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**DIALYSIS OUTCOMES AND PRACTICE PATTERNS AMONG CHRONIC KIDNEY DISEASE PATIENTS RECEIVING HEMODIALYSIS AT A PRIVATE DIALYSIS CENTRE IN NAIROBI, KENYA BETWEEN MAY 2016 AND JULY 2016**

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**ABSTRACT**

**Background:** Chronic Kidney Disease is a long-term condition caused by damage to both kidneys. It has become a major public health concern worldwide in the past decade and its prevalence is projected to rise in the coming years. Owing to its irreversible nature, renal transplantation has been proven to be the most effective renal replacement therapy. However, it is limited by its high cost and low availability of donor kidneys. Hemodialysis has therefore been adopted widely in Kenya as an alternative therapy for those with End Stage Renal Disease. This has led to an exponential increase in the number of dialysis units in Kenya over the past few years. This therefore raises a concern on the quality of hemodialysis delivered to patients around the country.

**Objective:** To determine dialysis outcomes and practice patterns for Chronic Kidney Disease patients receiving hemodialysis at a private centre in Nairobi, Kenya.

**Methodology:** This was a retrospective study. Records of 43 patients who received dialysis at the centre for more than six months were reviewed and the mid-year results for different parameters obtained.

**Results:** 62.8% were male, 51.2% were Africans with the rest being Asian. The mean age of the patients was 63years( $\pm 16$ ). 79.1% were married. 60.5% had both hypertension and diabetes. Arteriovenous Fistula (81.4%) and Tunneled catheter (18.6%) were the only routes used for vascular access. Majority of the patients (72.1%) received dialysis twice weekly. 93.0% and 97.7% were on iron and erythropoietin supplementation respectively. Most patients (39.53%) had hemoglobin of 10-10.99g/dl. 56.34% of the patients had Parathyroid hormone levels of 150 – 450pg/ml; 73.18% had calcium levels of 2.0 – 2.4mmol/L; 65% had phosphate levels of 1.0 – 1.8mmol/L

**Conclusion:** Majority of hemodialysis patients were males, aged above 60 years; Coexistence of diabetes and hypertension was the most common comorbidity among ESRD patients; Majority (67.44%) of the patients had hemoglobin level of 10-12g/dl.; 83% of patients achieved adequate dialysis based on the Urea Reduction Ratio

## INTRODUCTION

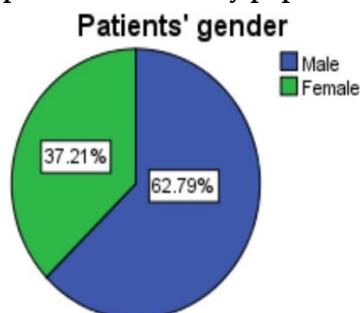
Chronic Kidney Disease is a long-term condition caused by damage to both kidneys. It has become a major public health concern worldwide in the past decade and its prevalence is projected to rise in the coming years. Owing to its irreversible nature many of these patients will require some form of renal replacement therapy. This can be either in the form of dialysis or transplantation. Renal transplantation has been proven to be the most effective renal replacement therapy. However, it is limited by its high cost and low availability of donor kidneys. Hemodialysis has therefore been adopted widely in Kenya as an alternative therapy for those with End Stage Renal Disease. Many dialysis units have been established in the country as a result of this. However, there are many complications related to dialysis for instance dialysis catheter associated infections; blood loos; depression among patients among others. This therefore raises the concern on the quality of hemodialysis delivered to patients around the country.

Few studies, if any have been conducted on dialysis practices and outcomes in Kenya. Thus, the findings of this study would extend and deepen the knowledge of health providers and inform the quality of hemodialysis. The aim of this study was to determine dialysis outcomes and practice patterns among patients undergoing hemodialysis at a private centre in Nairobi, Kenya

## MATERIALS AND METHODOLOGY

This was a retrospective study conducted at a private dialysis centre in Nairobi, Kenya. It was conducted between May 2016 and July 2016. The centre serves people from the former Nairobi and Central provinces. A total of 57 patients were dialyzed at the

Figure 1: Proportion of the study population by sex



centre during the period of study. They were both of African and Asian origins. Duration of dialysis formed the basis for inclusion into the study. Only those who had dialyzed for a period longer than 6 months were included. This saw 43 patients form the study population. The inclusion criterion was to reduce the chances of having biased results. Those who had dialyzed for less than 6 months were excluded from the study.

