis is as a rule performed in a dialysis focus three times for every week for 3 to 4 hours in each time. Every day home haemodialysis will be carried 5 to 7 times for every week for 2 to 3 hours at once. Nocturnal dialysis might be performed to 8 hours toward night whereas an individual sleep .

Peritoneal dialysis: cleaning the blood by utilizing the lining of the abdominal pit concerning illustration a channel. A purifying liquid, called dialysis solution will be emptied from a sack in to the abdomen. Liquids also wastes stream through the lining of the pit stay "trapped" in the dialysis solution. The solution will be then emptied from the abdomen, evacuating the additional liquids also wastes from those form cavities and remain "trapped" in the dialysis solution. The solution is then drained from the abdomen, removing the extra fluids and wastes from the body [1].

The greater part patients with renal disappointment voided little or no pee. Side impacts brought on by evacuating excessively liquid or evacuating liquid excessively quickly incorporate low blood pressure, fatigue, chest pains, leg-cramps, and queasiness what's more headaches. Since haemodialysis obliges get of the circulative system, patients undergoing haemodialysis might uncover their circulatory disappointment will microbes, which might prompt sepsis, a spoiling influencing those heart valves (endocarditis) or a spoiling influencing the bones (osteomyelitis) [2] .

Longterm difficulties about haemodialysis incorporate amyloidosis, neuropathy Furthermore Different manifestations of coronary illness. Expanding those recurrences Also period of medicines need been indicated on enhance liquid over-burden Also expansion of the heart that is usually seen On such patients [3] [4] .

The principle of haemodialysis is the same other procedures about dialysis; it includes dissemination for solutes over a semipermeable film. Haemodialysis uses counter current flow, the place the dialysate may be streaming in the inverse bearing on blood stream in the extracorporeal circlet. Counter-current stream administers the fixation gradient crosswise over the film at a most extreme expands those effectiveness of the dialysis. Liquid evacuation (ultrafiltration) will be attained by adjusting those hydrostatic weight of the dialysate compartment, bringing on free water what's more a percentage broken down solutes to move crosswise over those film along a made weight gradient [5] [6] .

Types:

There are three types of hemodialysis: conventional hemodialysis, daily hemodialysis, and nocturnal hemodialysis.

The procedure of conventional hemodialysis are: patients connected should a dialysis machine; the capacity of a dialysis machine will be with push blood with circularize through the patient's figure Furthermore machine, during those same time, screen temperature, pulse Furthermore the long haul of the procedure; if tolerant may be utilizing fistula alternately graft, two huge-gate needles ahead patients' side: particular case acquires wastes- full blood starting with patients' figure of the dialyzer, same time an additional needle carries clean blood back of the body; it is advertised three times a week Furthermore 3 or 4 hours for every session[7].

In daily home haemodialysis, the system of every day hemodialysis is comparative of the traditional hemodialysis but it will be performed six times a week and over 2 hours for every session .The system for nighttime hemodialysis may be comparable will accepted hemodialysis but it is performed six nights a week Furthermore 8 hours for every session same time the tolerant sleeps [8].

Aims of the study:

This study aimed to determination of lipid profile changes for patients under haemodialysis programs.

Subjects and methods

Eighty-three end stage renal disease patients were selected. Their ages range from 20- 65 years, and thirty apparently normal persons as control.

Watchful historical backdrop might have got from patients including age, sex, address, history of hypertension, diabetes mellitus, surgery operation and more other sicknesses .

To each tolerant the taking after tests was conveyed out:

1. Cholesterol.
2. Triglyceride.
3. High density lipoprotein.

Low density lipoprotein and very low density lipoprotein obtained from friedewald equation: -

$LDL_{cholesterol} = Total_{cholesterol} \_ VLDL_{cholesterol} \_ HDL_{cholesterol}$

$VLDL_{cholesterol} = \frac{TG}{5}$ in mg/dl

$VLDL_{cholesterol} = \frac{TG}{2.2}$ in mmol/l

To blood sampling, five ml from claiming blood test gathered from a standout amongst the veins in the risk –cubital fossa of every haemodialysed tolerant also control aggregation which were undergone, plasma and sera isolated for subsequently lipid profile tests.

