

# Outcome of patients between twice weekly versus three times per week hemodialysis: A single centre experience

Renuka S<sup>1</sup>, Limesh M<sup>2\*</sup>, Prashanth G Kedalaya<sup>3</sup>, Vinod N<sup>4</sup>, Kruthika D M<sup>5</sup>

<sup>1</sup>Professor, <sup>2</sup>Associate Professor, <sup>3</sup>Professor and Head <sup>4,5</sup>Assistant Professor, Dept. of Nephrology, St.Johns Medical College And Hospital, Bangalore, Karnataka, India

**\*Corresponding Author: Limesh M**

Email: limijay\_2007@yahoo.co.in

## Abstract

There is a paucity of data from india regarding the outcomes in frequency of hemodialysis. A retrospective analysis of the data was performed of dialysis patients at our centre from 2008- 2015 but those who expired .After extensive statistical analysis,the factors , that were associated with worst outcome were uncontrolled hypertension, high intradialytic weight gain and reduced frequency of dialysis.

**Keywords:** Dialysis frequency, Survival, Intradialytic weight gain.

## Introduction

The importance of determining survival for renal patients on hemodialysis (HD) favors the improvement of care, since it enables the early identification of patients at high risk, which improves their survival and quality of life. Besides contributing to the strategic planning of health actions – as evidence suggests that the increase in spending on HD is due to the increased survival of patients and not specifically to the growing demand for treatment (Fernanda Ismaela Rolim Teixeira et al. 2015)

Data repositories such as the United States Renal Data Service and the European Dialysis and Transplant Registry have prospectively tracked the steady improvement in health outcomes for dialysis patients over the ensuing 50 years. Special mention should be made in this context of the Australian and New Zealand Dialysis and Transplant Registry, one of the oldest and best exemplars in the world, which boasts a complete collection of health outcomes data for patients with treated ESKD in these two countries since 1963 (Vivekanand Jha 2015)

The three treatment modalities for patients with ESRD are hemodialysis (HD), peritoneal dialysis or kidney transplantation. HD is the most used in the majority of countries. The overall survival rate found was 86.2% and 60%, in one and five years, respectively. In a meta-analysis, reported that HD patient survival time depends on factors such as gender, age, hemoglobin (Hb), albumin, calcium x phosphorus product (CaxP) and parathyroid hormone (PTH) (Fernanda Ismaela Rolim Teixeira et al. 2015)

The rationale for this study was still growing evidences of morbidity and mortality of patients on maintenances of HD from despite there is improving on delivery of HD with improved efficiency and the burden of the ESRD and complication of HD needs attention. As treatment is lifelong and there are reports and studies that show linear relationship between dialysis vintage. There are also studies showing the different results on the number HD sessions per week. People with ESRD on HD also increasing all over the world India too: study should be undertaken to know the effect session delivered per week. This study may bring

some benefits for identifying and management suggestion in those who are HD.

## Significance of the study

ESRD is one the worst calamities to hit the world particularly developing countries has great impact on economic development and the cost dialysis expenses.. It is hoped also that the findings generated from this study may make contributions to both knowledge and understandings of the effect of number HD of session per week on survival. The purpose of this study was to determine associations, correlations, significance of session per week with different laboratory parameters.

## Objective and research questions

### General objective

The study was performed to determine associations, correlations, significance with the number of HD sessions.

### Specific objective

1. To determine prevalence of number of HD sessions per week
2. To assess factors associated with number of HD sessions per week
3. To assess complications during HD sessions
4. To determine associations, correlations, significance HD sessions per week
5. To assess factors associated on HD survival

### Research questions were

1. What was the magnitude of number of HD sessions per week patients on HD?
2. What factors were associated with HD survival among patient on regular HD sessions?

## Methods and Materials

### Study area and Period

The data collection was started on January 2011 and data collection was finalized April 2018.

**Study Design:** Retrospective cohort study design was employed using chart of patient who was on regular HD but died.

**Source Population:** all patients who were on HD since 2008- 2015 but expired.

**Study population:** patient who were on regular HD but expired and who had completed data on their chart.

#### Eligibility criteria

**Inclusion criteria:** Patients who were on regular HD since 2007- 2018 but expired and who had completed data on their chart.

