Proceeding S.Z.P.G.M.I vol: 10(1-2) 1996, pp. 32-37.

Clinical Risk Factors Predicting Survival in Haemodialysis Patients

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SUMMARY

Haemodialysis is one of the three principal forms of life-sustaining treatment for patients with end stage renal disease. We designed a retrospective study to find out the clinically applicable predictive factors for short and long term prognosis in a cohort of 260 patients on maintenance haemodialysis (HD) who were registered at Shaikh Zayed Hospital Lahore between December 1986 and March 1995. Factors potentially predicting early death were analyzed by Kaplan and Meier methods. The overall mortality was 18% at one year, 45% at five years and 58% at eight years. Peripheral vascular disease (PVD), diabetes mellitus, cardiac failure (CCF) and ischemic heart disease (IHD), were independent and significant prognostic markers for short and long term survival. Age, gender and causes of chronic renal failure other than diabetes mellitus were not associated with high mortality.

INTRODUCTION

Renal replacement therapy in the form of HD, continuous ambulatory peritoneal dialysis (CAPD) and transplantation is being exercised all over the world for patients with end stage renal disease[1]. The trend towards accepting old and high risk patients for the dialysis is increasing[2]. All these modalities are costly and have some constraints in the form of ethics and economy. Every year more than 10 billion dollars are spent on renal replacement therapy in the USA[3]. In the past, even in the UK, old and diabetic were excluded from renal replacement therapy irrespective of other markers of health status[4,5]. In a developing countries like Pakistan which has limited fiscal resources, shortage of dialysis facilities, poor understanding on the part of patients about their illness and lack of proper insurance cover makes the matter even worse. Therefore, it is important to have an accurate information about short and long term prognosis of the patients on maintenance haemodialysis. The influence of many prognostic markers on survival of patients on renal replacement therapy has been evaluated in various studies[6,7].

In an attempt to identify and quantify clinical risk factors predicting short and long term mortality, we performed a retrospective study of all patients who received haemodialysis between December 1986 and March 1995 in our institution.

PATIENTS AND METHODS

The medical records of 260 patients who received haemodialysis at Sheikh Zayed Hospital, Lahore between December 1986 to March 1995 were reviewed by a research fellow. The aim was to record the cause of renal failure, presence of co-morbid illness, complication of haemodialysis, ultimate outcome, identification and significance of clinical markers of prognosis.

The principal exclusion criteria was renal failure that was considered to be potentially reversible at the time of initiation of dialysis. Only those patients were included in the study who were diagnosed to have irreversible renal failure. The decision to label a case as irreversible was made by clinical grounds aided by biochemical and radiological criteria. Biochemical and nutritional markers of prognosis are not included in the study because of inadequate data collection for these variables.

All patients were dialysed for 8-12 hours per week. Low flux cupraphane hollow fiber dialyzer and acetate buffer concentrate solution was used throughout the study period.

The demographic and clinical characteristic of all patients at the first dialysis section were recorded. The variables recorded include age, gender, type of renal disease, presence or absence of cardiac failure, ischemic heart disease (IHD), severe peripheral vascular disease (PVD), complication of uremia, hypertension and systemic sepsis. The available data for the prediction of survival rate was analyzed by Kaplan and Meier method[8].

Null hypothesis for long term survival in relation to string variables was confirmed by application of non parametric tests, T tests, Mann Whitney, whereas Mantel Hanzel Chi-Square was used for comparison of variables with subgroup. SPSS program of SPSS corporation (USA) was used for application of Logrank test to find out the variable with poor prognostic pattern for survival. A p value of < 0.05 was considered statistically significant.

RESULTS

The base line demographic features are shown in Table 1. 365 patients received haemodialysis between 1986 and March 1995 in our unit. Annual induction of these patients is depicted in Figure 1. 105 patients received kidney transplant. The remaining 260 patients were followed up for a mean observation period of 17 months (range 1-100). Male to female ratio was approximately 2:1.

Table 1: Demographic outline of study patients (n=365)

Variable	*Number*	*Percent*
Transplanted	105	29
Maintenance haemodialysis	260	71
Male	180	69
Female	80	31
Mean age (years)	45	12-70
Mean observation period	17 mo	01-100

The mean age of patients was 45 years (range 12-70). The frequency of different age subgroups in shown in Fig. 2. It reveals that 35 (13.5%) patients were under 30 years of age, 39 (15%) were between 31-40 years, 57 (22%) between 41-50 years, 63 (24.2%) between 51-60 years and 66 (25.5%) patients were aged 61-70 years.

