FACTORS AFFECTING NUTRITIONAL STATUS AMONG CHRONIC KIDNEY DISEASE PATIENTS: A CROSS SECTIONAL STUDY

A PROJECT REPORT

BY

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Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment of B.Sc. in Nutrition and Food Engineering

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APPROVAL

This project titled **"Factors Affecting Nutritional Status Among Chronic Kidney Disease Patients: A Cross Sectional Study"**, submitted by **Rezoana Tabassum Alshi** to the Department of Nutrition and Food Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents.

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DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Md. Nawal Sarwer, Lecturer (Senior Scale)**, Department of Nutrition and Food Engineering, Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

This study aimed to identify factors associated with malnutrition among chronic kidney disease (CKD) patients, focusing on their body mass index (BMI) and other sociodemographic and clinical variables. A total of 229 CKD patients participated, with data collected on age, gender, education, family income, marital status, occupation, weight history, diet type, fluid intake, and gastrointestinal symptoms. The findings revealed significant associations between BMI and family income, occupation, and appetite condition, as well as a highly significant link between weight history post-diagnosis and BMI. However, no significant associations were found between BMI and gender, education, marital status, diet type, or gastrointestinal symptoms. Additionally, duration of CKD diagnosis and the stage of the disease showed some impact on BMI distribution, with a greater prevalence of underweight in early stages and a shift towards overweight and obesity in more advanced stages. The study emphasizes the importance of personalized nutritional care and early intervention in CKD management to prevent and address malnutrition. Recommendations include improving patient education, addressing appetite and dietary challenges, and providing financial support for accessing nutritious food. Further research is needed to explore the broader impact of comorbidities and CKD progression on nutritional health.

Keywords: Chronic Kidney Disease, Malnutrition, BMI, Nutritional Status.

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CHAPTER 1
INTRODUCTION

1.1 Background

Chronic kidney disease (CKD) is a long-term medical condition characterized by a gradual decline in kidney function. The kidneys, essential for filtering waste products and excess fluids from the blood, progressively lose their ability to maintain this critical balance, leading to the accumulation of toxins, fluid, and electrolytes in the body (Webster *et al.*, 2017). CKD is classified into five stages based on the estimated glomerular filtration rate (eGFR), ranging from mild kidney damage in stage 1 to kidney failure or end-stage renal disease (ESRD) in stage 5 (NIDDK, 2021).

CKD is primarily caused by diabetes and hypertension, accounting for the majority of cases. Other risk factors include aging, obesity, smoking, cardiovascular disease, and genetic predisposition (Chen *et al.,* 2020). The disease is associated with severe complications such as cardiovascular disease, anemia, bone and mineral disorders, and malnutrition, all of which significantly affect patient outcomes and quality of life (Flythe *et al.*, 2020).

Globally, CKD affects nearly 700 million individuals, ranking as a leading cause of morbidity and mortality (Bikbov *et al.*, 2020). The burden is particularly severe in low- and middle-income countries (LMICs), where late diagnosis, limited access to care, and insufficient healthcare resources exacerbate the disease's impact (Jha *et al.,* 2013). In regions like South Asia and sub-Saharan Africa, CKD is often diagnosed at advanced stages, leaving costly interventions like dialysis or kidney transplantation as the only options, which are frequently inaccessible (Stanifer *et al.*, 2014). Conversely, while developed nations have advanced healthcare systems, disparities persist among socioeconomically disadvantaged groups, leading to poorer outcomes (Narva *et al.*, 2016).

In Bangladesh, CKD prevalence is estimated at 15% to 20%, driven by rising rates of diabetes and hypertension. The healthcare system faces significant challenges in addressing CKD due to resource constraints, limited nephrology services, and the high cost of dialysis and transplantation, which pose a financial burden on patients and families (Khan *et al.,* 2020). These issues highlight the need for comprehensive public health strategies focusing on prevention, early detection, and better management of CKD-related complications.

Malnutrition is a particularly concerning complication in CKD, arising from various factors, including reduced appetite, dietary restrictions, and metabolic imbalances. Uremic toxins, gastrointestinal symptoms, and chronic inflammation contribute to reduced nutrient intake and absorption(Stenvinkel & Fouque, 2020). Dietary limitations, such as restricting protein, potassium, phosphorus, and sodium intake, while essential for CKD management, can lead to nutrient deficiencies and caloric insufficiency (Carrero *et al.*, 2018).

The consequences of malnutrition in CKD patients are profound, including protein-energy wasting (PEW), muscle mass loss, immune dysfunction, and increased susceptibility to infections (Ikizler, 2020). These complications further exacerbate CKD progression and mortality rates. In children, malnutrition can lead to stunted growth and developmental

delays, underscoring the need for early nutritional interventions and monitoring (Rees *et al.*, 2017).

This research explores the factors contributing to malnutrition in CKD patients, emphasizing the interplay between physiological, dietary, and systemic challenges. Understanding these factors is crucial for developing targeted interventions that improve patient outcomes and enhance their quality of life. In resource-limited settings like Bangladesh, addressing malnutrition requires a multidisciplinary approach and public health initiatives to mitigate the disease burden effectively. This research aims to provide insights into the underlying causes of malnutrition in CKD and inform strategies for better management and care.

1.2 Significance of The Study

The growing prevalence of chronic kidney disease (CKD) globally, and particularly in resource-limited settings like Bangladesh highlights the urgent need for focused research on its complications, including malnutrition. Malnutrition in CKD patients is a critical concern as it significantly impacts patient prognosis, quality of life and survival rates. Factor such as dietary restrictions, stage of CKD, comorbidities are taken to assess the find out the underlying causes. Despite the global and regional burden of CKD, limited attention has been given to understanding and addressing the nutritional challenges faced by these patients, especially in developing countries where healthcare resources are scarce. This research is a step toward improving the care of CKD patients with a specific focus on addressing malnutrition as a modifiable risk factor.

1.3 Research Question

What are the primary factors affecting nutritional status among patients with chronic kidney disease?

1.4 Objectives

1.4.1 General Objective

The aim of the study is to identify the factors affecting nutritional status among patients with chronic kidney disease (CKD).

1.4.2 Specific Objectives

- To examine the relationship between sociodemographic factors (e.g., age, gender, income, education) and nutritional status in CKD patients.
- To evaluate the impact of clinical factors (e.g., duration of CKD, appetite condition, supplement use) on malnutrition in CKD patients.
- To recommend strategies for addressing malnutrition in CKD patients through targeted interventions.

