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Original Research Article

Observational study of nutritional status of ESRD patients on Hemodialysis

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Abstract

Kidney's functions are completely lost at end stage renal disease (ESRD), where it cannot meet body's needs of excretion of waste materials. Dialysis is a medical treatment that artificially removes waste products, excess fluid and toxins from the blood. Glomerular filtration rate (GFR) <15 mL/min. is termed as end-stage renal disease. Treatment modality includes maintenance haemodialysis (MHD) for survival. Protein-energy malnutrition is very prominent feature in these patients. The data selection was convenience-based sampling. Data collection was done in 4 phases in 30 patients who fulfilled inclusion criteria. The results revealed that 30 patients undergoing dialysis showed history of hypertension in which 19 (63.3%) were also diagnosed with Anaemia of Chronic disease (AOCD), indicating a substantial prevalence of anaemia within this population. Additionally, 7 out of 30 patients (23.3%) had diabetes mellitus highlighting the importance of managing co-morbid condition alongside hypertension. This can be concluded that the patients who are on haemodialysis have a special dietary restriction, need to manage intake of protein & electrolytes to prevent complications. Patients need to carefully monitor fluid intake. Many dialysis patients observed anaemia due to erythropoietin deficiency, requiring regular monitoring and treatment. Dialysis does not replace the loss of erythropoietin, which is vital for maintaining healthy red blood cell levels.

Keywords: CKD, nutritional status, dialysis, end stage renal disease, anaemia, erythropoietin

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Introduction

Kidney plays a very important role in maintaining body's hemostasis by balancing fluid, electrolytes and excretion of waste products. When it loses its capacity to excrete wastes from the body is termed as ESRD, also known as stage 5 chronic kidney disease (CKD). While dialysis cannot replace all kidney functions, but it can maintain quality of life to some extent by removing waste and maintaining electrolyte balance. It can also prolong life and help patients manage their condition until they can receive a kidney transplant. CKD can progress through stages, and dialysis becomes necessary when the kidneys reach a stage where they can no longer function adequately (often Stage 5, or end- stage renal disease). Protein energy malnutrition and muscle wasting is very common in CKD with end stage renal disease along with many adverse effects on other parts of the body (Ahemad et al., 2020) [1]. According to the Kidney Disease Improving Global Outcomes (KDIGO) foundation, CKD has been defined on the basis of specific markers of kidney functions such as glomerular filtration rate. As per definition, CKD is diagnosed after confirmation of major 2 factors – GFR < 15 mL/min and albumin > 30mg/gram of creatinine alongwith derangement in kidney structure or function for more than 3 months (Scott et al., 2020 & Sagambat et al., 2019) [2], [3].

According to KDIGO 2012 clinical practice guideline, CKD is classified into five stages on the basis of the GFR level (Acosta et al., 2019) [4].

CKD Stage 1: GFR > 90 ml/min

CKD Stage 2: GFR between 60-89 mL/min

CKD Stage 3a: GFR between 45 to 59 mL/min

CKD Stage 3b: GFR between30 to 44 mL/min

CKD Stage 4: GFR between 15 to 29 mL/min

CKD Stage 5: GFR < 15 mL/min)

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Dialysis is a medical treatment that artificially removes body waste, maintains fluid balance and harmful toxins from the blood. The two main types of dialysis are:

Hemodialysis

In this method, blood is filtered through a dialyzer (artificial kidney), that usually occurs thrice a week in a dialysis center. One session takes about three to five hours.

Peritoneal Dialysis

This method involves filling the abdominal cavity with a special dialysis solution with the help of a catheter. This solution drains out waste products and excess amount of fluid and makes the blood free of toxins and wastes. It is replaced with another dialyzate after some time. This can be done at home and offers more flexibility in terms of scheduling.

Maintenance haemodialysis is the prime treatment modality for survival in ESRD patients. Generally, a four hour session thrice a week in adults and 4 hourly session twice a week in elderly or patients with small body build is sufficient. A common characteristic feature in these patients is protein-energy malnutrition. It is defined as decreased stores of protein and energy in body (Carrero et al., 2020)[5]. An improvement in the symptoms has been seen after initiation of dialysis, but still many factors that lead to malnutrition, remain the same. Many dietary factors such as poor appetite, poor diet intake, malabsorption, medication etc. are responsible for malnutrition (Sharma & Sahu, 2001)[6]. It also includes the change in diet pattern or meal timing due to process of hemodialysis. Dialysis may further aggravate the nutrient deficiencies due to nutrient losses and increased inflammatory cytokines (Laville & Fouque, 2000)[7]. Calorie intake may be further decreased due to symptoms like dyspepsia, indigestion and malabsorption (Wi & Kim, 2017)[8].

