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Serum Lipid Profile in Chronic Kidney Disease Patients on Haemodialysis

KEYWORDS: Chronic kidney disease, haemodialysis, Dyslipidemia, cardiovascular Disease.

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ABSTRACT *The burden of chronic kidney disease is increasing rapidly worldwide and has become a major health issue. Studies have shown that more than 50% of deaths in CKD patients are attributable to cardiovascular events. Lipid disorders (Dyslipidemia) are recognized risk factors for CVD and progression of renal diseases of varied aetiologies. There is paucity of information on the prevalence and pattern of lipids in CKD patients in our environment. It is for these reasons the present study has been undertaken to study the lipid profile in dialysis patients with an objective to adopt appropriate measures to decrease CVD mortality in this population. The study involved 50 CKD patients and 50 controls. A venous blood sample was obtained from each patient and control after an overnight fast for estimation of lipid profile and other blood parameters. The mean values of total cholesterol (211.4 ± 42.7 mg/dL) and triglyceride (151.08 ± 41.5 mg/dL) were found to be higher in the patients when compared to controls (162.9 ± 13.5 mg/dL and 110.1 ± 22.3 mg/dL) respectively. HDL and LDL Cholesterol were also found to be altered in dialysis patients. Most frequent lipid alterations were hypercholesterolemia (42%), hypertriglyceridemia (34%). The present study underscore the need for early assessment of these patients for lipid abnormalities as prompt treatment may prevent cardiovascular events and retard the progression of kidney disease.*

Introduction:-
Chronic kidney disease (CKD) is an increasingly health disease all around the world with a high burden of mortality and cardiovascular (CV) morbidity rate (Attman PO, Samuelsson O, Johansson AC, Moberly JB, Alaupovic P 2003). Even when renal replacement therapy is reached, more than half patients die, mainly for CV causes due either to uraemia-related cardiovascular risk factors (such as anaemia, hyperhomocysteinemia, mineral bone disease-CKD with hyperparathyroidism, oxidative stress, hypoalbuminemia, chronic inflammation, prothrombotic factors) or to traditional ones (age, male gender, diabetes, obesity, hypertension, smoking, insulin levels, family history, Dyslipidemia) (Kronenberg, F, Lingenhel A, Neyer U 2003). Among the latter causes Dyslipidemia represents one of the major, potentially correctable risk factor. (Kaysen GA. 2007). Approximately 50% of patients with end-stage renal disease (ESRD) die from cardiovascular events, which indicate that cardiovascular mortality is 30-times higher in dialysis patients. (Fox CS, Longenecker JC. et al 2004). Lipoprotein metabolism is altered in patients most with renal insufficiency.

Dyslipidemia develops early in renal failure. The imbalance between lipoprotein synthesis and degradation in prolonged renal disease results in a pronounced Dyslipidemia. There are many specific abnormalities in the lipoprotein metabolism in CKD patients. HD patients usually display elevated TG, reduced serum high density lipoprotein (HDL) cholesterol and elevated concentration of Total and LDL cholesterol levels. High level of LDL-C and low level of HDL-C are the major factors in the development of atherosclerosis which could result in cardiovascular disease (Foley RN, Parfrey PS, Sarnak MJ. 1998) and the higher the ratio of LDL-C to HDL-C the higher the risk of developing cardiovascular disease (CVD). Keeping in view the mortality associated with CVD in patients on HD, the present study aims to investigate the serum lipid status in CKD patients undergoing long-term maintenance HD treatment.

Materials and Methods:-
The study group consisted of 50 patients (31 males and 19 females) with CKD undergoing Haemodialysis. The 50 control subjects (28 males and 22 females) were recruited from healthy hospital staff and patient relatives. All controls were free from diseases including Dyslipidemia. The HD frequency of study group was two to three times per week and each session lasts for four hours. Informed consent was obtained from both patients and controls with approval given by the ethical committee of the hospital before commencement of the study. General information of each patient (age, sex, BMI, duration and frequency of HD, underlying renal disease, and family history of hypertension, hyperlipidemia and myocardial infarction) were recorded. Patients taking diuretics, lipid lowering agents as well as those with acute or chronic infection were excluded from the study.