Total cholesterol includes free cholesterol and cholesterol esters. Cholesterol ester can be hydrolyzed by cholesterol esterase to produce cholesterol and free fatty acid. Cholesterol is oxidized by cholesterol oxidase to produce △4-cholestenone and hydrogen peroxide. In the presence of 4-aminoamylpyridine and phenol, hydrogen peroxide catalyze peroxidase to form red quinone compounds of benzoquinone imine phenizone which absorbs at, or near 500nm. The intensity of the colored complex formed is directly proportional to the concentration of cholesterol the sample.

Serum triglycerides are hydrolyzed to glycerol and free fatty acids by lipase. In the presence of ATP and glycerol kinase (GK), the glycerol is converted to glycerol-1-phosphate. The glycerol-1-phosphate is then oxidized by glycerol phosphate oxidase (GPO) to yield hydrogen peroxide. The condensation of hydrogen peroxide with 4-chlorophenol and 4-aminophenazone (4-AA) in the presence of peroxidase (POD) produces a red colored quinonimine dye which absorbs at, or near 500nm. The intensity of the colored complex formed is directly proportional to the triglycerides concentration of the sample.

Low density lipoprotein (LDL), very low density lipoprotein (VLDL) and chylomicrons from specimens are precipitated by phosphotungestic acid (PTA) and Magnesium chloride. High density lipoprotein – cholesterol (HDL) obtained in supernatant after centrifugation is then measured with total cholesterol reagent.

Statistical Analysis:

The statistical analysis proceeded in this study, descriptive statistic analyzed by using one-way analysis of variance (ANOVA) were performed using means and standard deviation (SD) with LSD test for continuous variable ($p > 0.05$) was considered to be significant, and X^2, (p-value 0.01) was considered to be significant. All analyses were performed with the Statistical Package for the Social Sciences SPSS software.

Results and discussion:

End-stage renal ailment (ESRD) will be the last stage from claiming kidney disappointment that is denoted by the finish or almost finish irreversible passing for renal work .

Hemodialysis removes waste and abundance liquid from the blood when the kidneys cannot do so sufficiently. The blood drawn intravenously, sent through a machine known as a dialyzer, and come back of the constitution through a vein. Inside the dialyzer, that blood is passed again a film that filters waste Also liquid under a dialysate result. The dialysate may be then pumped out to a transfer tank more new dialysate is pumped over .

Table (1) Changes of lipid profile among patient before (A) and after (B) H.D.

Parameter	N	Mean	SD	Comparison of significant	
				p-value	Sig.
Chol A	83	3.91	1.09	.71	N.S
Chol B	83	3.94	1.15		
TG A	83	1.18	.75	.83	N.S
TG B	83	1.19	.71		
HDL A	83	1.14	.63	.32	N.S
HDL B	83	1.10	.58		
VLDL A	83	.53	.33	.94	N.S
VLDL B	83	.53	.32		
LDL A	83	2.22	1.34	.32	N.S
LDL B	83	2.29	1.27		

Table (1) demonstrated that there were slightly changes in concentration of lipid profile before and after haemodialysis with no significant (P-value>0.05) difference.These results were in agreement with the result of E.Prabhakar Reddy et al lab group [11], the principal features of renal dyslipidemia remain essentially unchnged during haemodialysis [12] [13].

Table (2) Changes of lipid profile patient before H.D Compared to control.