A vital step in offering health and dietary recommendations to these patients is the nutritional assessment. Subjective global assessment (SGA), bio-impedance, anthropometric measurements, are among the techniques used in nutritional assessment. This study was designed to evaluate the nutritional status of CKD ESRD patients, who were on MHD. It was done with the help of anthropometric measurements (body mass index (BMI), triceps skinfold thickness (TSFT). Better food planning and guidance for this patient cohort will be made possible by this study.

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Aim

- To study of nutritional status of ESRD patients with hemodialysis

Objectives

- To assess the overall nutritional status of ESRD patients on hemodialysis using anthropometry, biochemical & clinical markers
- To determine the prevalence of malnutrition among the patient population
- To analyse the dietary habits and nutrient intake of hemodialysis patients and identify potential deficiencies

Research Methodology

Study design

It was a prospective cross-sectional study, which was conducted at Mahatma Gandhi Hospital, Jaipur for 3 months. Subject selection was done on the basis ofconvenience-based sampling. All patients were taken from Nephrology ward that fulfilled inclusion criteria until desired number (i.e. 30) of sample was completed. The informed consent, demographic data (age, gender, and community) was collected from patient's file, attendant and patient.

Inclusion Criteria

- Patients who were suffering from CKD - ESRD undergoing dialysis
- All male & female patients
- Patients in the age group of 20 - 60 years of age

Exclusion Criteria

- Patients with known disabilities
- Patient having any other critical medical condition such as cancer of any type
- Patient gone through Renal Transplant
- Patients below 20 years or above 60 years of age
- Non- cooperate patients

Data collection & Assessment was done in 3 phases:

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Phase 1: Collection of demographic details

In this phase patient's general information like name, age, gender, economic status, activity pattern, educational status, marital status & medical history were noted using a pre-structured questionnaire.

Phase 2: Assessment of nutritional status

Collection of anthropometric measurements

In this section anthropometric parameters such as height, weight, triceps skinfold thickness (TSFT), mid-arm circumference (MAC) was measured.

BMI was calculated by formula = Kg/m^2.

Height and Weight were measured by Stadiometer and weighing scale, respectively. Mid upper arm circumference was measured using non stretchable measuring tape, and Harpenden's skin-fold callipers were used to measure TSFT.

Collection of biochemical data

In this section, biochemical parameters included the patient's related laboratory parameters (Haemoglobin, electrolyte & RFT).

Data collection of clinical signs & symptoms

In this part of the study, clinical signs and symptoms of the patients (i.e. GI symptoms, chewing problems, swallowing difficulty, constipation etc.) and functional capacity (bed ridden, difficulty in walking, no dysfunction) were recorded.

Data regarding dietary habits and nutrient intake

In this section, dietary intake of the patient in which 24-hour dietary recall was recorded in a self-completed food diary to find out either patient able to complete their nutritional needs or following any specific diet.

Phase 3: Data interpretation

Study of prevalence of malnutrition

Patients were classified as malnourished or healthy after comparison to reference values. As per WHO, the normal BMI range is between 18.5-24.9 Kg/m^2 (Table 1) and normal cut off of TSFT 12.5 mm for males and 16.5 mm for females.

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Classification	BMI (kg/m2)	Risk of co-morbidities
Under weight	< 18.5	Low
Normal range	18.5-24.9	Average
Overweight (pre-obese)	25-29.9	Mildly increased
Obese	≥ 30	Mildly increased
Class I	30 ≥ 34.9	Moderate
Class II	35 ≥ 39.9	Severe
Class III	≥ 40	Very severe

Table 1: WHO body mass index (BMI) Classification [9]

The WHO recommended BMI ranges have been summarized in Table 1. If BMI is <18.5 then person is highly malnourished. The causes can be inadequate calorie intake, chronic illness or metabolic disorders. If BMI range is between 25-29.9 kg/m2, then the person is in pre-obsese category which can increase the risk of health issues like type 2 diabetes.

Biochemical Parameters	Normal range
Hemoglobin	Male 13.5- 17.5g/dl Female 11.5-15.5g/dl
Renal Function Tests (mg/dL)	
Blood urea	15-40
Uric acid	3-7.2
Serum creatinine	0.5-1.2
Electrolytes mEq/ L	
Potassium	3.5-5
Chloride	95-106
Soldium	135-145
Magnesium	1.6-2.6
Phosphorus (mg/dL)	Adult 3.5 – 4.5 Child 4.5-6.5

Table 2: Normal range of RFT and Electrolytes

*Source: The Best of Basics in Clinical Nutrition-Dietician's Essential Pocket book 4th Edition – 2018 [10]