**Exclusion criteria:** -Patients who were on regular HD since 2007- 2018 but expired and who had incomplete data on their chart.

#### Sample size determination and sampling technique

Patients who were on regular HD since 2007- 2018 but expired

#### Sampling technique

Patients on regular HD greater than one month: the source population was stratified into two groups : Patients on twice weekly ( group 1 ) and thrice weekly hemodialysis (group 2)

#### Measurement

**Variables:** - dependent and independent variable of the study include:

**Dependent:** survival, serum albumin, hemoglobin, blood pressure

**Independent:** Age, Sex, number of HD sessions per week

#### Data collection instruments

Data was collected by using structured questionnaire and computer excel spread sheet. The questionnaire was developed by the investigators based on the study objectives and was pre-tested on few of the samples. The questionnaire and excel spread sheet contains questions about socio demographic and clinical and laboratory parameters.

#### Data Collection Process

Review of patients' charts obtained from the hospital archive and some missed data were also collected from software system.

#### Data Analysis and Interpretation

Data was cleared, coded and feed in computer using SPSS version 20 and odd data like incomplete, inconsistent data were not included in the analysis. Descriptive statistics using frequency distribution was performed for socio-demographic, clinical, and laboratory values. The association between the independent and dependent variables were assessed using relevant statistics like chi-square. Multivariate analysis using logistic regression was performed to control effect of confounding variables. Survival analysis was also performed using Kaplan Meier curve.

#### Data Quality Assurance

The following measures were undertaken to assure quality of data

1. Before data collection was collected by the principal investigator and three dialysis assistant after giving half day orientation
2. Data and information which neither is incomplete nor clear from the chart were crossed checked from the system.

#### Limitations

Incomplete charts and it is retrospective stud design.

#### Operational Definitions

**Hypertension-** defined systolic BP of  $\geq 140$  mmhg and/or diastolic pressure of  $\geq 90$  mmhg or being on anti- hypertensive medication (KDIGO Clinical Practice Guideline for the Management of Blood Pressure in Chronic Kidney Disease 2012)

**Hemoglobin level**  $\geq 11$ gm/dl anemia  $< 11$ gm/dl (Chronic Kidney Disease: Managing Anaemia 2015)

#### Result

A total of 168 hemodialysis patients at St. John medical college hospital dialysis center were reviewed; all patients were on four hours hemodialysis. 41 were not recruited due to incomplete data recording. 127 patients were analyzed 88(69.29%) were male and 39(30.71%) were female.

Those patients on regular HD were grouped into group one those thrice weekly HD or group two those twice weekly HD found 73 and 54 respectively. The sex difference between the two was assessed groups i.e. Group one or group two 50 and 38 respectively (p- 0.822). The age distribution in both groups was evenly distributed as follow: the average age in our study was 57.2yrs(Std-10.6) when we see between groups in those group one the mean age was seen 58.64yrs (Std: 9.19), in group two the mean age was seen 55.35yrs (Std: 12.1) with (p\_ value 0.084). The average interdialytic weight gain in kg those group one was 3.59kg (Std: 1.31), in group two was seen 3.30kg (Std: 1.27) with (p\_ value 0.214). The mean systolic blood pressure in group one was 144.1 (Std: 15.44) during group two 145.74 (Std: 17.86) with (p value 0.583). The mean diastolic blood pressure in group one was 85.06 (Std: 6.06) during group two 85.37 (Std: 6.64). Diabetic patients counts were in group one or group two were 55 and 35 respectively (p\_ 0.512). Hypertensive patients count were in group one or group two were 71 and 54 respectively (p\_ 0.00). Patients achieved ideal weight in group one or group two were 22 and 11 respectively (p\_ 0.005). Patients who took HBV vaccine in group one or group two were 35 and 29 respectively (p\_ 0.322) which is nearly 50% of the study groups. The type access in both groups (study group) 98.4% were arterio-venous fistula (AVF) in group one or group two were 71 and 54 respectively (p\_ 0.513). Nineteen patients had AVF failure i.e. 14 patients in group one and 5 patients in group two was seen (p\_0.141) (table-1).