CHAPTER 2
LITERATURE REVIEW

2.1 Nutritional Challenges in CKD

CKD patients face unique nutritional challenges due to the disease's impact on metabolism and the stringent dietary restrictions required for its management. Protein-energy wasting (PEW) is a common syndrome in CKD, characterized by the loss of muscle and fat stores due to inadequate protein and calorie intake, inflammation, and metabolic disturbances (Fouque & Koppe, 2019). Additionally, strict dietary limitations on sodium, potassium, and phosphorus complicate meal planning, often leading to nutrient imbalances and deficiencies (Ikizler *et al.,* 2020).

Loss of appetite, a hallmark symptom in CKD, significantly contributes to malnutrition. Factors such as uremia, inflammation, and gastrointestinal disturbances are linked to poor appetite and reduced food intake, increasing the risk of malnutrition (Kalantar-Zadeh & Fouque, 2017). These issues are particularly pronounced in advanced stages of CKD, where the body's ability to metabolize nutrients is severely compromised.

2.2 Socioeconomic and Lifestyle Factors

Socioeconomic factors play a critical role in malnutrition among CKD patients. Limited financial resources can restrict access to kidney-friendly foods, which are often more expensive and less readily available. Studies highlight those patients from low-income backgrounds are disproportionately affected by malnutrition due to poor diet quality and limited access to healthcare resources(Jayawardena *et al.,* 2020).

Lifestyle factors, including physical inactivity and lack of nutritional knowledge, further exacerbate malnutrition risk. Sedentary behavior is common in CKD patients, contributing to muscle loss and reduced overall nutritional status(Kistler *et al.,* 2018). Inadequate health literacy also impacts patients' ability to adhere to complex dietary regimens, increasing the likelihood of malnutrition (Kopple, 2001).

2.3 Psychological and Behavioral Barriers

Psychological factors such as depression, stress, and dietary fatigue contribute significantly to malnutrition in CKD patients. The chronic nature of CKD and the constant need for dietary vigilance often leads to emotional distress, negatively impacting appetite and adherence to dietary recommendations (Matos, 2021). Furthermore, dietary fatigue, stemming from the monotony of restricted diets, can reduce patients' motivation to maintain proper nutrition over time.

Behavioral barriers, including non-compliance with prescribed dietary plans, also play a role. Non-adherence may result from misunderstanding dietary guidelines, underestimating the importance of nutrition, or difficulty incorporating restrictions into daily life (Ikizler & Pupim, 2020).

2.4 Clinical Factors and Disease Progression

Disease-related factors, including the duration and severity of CKD, significantly influence nutritional status. Prolonged disease duration is associated with a higher prevalence of malnutrition due to the cumulative effects of inflammation, metabolic acidosis, and declining kidney function (Kalantar-Zadeh & Fouque, 2017). Additionally, comorbid conditions such as diabetes, cardiovascular disease, and gastrointestinal disorders can further complicate nutritional management, increasing the risk of malnutrition.

Inflammation and metabolic derangements, common in CKD, exacerbate malnutrition through increased catabolism and altered nutrient utilization. Anorexia, muscle wasting, and nutrient loss during dialysis are among the physiological factors that contribute to poor nutritional outcomes (Fouque & Koppe, 2019).

2.5 Addressing Malnutrition in CKD

Interventions to combat malnutrition in CKD include dietary counseling, nutritional supplementation, and multidisciplinary care. Individualized dietary plans developed by dietitians can help patients balance macronutrient and micronutrient intake while adhering to CKD-specific restrictions(Cupisti *et al.,* 2019). Oral nutritional supplements and intradialytic parenteral nutrition may be recommended for patients at high risk of protein-energy wasting, particularly in advanced CKD stages.

Psychosocial support and educational programs are also essential to address behavioral and psychological barriers. Increasing awareness of nutritional requirements and fostering adherence through patient-centered approaches can improve outcomes (Fouque & Koppe, 2019). Digital tools, such as mobile health applications, offer additional support by facilitating dietary tracking and self-management, empowering patients to take an active role in their care (Chen *et al.,* 2020).

Malnutrition in CKD is a multifactorial issue influenced by physiological, socioeconomic, psychological, and clinical factors. Addressing these contributors through tailored interventions and multidisciplinary care is crucial for improving nutritional outcomes and quality of life in CKD patients.

CHAPTER 3
METHODOLOGY

3.1 Study Design

This research is a cross-sectional study aimed at identifying factors influencing the nutritional status of patients with chronic kidney disease (CKD). The study will assess sociodemographic, clinical, lifestyle, and dietary factors contributing to malnutrition among CKD patients.

3.2 Study Area and Population

The study is conducted at Kidney Foundation Hospital & Research Institute in Mirpur, Dhaka.

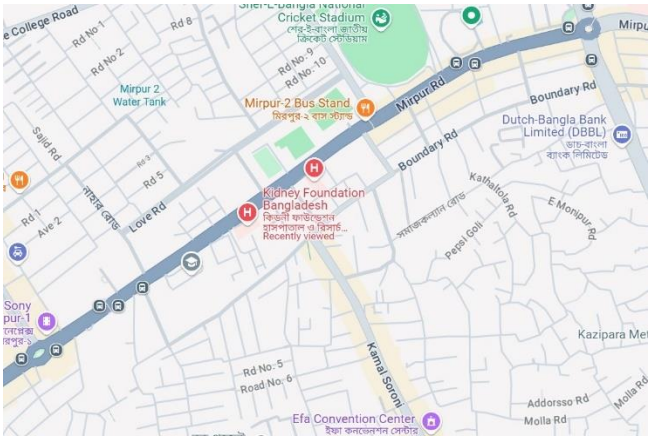

Figure 1: Location of the study area

The target population includes adult CKD patients (≥17 years) diagnosed by a nephrologist, attending regular follow-ups or undergoing dialysis.

3.3 Inclusion and Exclusion Criteria

3.3.1 Inclusion Criteria

- Adult CKD patients (≥17 years).
- Patients at any stage of CKD, including those on dialysis.
- Patients willing to provide informed consent.

3.3.2 Exclusion Criteria

- Patients with acute kidney injury.
- Patients with terminal illnesses or requiring palliative care.
- Patients who are not willing to provide information.

3.4 Sample Size

The sample size calculated using the formula for cross-sectional studies (Cochrane's Formula)

Where:

$$n = \frac{Z^2 p(1-p)}{d^2}$$

Here,
n= Number of samples
Z = Z-score (1.96 at 95% confidence interval).
p = Prevalence of chronic kidney disease patient in Bangladesh, 17.3% (Hasan *et al.,* 2018)
d = Marginal error, 5%.

