Research Article

Coagulation Profiles an Indicator of Vascular Haemostatic Function in Chronic Renal Failure Patients Who Are on Renal Dialysis.

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Abstract: Renal disease is a common cause of death and disability in many countries throughout the world. Renal failure can be classified as acute and chronic depending upon the etiological factors. Chronic kidney disease (CKD) is a common threat to critically ill patients in intensive care units with a mortality rate ranging from 42% to 88%. Treatment methods such as dialysis and transplantation are becoming more effective in life threatening conditions. To assess the coagulation profile level in chronic renal failure patients who are on haemodialysis and comparison was made with age matched controls. Totally 50 members were selected for the study. Among them 25members were chronic renal failure patients (Group A) and 25 members were normal healthy subjects served as controls (Group B). Both the groups were age matched and comparison of coagulation profile was done. Parameters analysed in the study are Platelet count (Pl), Prothrombin time (PT), international normalization ration (INR), Activated Prothrombin time (APTT), Plasma fibrinogen (PF). From our study we concluded that Prothrombin time, INR, Activated Prothrombin time, Plasma fibrinogen level were increased in chronic renal failure patients(Group A) when compared to control (Group B). Platelet count was found be increased in control (Group B) when compared to chronic renal failure patients (Group A). Coagulation profiles has a significant variations in chronic renal failure. This leads to lot of complications such as sepsis, massive tissue repair and obstruction in vascular compartment. Regular monitoring of anticoagulant doses and haemodialysis may minimise the risk of vascular injury.
Keywords: Renal disease, Prothrombin time (PT), international normalization ration (INR), Activated Prothrombin time (APTT), Plasma fibrinogen(PF).

INTRODUCTION

Chronic renal failure is currently known as Chronic Kidney Disease (CKD) or Chronic Renal Insufficiency (CRI) implies long standing, progressive and irreversible renal parenchyma disease resulting in diminished renal function up to 40 to 60%. Diabetes mellitus (DM) nearly 60 -80 % progress the End-Stage Renal failure (ESRF), arterial hypertension contributes to 15 to 30% and less than10% is due to glomerulonephritis. The distinction between acute and chronic renal failure or even acute on chronic renal failure, cannot be readily apparent in a patient presenting with uraemia. Risk factors for chronic renal failure are elderly patient with renal disease are prone than young patients in developing ESRD. Recurrent pyelonephritis and UTI, polycystic kidney disease, autoimmune disorders such as systemic lupus erythematous (SLE), atherosclerotic vessels, urinary tract obstruction due to renal stones, strictures, chronic use of nephrotoxic drugs and heavy metals [1].

The National Kidney Foundation rates ESRD as fifth stage among CKD, which is based on the presence of kidney damage and level of kidney function whereas GFR <15 ml/min/1.75m² for ≥ 3 months. The ESRD patients require a regular course of dialysis or kidney transplantation to maintain life. Although dialysis is life saving and prolongs survival, it is only temporary and does not replace all of the renal functions [2].

Diabetic nephropathy plays major contribution for developing ESRD requiring dialysis. The treatment of ESRD is composed of conservative management and Renal Replacement Therapy (RRT). RRT is considered when conservative management fails to be effective against the progression of renal deterioration. Renal dialysis refers to the diffusion of small molecules down their concentration gradient across a semi- permeable membrane. Small molecule's such as urea, potassium,

and phosphorus diffuse down their concentration gradients from the blood in to dialysate solutions. Calcium and bicarbonate move down their concentration gradient from the dialysate solution in to the blood. The effect of dialysis is to remove low-molecular weight toxins from the blood while increasing the plasma concentration of molecules that may be deficient in patient with renal failure. Haemodialysis is a process of purification of blood toxin products by using an artificial kidney. Urea is the most commonly chosen as the marker for small molecule diffusion during dialysis. The commonly used dialyzer membrane was poly – sulpha cellulose. This approximately contains 10,000 capillary tubes arranged in parallel row. The blood circulates through the lumen of the capillary tubes and dialysate solution bathes the capillary tubes from the outside, moving in the opposite direction [1,8]. This study was primarily conducted to assess the coagulation profile parameters such as Platelet count (Pl), Prothrombin time (PT), INR, Activated Prothrombin time (APTT), Plasma fibrinogen (PF) levels in chronic renal failure patients.