**Table 1:** the general characteristics of study groups in St. John’s national medical college Hospital dialysis center, Bengaluru, Karnataka India 2018.

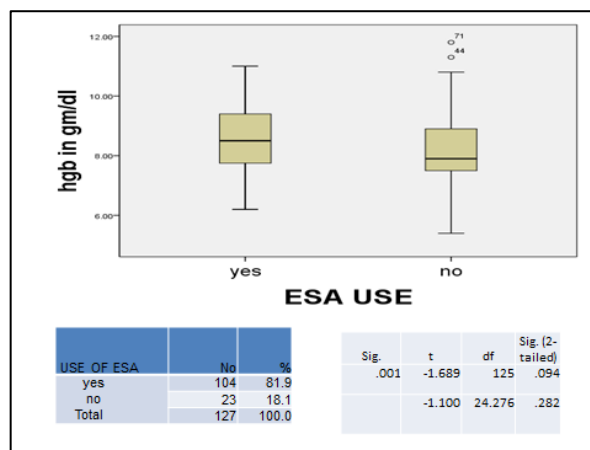
variables		Number of HD		P-value
		Group 1	Group 2	
HD per week	Count	73	54	
	%	57.5	42.5	
male	Count	50	38	0.822
	%	56.8	43.2	
average age in years	mean	58.64	55.35	0.084
	Std	9.19	12.10	
dialysis vintage in months	median	11	10.5	
	Std error Of skewness	0.281	0.325	
Interdialytic wt gain in kg	mean	3.59	3.30	0.214
	Std	1.31	1.27	
systolic b/p mmhg	mean	144.1	145.74	0.583
	Std	15.44	17.86	
diastolic b/p	mean	85.06	85.37	0.790
	Std	6.06	6.64	
Diabetic patients means survival time	Count	55	35	0.405
	mean	30.74	24.63	
	Std	4.40	4.2	
HTN	Count	71	54	0.000
	%	56.8	43.2	
CGN	Count	<5	5	0.055
	%	n<5	71.4	
CIN	Count	<5	<5	0.402
	%	n<5	n<5	
achieved ideal weight	Count	22	11	0.005
	%	66.7	33.3	
HBV vaccine	Count	35	29	0.322
	%	54.7	45.3	
types of HD access	Count	71	54	0.513
	%	56.8	43.2	
fistula failure	Count	14	5	0.141
	%	73.7	26.3	

Complication occurring during HD the highest was accelerated hypertension 23 (18.1%) followed by fistula failure 19 (15.0%), hypotension 8 (6.3%), nausea 7 (5.5%) (Table-2).

**Table 2:** Complication occurring during HD in the study groups .

Variables	Frequency	Percent
fistula failure	19	15.0
accelerated hypertension	23	18.1
hypotension	8	6.3
nausea	7	5.5

**Associations**



**Fig. 1:** Use of ESA with Hb level in the study groups

The use EAS irrespective of its type between the groups was analyzed based on the independent-sample t-test in reaching the target level of Hb was found to be significantly associated (p- 0.001) (Fig. 1).

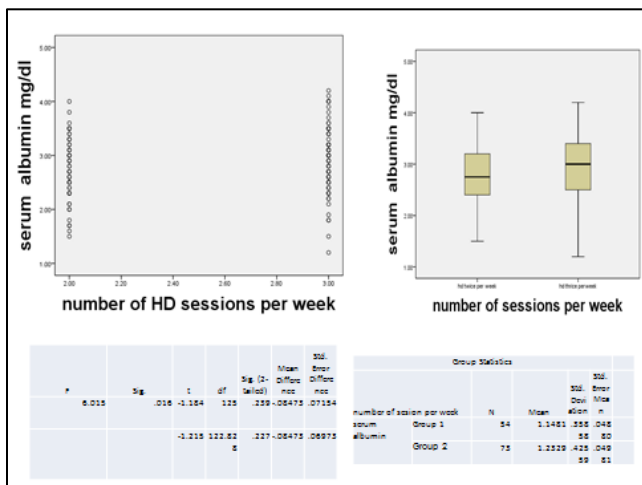


Fig. 2: Association between serum albumin and number of HD per week in St. John’s national medical college Hospital dialysis center, Bengaluru, Karnataka India 2018.