Required samples to conduct this research is 220. However, 229 responses were collected.

3.5 Questionnaire Development

Sociodemographic Information: Age, gender, education, marital status, and family income.

Clinical Data: Stage of CKD, duration since diagnosis, comorbidities, and treatment type (dialysis or conservative management).

Lifestyle Factors: smoking

Dietary Practices: Meal frequency, food restrictions, and appetite changes.

Anthropometric Measurements: Height and weight will be measured to calculate Body Mass Index (BMI).

3.6 Data Collection Procedure

Data collected using random sampling procedure. Participants are recruited during their routine visits to Kidney Foundation, Mirpur, Dhaka.

3.7 Ethical Considerations

Ethical approval is taken from the Faculty of Health & Life Sciences. Written informed consent will be taken from all participants, ensuring confidentiality and voluntary participation. Data will be anonymized to maintain patient privacy.

3.8 Statistical Analysis

Analysis is done using IBM SPSS Statistics version 27.0. Chi square is used to find significant relation between variables. In all analysis P-value <0.05 is considered statistically significant. Frequencies and percentages will summarize categorical variables (e.g., gender, income level). Chi-square tests will assess associations between categorical variables (e.g., income and nutritional status).

CHAPTER 4
RESULTS

4.1 Descriptive Information

A total of 229 participants were included in this study. The sociodemographic characteristics of the respondents are summarized in the following categories:

The age range of the participants varied from 17 to 76 years. Most respondents were aged between 40–59 years, comprising 102 individuals (44.5%), followed by 20–39 years (75 individuals, 32.8%). A smaller proportion of participants were in the 60–76 years category (48 individuals, 21%) and 17–19 years (4 individuals, 1.7%).

Table 1: Socio-Demographic Characteristics of Participants (Age, Income, Occupation)

Variables	Category	N (%)
Age Group	17-19 years	4 (1.7)
	20-39 years	75 (32.8)
	40-59 years	102 (44.5)
	60-76 years	48 (21)
Monthly Family Income	10,000-25,000 Tk	26 (11.4)
	30,000-45,000 Tk	76 (33.2)
	50,000-65,000 Tk	70 (30.6)
	70,000-85000 Tk	38 (16.6)
	90,000 Tk or above	19 (8.3)
	Divorced/ Widowed	17 (7.4)
Occupation	Employed/Business	73 (31.9)
	Unemployed	77 (33.6)
	Housewife	79 (34.5)

Family income ranged across five brackets. Most participants had a monthly family income of 30,000–45,000 Tk (76 individuals, 33.2%), followed by 50,000–65,000 Tk (70 individuals, 30.6%). Other income groups included 10,000–25,000 Tk (26 individuals, 11.4%), 70,000–85,000 Tk (38 individuals, 16.6%), and 90,000 Tk or above (19 individuals, 8.3%). Occupational status showed a balanced distribution among participants. 79 individuals (34.5%) were housewives, while 77 individuals (33.6%) were unemployed. Those who were employed or engaged in business accounted for 73 individuals (31.9%).

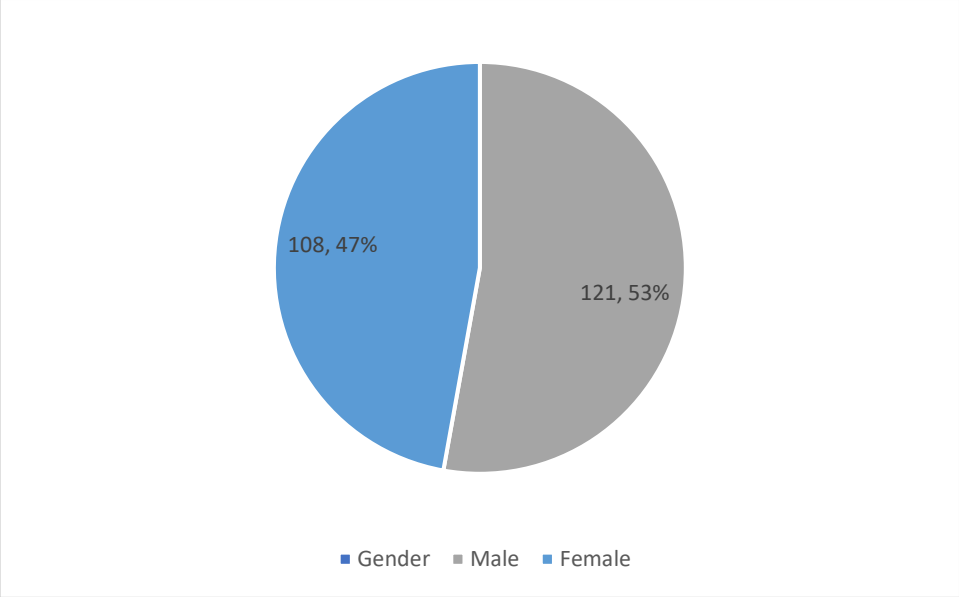

Figure 2: Gender distribution of the participants

Among the participants, 121 (52.8%) were male, while 108 (47.2%) were female, resulting in a near-equal gender distribution.

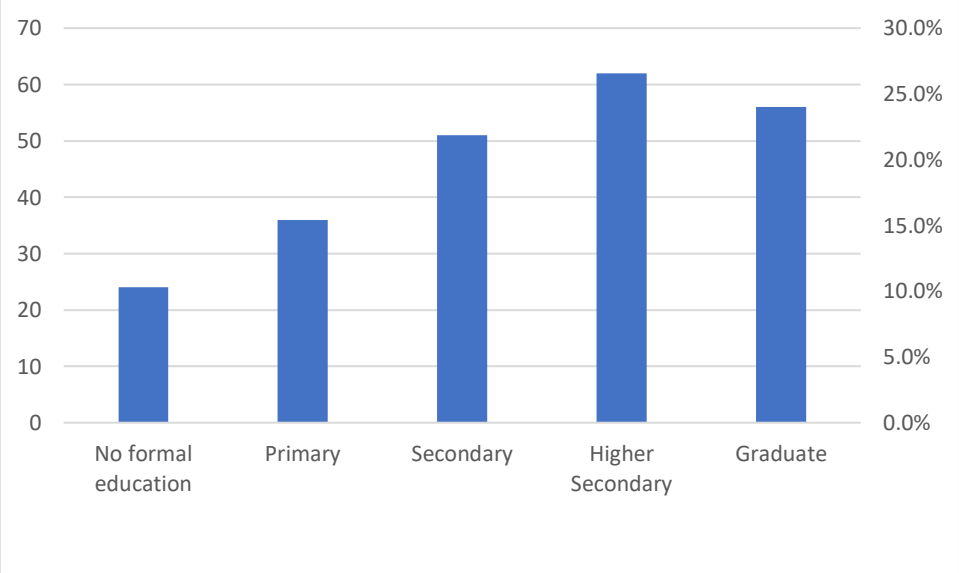

Figure 3: Education level of the participants

The participants had varying levels of education. The highest proportion had attained Higher Secondary education (62 individuals, 27.1%), followed by Graduates (56 individuals, 24.5%) and those with Secondary education (51 individuals, 22.3%). A smaller proportion had Primary education (36 individuals, 15.7%), while 24 individuals (10.5%) had no formal education.