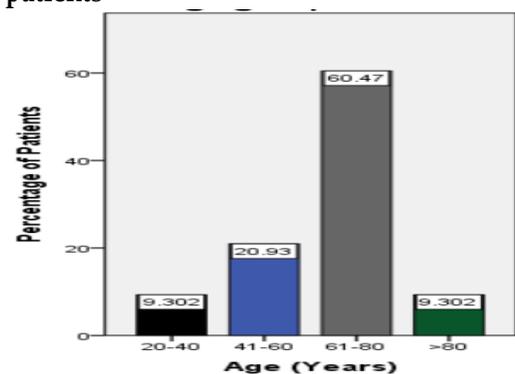
The records of the forty-three chronic kidney disease patients who had met the inclusion criteria were reviewed and data values on different variables were obtained. This was guided by structured questionnaires which had different parts with various variables. The groups of variables for the study included: demographics; dialysis treatment; anemia management; serological status and laboratory parameters. The mean values for the continuous variables were obtained. The data was then cleaned and analyzed using SPSS version 20 computer software and MS Excel. Frequencies, means, modes, ranges and standard deviations were obtained. The results were presented using tables, charts and paragraphs.

## RESULTS

The study population was 43 and any percentage in this section is a representation of the portions of this number.

**Demographics:** Out of the 43 patients, 62.8% were males while 37.2% were females (Figure 1); 51.2% were of African ethnic origin; 48.8% of Asian origin. They were aged between 22 years and 97 years. The mean age of the patients was 63 years ( $\pm 16$ ). Patients in the age group 61-80 years were the most affected representing 60.5% of the study population (Figure 2).

Figure 2: Age groups of the hemodialysis patients



**Comorbidities:** 60.5% of the patients had both hypertension and diabetes; 16.3% had hypertension only; 11.6% had diabetes only; 4.65% had Human Immunodeficiency Virus infection (HIV). None had Hepatitis B nor Hepatitis C infection.

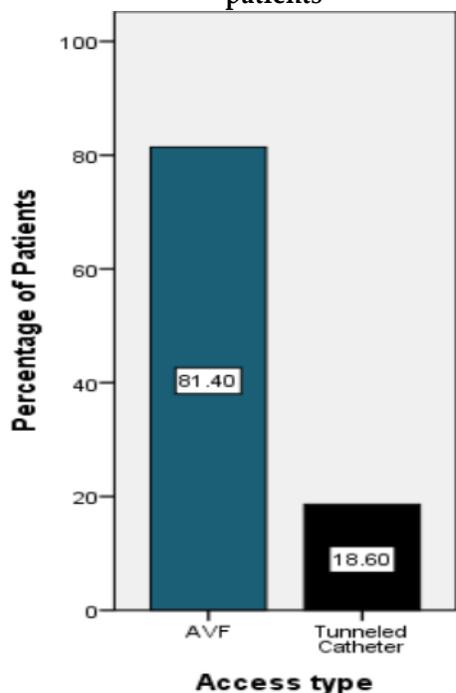
**Dialysis practices pattern:**

**Vascular access:** The two major routes for vascular access used at the centre were Arteriovenous Fistula, AVF (81.4%) and Tunneled catheter, “Perm Cath” (18.6%) (Figure 3).

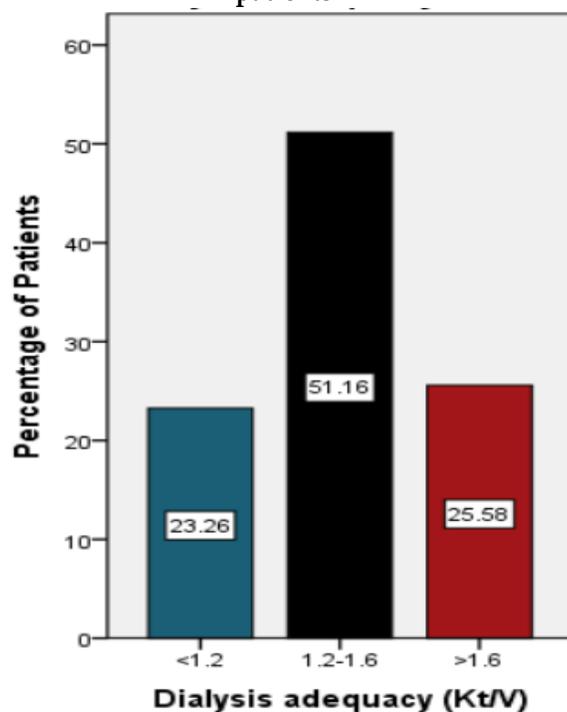
**Dialysis frequency:** 72.1% of the patients received hemodialysis twice weekly; 21.6% dialyzed thrice weekly while 2.3% of the patients were not regular with their dialysis sessions.

