Research Paper

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Effect of hemodialysis and gender on lipoprotein (a) in chronic renal failure patients

Medical Science

KEYWORDS : Chronic renal failure, Lipoprotein(a), Hemodialysis

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ABSTRACT

Lipoprotein(a) (Lp(a)) is a novel cardiovascular risk factor and its level is increased in chronic renal failure (CRF) patients. The study was carried out to see any effect of hemodialysis and gender on Lp(a) in CRF patients. 3 groups were made, Group-I: Controls (30), Group-II: Undialysed CRF patients (30) and Group-III: CRF patients on hemodialysis for >6 months (30). Fasting blood samples were collected & analyzed for urea, creatinine and Lp(a). Lp(a) was significantly higher in gr-II and III as compared to controls (p<0.01) but the difference between Lp(a) in gr-II and III was found insignificant (p>0.05). No significant difference (p>0.05) was observed between Lp(a) levels in male and female patients in gr-I, II & III. It is concluded that hemodialysis process cannot decreased the increased Lp(a) levels in CRF patients and both male and female CRF patients have elevated Lp(a) levels without any discrimination of sex.

Introduction

Chronic renal failure (CRF) is a syndrome in which there is progressive loss of both glomerular and tubular function [1]. It gradually leads to end stage renal disease (ESRD) and it is associated with high cardiovascular complications [2]. Lp(a) is low density lipoprotein (LDL)-like particle but contains apo(a), a glycoprotein with sequence homology to plasminogen. Lp(a) plays very importal role in the development of atherosclerosis and is a potentially modifiable cardiovascular disease risk factor in hemodialysed CRF patients [3]. Cardiovascular disease is the major cause of death in patients with ESRD and it is still higher in dialysis patients than in post transplantation patients due to abnormalities in lipids and lipoproteins structure and metabolism [4]. There are controversies exist regarding Lp(a) levels in CRF patients with and without hemodialysis. Some studies showed raised Lp(a) level in CRF patients [5,6,7] and in hemodialysed patients [8]. Lp(a) levels were decreased after hemodialysis [6,9] and Lp(a) levels did not vary before and after hemodialysis [3,10]. With the implication Lp(a) in the pathogenesis of atherosclerosis and ischemic heart disease, it becomes worthwhile to study the effect of hemodialysis and gender on Lp(a) in CRF patients.

Materials and Methods

This prospective, observational study was started after prior approval from Institutional Ethics Committee, Govt. Medical College and Sir T General Hospital, Bhavnagar, Gujarat (India). Before enrollment, informed consent was obtained from the patients. Age and sex matched (Both male and female patients aged 18-60 years) 60 patients of CRF and 30 controls were recruited for this study. They were divided into Group-I (Controls), Group-II (Undialysed CRF patients) and Group-III (CRF patients on hemodialysis >6 months). Exclusion criteria includes Body mass index (BMI) more than 24.9 kg/m2, known case of acute renal failure/diabetes mellitus/hypertension/ischemic heart disease, taking drugs that affect lipids/lipoproteins level. 5 ml of venous blood samples were collected in plain tubes after an overnight fast. After collection, the samples were allowed to clot for half an hour following which the samples were centrifuged and serum was analysed. Serum Lp(a), urea and creatinine, were measured using commercially available kits in Miura- fully auto analyzer. Statistical analysis was carried out in SPSS, Version 12.0. All the values obtained were expressed as mean and standard errors of mean (SEM). "Mann Whitney U test" was applied to compare the difference in the means between controls and study group. Comparison of Lp(a) levels between male and female patients was carried out in all the three groups by using unpaired t-test. The differences were considered as significant if p value was <0.05.

Results

A prospective study was taken to see the effect of hemodialysis and gender on Lp(a) level. The comparison was made between (1) Group-II & Group-III (2) Group-I & Group-II and (3) Group-I & Group-III which is shown in table 2. Lp(a) levels were found significantly higher (p < 0.01) in CRF patients with and without hemodialysis as compared to controls. When comparison made between Group-II & Group-III, there was no significant difference found in levels of Lp(a) (p>0.05). This comparison clearly showed the effect of hemodialysis on Lp(a) in CRF patients.