Identify dietary habits and nutrient intake that need to be modified

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In Table 3 the nutrients recommendation for CKD patients who are on dialysis the guidelines are given by Indian Dietetics Association. Nutrients play a significant role on dialysis patient. During hemodialysis, blood is filtered through a dialyzer (artificial kidney) to remove waste products and excess fluid. This process can lead to the loss of small and medium-sized proteins. On average, a patient undergoing hemodialysis might lose about 5 to 10 grams of protein per session. This loss necessitates an increased dietary protein intake to compensate for what is lost and to prevent deficiencies. It's important for hemodialysis patients to focus on high-quality proteins that provide all essential amino acids. Dietary potassium restriction depends on the blood levels. Condition of hyper or hypokalemia, both are fatal as it may impair function of the heart and may even lead to death. Therefore, maintaining potassium levels in a narrow range is very critical. Generally fluid is restricted with hemodialysis, still total amount of fluid to be consumed depends on urine output also. So, the restriction can range from one-two litres per day.

Nutrient	Recommendation
Energy	30 - 35 Kcal/ kg/ day Protein
Protein	CKD patients with dialysis, 1.2 – 1.4 g/kg/day protein is given
Potassium	Depends on potassium levels of blood
Sodium	Depends on edema & high BP, recommended 4 g salt /day
Fluid	1000 ml + urine output if patient is on dialysis (Depends on extent of edema, BP & sodium level in blood)
Phosphorus	800 - 1000 mg/day

Table 3: Nutrient recommendations for dialysis patient

*Source: Clinical Dietetics Manual (Indian Dietetics Association) [11]

Data Analysis

A statistical evaluation of the collected data was conducted. Statistical tests and techniques were used to tabulate and analyze the data collected, which included anthropometric, biochemical, clinical and diet intake components. To evaluate the

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gathered data and the mean scores obtained for the outcomes of various patients are significantly different from one another, statistics in the form of mean & standard deviation.

Results and discussion

The study was conducted to assess the nutritional status of ESRD patients who were on dialysis. The results and discussion part has been divided into 3 phases:

Phase 1: Demographic details

The sample size of the study was n = 30 and subjects were patients who were on dialysis. There were 19 males and 11 females selected from Mahatma Gandhi hospital. The age group of all samples lied between 20- 60 years, and the preliminary data reveals that the average age was 43.1 ± 15.1 (Table 4).

Subjects	n = 30
Male	19
Female	11
Age (years)	43.1

Table 4: Background Information of the subjects

Phase 2: Assessment of nutritional status

2.1 Anthropometric measurements

In table 5 the basic anthropometric measurements of subjects are given. The average height of the selected sample was 161.5 ±6.42. The average usual weight was 61 ± 10.6 and current weight was 57.75 ± 11.7. The average BMI was 21.37± 3.42.

S. No.	Parameters	Mean	Standard Deviation
1	Average Height (cm)	161.5	6.42
2	Average Usual Weight (Kg)	61	10.6
3	Average current weight (kg)	57.75	11.7

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4	Average BMI (Kg/m2)	21.37	3.42
5	Average MUAC (cm)	22.6	4.21
6	Triceps skinfold thickness (TSFT) (mm)	23.6	7.5

Table 5: Basic anthropometric measurements of the subjects

2.2 Biochemical parameters

In figure 1, the biochemical parameters range of haemoglobin and creatinine fluctuations level is shown many patients is observed to be seen anaemia due to reduced erythropoietin production by kidneys, blood loss during dialysis also due to inadequate intake of nutrients necessary for red blood cell production is observed in these patients.

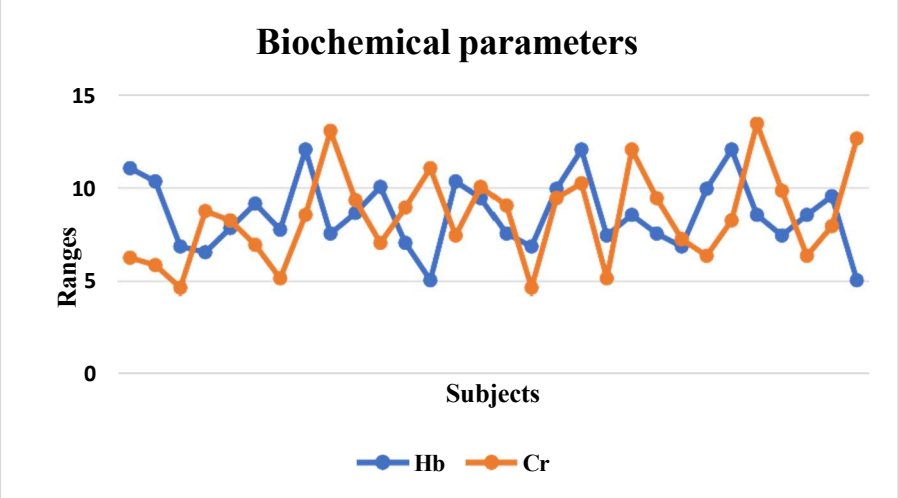

Figure 1: Haemoglobin & Creatinine levels during study

2.3 Clinical signs & symptoms

In the given result in figure 2 the physical examination of patient is seen in which (n=30) the 30% of them functional capacity is difficulty with ambulation and in 17 of them is seen to be normal there is no dysfunction is to be seen while in 4 of them is bed ridden.