Number of HD per week and low serum albumin (<3.4mg/dl) and normal serum albumin level (>= 3.5mg/dl) was analysis based on the independent-sample t-test was found higher in those three times weekly dialysis with associated (p- 0.016)(Fig. 2).

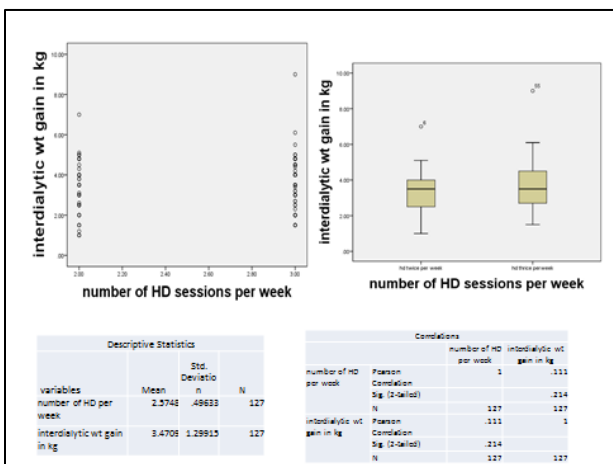


Fig. 3: Correlation with number of dialysis sessions between the groups on interdialytic weight gain in St. John’s national medical college Hospital dialysis center, Bengaluru, Karnataka India 2018.

Interdialytic weight gain was assessed whether there could be any correlation with number of dialysis sessions between the groups and found there was no correlation with correlation coefficient (0.111).

Multiple regressions was done between dialysis vintage and independent variables and found to be serum calcium (p<0.008), systolic blood pressure (p<0.009), serum albumin (p<0.02), serum creatinine (p<0.04) (Table 3, Fig. 4).

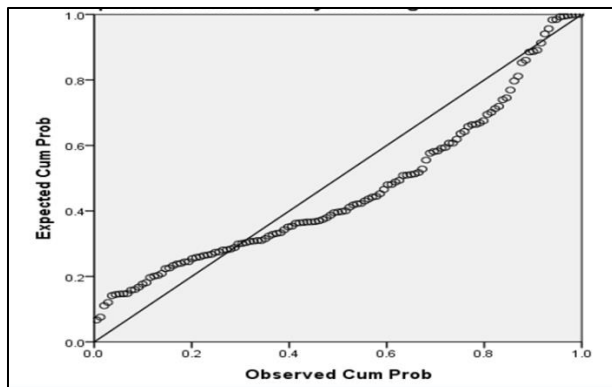


Fig. 4: Normal P-P plot of standardized residual dependent variables on dialysis vintage study groups.

**Survival analysis**

The mean survival in months in this study was 19.4(Std-22.6) or the median was 11months. The categorical survival: one year 70(55.1%), two years 21(16.5%), more than two year 36(28.3%). The mean survival of diabetic patients was found to be 30.7 months in 3xHD/wk and 24.6 months in 2xHD/wk (p<0.405).

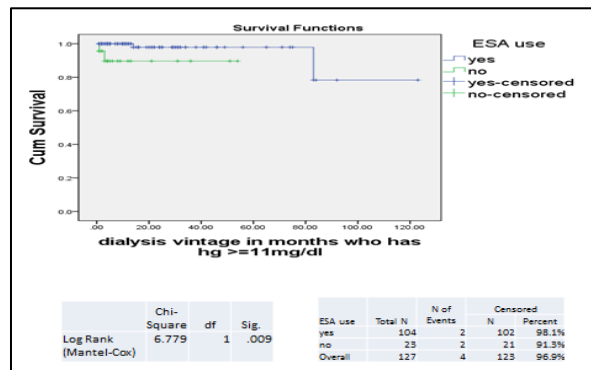


Fig. 5: Survival use of EAS and achieved target hemoglobin level.