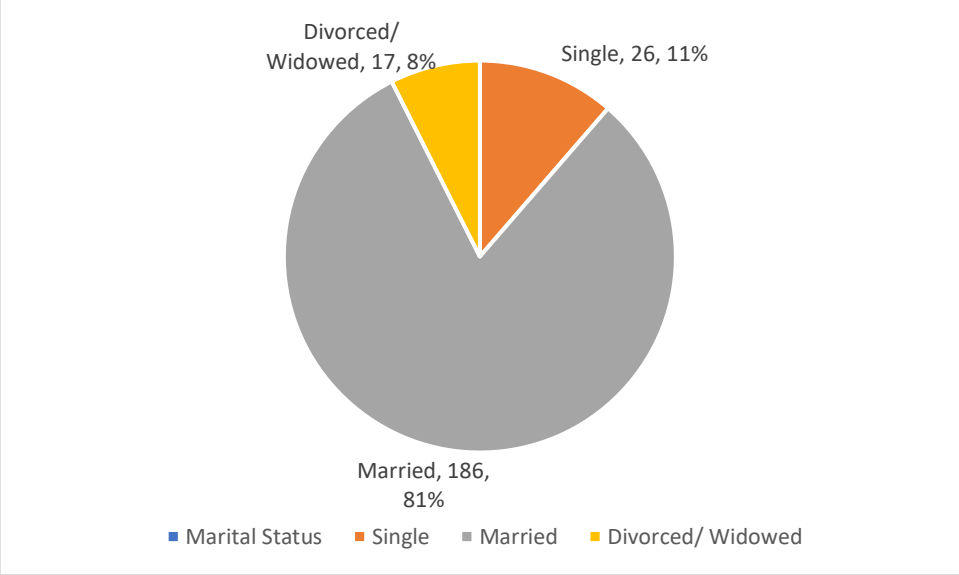

Figure 4: Marital status of the participants

The majority of the participants were married (186 individuals, 81.2%), while 26 individuals (11.4%) were single. A smaller proportion were divorced or widowed (17 individuals, 7.4%).

Table 2: Association Between Socio-Demographic characteristics and Nutritional Status of CKD Patients

Variables	Category	BMI Level					P-Value
		Under-weight	Normal range	Over-weight	Obese I	Obese II	
		N (%)	N (%)	N (%)	N (%)	N (%)	
Age Range	17-19 years	4 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0.54
	20-39 years	40 (53.3)	26 (34.7)	6 (8.0)	2 (2.7)	1(1.3)	
	40-59 years	44 (43.1)	32 (31.4)	15 (14.7)	10 (9.8)	1 (1.0)	
	60-76 years	15 (31.3)	17 (35.4)	6 (12.5)	10 (20.8)	0 (0)	
Gender	Male	59 (48.8)	42 (34.7)	12 (9.9)	8 (6.6)	0 (0)	0.164
	Female	44 (40.7)	33 (30.6)	15 (13.9)	14 (13)	0 (1.9)	
Education Level	No formal	11 (45.8)	9 (37.5)	2 (8.3)	2 (8.3)	0 (0)	0.208
	Primary	10 (27.8)	11 (30.6)	6 (16.7)	8 (22.2)	1 (2.8)	
	Secondary	22 (43.1)	20 (39.2)	6 (11.8)	2 (3.9)	1 (2)	
	Higher Secondary	29 (46.8)	18 (29)	10 (16.1)	5 (8.1	0 (0)	
	Graduate	31 (55.4)	17 (30.4)	3 (5.4)	5 (8.9)	0 (0)	

Monthly Family Income	10,000-25,000 Tk	15 (57.7)	8 (30.8)	3 (11.5)	0 (0)	0 (0)	0.033
	30,000-45,000 Tk	29 (38.2)	23 (30.3)	15 (19.7)	7 (9.2)	2 (2.6)	
	50,000-65,000 Tk	35 (50)	23 (32.9)	7 (10)	5 (7.1)	0 (0)	
	70,000-85000 Tk	18 (47.4)	15 (39.5)	1 (2.6)	4 (10.5)	0 (0)	
	90,000 Tk or above	6 (31.6)	6 (31.6)	1 (5.3)	6 (31.6)	0 (0)	
Marital Status	Single	18 (69.2)	6 (23.1)	0 (0)	2 (7.7)	0 (0)	0.202
	Married	77 (41.4)	63 (33.9)	24 (12.9)	20 (10.8)	2 (1.1)	
	Divorced/ Widowed	8 (47.1)	6 (35.3)	3 (17.6)	0 (0)	0 (0)	
Occupation	Employed / Business	45 (61.6)	17 (23.3)	7 (9.6)	4 (5.5)	0 (0)	0.026
	Unemployed	32 (41.6)	29 (37.7)	9 (11.7)	7 (9.1)	0 (0)	
	Housewife	26 (32.9)	29 (36.7)	11 (13.9)	11 (13.9)	2 (2.5)	

BMI distribution varied across age groups, but no statistically significant association was found (*P*=0.54). Participants aged 17–19 years were entirely in the underweight category (100%). The 20–39 years group had the highest proportion in the normal range (34.7%), followed by underweight (53.3%). The 40–59 years group had 43.1% underweight and 31.4% normal weight, with a noticeable proportion in the overweight (14.7%) and obese (Class I) categories (9.8%). Among participants aged 60–76 years, 31.3% were underweight, and 35.4% were within the normal range, but 20.8% fell into the obese (Class I) category.