The underlying causes of renal failure are shown in Table 2. Hypertension was the most frequent cause which was found in 97 (37.3%) patients, followed by diabetic nephropathy which was present 74 (28%) patients. 29 (11.2%) had chronic glomerulonephritis, 14 (5.4%) had polycystic kidney disease, 6 (2.3%) were due to chronic interstitial disease, 2 (0.07%) were due to calculus renal disease and in 38 (15%) patients, no cause could be determined.

Table 2: Underlying renal disease.

Causes	*Number*	*Percent*
Diabetic	74	28
Hypertensive	97	37.3
Ch. GN	29	11.2
Polycystic kidney disease	14	5.4
Ch. interstial disease	6	2.3
Renal stone disease	2	0.7
Others	38	15.00
Total	**260**	**100.00**

The number of patients with co-morbid illness at the time of dialysis are shown in Table 3. Cardiac failure due to ischemia and hypertension was found in 64 (24.6%) patients. 20 (7.7%) patients had IHD without cardiac dysfunction, 4 (1.5%) had bronchial asthma and 20 (7.7%) suffered from sepsis. Arthritis was noted in 12 (4.6%), chronic hypertension in 19 (7.3%). Altered consciousness in 6 (2.3%), depression in 2 (0.07%) renal osteodystrophy in 4 (1.5%) and severe peripheral vascular disease in 12 (4.6%) patients.

Table 3: Co-morbid illnesses.

Conditions	*Number (n=168)*	*Percent*
Cardiac failure	64	24.6
Ischemic heart disease	20	7.7
Bronchial asthma	4	1.5
Sepsis	20	7.7
Arthritis	5	1.9
Pericardial effusion	12	4.6
Chronic hypertension	19	7.3
Altered consciousness	6	2.3
Depression	2	0.07
Renal osteodystrophy	4	1.5
Severe PVD	12	4.6

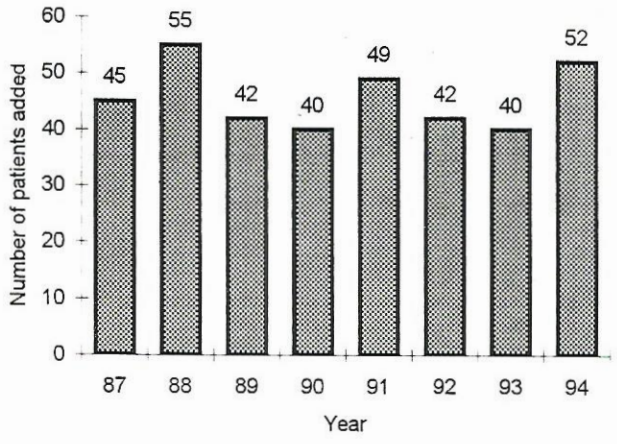

Fig. 1: Annual induction of patients.

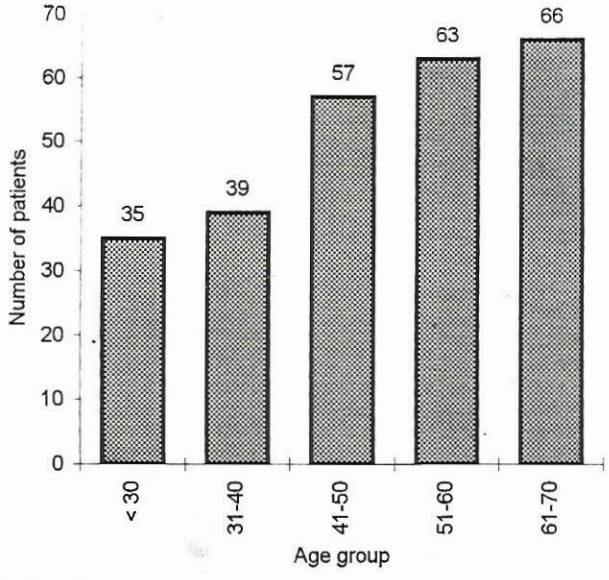

Fig. 2: Age groups.