Five ml of venous blood was drawn aseptically from the antecubital fossa of every patient and control after an overnight fast for lipid profile determination. Blood was allowed to clot and serum was separated after centrifuging the samples. Other biochemical parameters like urea, creatinine and serum electrolytes along with the lipid parameters - total cholesterol, triglycerides, LDL and HDL cholesterol were also analysed. All the parameters were estimated using commercially available kits on semiautoanalyser – Robonik. The serum total cholesterol and high density lipoprotein cholesterol (HDL) were analyzed using cholesterol oxidase CHOD-PAP method, triglyceride by GPO-PAP method while low density lipoprotein cholesterol (LDL) was obtained using Frieldwald formula: LDL cholesterol= Total cholesterol – TGL÷5 – HDL cholesterol.

Results:-
Table 1 shows the demographic, clinical and laboratory parameters of 50 study subjects and 50 controls. The age range selected was 15-75 years. The CKD was more prevalent among patients belonging to age group 45-60 years. (Graph 1).The weight of patients was greater than that of the controls (62.5 ± 13.9 kg versus 54.3 ± 11.7 kg). Similarly comparing the body mass index, it was found to be high in patients. Both the systolic (152.4 ± 29.7mmHg) and diastolic (84.3 ± 17.5 mmHg) blood pressure in patients were high when compared to that of the controls (118.2 ± 6.8 mmHg and 78.2 ± 4.9mmHg respectively). The mean values of urea (120 ± 39.28 mg/dL) and creatinine (7.42 ± 4.56 mg/dL) in CKD patients were found to be very high as compared to

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controls (28.8 ±7.5 and 1.1 ± 0.4 resp). The mean values of serum sodium and potassium in CKD patients were 130.6 ± 3.2 and 4.9 ± 3.8 resp. when compared to controls 138.2 ± 3.3 and 3.7 ± 0.9 resp. indicating the electrolyte imbalance in them. The lipid profile pattern in the CKD patients and the controls were compared. The mean of total cholesterol (211.4 ± 42.7 mg/dL) and triglyceride (151.08 ± 41.5 mg/dL) was higher when compared with that of controls (162.9 ± 13.5 mg/dL and 110.1 ± 22.3 mg/dL) respectively. Similarly, an elevated level of LDL Cholesterol was also observed in CKD patients as compared to controls. (132.08 ± 19.4 mg/dL versus 100.3 ± 15.1 mg/dL) There was a slight reduction in HDL Cholesterol in study patients (39.4 ± 7.08 mg/dL) when compared with controls (50.02 ± 4.7 mg/dL). Table 2 shows the prevalence of Dyslipidemia from lipid profile components in the study population: Total cholesterol (42%), HDL (8%), LDL (18%) and triglyceride (34%).

Table 1: Demographic, clinical and blood parameters of the study subjects and controls.

Variables	CKD (n=50)	Controls (n=50)
Male	31	28
Female	19	22
Weight (Kg)	62.5 ± 13.9	54.3 ± 11.7
BMI (Kg/m^2)	21.6 ± 5.2	18.5 ± 3.4
Systolic BP (mmHg)	152.4 ± 29.7	118.2 ± 6.8
Diastolic BP (mmHg)	84.3 ± 17.5	78.2 ± 4.9
Urea (mg/dl)	120 ± 39.28	28.8 ± 7.5
Creatinine (mg/dl)	7.42 ± 4.56	1.1 ± 0.4
Sodium (mmEq/L)	130.6 ± 3.2	138.2 ± 3.3
Potassium (mmEq/L)	4.9 ± 3.8	3.7 ± 0.9
Total Cholesterol (mg/dL)	211.4 ± 42.7	162.9 ± 13.5
HDL Cholesterol (mg/dL)	39.4 ± 7.08	50.02 ± 4.7
LDL Cholesterol (mg/dL)	132.08 ± 19.4	100.3 ± 15.1
Triglycerides (mg/dL)	151.08 ± 41.5	110.1 ± 22.3