Table 1: Baseline characteristics of study population

	Group-I	Group- II	Group-III
Age (years) Mean ± SD Range	44.27 ± 10.72 18-60	44.27 ± 10.72 18-60	44.27 ± 10.72 18-60
Male/ Female	18/12	18/12	18/12
BMI (kg/ m2) Mean ± SD	22.01 ± 1.32	21.23 ± 0.86	20.89 ± 1.14

(CRF=chronic renal failure, pts= patients, HD= hemodialysis, BMI=Body mass index)

Table 2: The Biochemical parameters among Control and CRF Patients with and without hemodialysis (Results are shown in Mean ± Standard Error of Mean)

Parameters (mg/dl)	Group-I (n=30)	Group- II (n=30)	Group-III (n=30)
Urea	27.8 ± 6.58	132.73 ± 52.55	107.26 ± 35.27
Creatinine	0.84 ± 0.35	11.48 ± 3.19	6.19 ± 2.89
Lp(a)	8.7 ± 4.46	38.87 ± 7.5**	39.86 ± 10.11**

(* p< 0.05 **p < 0.01. Figures in parentheses indicate the number of patients. CRF= chronic renal failure, pts= patients, HD= hemodialysis)

Out of 30, there were 18 male patients and 12 female patients in each group. Comparison of Lp(a) levels between male & female patients in each group was also carried out. Table 3 shows no significant difference (p>0.05) between Lp(a) levels in male & female patients of all the three groups.

Table 3: Comparison of Lp(a) levels (Mean ± SD) between male and female patients in Group-I, II & III

Variable	Group-I		Group-II		Group-III	
	M	F	M	F	M	F
Lp(a) (mg/dl)	9.6 ± 4.4	7.3 ± 4.4	38.6 ± 7.2	39.3± 7.1	37.4 ± 9.9	43.5 ± 9.61
t -value	1.3924*		-0.22*		-1.67*	

(*p>0.05= statistically insignificant, degree of freedom= 28, M=male, F=female)

Discussion

Chronic renal failure results in profound dysregulation of several key enzymes and receptors involved in the metabolism of lipoproteins [8,11]. The Cardiovascular disorders are one of the most serious problems in chronic hemodialysis patients. The mortality due to cardiovascular disease in hemodialysis patients is estimated to be 9% annually and is 30 times higher than that observed in the general population. Elevated Lp(a) is now identified as a newer risk factor for developing cardiovascular disease in hemodialyzed patients [12].

Lp(a) is a cholesterol-rich lipoprotein with structural similarities to LDL but contains apo(a), a glycoprotein with sequence homology to plasminogen [3].The kidney may be involved in the metabolism of Lp(a), and it is suggested that renal failure mainly affect the normal breakdown of Lp(a) [6]. A causal role of Lp(a) in atherosclerosis is because of its characteristic atherogenic and thrombogenic properties by various mechanisms [13]. Besides other lipid abnormalities, there is significant increase in the level of serum Lp(a) in CRF patients [6]. Hemodialysis therapy may increases Lp(a) level [8] or decreases Lp(a) level [6,9]. Some studies also reported that Lp(a) level did not change before and after hemodialysis [3,10] In our study we found elevated Lp(a) level in CRF patients with and without hemodialysis as compared to controls. The difference was found highly significant. But there was no significant difference found in Lp(a) levels in between group-II and group-III. To see the effect of gender, we compared the levels of Lp(a) between male and female patients in all the three groups. We found that both male and female patients of CRF with and without hemodialysis have elevated levels of Lp(a). The loss of both glomerular and tubular renal functions in hemodialysed patients held responsible for raised Lp(a) levels because of decreased clearance but not increased production of Lp(a). Thus the high risk of atherosclerosis in these patients is because of the prolonged retention time of Lp(a)[14].

