# THE EFFECT OF HEMODIALYSIS ON LIPID PROFILE IN YEMENI PATIENTS WITH CHRONIC KIDNEY DISEASE.

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**ABSTRACT** Mortality from cardiovascular (CVD) disease in patients on chronic hemodialysis (CHD) is 10 to 20 times greater than in the general population. Fifty Yemeni hemodialysis patients with end stage-renal disease (ESRD), aged 12-80 years, undergoing MHD at a dialysis Unit in Al-Thawra Hospital in Ibb city, were enrolled in this study. Pre- and post-dialysis blood samples were collected and analyzed for plasma glucose, total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), and triglycerides (TG). Low density lipoprotein cholesterol (LDL-C) was determined by using the friedewald equation. Non-HDL-C was calculated as TC-HDL-C.

Level of glucose was decreased significantly ($P<0.05$) by 51% post-dialysis. There were significant post-dialysis increases in TC, LDL-C, non-HDL-C and TG by 39%, 45%, 52.3%, and 16.7% respectively, and also significant increases in antiatherogenic profile represented by HDL-C by about 14.7%.

In conclusion, levels of atherogenic lipoproteins increase postdialysis in Yemeni patients with ESRD. The increase in lipid levels is therefore related to retention of lipoproteins with each dialysis. With repeated dialysis, dyslipidaemia may get progressively worse and further accentuate Cardiovascular disease risk.

**Key words:** hemodialysis, cholesterol, lipoproteins, Yemen.

## INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality among patients who reach end-stage renal disease (ESRD) on maintenance hemodialysis (MHD) worldwide [1-5], including Yemen [6, 7]. Mortality from cardiovascular disease in dialysis patients is 10 to 20 times greater than in the general population [1, 5] .The excess risk of vascular disease is due, at least in part, to traditional risk factors identified in the general population, including hypertension, diabetes mellitus, hyperlipidemia, tobacco use and physical inactivity [8].In addition,hemodynamic and metabolic factors related to the kidney disease are involved. These uremia related risk factors include dyslipidemia high lipoprotein(a), prothrombic factors, hyperhomocysteinemia, increased oxidant stress, hypoalbuminemia, inflammation, hemodynamic overload and anemia [9,10] . Hemodialysis patients usually have normal total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) levels, whereas they have a tendency toward lower high-density lipoprotein cholesterol (HDL-C) and higher triglyceride (TG) levels [11-13]. Non –high density lipoprotein cholesterol (non-HDL-C) represents the sum of LDL-C, intermediate-density lipoprotein cholesterol (IDL-C), and very low density lipoprotein cholesterol (VLDL-C) levels and correlates with highly with ApoB level. Therefore, it has been suggested that non-HDL-C level may be a better marker of

atherogenic cholesterol than LDL-C level [14]. Non-HDL-C can be calculated easily by subtracting HDL from TC (non-HDL-C= TC-HDL-C). In the general population, non-HDL-C level is at least as a powerful predictor of cardiovascular disease as LDL-C level [15].

This study was designed to evaluate acute changes in blood lipoproteins and glucose after a single session of hemodialysis in Yemeni patients with ESRD on MHD.

## PATIENTS AND METHODS

This study included fifty Yemeni subjects, aged 12-80 years, diagnosed with chronic renal failure (CRF) and undergoing intermittent maintenance hemodialysis (MHD) for varying length of time at the Dialysis Unit of Al-Thawra hospital in Ibb city, Yemen ,during the period from 10th of November2007 to 10th of June 2008. They were all essentially otherwise medically stable and free of cardiovascular disease (CVD) or any other systemic illness. The subjects were on twice per week, 4-hourly haemodialysis sessions, typically in the morning or afternoon and were none fasting. They were interviewed for details of their age, sex, smoking habit, qat chewing, current medications and history of diabetes, CVD, liver disease, goat and hypertension. Dialysis in each subject was on changed poly sulfone dialyser on a fresenius 4800S Hemodialysis machine (Fresenius, Germany) and bicarbonate dialysate (Fresenius, Germany) with the following constituents (mmol/l): glucose 0, Na 138, K 2, Ca 1.75, Cl 109.5, Mg 0.5, acetate 3, HCO3 32 and osmolality 287. The intradialysis heparin dose was given in the range of 1000-3500 iu intravenously. The rates of flow of blood and dialysate were 250 and 500 ml/h respectively. The adequacy of dialysis was assessed by regular Kt/V monitoring in all subjects. Non-fasting blood samples were collected from each subject immediately prior to dialysis (pre-dialysis), and immediately on completion (post-dialysis) of the dialysis session on the same day. Serum was obtained, separated and analyzed for serum TC, HDL-C, triglyceride TG and glucose. LDL-C levels were calculated by using the Friedwald equation (LDL-C= TC-HDL-C-TG/5) [16].

Non-HDL-C, which contains all remnant lipoproteins including atherogenic small dense LDL, was calculated as TC-HDL-C [14]. Reagents made by Spinreact Company (Spain) and spectrophotometer made by Spectronic Company (USA) was used.