**Dialysis adequacy:** Kt/V (K= Clearance rate; t=Effective treatment time; V=Volume of distribution) was greater than 1.2 in 76.8% of the patients while the rest (26.8%) had a value less than 1.2 (Figure 4); 83.7% had a Urea Reduction Rate (URR) greater than 65% with 16.3% having a URR less than 65%.

**Figure 3: Vascular access routes for the hemodialysis patients**



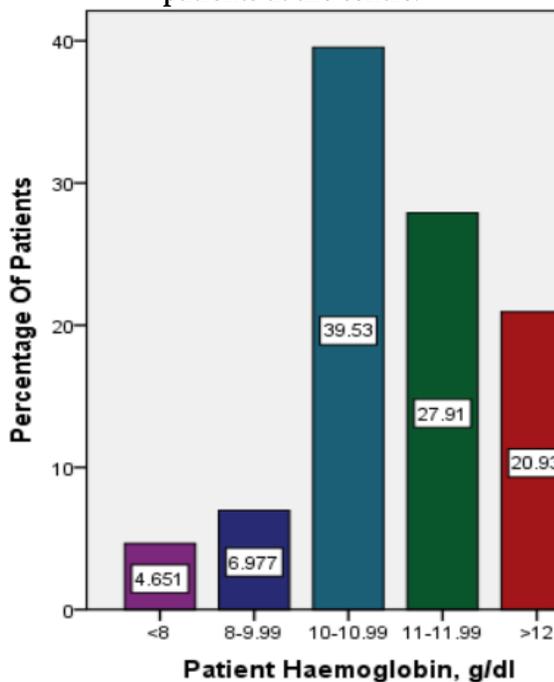
**Figure 3: Dialysis adequacy for the hemodialysis patients**



*Anemia management:* most of the hemodialysis patients had a hemoglobin (Hb) level of 10-12g/dl (67.4%); 20.9% had hb >12g/dl with the rest having hb <8g/dl (Figure 5); 97.7% and 93.0% of the patients were on weekly erythropoietin; and intravenous iron supplementation respectively. Weekly erythropoietin dose differed from one patient to the

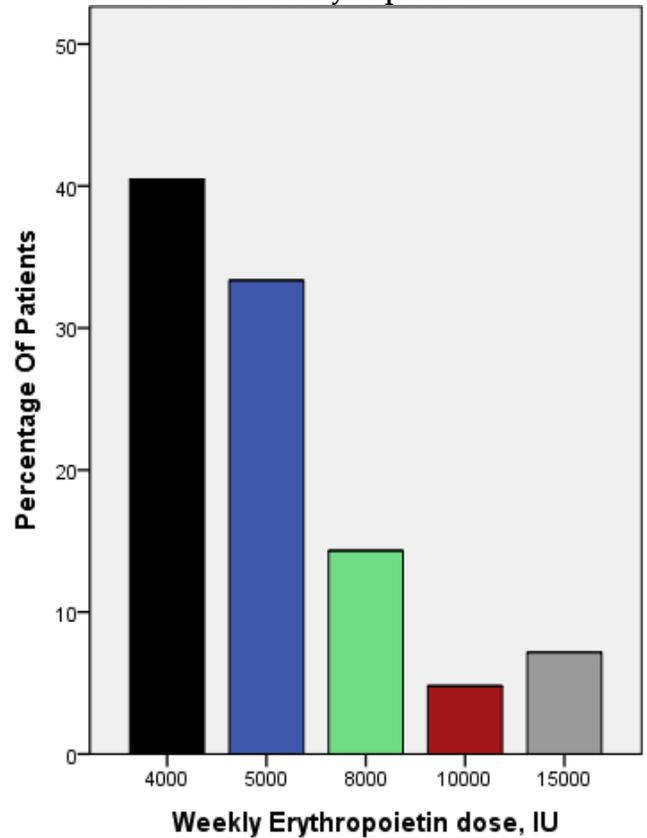
other. 40.5% were on 4000IU weekly, 33.3% on 5000IU weekly, 14.3% on 8000IU weekly, 7.1% on 15000IU weekly and 4.7% being on 10000IU weekly (Figure 6). Recormon™ was the most commonly used brand (44.2%), 18.60% used Wepox™, 13.95% used Vintor™, 11.63% used Epofit™ while another 11.63% used other brands (Table 1).