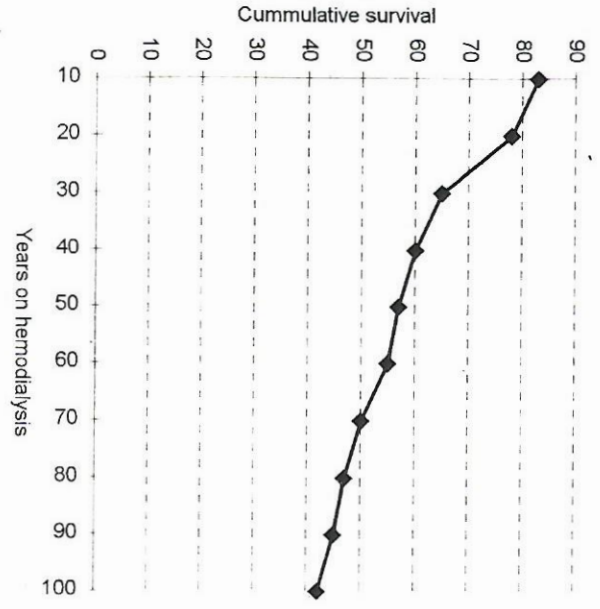

Fig. 3: Cummulative survival of patients on haemodialysis.

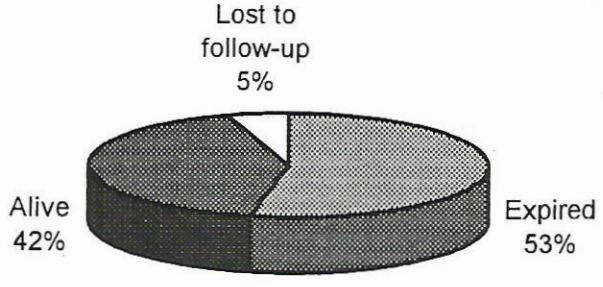

Fig. 4: Final outcome (n=260).

Overall survival at different time periods is shown in Figure 3. Actuarial survival of all patients was 82%, 55% and 42% at 1, 5 and 8 years respectively. These results are similar to these reported by most large scale studies worldwide[9,10]. Out of 260 patients, 138 died, 13 were untraceable and 109 were alive (Fig. 4).

Survival curve in Fig. 5 reveals non-significant difference between patients above 60 and under 60 years of age (P = NS). Difference between male and female population were also insignificant (P = NS) (Fig. 6).

Difference in survival between the underlying cause of renal failure was significant (Fig. 7). Cumulative survival in patients with diabetic nephropathy was significantly lower (28%) as compared to chronic glomerulonephritis (48%), hypertension (44%), chronic interstitial disease (50%) at the same time period ($p < 0.05$).

Figure 8 shows comparison of survival between coexisting morbid condition present in these patients. At the end of study period, highest mortality was observed in patients with CCF and pericardial effusion, 92% and 100% respectively. The

mortality rate in IHD was 75%, in severe peripheral vascular disease 85% and 60% in patients with sepsis ($p < 0.05$).

Table 4: Causes of deaths.

Causes	*Number (n = 138)*	*Percent*
IHD	15	10.9
CCF	59	42.8
Sepsis	12	8.7
Peri. eff.	12	8.7
CVA	5	3.6
RF	5	3.6
Dysrrth.	16	11.6
Others	14	10.4

Table 5: Etiology of end-stage renal disease

Variables	*Number*	*Percent*
Diabetic nephropathy	71	28%
Hypertensive nephropathy	97	37.3%
Chronic interstial disease	6	2.3%
Renal stone disease	2	0.07%
Chronic glomerulonephrritius	29	11.2%
Polysistic kidney disease	14	5.4%
Others	38	15%
Total	**260**	**100.00**

Table 6: Co-existng morbid illnessess in study population

Variables	*Number*	*Percent*
Cardiac failure	64	24.6
IHD without cardiac disfunction	20	7.7
Bronchial asthma	4	1.5
Sepsis	20	7.7
Arthritus	5	1.9
Pericardial effusion	12	4.6
Chronic hypertension	19	7.3
Altered consciousness	6	2.3
Depression	2	0.07
Renal osteodystrophy	4	1.5
Severe peripheral vascular disease	12	4.6
Total	**168**	**100.00**

Table 4 shows number and causes of death in these patients. Out of 138 patients, 59 (42.8%) died of cardiac failure, 15 (10.9%) of IHD, 12 (8.7%) of sepsis and 12 (8.7%) of pericardial effusion. 5 (3.6%) death were due to cerebrovascular accident, and 5 (3.6%) were due to respiratory failure. Dysrrythmia was the cause of death in 16 (11.6%) patients and 14 (10.4%) death was due to miscellaneous causes.