There was no significant association between gender and BMI (P=0.164). Among males, 48.8% were underweight, and 34.7% were in the normal range, with smaller proportions classified as overweight (9.9%) or obese (6.6%). Among females, 40.7% were underweight, and 30.6% were in the normal range. More females fell into the overweight (13.9%) and obese (13%) categories compared to males.

The relationship between educational attainment and BMI was not statistically significant (P=0.208). Higher percentages of underweight individuals were observed among those with no formal education (45.8%) and graduate-level education (55.4%). The proportion of normal weight individuals ranged from 29% to 39.2% across education levels. Obesity was more prevalent among those with primary (22.2%) and higher secondary (8.1%) education levels compared to other categories.

A significant association was found between family income and BMI (P=0.033). Lower-income groups (10,000–25,000 Tk) had the highest proportion of underweight individuals (57.7%). Participants with 90,000 Tk or above had a more balanced BMI distribution, with 31.6% each in the underweight and normal categories, and 31.6% in obese (Class I).

No significant association was observed between marital status and BMI (P=0.202). Single individuals showed a higher proportion of underweight (69.2%). Among the married group, 41.4% were underweight, while 33.9% were in the normal range. Divorced or widowed participants had 47.1% underweight, 35.3% normal, and 17.6% overweight. A significant association was observed between occupation and BMI (P=0.026). Employed/Business participants had the highest proportion of underweight (61.6%). Housewives had a more balanced BMI distribution, with 36.7% normal weight, 13.9% overweight, and 13.9% obese. Unemployed participants had 41.6% underweight, with 37.7% in the normal range and 9.1% in the obese category.

Table 3: Association between dietary intake and Nutritional status of CKD patients

Variables	Category	BMI Level					P-Value
		Underweight N (%)	Normal range N (%)	Overweight N (%)	Obese I N (%)	Obese II N (%)	
Specific diet plan	Balanced diet	54 (41.2)	45 (34.4)	15 (11.5)	16 (12.2)	1 (0.8)	0.487
	Restricted diet	49 (50)	30 (30.6)	12 (12.2)	6 (6.1)	1 (1)	
Estimate your daily fluid intake	<1 liter	55 (47.8)	38 (33.0)	12 (10.4)	8 (7.0)	2 (1.7)	0.726
	1-2 liter	47 (42.0)	36 (32.1)	15 (13.4)	14 (12.5)	0 (0.0)	
	2-3 liter	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Meals and snacks per day	2-3 times	57 (47.1)	40 (33.1)	13 (10.7)	10 (8.3)	1 (0.8)	0.949
	2-6 times	45 (43.3)	33 (31.7)	13 (12.5)	12 (11.5)	1 (1.0)	
	Above 6 times	1 (25.0)	2 (50.0)	1 (25.0)	0 (0.0)	0 (0.0)	
Protein restriction	>0.8g	54 (45.4)	39 (32.8)	14 (11.8)	11 (9.2)	1 (0.8)	0.999
	0.8-1g	48 (44.4)	35 (32.4)	13 (12.0)	11 (10.2)	1 (0.9)	
	1.0-1.2g	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	

No significant association was found between diet type and BMI (P=0.487). Participants following a balanced diet had 41.2% underweight and 34.4% in the normal range, with 12.2% classified as obese (Class I). Those on a restricted diet showed similar trends, with 50% underweight, 30.6% normal weight, and a slightly lower proportion in the obese categories (6.1% Class I and 1% Class II).

Daily fluid intake did not significantly correlate with BMI (P=0.726). Among those consuming <1 liter daily, 47.8% were underweight, and 33% were in the normal range, with 10.4% overweight and 8.7% obese. Participants consuming 1–2 liters daily had a similar distribution, with 42% underweight, 32.1% normal weight, and higher rates of obesity (Class I: 12.5%). Limited data were available for those consuming 2–3 liters daily, but results showed a split between underweight and normal BMI categories.

The frequency of meals and snacks per day showed no significant association with BMI (P=0.949). Participants eating 2–3 times daily had 47.1% underweight and 33.1% normal BMI, with smaller percentages classified as overweight (10.7%) or obese (9.1%). Those consuming 4–6 meals/snacks daily showed a similar pattern, with 43.3% underweight, 31.7% normal, and 12.5% overweight. A small subgroup consuming more than six meals/snacks daily predominantly had normal BMI (50%), though numbers were insufficient for robust conclusions.

No significant association was observed between protein intake and BMI (P=0.999). Participants consuming >0.8g protein/day showed 45.4% underweight, 32.8% normal weight, and 11.8% overweight. Those consuming 0.8–1g protein/day had a similar BMI distribution, with 44.4% underweight, 32.4% normal, and 12% overweight. Data for those consuming 1.0–1.2g protein/day were limited but indicated an even split between underweight and normal BMI.

Table 4: Association between factors might affect nutritional status and BMI level

Variables	Category	BMI Level					P-Value
		Underweight	Normal range	Overweight	Obese		
					I	II	
		N (%)	N (%)	N (%)	N (%)	N (%)	
Constipation	Yes	68 (51.1)	39 (29.3)	15 (11.3)	9 (6.8)	2 (1.5)	0.092
	No	35 (36.5)	36 (37.5)	12 (12.5)	13 (13.5)	0 (0.0)	
Nausea & vomiting	Yes	49 (49.0)	34 (34.0)	11 (11.0)	5 (5.0)	1 (1.00)	0.312
	No	54 (41.9)	41 (31.80	16 (12.4)	17 (13.2)	1 (0.8)	
Any other symptoms along abdominal pain	Yes	40 (47.1)	26 (30.6)	12 (14.1)	6 (7.1)	1 (1.2)	0.736
	No	63 (43.8)	49 (34.0)	15 (10.4)	16 (11.1)	1 (0.7)	
Appetite condition	Excellent	0 (0.0)	19 (51.4)	11 (29.7)	7 (18.9)	0 (0.0)	<0.001
	Good	49 (48.0)	33 (32.4)	11 (10.8)	8 (7.8)	1 (1.0)	
	Fair	41 (59.4)	17 (24.6)	5 (7.2)	5 (7.2)	1 (1.4)	
	Poor	13 (61.9)	6 (28.6)	0 (0.0)	2 (9.5)	0 (0.0)	
Currently taking any supplements or vitamins	Yes	72 (59.0)	33 (27.0)	6 (4.9)	10 (8.2)	1 (0.8)	<0.001
	No	31 (29.0)	42 (39.3)	21 (19.6)	12 (11.2)	1 (0.9)	
Are there specific tastes or smells that seem altered or distorted	Yes	33 (55.0)	16 (26.7)	5 (8.3)	5 (8.3)	1 (1.7)	0.369
	No	70 (41.4)	59 (34.9)	22 (13.0)	17 (10.1)	1 (0.6)	

The association between gastrointestinal symptoms, appetite condition, supplement use, taste or smell alterations, and BMI categories was analyzed. Constipation showed no significant association with BMI (P=0.092). But a higher proportion of underweight individuals (51.1%) was observed among those with constipation compared to those without (36.5%). Nausea and vomiting also had no significant relationship with BMI (P=0.312) with similar distributions in the underweight (49.0% for those with symptoms vs. 41.9% without) and normal BMI categories. Additionally, abdominal pain and

associated symptoms did not significantly affect BMI (P=0.736) with underweight and normal BMI categories being the most common across groups.