Note:-Values are expressed as Mean ± Standard Deviation

Graph 1: Age-wise distribution of study patients

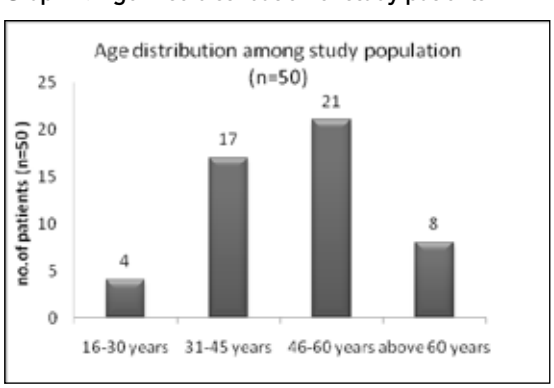

Table 2: Prevalence of Dyslipidemia in the study subjects

Variables	CKD (n=50)
Total Cholesterol (>200 mg/dL)	21 (42%)
HDL Cholesterol (<40 mg/dL)	4 (8%)
LDL Cholesterol (>130 mg/dL)	9 (18%)
Triglycerides (>150 mg/dL)	17 (34%)

Discussion:-

Our study shows that the peak incidence of CKD was between 30 and 60 years of age. Patients with CKD were found to have higher BMI as compared to the controls, which showed that weight increase is a risk factor of CKD. (Bonnet F, Deprele C et al 2001). The mean values of both systolic and diastolic blood pressure were higher in study subjects as compared to that of the controls. This was not surprising as hypertension was the one of the leading cause of CKD in this study. The presence of hypertension in these patients could accelerate the development of dyslipidaemia and progression of CKD. [7] Our study revealed that the mean values of all the lipid profile studied were higher than those of the controls. It underscores the importance of evaluating CKD patients for lipid disorders as lipids contribute directly to glomerulosclerosis and tubulointerstitial injury and that correction of lipid abnormalities associated with renal disease will slow the progression of chronic kidney disease. (Keane WF, Kasiske BL et al 1991) Cardiovascular (CV) disease is the leading cause of death in patients on maintenance haemodialysis (MHD) accounting for almost 50 percent of deaths. Many CV risk factors (such as anaemia, hyperhomocysteinemia, oxidative stress, hypoalbuminemia, chronic inflammation) are more prevalent in chronic haemodialysis patients than in general population. (Levey AS, Eknoyan G 1999) . The traditional risk factors for CVD (such as age, male gender, diabetes, obesity, hypertension, smoking, family history, and Dyslipidemia) can cause deterioration in renal function. Among the latter causes Dyslipidemia represents one of the major, potentially correctable risk factor. Patients with chronic kidney disease (CKD) exhibit alterations in lipoprotein metabolism which might predispose to the development of atherosclerosis and CV disease. (Liu J, Rosner MH. 2006). Dyslipidemia develops early in renal failure and it becomes more pronounced as the renal disease progresses because of imbalance between lipoprotein synthesis and degradation due to impaired activity of lipoprotein lipase and direct inhibitory effect of various uremic toxins on the enzymes involved in lipid metabolism. The altered lipoproteins are in turn taken up by the scavenger receptors on macrophages and vascular smooth muscle cells, which are increased in uraemia, favouring the development of atherosclerotic plaques. (Cheung AK, Parker CJ et al (1996). Magnitude of CKD and the scarcity of existing treatment modalities for such patients in our environment which they can hardly afford, means that effort should be geared toward preventive measures and early treatment in order to curtail future ESRD epidemic. An aggressive proactive approach is required in the management of CKD and this will include the control of dyslipidaemia, hypertension, infections, diabetes mellitus, smoking and alcohol consumption. The need to intensify effort on health education and screening of general public for CKD and dyslipidaemia cannot be over emphasized. Routine counselling and encouraging physical activity in MHD patients has potential to improve physical functioning, optimizing the quality of life and possibly improving the plasma lipids and lipoprotein pattern.