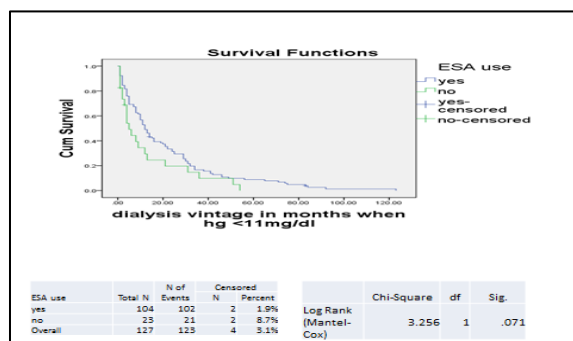


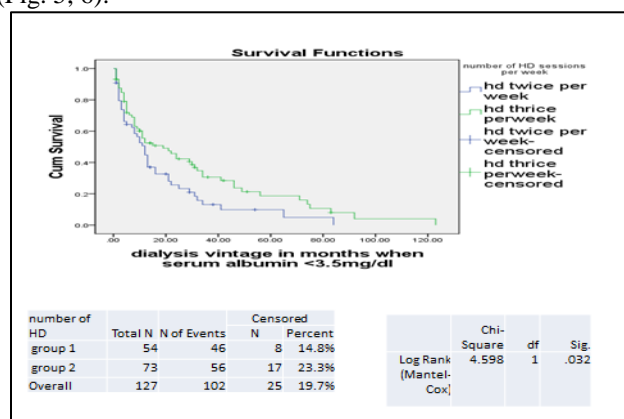
Fig. 6: Survival use of EAS and did not achieved target hemoglobin level.

**Table 3:** Multiple regression on dialysis vintage study groups.

Model Summary <sup>c</sup>									
Model	R	R Square	Adjusted R Square	Change Statistics					
				R Square Change	F Change	df1	df2	Sig. F Change	
serum calcium	.234 <sup>a</sup>	.055	.047	.055	7.227	1	125	.008	
systolic blood pressure	.325 <sup>b</sup>	.106	.091	.051	7.064	1	124	.009	
serum albumin	.380 <sup>c</sup>	.144	.124	.039	5.583	1	123	.020	
serum creatinin	.417 <sup>d</sup>	.174	.146	.029	4.301	1	122	.040	

Dependent Variable: dialysis vintage in months

Test of equality of survival distributions using Kaplan Meir analysis was performed for the different levels of ESA use who achieved target hemoglobin ( $\geq 11\text{gm/dl}$ ) and showed use of ESA irrespective its type and achieving target hemoglobin level is associated with increase survival ( $p < 0.009$ ) however those using ESA but did not achieved target hemoglobin level did not increase survival ( $p < 0.071$ ) (Fig. 5, 6).



**Fig. 7:** Survival different levels of serum albumin (normal  $\geq 3.5\text{mg/dl}$ , low  $< 3.5\text{mg/dl}$ ) for the different levels of number HD sessions per week between groups [3xHD/wk with 2xHD/wk.

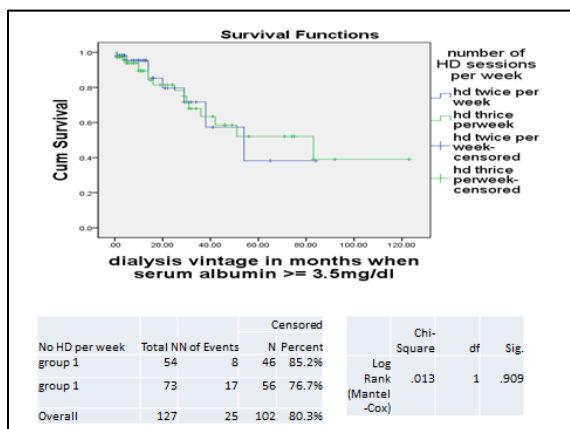
Test of equality of survival distributions using Kaplan Meir analysis was performed for the different levels of serum albumin (normal  $\geq 3.5\text{mg/dl}$ , low  $< 3.5\text{mg/dl}$ ) for the different levels of number HD sessions per week between groups [3xHD/wk with 2xHD/wk] in group1 [3xHD/wk] associated with increase survival was observed whether the serum albumin level was low or normal but the benefit is more seen when serum albumin level was low ( $p < 0.032$ ) as compare to when serum albumin level is normal ( $p < 0.909$ ) (Fig. 7,8).