**Figure 5: Hemoglobin levels for the hemodialysis patients at the centre.**



The amount of iron supplementation was calculated in terms of monthly doses. 48.8% of the patients were on 100mg monthly, 39.0% were on 400mg monthly, 9.8% on 200mg monthly, and 2.4% of the patients on

**Figure 6: Weekly Erythropoietin supplementation dose for the hemodialysis patients**



800mg monthly dose of intravenous iron (Figure 7). Venofer (46.5%) and ferrose (7%) were the most commonly used and least used brands respectively (Table 1).

Figure 7: Monthly Intravenous Iron supplementation for hemodialysis patients

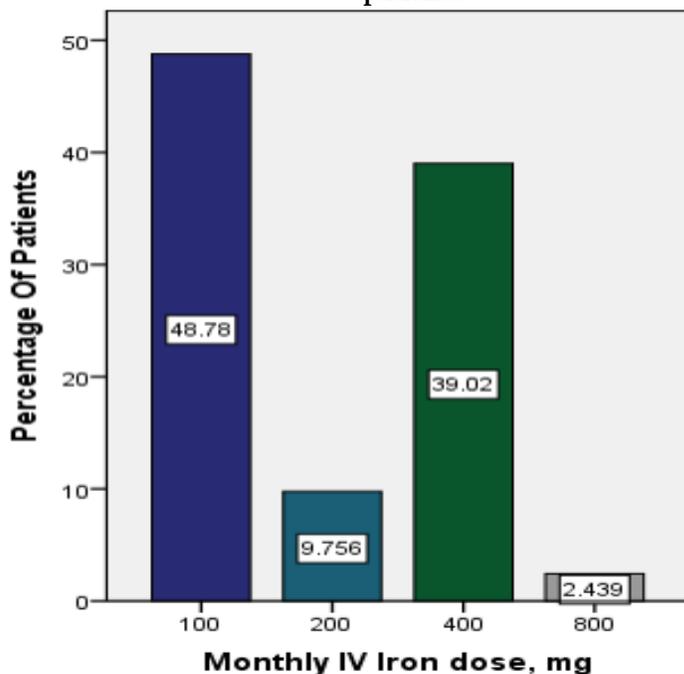


Table 1

Brands used for Erythropoietin and Intravenous Iron Supplementation among the hemodialysis patients

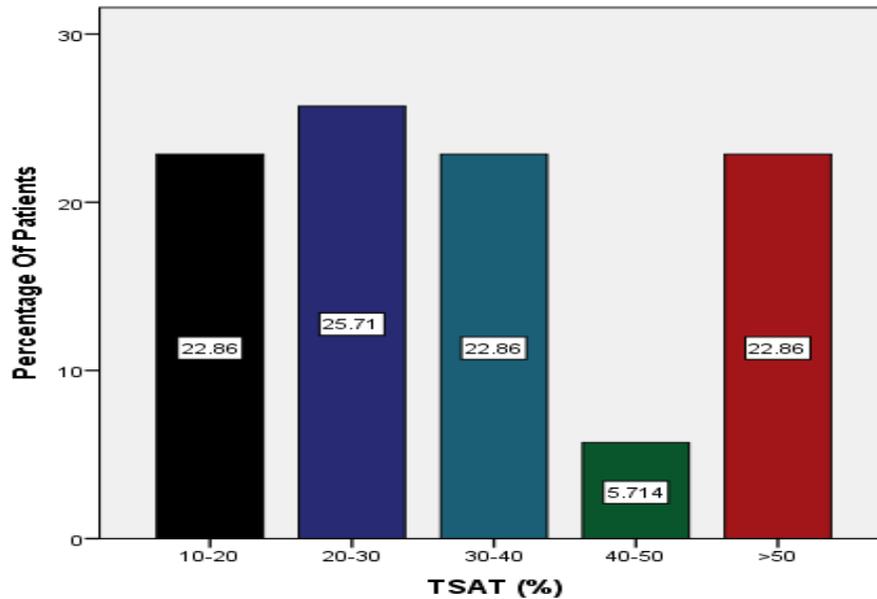
Erythropoietin Supplementation Agents		Intravenous Iron Supplementation	
Brand	Patient Usage (%)	Brand	Patient Usage (%)
Recormon	44.19	Venofer	46.51
Wepox	18.60	Encifer	34.88
Vintor	13.95	Ferrose	6.98
EpoFit	11.63	Megafer	6.98
Others	11.63		