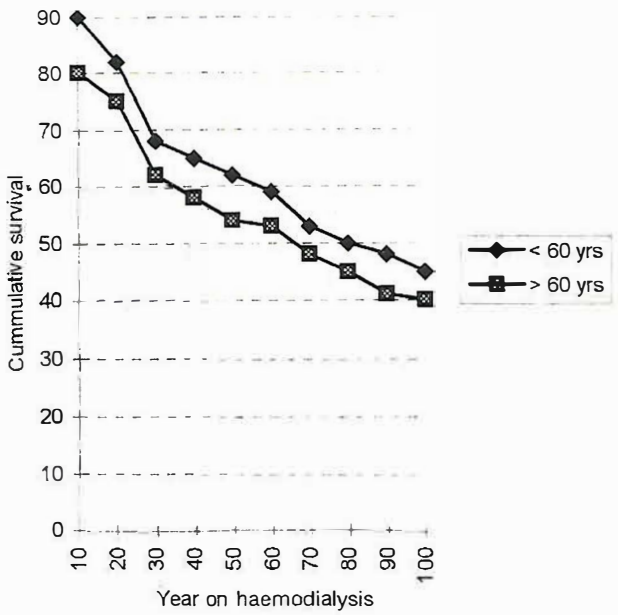

Fig. 5: Cumulative survival in different age groups.

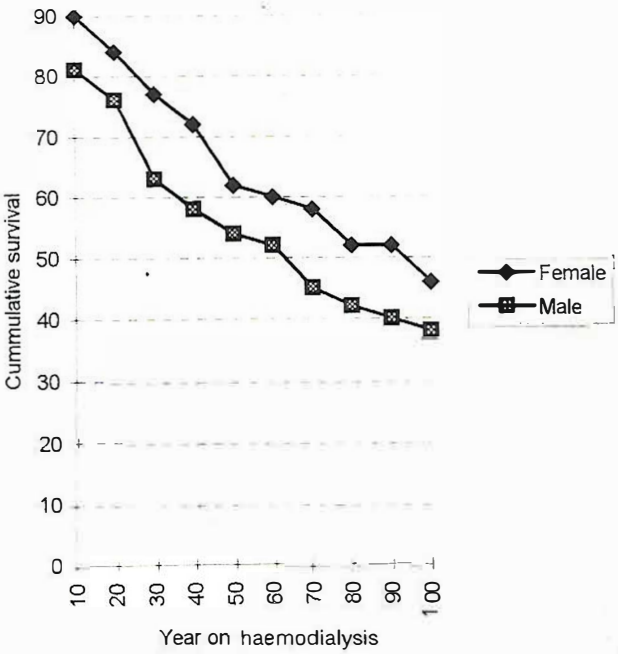

Fig. 6: Cumulative survival in different sex groups.

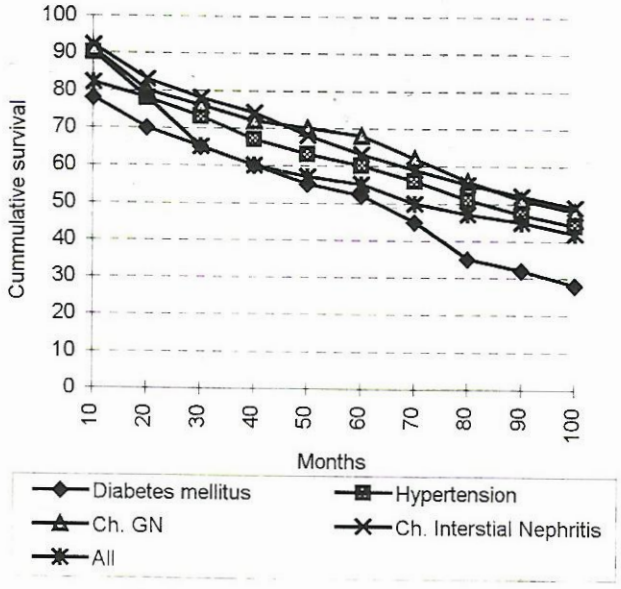

Fig. 7: Cumulative survival in various renal disease.