In conclusion, CRF patients with and without hemodialysis are at greater risk of development of elevated Lp(a) levels and it is not decreased by the hemodialysis process. Both male and female patients of CRF have elevated Lp(a) levels without any discrimination of sex. Being the modifiable cardiovascular risk factor, a strict monitoring should be taken on the Lp(a) levels to reduce the morbidity and mortality rate in CRF patients.

REFERENCE

1. William JM, Stephen KB, editors. (2008).Clinical Biochemistry: metabolic and clinical aspects. 2nded. Philadelphia: Churchill Livingstone, Elsevier;: p.145, 154. | 2. Godela B, Mony F. (2010) CME topic on Chronic Kidney Disease: Whom to Screen and How to Treat, Part 1: Definition, Epidemiology and Laboratory Testing. Southern Medical Journal, 103(2):140-146. | 3. Cressman MD, Heyka RJ, Paganini EP, O'Neil J, Skibinski CI, Hoff HF. (1992).Lipoprotein(a) is an independent risk factor for cardiovascular disease in hemodialysis patients. Circulation; 86(2): 475-482. | 4. Fauci AS, Kasper DL, Longo DL, Braunwald E, Hauser SL, Larry Jameson J, Loscalzo J, editors. (2008)Harrison's principles of Internal Medicine. 17th ed. New York: McGraw Hill, Health Professions Division: p. 1772-1776. | 5. Kronenberg F, Lingenhel A, Neyer U, Lhotta K, Konig P, Auinger M, et al. (2003).Prevalence of Dyslipidemic risk factors in hemodialysis and CAPD patients. Kidney International; 63(Suppl 84): 113-116. | 6. Kalra OP, Khaira A, Gambhir JK, Agarwal S, Bhargava SK. (2003).Lipoprotein(a) in Chronic Renal Failure: Effect of Maintenance Hemodialysis. Hemodial Int; 7(4): 326-33. | 7. Yerkey MW, Kernis SJ, Franklin BA, Sandberg KR, McCullough PA. (2004). Renal Dysfunction and Acceleration of Coronary Disease. Heart; 90: 961-966. | 8. Janicki K, Molas G, Furmaga J, Pieprzny S, Gieryng J, Kufel M, et al. (2007).Abnormal lipoprotein metabolism in hemodialysis patients , Annales Universitatis Mariae Curie - Sklodowska Lublin Polonia; 62: 311-314. | 9. Kandoussi A, Cachera C, Pagniez D, Dracon M, Fruchart JC, Tacquet A. (1992).Plasma level of lipoprotein Lp(a) is high in predialysis or hemodialysis, but not in CAPD. Kidney International,; 42: 424-425. | 10. Barbagallo CM, Averna MR, Sparachio V, Galione A, Caputo E, Scafidi V, et al. (1993).Lp (a) levels in end-stage renal failure and renal transplantation. Nephron; 64(abstract): 560-564. | 11. Vaziri ND. (2006).Dyslipidemia of chronic renal failure: the nature, mechanisms, and potential consequences. Am J Physiol Renal Physiol; 290 (2): F262-72. | 12. Sonician M, Parissis JT. (2003).Cardiovascular Diseases and Hemodialysis: Novel Strategies for Diagnosis, Prevention and Treatment. Hellenic J Cardiol; 44: 206-217. | 13. Deb A, Caplice NM. (2004). Lipoprotein(a): New Insights into Mechanisms of Atherogenesis and Thrombosis. Clin. Cardiol,27: 258–264. | 14. Frischmann ME, Kronenberg F, Trenkwalder E, Schaefer JR , Schweer H, Dieplinger B, et al. (2007).In vivo turnover study demonstrates diminished clearance of lipoprotein(a) in hemodialysis patients. Kidney International, 71(abstract): 1036–1043.