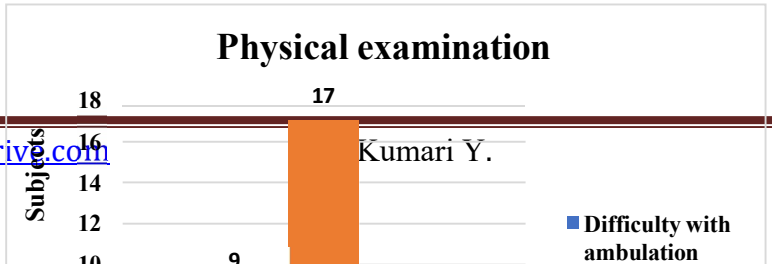

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Figure 2: Physical examination of the subjects

Phase 3: Data interpretation

Prevalence of malnutrition

In fig 3 subjects presented with co-morbidity at the time of study in the given result shown that 63.33% of them is diagnosed with Anemia of Chronic Disease (AOCD), indicating a substantial prevalence of anemia within this population while 23.33% of them is diagnosed with type 2 diabetes.

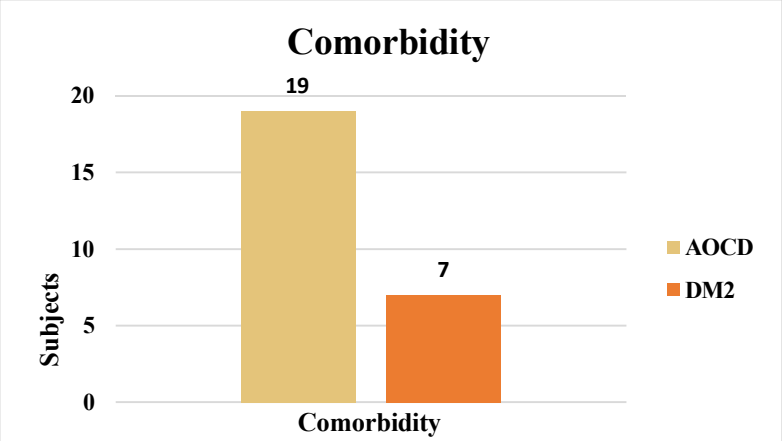

Figure 3: Subjects presented with comorbidity at the time of the study

The result of the data is shown during the study that the dialysis patient often experiences changes in appetite due to several factors. They have strict dietary restrictions additionally

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the buildup toxins in blood known as uremia, can cause nausea and bad taste in mouth, leading to decreased hunger. Due to the interconnectedness of chronic illness and nutritional deficiencies, these patients are particularly prone to anemia of chronic disease (AOCD).

Dietary factors: As we observed the nutritional status of ESRD patient with dialysis there is changes in appetite is seen during the dialysis. In 67% of them changes in appetite is seen while in 33% of them there is no changes in appetite is seen which tell us in Figure 4.

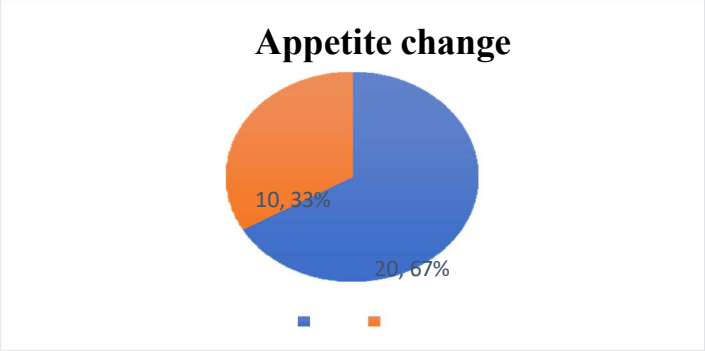

Figure 4: Changes in appetite during dialysis

Conclusion

On the basis of observations during the study, following conclusion could be derived that end- stage renal disease is a fatal condition, that requires comprehensive management through dialysis or transplantation. Understanding ESRD and its implications is essential for patients and caregivers, enabling better adherence to treatment plans and lifestyle changes to enhance quality of life. Effective diet management is essential for patients with ESRD to control symptoms, manage electrolytes, and support overall health. Due to the interconnectedness of chronic illness and nutritional deficiencies, these patients are particularly prone to anemia of chronic disease (AOCD). The quality of life and health outcomes of patients with AOCD can be greatly enhanced by attending to their dietary needs while using medication and routine monitoring.

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