Parameter		N	Mean	SD	Comparison of significant	
					P - value	Sig.
Chol	Before	83	3.91	1.09	.00٠٥	H.S
	Control	30	4.85	1.03		
TG	Before	83	1.18	.75	.033	S
	Control	30	.86	.52		
HDL	Before	83	1.14	.63	.641	N.S
	Control	30	1.09	.33		
VLDL	Before	83	.53	.33	044.	S
	Control	30	.39	.23		
LDL	Before	83	2.22	1.34	.0005	H.S
	Control	30	3.36	1.01		

Table (2) revealed that there was a highly significant (P-value<0.01) difference between cholesterol and low-density lipoprotein [LDL] cholesterol concentration before haemodialysis compared to control. The table showed that there was a decrease in cholesterol concentration (3.915±1.092) before haemodialysis in comparison with control (4.856±1.038), while the LDL-cholesterol concentration (2.221 ±1.341) was decrease in compared with control (3.364±1.014).The table showed that there was a significant difference (P-value<0.05) between triglyceride [TG] and very low density lipoprotein [VLDL] cholesterol concentration before haemodialysis compared to control, triglyceride concentration (1.188±0.750) was increased compared to control (0.868±0.528) and VLDL-cholesterol concentration (0.535 ±0.339) was increased compared to control (0.398±0.235).

However, non-significant difference (P-value>0.05) between high-density lipoprotein [HDL] cholesterol concentration (1.148±0.634) and control (1.091±0.336) was observed. These results were in agreement with the observation of A M Rao et al [14], except it was considered the difference in the cholesterol level was not statistical significant. While in the M. Jugovi study the cholesterol concentration, show a significant decrease than control [15].

Table (3) lipid profile concentration in ESRD patient after H.D compared to control.

Parameter		N	Mean	SD	Comparison of significant	
					p- value	Sig.
Chol	After	83	3.9419	1.15984	.000°	H.S
	Control	30	4.8563	1.03814		
TG	After	83	1.1986	.71563	.023	S
	Control	30	.8680	.52854		
HDL	After	83	1.1083	.58541	.881	N.S
	Control	30	1.0913	.33654		
VLDL	After	83	.5366	.32637	.036	S
	Control	30	.3983	.23597		
LDL	After	83	2.2902	1.27547	.000°	H.S
	Control	30	3.3640	1.01464		

Table (3) revealed that there was a highly significant (P-value<0.01) difference between cholesterol and low-density lipoprotein [LDL] cholesterol concentration after haemodialysis compared to control. The table showed that there was a decrease in cholesterol concentration (3.941±1.159) after haemodialysis in comparison with control (4.856±1.038), while the LDL-cholesterol concentration (2.290 ±1.275) was decrease in compared with control (3.364±1.014).

Also there was a significant difference (P-value<0.05) between triglyceride [TG] and very low density lipoprotein [VLDL] cholesterol concentration after haemodialysis compared to control, triglyceride concentration (1.108±0.715) was increased compared to control (0.868±0.528), also VLDL-cholesterol concentration (0.536±0.326) was increased compared to control (0.398±0.235).On the contrary, non-significant difference (P-value>0.05) between high-density lipoprotein [HDL] cholesterol concentration (1.108±0.585) and control (1.091±0.336) was observed.

Table (4) Lipid profile changes among male ESRD patient before and after HD compared with control.

Parameter		N	Mean	S.D	Min	Max	ANOVA	
							P -value	sign
Chol	Before	47	3.7504	1.09786	2.04	5.67	.001	HS
	Control	20	4.7785	.94870	3.71	6.96		
	After	47	3.7385	1.20958	1.60	6.00		
TG	Before	47	1.1566	.58546	.32	3.04	.353	NS
	Control	20	.9570	.60576	.30	2.40		
	After	47	1.1460	.47209	.34	2.31		
HDL	Before	47	1.1100	.62285	.25	2.72	.358	NS
	Control	20	.9060	.15035	.74	1.32		
	After	47	1.0440	.53168	.32	2.85		
VLDL	Before	47	.5196	.26369	.15	1.38	.470	NS
	Control	20	.4405	.26844	.13	1.09		
	After	47	.5091	.21814	.16	1.05		
LDL	Before	47	2.1030	1.36782	.10	4.54	.000°	HS
	Control	20	3.4320	.96183	2.54	5.78		
	After	47	2.1796	1.27575	.14	4.54		