MATERIALS AND METHODS
Totally 50 subjects were selected for the study. Among them 25 were chronic renal failure patients (Group A) and 25 members were normal healthy subjects served as controls (Group B). The study was conducted in Sri Ramachandra University, Chennai. Among the study population 29%were males and 21% were females in total population. The mean age of the whole study population was around 44±13 years. The mean period of patients suffering from renal failure was around 39.12 ± 17.08 months. Patients undergoing dialysis thrice in a week for about 4 to 5 hours per session at blood flow rate of 175 to300ml/min by using sulphone hollow fibre filter. Written informed consent was obtained from each patient before participation. Institutional ethical committee approval was obtained.

Inclusion criteria
Chronic renal failure patients of both the genders aged between 30 to 60 yrs who are on hemodialysis for the period of minimum 6 to 12 months who were free from vascular access infection, Regular erythropoietin therapy.

Exclusion Criteria
Patients who were on peritoneal dialysis. Patient who had present or past history of hepatic diseases, repeated infections, viral diseases, cancer, smokers and alcoholics were excluded from the study.

Method of analysis of variables for coagulation profile
Totally 50 samples were analysed in the study. In control group by aseptic precaution 5ml of whole blood were withdrawn from anti-cubitalvein, in CRF patients the blood is drawn from venous line of dialysis machine after 5 minutes of initiation of dialysis. All the samples were processed for analysis immediately after the collection of samples from the patients. Platelet count blood samples were stored in vacutainer tube containing diluted 1 in 20 using 1% ammonium oxalate solution as a diluents, which haemolysis RBC in the blood container. Platelet count was analysed by Behring coagulation timer. Prothrombin time (PT) measures the time taken by plasma to clot in the presence of an optimal concentration of tissue extract (Thromboplastic). APTT was done by kaolincepharin clotting method by using Behring coagulation timer by using Trombone R reagent.

Statistical Analysis: The data obtained were analysed by using SPSS version 16 software. Variables were presented as mean ±standard deviation. Descriptive analysis was done by independent t-test and paired t-test.

RESULTS

Table -1: Show the Mean Difference in Coagulation Profile between Chronic Renal Failure Patients (Group A) With Controls (Group B)

Parameters	Chronic Renal Failure Patients (Group A)	Controls (Group B)	P-Value
Platelet Count X10^3u /L	187.32±49.74	216.45±33.00	< 0.001**
Prothrombin Time (PT)	27.33±8.73	16.44±0.79	<0.001**
INR	2.18±0.17	0.99±0.3	<0.001*
Aptt (Seconds)	74.39±12.38	29.37±7.33	<0.001*
Plasma Fibrinogen g/l	8.83±1.74	1.78±0.58	<0.001**

*significant **highly significant

From our study we collected totally 50 blood samples for analysis. Among them 25 were chronic renal failure patients (Group A) and 25 members were normal healthy subjects served as controls (Group B). Both the groups were age matched and comparison of coagulation profile was done. There was an decrease in platelet count in chronic renal failure patients (GROUP A) when compare to control group (GROUP B) the mean value was around 187.32±49.74, 216.45±33.00 off P value (0.001).Prothrombin time (PT) was increased in chronic renal failure patients(GROUP A) when compare to control group (GROUP B) the mean value was around 27.33±8.73, 16.44±0.79 off P value (0.001). INR level was increased in chronic renal failure patients (GROUP A) when compare to control group (GROUP B) the mean value was around 2.18±0.17, 0.99±0.3 off P value (0.001).APTT SECONDS was increased in chronic renal failure patients (GROUP A) when compare to control group (GROUP B) the mean value was around 74.39±12.38, 29.37±7.33 off P value (0.001). Plasma fibrinogen level was increased in chronic renal failure patients (GROUP A) when compare to control group (GROUP B) the mean value was around 8.83±1.74, 1.78±0.58 off P value (0.001).