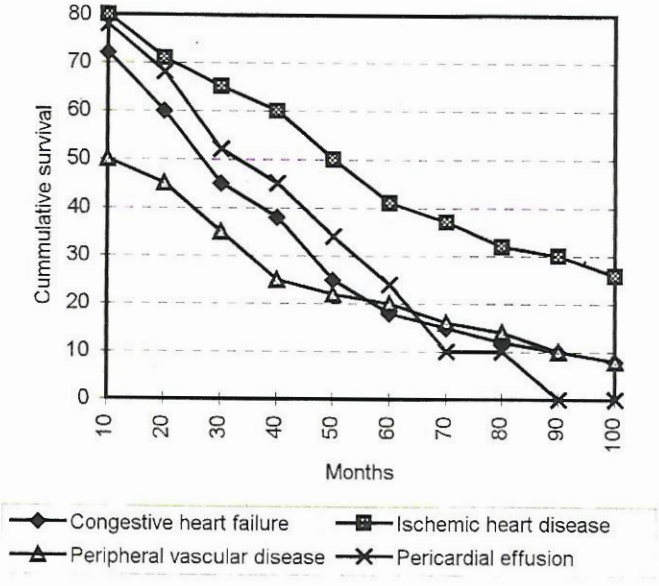

Fig. 8: Survival analysis in various co-morbid illnesses.

DISCUSSION

The purpose of this retrospective study was to identify clinical risk predictors for short and long term survival among patients on maintenance haemodialysis in a tertiary care centre. Haemodialysis is an expensive form of renal replacement therapy and its availability is limited in Pakistan. In a developing country like Pakistan with limited fiscal resources, it is desirable to find out some prognostic markers which show positive predictive value for short and long term survival. This information may be useful to the physician in making decision about proper rationing of scarcely available facilities. Of the factors that independently predict death, age, diabetic mellitus cardiovascular disease, IHD have been identified as predictor of adverse prognosis over long time frame[9,11].

The issue of advanced age as a sole factor precluding dialysis remains unsolved[12]. Analysis of European patients beginning renal replacement therapy reveals that 1 year survival of patients aged over 65 varies between 50% to greater than 70%[13]. Most authors agree that age alone is not the most important influence on patient survival[14]. In our study, difference in survival between two age groups were not significant. Similarly gender did not influence the long term outcome.

Most prognostic studies have highlighted diabetes mellitus as a marker for adverse prognosis[15-16]. Foley et al. showed that diabetes mellitus was not associated with early death[17]. In another prospective study, diabetes mellitus did not predict death at 18 months[18]. We have observed that patients with diabetic nephropathy had inferior long term survival as compared to other underlying causes of renal failure.

The presence of comorbid conditions affecting organs other than the kidney may have a profound effect on patient survival[19]. Hepatic dysfunction, IHD, sepsis, coma, respiratory failure and CCF have been found to predict death. We have also observed that highest mortality was found in patient with CCF, pericardial effusion, IHD and severe PVD. Inadequate dialysis and poor nutritional status has been suggested as risk factors for adverse outcome[20-21]. We are unable to confirm this observation as these markers are not studied because of difficulty in collecting proper data for these variables. Other biochemical markers, serum creatinine, and lipid profile an also not included in the study.

The discontinuation of dialysis has been suggested as a cause of death[22]. In Western Societies there is an increasing trend towards the patient's family making the decision to stop treatment if they realise that patient is coming to the end of his or her life. This trend is unlikely to develop in our country as social and religious factors play a major role in making such vital decisions. Consequently dialysis was continued in all patients till the final outcome.

The study has few limitation. Firstly, because of

its retrospective design, it suffers for bias in data collection and diagnostic labelling. Secondly, biochemical and nutritional markers for survival have not been studied.However this study has important implications. It provides information about clinical prognostic markers which adversely affect survival in dialysis patients. Therefore it may be possible for the physician to tell a given patient whether he or she has a high probability of death or high probability of survival with a reasonable degree of accuracy.

It is concluded that diabetes mellitus, severe PVD, IHD and CCF has profound effect on short and long term survival in haemodialysis patients. It is very difficult to provide dialysis facility to all patients with ESRD. These patients may be divided into high and low risk groups on the basis of their survival predictability. The scarcely available haemodialysis treatment should be properly rationed among large number of patients who need it to save their lives. The patients with high survival predictability should be given preference for the initiation of dialysis.

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