**Dialysis outcomes:**

*Anemia management outcomes:* Of the 43 patients, only 6.98% had received blood transfusion within 6 months prior to the study. 22.86% had Transferrin

Saturation (TSAT) levels of 10-20%; 25.71% had TSAT of 20-30%; 22.86% had levels of 30-40%; 5.71% had TSAT of 40-50% while the rest, 22.86% had TSAT >50% (Figure 8)

Figure 8: Transferrin Saturation levels for the hemodialysis patients



Bone mineral Status outcomes: 73.3% of the patients had corrected calcium levels between 2.0mmol/L and 2.4mmol/L while 7.3% had levels <2.0mmol/L; phosphate levels ranged from <0.6mmol/L to >2.0mmol/L. 80.0% had phosphate levels of 1.0mmol/L-2.0mmol/L. Proportions of patients with

different Parathyroid Hormone (PTH) levels: <150pg/ml (22.0%), 150-300pg/ml (29.3%), 300-450pg/ml (17.1%), 450-600pg/ml(4.9%) and >600pg/ml (26.8%). Majority (25.64%) of the patients had weekly Vitamin D3 dosages of 50000-60000ng/dl (Table 2b)

Table 2a

Corrected calcium and Parathyroid Hormone levels for the hemodialysis patients

Corrected calcium		Parathyroid Hormone (PTH)	
Corrected calcium range, mmol/L	Patients (%)	PTH range, pg/ml	Patients (%)
<2.0	7.32	<150.0	21.95
2.0-2.2	36.59	150-300	29.27
2.2-2.4	36.59	300-450	17.07
2.4-2.6	17.07	450-600	4.88
2.6-2.8	2.44	>600	26.83

**Table 2b**  
*Vitamin D3 and Phosphate levels for the hemodialysis patients*

Vitamin D3		Phosphates	
Vitamin D3 weekly dose, IU	Patients (%)	Phosphate Level, mmol/L	Patients (%)
<10000	5.13	<0.6	2.5
10000-20000	5.13	0.6-0.8	2.5
20000-30000	20.51	0.8-1.0	5.0
30000-40000	15.38	1.0-1.2	15.0
40000-50000	17.95	1.2-1.4	12.5
50000-60000	25.64	1.4-1.6	17.5
>60000	10.26	1.6-1.8	20.0
		1.8-2.0	15.0
		>2.0	10.0

*Nutritional outcomes:* 51.2% had albumin levels >40g/dl, 43.9% had levels of 30-40g/dl while 4.9% had levels of 20-30g/dl.

## DISCUSSION

The study showed that End Stage Renal Disease affected more males than females; 62.8% and 37.2% were males and females respectively with M: F ratio of 1.7:1. Similar pattern has been reported in studies elsewhere (1,2). Men have been shown to be at an increased risk of non-communicable diseases such as Hypertension and Type 2 Diabetes Mellitus, conditions which are highly implicated in the development of CKD (3). The mean age of the study population was 63 ( $\pm$ 16) years. 69.8% of the patients were aged above 60years. Lifestyle diseases that are known to play a role in the pathogenesis of CKD affects the elderly people; aging is also known to be strongly connected with decline in renal function. The findings were comparable with those reported from local studies which reported a mean age of 59.4( $\pm$ 10.6) years among CKD patients with 87.2% being older 50years (4). A cross-sectional survey conducted on Type 2 diabetes outpatients in Tokyo, found the mean age of participants to be 61years ( $\pm$ 12) (5). These findings are also consistent with those of the China Kidney Disease Network annual report of 2015 (6). From the study, more patients were of African ethnicity, something which is in accordance with the reports of several studies that have

confirmed black race predominance among CKD patients. This could also be explained by the catchment population for the private centre.

Diabetes Mellitus (DM) and Hypertension were the most common comorbidities among the hemodialysis patients. Although accurate statistics are not available in Kenya, hypertension and type 2 Diabetes Mellitus, in line with the worldwide trends, are the dominant diseases associated with ESRD, particularly among the blacks (7, 8). It therefore follows that prevention among the general population requires interventions that improve lifestyles that lead to a reduction in Blood Pressure and Type 2 DM.