Conclusion:-

Lipid metabolism is altered in most patients with renal insufficiency. Our results indicate that patients undergoing MHD show important abnormalities of lipid metabolism such as hypertriglyceridemia, high levels of cholesterol and low HDL-cholesterol, which could contribute to atherosclerosis and cardiovascular disease and may increase the morbidity and mortality in this group. This alteration of lipid metabolism may contribute to the pathogenesis of atherosclerosis and cardiovascular disease as well as to the progression of renal disease. As a first step of controlling hyperlipidemia, body weight normalization, dietary modification, regular exercise and education about diet should be applied. It may also be useful to supplement the diet with polyunsaturated fatty acids from fish oil in order to reduce triglycerides. Statins can be used safely in patients with CKD with careful monitoring. Further research has to be done to confirm whether early detection and treatment (diet /drug therapy) of this Dyslipidemia is quite promising, in the prevention of adverse clinical outcomes in predialysis CKD patients and in those on maintenance haemodialysis. This underscores the need

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for early assessment of these patients for lipid abnormalities as prompt treatment may prevent cardiovascular events and retard the progression of chronic kidney disease.

REFERENCE

1. Attman PO, Samuelsson O, Johansson AC, Mo¬berly JB, Alaupovic P. (2003).Dialysis modalities and dyslipidemia. Kidney International, (84):110-2. | 2. Bonnet F, Deprele C, Sassolas A, Moulin P, Alamartine E, Berthezène F. (2001). Excessive body weight as a new independent risk factor for clinical and pathological progression in primary IgA nephritis. American Journal of Kidney diseases. 37(4):720-7. | 3. Cheung AK, Parker CJ, Ren K, Iverius PH. (1996). Increased lipase inhibition in uremia: identification of pre-beta-HDL as a major inhibitor in normal and uremic plasma. Kidney Internattional, 49(5):1360-71. | | | 4. Foley RN, Parfrey PS, Sarnak MJ. (1998). Clinical epidemiology of cardiovascular disease in chronic renal disease. American Journal of Kidney diseases, 32(5 Supplement 3): 112-9. | 5. Fox CS, Longenecker JC, Powe NR, Klag MJ, Fink NE, Parekh R.CHOICE Study. (2004). Under treatment of hyperlipidemia in a cohort of United States kidney dialysis patients. Clinical Nephrology, 61(5):299-307. | 6. Gomez Dumm NT, Giammona AM, Touceda LA, Raimondi C. (2001). Lipid abnormalities in chronic renal failure patients undergoing hemodialysis. Medicina, 61(2):142-6. | 7. Kaysen GA. (2007) Hyperlipidemia in chronic kidney disease. The International journal of artificial organs, 30(11):987-92. | | 8. Keane WF, Kasiske BL, O'Donnell MP, Kim Y. (1991). The role of altered lipid metabolism in the progression of renal disease. American Journal of Kidney diseases, 17(5 Supplement 1):38-42. | 9. Kronenberg, F, Lingenhel A, Neyer U. (2003). Prevalence of Dyslipidemia risk factors in hemodialysis and CAPD patients. Kidney International, (84):S113-6. | 10. Levey AS, Eknoyan G. Cardiovascular disease in chronic renal disease. (1999). Nephrology, Dialysis, Transplantation, 14(4):828-33. | 11. Liu J, Rosner MH. (2006). Lipid abnormalities associated with end-stage renal disease. Seminars in Dialysis, 19(1):32-40. | 12. Longenecker JC, Coresh J, Powe NR, Levey AS, Fink NE, Martin A. (2002). Traditional cardiovascular disease risk factors in dialysis patients compared with the general population: the CHOICE Study. Journal of the American Society of Nephrology, 13(7):1918-27. | 13. Taylor OG, Oyediran OA, Bamgboye AE, Afolabi BM, Osuntokun BO. (1996). Profile of some risk factors for coronary heart disease in a developing country. African Journal of Medicine and Medical sciences, 25(4):341-6. |