Legend -1 There was a decrease in platelet count in chronic renal failure patients (GROUP A) when compare to control group (GROUP B). All the other parameters such as Prothrombin time (PT), INR, Activated Prothrombin time (APTT), Plasma fibrinogen (PF) are increased in chronic renal failure patients (GROUP A) when compare to control group (GROUP B

DISCUSSION

Renal disease is the most common causes of death and disability in many countries throughout the world. It is a common threat to critically ill patients in intensive care units with a mortality rate ranging from 42% to 88%. Although treatment methods such as dialysis and renal replacement methods are effective in correcting this life-threatening condition, however the mortality rate associated with acute renal failure has not changed substantially till 1960s. This is probably because acute renal failure is seen more often in elderly patients, who are often superimposed with other co morbid, life-threatening conditions [7]. Kidney is one of the highly differentiated, essential organs that are responsible for a multitude of bodily functions. The most important kidney function is filtering the plasma and removing unwanted substances from the filtrate at variable rates, depending on the body requirements. Azotaemia is the most common indicator of acute renal failure, an accumulation of nitrogenous wastes in the blood. Other function include reabsorption of water, glucose, amino acids, secretion of rennin, renal erythropoietin factor, 1, 25 DHCC, prostaglandins and the small molecular weight proteins regulation of acid base balance and gluconeogenesis blood pressure and homeostasis. .Renal failure is the deterioration of the renal excretory function due to damage of renal parenchyma, where the kidneys fail to maintain homeostasis is defined as renal failure .Types of renal failure includes-Acute kidney injury (AKI), Chronic Kidney Disease (CKD) or Chronic Renal Insufficiency (CRI) CKD is differentiated from acute kidney disease in that the reduction in kidney function must be present for over 3 months. Acute renal injury is previously known as acute renal failure, is characterized by the sudden impairment of renal function resulting in the retention of nitrogenous and other waste products normally cleared by the kidneys which is usually reversible over a period of days or weeks. ARF is a medical emergency, if not intervened it may switch over to chronic renal failure causing life threatening biochemical disturbances [7, 8, 9].

AKI complicates 5 to 7% of acute care hospital admissions and up to 30 % admissions to the intensive care unit. The epidemiology of AKI differs tremendously between developed and developing countries, showing the difference in demographics, economics, and geography and co morbid disease burden... Chronic renal failure is known as Chronic Kidney Disease (CKD) or Chronic Renal Insufficiency (CRI) implies long standing, progressive and irreversible renal parenchyma disease resulting in diminished renal function. In many instances, no effective means are available to reverse the primary disease process. 40 to 60% chronic renal failure are caused by diabetes mellitus (DM), that progress to End-Stage Renal failure (ESRF), arterial hypertension contributes to 15 to 30% and less than10% is due to glomerulonephritis Only 2-3% of all CRF patients present renal polycystosis [1,3,5].

From the present study we found that there was a marked significant change in coagulation profile among CRF population. Platelet count was less in chronic renal failure patients when compared to controls. Our study was supported by Malyszkoj et al..In 2001 they proved that platelet count was low in CRF patients. This is due to low thrombopoetin level which inhibits the thrombopoesis. Uraemia and fluid over load are the 2 factors which decreases the circulation thrombopoetin level [4]. Knudsen et al. In 1985 from their study they stated that Prothrombin time was increased in CRF patients when compared with normal subjects. This is due to regular heparin dosage. CRF patients are more prone for anaemia and vessel wall thrombosis which decreases the efficiency of circulatory system. [5, 13]. Inagaki et al.. in 2001 stated that APTT level was found to be more in CRF patients , the reason for increase in APTT level is due to anticoagulant usage in HD (heparin) binds to the enzyme inhibitor antithrombin II , which inactivates activation of thrombin and other factors involved in clotting [6].. Martinez et al... In 1999 from their study proved that the plasma fibrinogen level was increased in CRF patients. The result of the study supports our

findings. The reason behind the elevated level of plasma fibrinogen is due to inhibition of release of platelet derived growth factors and endothelial growth factors which increases the circulating plasma fibrinogen level [2,12].

CONCLUSION

From our study we found that coagulation profile level has a variation among chronic renal failure patients. Coagulation profile affects the circulatory system which progress many health hazards. Anaemia, with azotaemia in CRF patients favours the poor circulatory status and vessel wall thrombosis. Monitoring the heparin dosage level and frequency of dialysis maintains the proper circulatory mechanism in CRF patients. Regular monitoring of coagulation profile in CRF patients improves the quality of life among CRF patients. Heparin free and tight heparin forms of dialysis should be monitored periodically to avoid the thrombosis of vessel walls in CRF patients.

Acknowledgement

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