There are many ways of establishing intravenous access on hemodialysis patients. These are broadly classified into permanent and temporary accesses. The American Nephrology Nurses Association recommends that patients who require hemodialysis must have a permanent intravenous access. Arteriovenous Fistula was the most commonly used mode of vascular access (81.4%) with Tunneled catheter uptake at 18.6%. No one used either a temporary catheter or an arteriovenous graft. There exist significant differences in the use of various intravenous routes among different countries (9). However, corresponding patterns were noted in Japan in which 83% of the patients used AVF, 15% used catheter with the remaining 1% using AV graft (9). AVF is the preferred route since it is associated with improved quality of life and reduced incidences

of infections. The functionality of a vascular too is a very strong predictor of outcomes (10).

Dialysis adequacy can be measured in terms of Kt/V and URR. Through Randomized Controlled Trials URR >65% and Kt/V >1.2 have been settled on as the standard dialysis dose. 76.8% of the patients had Kt/V >1.2 and 83.7% of the patients had URR >65%. It is evident that majority of the patients dialyzed adequately during the sessions.

Anemia is a common occurrence in CKD patients, though variable in its time of presentation and severity within individuals. It contributes significantly to the heavy symptom burden of the disease. It is diagnosed in those above 15 years with CKD if haemoglobin is <13.0g/dl in men and <12.0g/dl in females (11). Out of the 43 patients, 11.63% had haemoglobin level below recommended level of 10-12g/dl (12). It is evident that this percentage varies substantially across countries ranging from 23% in Sweden to 77% in Japan (13). Nevertheless, the findings of the study corresponded closely with those obtained from France (13)

Anemia has a major impact on the lives of CKD patients, but it is potentially reversible with appropriate treatment. Poor control has been associated with cardiovascular disease, poor quality of life, greater hospitalization rate and increased mortality risk. The renal community has therefore continually prioritized matters of anemia management practices. These practices include Iron and erythropoietin supplementation; and blood transfusion. ESA supplementation should be initiated once the haemoglobin is <9-10g/dl. In our study, 93.0% and 97.7% of the population were on intravenous Iron and Erythropoietin supplementation. The findings were better than those reported from other countries, which ranged from 27% in the US to 65% in Sweden for ESA supplementation (13). 25.7% of the patients had recommended TSAT levels of 20-30% (12).

CKD is associated with disruption in endocrine and mineral functions. These two functions are vital in regulation of initial formation, growth and remodeling of bones. As a result, bone abnormalities are found universally in CKD. These changes cause abnormal growth of the parathyroid glands, which in

turn results raised PTH and mobilization of calcium from the bones. In kidney disease, PTH is the most widely tested as a bone turnover marker (BTM), and vitamin D, calcium, and phosphorus are used to assess mineralization (14). Raised PTH coupled with reduced kidney function lead to build up of serum phosphate. Any of these derangements is associated with increased mortality risk. Therefore, the mineral levels should be carefully controlled among the patients undergoing hemodialysis to ensure they remain within their respective recommended range. The study indicates that 36.6% of the patients had corrected calcium levels of 2.2mmol/L-2.4mmol/L which is within the recommended range as per the K/DOQI guidelines; 50% had normal phosphate levels (0.8-1.6mmol/L); 48.8% of the patients had PTH above the recommended upper limit of 300ng/ml with 29.3% having normal PTH levels. This could be due to either secondary or tertiary hyperthyroidism. Less than 60,000IU of vitamin D3 was administered per week to most of the patients with the exception of a few who were most likely in the initiation phase of treatment.

Nutritional management is important in the care of hemodialysis patients. In acknowledgement of this, K/DOQI came up with recommendations for nutritional management in patients undergoing hemodialysis as part of the effort to enhance the domains of care in order to achieve the primary goals of improved quality of life and increased survival. Less than 5% of the patients had albumin levels below 30g/L. Low albumin levels have been shown to increase the mortality risk among Chronic Kidney Disease patients (13).

## CONCLUSION

Based on the findings of the study it would be concluded that:

- a) Majority of hemodialysis patients were males and aged above 60 years
- b) Coexistence of diabetes and hypertension was the most common comorbidity among ESRD patients
- c) Majority (67.44%) of the patients had hemoglobin level of 10-12g/dl.

- d) 83% of patients achieved adequate dialysis based on the Urea Reduction Ratio

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