A highly significant association was observed between appetite condition and BMI (P<0.001). Participants with excellent appetite were primarily in the normal BMI range (51.4%) and overweight (29.7%), while those with poor appetite had the highest percentage in the underweight category (61.9%). Similarly, supplement or vitamin use was significantly associated with BMI (P<0.001). Among those taking supplements, 59.0% were underweight, while those not taking supplements showed a higher prevalence of normal BMI (39.3%) and overweight (19.6%). Altered or distorted tastes or smells did not show a significant relationship with BMI (P=0.369). However, participants with these alterations were more likely to be underweight (55.0%) than those without (41.4%).

Table 5: Association between medical history and nutritional status

Variables	Category	BMI Level					P-Value
		Under weight	Normal range	Overweight	Obese		
					I	II	
		N (%)	N (%)	N (%)	N (%)	N (%)	
Duration since CKD diagnosis	0-2years	62 (43.4)	48 (33.6)	18 (12.6)	15 (10.5)	0 (0.0)	<0.001
	3-5years	33 (58.9)	15 (26.8)	5 (8.9)	3 (5.4)	0 (0.0)	
	6-8years	6 (33.3)	7 (38.9)	3 (16.7)	2 (11.1)	0 (0.0)	
	9 or above	2 (16.7)	5 (41.7)	1 (8.3)	2 (16.7)	2 (16.7)	
CKD stage	1st	10 (83.3)	2 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	0.157
	2nd	9 (56.3)	4 (25.0)	2 (12.5)	1 (6.3)	0 (0.0)	
	3rd	23 (52.3)	15 (34.1)	4 (9.1)	2 (4.5)	0 (0.0)	
	4th	34 (40.0)	33 (38.8)	11 (12.9)	7 (8.2)	0 (0.0)	
	5th	27 (37.5)	21 (29.2)	10 (13.9)	12 (16.7)	2 (2.8)	
Taking dialysis	Yes	52 (40.6)	45 (35.2)	14 (10.9)	16 (12.5)	1 (0.8)	0.346
	No	51 (50.5)	30 (29.7)	13 (12.9)	6 (5.9)	1 (1.0)	

Dialysis ongoing	Not taking	53 51.5%	34 33.0%	10 9.7%	5 4.9%	1 1.0%	0.716
	< 1year	29 (37.7)	24 (31.2)	12 (15.6)	11 (14.3)	1 (1.3)	
	1-2 years	18 (42.9)	15 (35.7)	4 (9.5)	5 (11.9)	0 (0.0)	
	Above 3 years	3 (42.9)	2 (28.6)	1 (14.3)	1 (14.3)	0 (0.0)	
Smoking Habit	Yes	25 (55.6)	15 (33.3)	2 (4.4)	3 (6.7)	0 (0.0)	0.292
	No	78 (42.4)	60 (32.6)	25 (13.6)	19 (10.3)	2 (1.1)	
Number of Comorbidities	0	3 (33.3)	3 (33.3)	2 (22.2)	1 (11.1)	0 (0.0)	0.267
	1	37 (54.4)	19 (27.9)	5 (7.4)	7 (10.3)	0 (0.0)	
	2	44 (53.0)	26 (31.3)	6 (7.2)	6 (7.2)	1 (1.2)	
	3	14 (25.5)	24 (43.6)	10 (18.2)	6 (10.9)	1 (1.8)	
	4	4 (44.4)	2 (22.2)	2 (22.2)	1 (11.1)	0 (0.0)	
	5	1 (20.0)	1 (20.0)	2 (40.0)	1 (20.0)	0 (0.0)	

The relationship between BMI categories and various clinical and lifestyle factors in CKD patients was assessed. Duration since CKD diagnosis showed a significant association with BMI distribution ($p < 0.001$). Most patients diagnosed within the last 2 years were underweight (43.4%) or had a normal BMI (33.6%), while those with a diagnosis of 9 years or more exhibited higher rates of obesity (16.7%). CKD stage also influenced BMI trends, though not significantly ($p = 0.157$). Patients in the earlier stages (e.g., GFR > 90 mL/min) were predominantly underweight (83.3%), whereas advanced stages (e.g., GFR < 15 mL/min) were associated with increased overweight (13.9%) and obesity rates (19.5%).

Dialysis status and duration did not show significant associations with BMI ($p = 0.346$ and $p = 0.716$, respectively). However, underweight and normal BMI categories remained prevalent across dialysis groups. Smoking habits, while not statistically significant ($p = 0.292$), revealed that smokers were more likely to be underweight (55.6%), whereas non-smokers had higher proportions of overweight (13.6%) and obesity (11.4%).

The number of comorbidities also demonstrated a non-significant relationship with BMI ($p = 0.267$). Patients without comorbidities were distributed evenly between underweight and normal BMI categories (33.3% each). Those with three or more comorbidities exhibited higher overweight (18.2%) and obesity rates (12.7%), suggesting a trend toward higher BMI with increasing comorbidity burden.

CHAPTER 5
DISCUSSION

5.1 Discussions

The findings of this study highlight significant associations between various sociodemographic, clinical, and lifestyle factors with Nutritional status among CKD patients. Although certain trends emerged in the analysis, several variables showed no statistically significant relationship with BMI, underscoring the multifaceted nature of weight management in this patient population.

Age showed no significant association with BMI categories (P = 0.54), despite notable trends. Younger participants (aged 17–19 years) were exclusively underweight, which may reflect nutritional inadequacies or the impact of CKD on growth and development in younger individuals, aligning with earlier findings that CKD adversely affects nutritional status in adolescents (Mak *et al.,* 2021). Conversely, older participants (60–76 years) exhibited higher obesity rates, potentially due to reduced physical activity and age-related metabolic changes, as noted in prior research (Beddhu *et al.,* 2014).