Multiple Comparisons LSD

Parameter			P –value	Sig
Chol	Before	Control	.001	HS
		After	.959	NS
	After	Control	.001	HS
LDL	Before	Control	.000°	HS
		After	.770	NS
	After	Control	.000°	HS

Data presented in table (4) showed that there was a significant difference between cholesterol concentrations before (3.750±1.097) and after (3.378±1.209) haemodialysis in male ESRD patient compared to control (4.778±0.948) and LDL-cholesterol concentrations before (2.103±1.367) and after (2.179±1.275) haemodialysis in male ESRD patient compared to control (3.432±0.961),but there was no significant difference between TG, HDL-cholesterol, LDL-cholesterol concentrations compared to control. These results were in agreement with the result of A. Altaf et al [16].

Table (5) Lipid profile changes among female ESRD patient before and after HD compared to control.

Parameter		N	Mean	S.D	Min	Max	ANOVA	
							P -value	sign
Chol	Before	36	4.1306	1.06169	2.06	6.90	.071	NS
	Control	10	5.0120	1.23784	3.64	7.13		
	After	36	4.2075	1.04911	2.01	6.06		
TG	Before	36	1.2308	.92973	.30	5.29	.180	NS
	Control	10	.6900	.26957	.30	1.10		
	After	36	1.2672	.94782	.17	5.44		
HDL	Before	36	1.1983	.65571	.31	2.92	.449	NS
	Control	10	1.4620	.29705	1.09	1.75		
	After	36	1.1922	.64700	.16	3.29		
VLDL	Before	36	.5553	.42188	.13	2.40	.189	NS
	Control	10	.3140	.12429	.13	.50		
	After	36	.5725	.42973	.10	2.47		
LDL	Before	36	2.3769	1.30988	.12	5.83	.167	NS
	Control	10	3.2280	1.15473	1.68	5.00		
	After	36	2.4347	1.27847	.12	4.65		

Result in table (5) represented the lipid profile changes among female ESRD patient before and after HD and there was no significant difference (P-value>0.05) in lipid profile concentration [cholesterol, triglyceride, HDL-cholesterol, LDL-cholesterol, VLDL-cholesterol] compared to control. These results were in agreement with the result of A. Altaf et. al. [16] who found that the lipid profile in female MHD changed were no statistical significant. He also found that total cholesterol and LDL-C was significantly changed in male MHD patient while triglyceride and HDL-C was no statistical significant changed that similar to the result in the table (4) in this study.

Table (6) Lipid profile changes according to age group (20-35) among ESRD patient before and after HD compared to control.

Parameter		N	Mean	S.D	Min	Max	ANOVA	
							P -value	sign
Chol	Before	34	3.6788	.99847	2.06	5.58	.000*	HS
	Control	26	4.7996	1.01421	3.64	7.13		
	After	34	3.8418	1.16791	1.60	6.06		
TG	Before	34	1.1000	.60670	.30	3.04	.007	HS
	Control	26	.7319	.32009	.30	1.30		
	After	34	1.1224	.52020	.34	2.31		
HDL	Before	34	1.2029	.54666	.25	2.58	.589	NS
	Control	26	1.1000	.32170	.74	1.75		
	After	34	1.2274	.54311	.32	3.29		
VLDL	Before	34	.4921	.27050	.13	1.38	.011	S
	Control	26	.3373	.13990	.13	.59		
	After	34	.5056	.23539	.16	1.05		
LDL	Before	34	1.9750	1.1986	.12	4.37	.000*	HS
	Control	26	3.3608	1.0268	1.68	5.78		
	After	34	2.0850	1.2619	.12	4.48		

Multiple Comparisons LSD

Parameter			P –value	Sig
Chol	Before	Control	.000*	HS
		After	.531	NS
	After	Control	.001	HS
TG	Before	Control	.007	HS
		After	.857	NS
	After	Control	.004	HS
VLDL	Before	Control	.011	S
		After	.807	NS
	After	Control	.006	HS
LDL	Before	Control	.000	HS
		After	.701	NS
	After	Control	.000	HS

Data presented in table (6) showed that high significant difference (P-value<0.01) between cholesterol, triglyceride, LDL-cholesterol concentrations before and after haemodialysis in ESRD patient compared to control in this age group. However, there was no significant difference (P-value>0.05) between HDL-cholesterol concentrations compared to control, while VLDL-cholesterol demonstrated a significant difference (P-value<0.05) in comparison with control.