Data was reported as means ±SD. P- value less than 0.05 was considered statistically significant .Pre-and post-dialysis levels of the different analytics were compared for the subjects, using student's t tests. The statistical software used for analysis was SPSS, Version 10.0.

## RESULTS

Table1 shows the demographic and clinical data of the patients with ESRD on MHD. The age of the patients ranged from 12years to 80years with a mean of 48.6±22years. Thirty tow of patients (64%) were males and 18 patients (36%) were females. The results also show that hemodialysis patients displayed a marked

atherogenic profile, as attested by 66.4% of patients were arterial hypertension, 22% diabetic, 16% cardiovascular disease , 28% smokers and 18% were qat chewers.

Table1.Demographic and clinical data of the patients (mean±SD)

| Variable | |
|---|---|
| N(m/f) | 50(32/18) |
| Age(years) | 48.6±22 |
| Duration of dialysis(months) | 24.02±8.6 |
| Hypertension | 66.4% |
| Diabetes | 22% |
| Cardiovascular disease | 16% |
| Smoking | 28% |
| Qat chewing | 18% |

Table2 indicates the pre and post-dialysis levels of glucose, TC, LDL-C, HDL-C, TG, and non HDL-C in the subjects. Level of glucose was decreased significantly by 51% post-dialysis. There were significant post-dialysis increases in atherogenic profile represented by TC, LDL-C, non-HDL-C and TG by 39%, 45%, 52.3%, and 16.7% respectively, and also significant increases in antiatherogenic profile represented by HDL-C by 14.7%.

Table 2. Pre- and post-dialysis levels of glucose, TC, LDL-C, HDL-C, TG and non-HDL-C in the study group (means ± SD).

| Analyte | Pre-dialysis (n=50) | Post-dialysis (n=50) | P value |
|---|---|---|---|
| Glucose (mmol/L) | 6.91 ± 4.20 | 3.41± 1.57 | <0.05 |
| TC(mmol/L) | 3.66±1.10 | 5.09 ± 1.32 | <0.001 |
| LDL-C(mmol/L) | 1.71 ± 1 | 2.48 ± 1.29 | <0.01 |
| HDL-C(mmol/L) | 1.29 ± 0.45 | 1.48 ± 0.53 | <0.05 |
| TG(mmol/L) | 1.20 ± 0.52 | 1.40 ± 0.71 | <0.05 |
| Non-HDL-C(mmol/L) | 2.37± 0.88 | 3.61± 0.79 | <0.05 |

## DISSCUTION

In the present study, we evaluated cardiovascular disease risk in hemodialysis patients. To that end, we measured pre- and post-dialysis serum lipid profiles and glucose level. It was observed that the patients in our study were younger than those encountered in the USA, Tunisia and Kuwait with more preponderance of males [17-19]. Most of our patients had a history of malaria and / or streptococcal infection. The high prevalence of these infectious diseases and the inappropriate treatment can lead to development of chronic infection and CRF [20].

Our study demonstrated that, the dyslipidemia associated with ESRD is characterized by increased levels of intact and partially metabolized VLDL and LDL, and resulting from their impaired metabolism and clearance, and containing a disproportionate amount of the highly atherogenic small dense LDL fraction [13, 21]. Non-HDL cholesterol represents the sum of atherogenic LDL, IDL, and very LDL cholesterol levels (VLDL-C) [22]. Non-HDL has been recommended by the National Cholesterol Education Program (NCEP) guidelines as the secondary target for lipid control in

individuals with high TG levels, as indeed ESRD patients tend to be and has also been suggested as the target for Lipid-lowering in patients on MHD [23].

Uremic dyslipidemia may contribute not only to accelerated atherosclerosis but may enhance the progression of renal disease in patients with residual renal function [24]. Others suggest a limited role for dyslipidemia in the progression of chronic kidney disease [25]. In most stable patients with ESRD, MHD is performed at least twice a week. One might thus speculate that persisting increases in these lipoproteins with each dialysis session could, with time, worsen dyslipidaemia and further accentuate an already quite considerable risk.

A criticism of the study may be that samples were taken from non-fasting subjects. However, only glucose and TG are the analytes most likely to have been influenced by prior feeding; HDL-C and LDL-C, measured by direct methods, were unlikely to have been affected. And with respect to TG, data from other study suggested that non-fasting TG levels were more useful than fasting ones for CVD risk stratification [17, 26].TG levels ordinarily should decrease post-dialysis as heparin given during dialysis activates endothelial lipoprotein lipase, which enhances hydrolysis of circulating TG. Our measured postdialysis TG levels therefore possibly underestimated 'real' TG levels. This study therefore suggests that the dyslipidaemia in patients with ESRD on MHD may be acutely worsened by dialysis. We evaluated only single dialysis sessions here. It would be of interest to see if, as we speculate, the post-dialysis changes persist until the next dialysis session usually within a few days, and get further increased with each session over time, and with time, precipitate a vicious circle to further accentuate cardiovascular morbidity risk [18].

In conclusion, levels of atherogenic lipoproteins were increased postdialysis in Yemeni patients with ESRD. The increase in lipid levels is therefore related to retention of lipoproteins with each dialysis. With repeated dialysis, dyslipidaemia may get progressively worse and further accentuate CVD risk.

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