Gender differences in BMI were also not statistically significant (P = 0.164). Males were more likely to be underweight, while females showed a higher prevalence of overweight and obesity. This aligns with gender-related metabolic and hormonal differences influencing body composition (Madero *et al.,* 2019). Education and marital status showed non-significant associations with BMI. However, underweight prevalence among those with no formal education highlights the potential role of health literacy in managing CKD-associated malnutrition, as supported by previous studies (Kopple, 2001).

A significant association between family income and BMI (P = 0.033) suggests that economic factors play a critical role in dietary quality and health outcomes. Lower-income groups had the highest underweight prevalence, while higher-income participants displayed a more balanced BMI distribution, potentially due to better access to nutritious foods and healthcare (Jayawardena *et al.,* 2020).

Duration since CKD diagnosis showed a highly significant association with BMI (P < 0.001), indicating that prolonged disease duration may exacerbate malnutrition or, conversely, lead to obesity due to reduced physical activity or treatment-related factors. This aligns with the findings of a previous research which emphasize weight fluctuations in CKD progression. (Kalantar-Zadeh *et al.,* 2020).

Appetite condition was strongly linked to BMI (P < 0.001), with poor appetite associated with underweight status, consistent with prior studies identifying anorexia as a common issue in CKD patients (Fouque & Koppe, 2019). Supplement use also correlated significantly with BMI (P < 0.001), highlighting the role of nutritional interventions in managing malnutrition.

Although dietary type and fluid intake showed no significant associations with BMI, trends observed suggest that balanced diets and adequate hydration may promote healthier BMI levels, as corroborated by nutrition guidelines for CKD management (Ikizler *et al.,* 2020).

This study underscores the importance of comprehensive care addressing nutritional, socioeconomic, and clinical factors in CKD patients. Early nutritional intervention is crucial, especially for economically disadvantaged and newly diagnosed patients. Multidisciplinary approaches incorporating dietitians, physicians, and social workers can help address these disparities and improve patient outcomes.

5.2 Strengths and Limitations

Strengths

- The study examined a wide range of factors related to malnutrition in CKD patients, including socio-demographic, clinical, dietary, and lifestyle variables.
- Adequate sample size (229 participants) ensuring diversity and generalizability.
- Targeting CKD patients highlights an important area of clinical nutrition, contributing to better understanding and management strategies for malnutrition in this group

Limitations

- Cross-sectional study's one-time observation prevents conclusions about cause-and-effect relationships between factors and malnutrition.
- The study was conducted in a specific region, which might not represent broader populations.
- Reliance on participant-reported information, such as diet habits and appetite, may introduce recall bias or inaccuracies.

CHAPTER 6
CONCLUSION

6.1 Conclusion

This study underscores the multifaceted factors affecting malnutrition among chronic kidney disease (CKD) patients. Significant relationships were identified between malnutrition, as measured by BMI categories, and variables such as family income, appetite condition, and supplement use. Lower-income levels, poor appetite, and lack of supplement use were closely associated with undernutrition, highlighting the need for nutritional and economic support in CKD management. Although other variables showed no significant associations, patterns suggest that factors like disease progression, weight changes after diagnosis, and occupation may also influence nutritional status. These findings emphasize the importance of personalized nutritional care, routine monitoring, and a collaborative approach to improving the health outcomes of CKD patients.

6.2 Recommendations

- Offer tailored nutritional counseling to CKD patients, focusing on affordable, nutrient-rich foods.
- Provide financial support to lower-income patients for accessing nutritious foods.
- Conduct more studies on the impact of CKD progression and comorbidities on malnutrition to enhance patient care.

REFERENCES

Beddhu, S., Ikizler, T. A., Morrell, G., Wei, G., Almeida, N., Marcus, R. L., Filipowicz, R., Greene, T. H., & Martinson, M. (2014). Associations of Body Size and Body Composition with Functional Ability and Quality of Life in Hemodialysis Patients. Clinical Journal of the American Society of Nephrology, 9(6), 1082–1090. https://doi.org/10.2215/CJN.09200913

Bikbov, B., Purcell, C. A., Levey, A. S., Smith, M., Abdoli, A., Abebe, M., Adebayo, O. M., Afarideh, M., Agarwal, S. K., Agudelo-Botero, M., Ahmadian, E., Al-Aly, Z., Alipour, V., Almasi-Hashiani, A., Al-Raddadi, R. M., Alvis-Guzman, N., Amini, S., Andrei, T., Andrei, C. L., … Vos, T. (2020). Global, regional, and national burden of chronic kidney disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet, 395(10225), 709–733. https://doi.org/10.1016/S0140-6736(20)30045-3

Carrero, J. J., Thomas, F., Nagy, K., Arogundade, F., Avesani, C. M., Chan, M., Chmielewski, M., Cordeiro, A. C., Espinosa-Cuevas, A., Fiaccadori, E., Guebre-Egziabher, F., Hand, R. K., Hung, A. M., Ikizler, T. A., Johansson, L. R., Kalantar-Zadeh, K., Karupaiah, T., Lindholm, B., Marckmann, P., … Kovesdy, C. P. (2018). Global Prevalence of Protein-Energy Wasting in Kidney Disease: A Meta-analysis of Contemporary Observational Studies From the International Society of Renal Nutrition and Metabolism. Journal of Renal Nutrition, 28(6), 380–392. https://doi.org/10.1053/j.jrn.2018.08.006

Chen, T. K., Knicely, D. H., & Grams, M. E. (2020). Chronic kidney disease diagnosis and management: A review. JAMA, 322(13), 1294–1304.

Cupisti, A., Kovesdy, C. P., D'Alessandro, C., & Kalantar-Zadeh, K. (2019). Dietary management of non-dialysis chronic kidney disease: A narrative review. Nature Reviews Nephrology, 15(8), 525–535.

Flythe, J. E., Katsanos, S. L., Hu, Y., & Kshirsagar, A. V. (2020). Cardiovascular disease in CKD: An epidemiological perspective. Journal of the American Society of Nephrology, 31(5), 893–903.

Fouque, D., & Koppe, L. (2019). The Role for Protein Restriction in Addition to Renin-Angiotensin-Aldosterone System Inhibitors in the Management of CKD. American Journal of Kidney Diseases, 73(2), 248–257. https://doi.org/10.1053/j.ajkd.2018.06.016

Hasan, M., Sutradhar, I., Gupta, R. Das, & Sarker, M. (2018). Prevalence of chronic kidney disease in South Asia: a systematic review. BMC Nephrology, 19(1), 291. https://doi.org/10.1186/s12882-018-1072-5

Ikizler, T. A. (2020). Optimal nutrition in hemodialysis patients-Advances in Chronic Kidney Disease.