Table (7) Lipid profile changes according to age (36-50) among ESRD patient before and after HD compared to control.

Parameter		N	Mean	S.D	Min	Max	ANOVA	
							P -value	sign
Chol	Before	19	4.0142	1.47301	2.04	6.90	.235	NS
	Control	4	5.2250	1.27949	4.37	7.13		
	After	19	3.9105	1.33616	2.00	6.00		
TG	Before	19	1.4468	1.18527	.36	5.29	.891	NS
	Control	4	1.7525	.80189	.75	2.40		
	After	19	1.5126	1.18122	.36	5.44		
HDL	Before	19	.9668	.69730	.31	2.72	.941	NS
	Control	4	1.0350	.47704	.77	1.75		
	After	19	.9200	.62676	.16	2.58		
VLDL	Before	19	.6537	.53846	.16	2.40	.888	NS
	Control	4	.7950	.36483	.34	1.09		
	After	19	.6837	.53760	.16	2.47		
LDL	Before	19	2.3653	1.71341	.10	5.83	.426	NS
	Control	4	3.3850	1.07869	2.80	5.00		
	After	19	2.3168	1.34280	.24	4.65		

Result in table (7) showed that the lipid profile changes according to age (36-50) among ESRD patient before and after HD compared to control.

The data demonstrated in the table revealed that there was no significant difference (P-value>0.05) in lipid profile concentration [cholesterol, triglyceride, HDL-cholesterol, LDL-cholesterol, VLDL-cholesterol] compared to control. These results were in agreement with the result of Prata et al [17].

Table (8) Lipid profile changes according to age (51-65) among ESRD patient before and after HD.

Parameter		N	Mean	S.D	Min	Max	ANOVA	
							P -value	sign
Chol	Before	30	4.1207	.88150	2.10	5.58	.857	NS
	After	30	4.0753	1.05481	2.01	5.58		
	Control							
TG	Before	30	1.1260	.49295	.30	2.00	.740	NS
	After	30	1.0860	.43540	.17	2.12		
	Control							
HDL	Before	30	1.2013	.68550	.39	2.92	.513	NS
	After	30	1.0927	.59115	.39	2.85		
	Control							
VLDL	Before	30	.5087	.22508	.13	.90	.587	NS
	After	30	.4787	.19993	.10	.96		
	Control							
LDL	Before	30	2.4107	1.22977	.12	4.35	.767	NS
	After	30	2.5060	1.25322	.33	4.43		
	Control							

Result in table (8) showed that the lipid profile changes according to age (36-50) among ESRD patient before and after HD compared to control.

The data demonstrated in the table revealed that there was no significant difference (P-value>0.05) in lipid profile concentration [cholesterol, triglyceride, HDL-cholesterol, LDL-cholesterol, VLDL-cholesterol] compared to control. These results were in agreement with the result of Nelva T. de Gomez Dumm et al [18].

Conclusions: -

The data presented in this study enable us to conclude the following: -

- Cholesterol concentration didn't change pre and post haemodialysis but it changed in male end stage renal disease patient and in patient aged 20-35 years.
- Triglyceride concentration increase in end stage renal disease patient compared to control and remains unchanged after haemodialysis.
- High-density lipoprotein cholesterol concentration didn't effect by haemodialysis and unchanged during it.
- Low density lipoprotein cholesterol concentration, as cholesterol, decrease when compared with control, unchanged after haemodialysis, and changed in male end stage renal disease patient and in patient aged 20-35 years.
- Very low-density lipoprotein cholesterol concentration unchanged during haemodialysis inspite of increase its concentration compared to control before haemodialysis.

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