**Discussion**

In this study the presence of hypertension between the two groups' which is better in group one [3Xhd/wk] with ( $p < 0.001$ ). There was no association seen separately on the systolic or diastolic BP. Association was found in achieving ideal weight between groups in which better achieving their ideal weight in group one [3xHD/wk] ( $p < 0.005$ ). The use EAS on achieving target HB level was analysis based on the independent-sample t-test was found to be significantly associated ( $p < 0.001$ ). Normal level of serum albumin was seen in group one [3xHD/wk] ( $p < 0.016$ ). The highest complication during their HD was accelerated hypertension 23 (18.1%) followed by fistula failure 19 (15.0%). Multiple regressions was done between dialysis vintage and found to be serum calcium ( $p < 0.008$ ), systolic blood pressure ( $p < 0.009$ ), serum albumin ( $p < 0.02$ ), serum creatinine ( $p < 0.04$ ). Use of ESA irrespective of its type and achieving target hemoglobin ( $\geq 11\text{gm/dl}$ ) showed increase survival ( $p < 0.009$ ). The mean survival in months in this study was 19.4(Std-22.6) or the median was 11months. The categorical survival: one year 70(55.1%), two years 21(16.5%), more than two year 36(28.3%). Group1 [3xHD/wk] was associated with increase survival was observed irrespective of serum albumin level but benefit was more seen when serum albumin level was low ( $p < 0.032$ ) as compare to normal serum albumin level ( $p < 0.909$ ). Despite the mean survival of diabetic patients was found to be longer 30.7 months in 3xhd/wk but there was no significant difference seen with 2xHD/wk ( $p < 0.405$ ).

There is no significant association was seen by sex, age, type of access, hbv vaccine.

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**Fig. 8:** Survival different levels of serum albumin (normal  $\geq 3.5\text{mg/dl}$ , low  $< 3.5\text{mg/dl}$ ) for the different levels of number HD sessions per week between groups [3xHD/wk with 2xHD/wk.

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In our study hypotension 8(6.3%), nausea 7(5.5%) which is less (table-2) Nausea and vomiting was encountered in the hemodialysis patient group at rates up to 10% (Gülsüm Özkan and Şükrü Ulusoy 2011) The study done in 50 patient Melmaruvathur Adhiparasakthi Institute of Medical Sciences, Melmaruvathur in the period of around 5 months from December 2013 to March 2014 in renal dialysis ward of Nephrology department. Hypotension was (70-80%) Nausea and vomiting (50%) was seen.

(Appandraj et al. 2014)

Multiple regressions was done between dialysis vintage and found to be serum calcium ( $p < 0.008$ ), systolic blood pressure ( $p < 0.009$ ), serum albumin ( $p < 0.02$ ). From the main secondary outcomes in HEMO Study death from any cause was seen when there is 15% decline in serum albumin (HEMO Study 2004. In our study also the is significant association with the serum albumin level on survival ( $p < 0.02$ ) (table 3) ) serum creatinine ( $p < 0.04$ ). Use of ESA irrespective of its type and achieving target hemoglobin ( $\geq 11$  gm/dl) showed increase survival ( $p < 0.009$ ). The mean survival in months in this study was 19.4 (Std-22.6) or the median was 11 months. The categorical survival: one year 70(55.1%), two years 21(16.5%), more than two year 36(28.3%). A study which was conducted in 23 patients on HD with age of more 60 in Department of Medicine in the S.Nijalingappa Medical College and HSK Hospital and Research Center between 1st May 2005 and 31st March 2011 A 1 year survival was seen in 34.75% (8/23) patients and a 2 year survival was seen in 26 % ( 6/23) patients (R and Malaji Sangamesh 2011). Group1 [3xHD/wk] was associated with increase survival was observed irrespective of serum albumin level but benefit was more seen when serum albumin level was low ( $p < 0.032$ ) as compare to normal serum albumin level ( $p < 0.909$ ). Despite the mean survival of diabetic patients was found to be longer 30.7 months in 3Xhd/wk but there was no significant difference seen with 2xHD/wk ( $p < 0.405$ ).

There is no significant association was seen by sex, age, type of access, hbv vaccine.

### Paragraph three Analysis of Results

In our study is no difference seen between systolic or diastolic HTN however the presence HTN between the groups has significant difference which had higher low in [3xHD/wk] with ( $p < 0.001$ ). A meta-analysis of 35 study arms of 928 analyzable patients indicated a significant decrease in systolic BP in frequent or extended hemodialysis (-14.1; 95% CI, -17.2 to -11.0 mm Hg;  $p <$

0.001), and an alteration of diastolic BP by -7.1 mm Hg (95% CI, -9.2 to -4.9;  $p < 0.001$ ). (Mohammad Ali Shafiee et al. 2017)

Association was found in achieving ideal weight between groups in which better achieving their ideal weight in group one [3xHD/wk] ( $p < 0.005$ ). The use EAS on achieving target HB level was analysis based on the independent-sample t-test was found to be significantly associated ( $p = 0.001$ ). Normal level of serum albumin was seen in group one [3xHD/wk] ( $p < 0.016$ ).

The highest complication during their HD was accelerated hypertension 23 (18.1%) followed by fistula failure 19 (15.0%).

Acute complications was in few patients: nausea and vomiting can be part of dialysis-related complications such as disequilibrium syndrome, hypotension, allergic reactions and electrolyte imbalance, acute coronary syndrome, cerebrovascular events and infections. Patients with nausea and vomiting should be examined for the causes of these events. (Gülsüm Özkan and Şükrü Ulusoy 2011) hypotension and vomiting was seen less in our study than the study was on process in Melmaruvathur Adhiparasakthi Institute of Medical Sciences, Melmaruvathur in 50 patients the period of around 5 months from December 2013 to March 2014 in renal dialysis ward of Nephrology department. This difference could be Appandraj et al. 2014).

Multiple regressions was done between dialysis vintage and found to be serum calcium ( $p < 0.008$ ), systolic blood pressure ( $p < 0.009$ ), serum albumin ( $p < 0.02$ ), serum creatinine ( $p < 0.04$ ). Use of ESA irrespective of its type and achieving target hemoglobin ( $\geq 11$  gm/dl) showed increase survival ( $p < 0.009$ ). The mean survival in months in this study was 19.4 (Std-22.6) or the median was 11 months. The categorical survival: one year 70(55.1%), two years 21(16.5%), more than two year 36(28.3%). Survival in our study was one year 70(55.1%), two years 21(16.5%) higher than the average age of our study also 57.2yrs but the number was only 23 which was higher in our study 127a study which was conducted in 23 patients on HD with age of more 60 in Department of Medicine in the S.Nijalingappa Medical College and HSK Hospital and Research Center between 1st May 2005 and 31st March 2011 A 1 year survival was seen in 34.75% (8/23) patients and a 2 year survival was seen in 26 % ( 6/23) patients (R and Malaji Sangamesh 2011). Group1 [3xHD/wk] was associated with increase survival was observed irrespective of serum albumin level but benefit was more seen when serum albumin level was low ( $p < 0.032$ ) as compare to normal serum albumin level ( $p < 0.909$ ). Despite the mean survival of diabetic patients was found to be longer 30.7 months in 3xhd/wk but there was no significant difference seen with 2xHD/wk ( $p < 0.405$ ).

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None.

**Conflict of interest**

None.

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