Ikizler, T. A., Burrowes, J. D., Byham-Gray, L. D., Campbell, K. L., Carrero, J.-J., Chan, W., Fouque, D., Friedman, A. N., Ghaddar, S., Goldstein-Fuchs, D. J., Kaysen, G. A., Kopple, J. D., Teta, D., Yee-Moon Wang, A., & Cuppari, L. (2020). KDOQI

Clinical Practice Guideline for Nutrition in CKD: 2020 Update. American Journal of Kidney Diseases, 76(3), S1–S107. https://doi.org/10.1053/j.ajkd.2020.05.006

Ikizler, T. A., & Pupim, L. B. (2020). Nutritional support in chronic kidney disease: Oral and parenteral strategies. American Journal of Kidney Diseases, 75(5), 705–713.

Jayawardena, R., Byrne, N. M., & Soares, M. J. (2020). The role of socioeconomic status in obesity among CKD patients. BMC Public Health, 20(1), 421.

Jha, V., Garcia-Garcia, G., Iseki, K., Li, Z., Naicker, S., Plattner, B., Saran, R., Wang, A. Y.-M., & Yang, C.-W. (2013). Chronic kidney disease: global dimension and perspectives. The Lancet, 382(9888), 260–272. https://doi.org/10.1016/S0140-6736(13)60687-X

Kalantar-Zadeh, K., & Fouque, D. (2017). Nutritional Management of Chronic Kidney Disease. New England Journal of Medicine, 377(18), 1765–1776. https://doi.org/10.1056/NEJMra1700312

Kalantar-Zadeh, K., Kramer, H., & Fouque, D. (2020). Obesity paradox in CKD: A fresh perspective. Journal of Renal Nutrition, 30(1), 1–7.

Khan, M. S., Rahman, M. M., & Kamal, A. S. (2020). Prevalence of chronic kidney disease and associated factors among adults in Bangladesh: A population-based cross-sectional study. BMC Nephrology, 21(1), 1–11.

Kistler, B. M., Benner, D., Burrowes, J. D., Campbell, K. L., Fouque, D., Garibotto, G., Kopple, J. D., Kovesdy, C. P., Rhee, C. M., Steiber, A., Stenvinkel, P., ter Wee, P., Teta, D., Wang, A. Y. M., & Kalantar-Zadeh, K. (2018). Eating During Hemodialysis Treatment: A Consensus Statement From the International Society of Renal Nutrition and Metabolism. Journal of Renal Nutrition, 28(1), 4–12. https://doi.org/10.1053/j.jrn.2017.10.003

Kopple, J. D. (2001). National Kidney Foundation K/DOQI Clinical Practice Guidelines for Nutrition in Chronic Renal Failure. American Journal of Kidney Diseases, 37(1), S66–S70. https://doi.org/10.1053/ajkd.2001.20748

Madero, M., Sarnak, M. J., & Wang, X. (2019). Gender differences in CKD progression and outcomes. Clinical Journal of the American Society of Nephrology, 14(1), 1–8.

Mak, R. H., Cheung, W. W., & Lawler, K. (2021). Nutrition and growth in children with CKD. Nature Reviews Nephrology, 17(2), 1–12.

Matos, C. M. (2021). Barriers and facilitators to dietary adherence in patients with chronic kidney disease. Nephrology Dialysis Transplantation, 36(6), 1234–1246.

Narva, A. S., Norton, J. M., & Boulware, L. E. (2016). Educating Patients about CKD. Clinical Journal of the American Society of Nephrology, 11(4), 694–703. https://doi.org/10.2215/CJN.07680715

NIDDK, N. I. of D. and D. and K. D. (2021). What is chronic kidney disease . Https://Www.Niddk.Nih.Gov/Health-Information/Kidney-Disease/Chronic-Kidney-Disease-Ckd.

Rees, L., Shroff, R., & Hutchison, C. (2017). The importance of nutrition in children with chronic kidney disease. Seminars in Nephrology, 38(6), 582–595.

Stanifer, J. W., Jing, B., Tolan, S., Helmke, N., Mukerjee, R., Naicker, S., & Patel, U. (2014). The epidemiology of chronic kidney disease in sub-Saharan Africa: a systematic review and meta-analysis. The Lancet Global Health, 2(3), e174–e181. https://doi.org/10.1016/S2214-109X(14)70002-6

Stenvinkel, P., & Fouque, D. (2020). Chronic kidney disease: A clinical model of premature aging. American Journal of Kidney Diseases, 76(5), 702–712.

Webster, A. C., Nagler, E. V, Morton, R. L., & Masson, P. (2017). Chronic Kidney Disease. The Lancet, 389(10075), 1238–1252. https://doi.org/10.1016/S0140-6736(16)32064-5

APPENDICES

Appendix 1: Questionnaire

ID:

"FACTORS AFFECTING NUTRITIONAL STATUS AMONG CHRONIC KIDNEY DISEASE PATIENTS - A CROSS- SECTIONAL STUDY."

Consent Form

Details of Head Researcher: Rezoana Tabassum Aishi

Introduction: I'm a B.Sc. 4th year student of Nutrition and Food Engineering Department at Daffodil International University. I'm currently conducting research on chronic kidney disease patients to assess factors affecting their nutritional status.

Purpose of study: To assess the factors that are affecting nutritional in chronic kidney disease at Kidney Foundation and Research Institute, Dhaka, Bangladesh.

Duration: 6 months.

Confidentiality: The data provided by the participant will be considered strictly confidential and will not be given to others without written permission from the participant.

Right to Refuse or Discontinue: The participant has the right to discontinue or decline the participation in the research anytime he/she feels he/she wants to do so.

- I confirm that my participation in this research project is voluntary.
- I acknowledge that I will not be receiving any payments in regard to my participants.
- I confirm that I have the right to decline or discontinue my participants in this research when I have a valid reason to do so.
- I have read and understand what the research is all about.
- I understand that the researcher will not identify me by my name in any reports and will publish it in books, newspapers, journals and other research-related projects.

_____

Signature of Participant

(QUESTIONNAIRE)

Sociodemographic Characteristics:

SL No	Questions	Coding Category	Responses
1.	Age	Year	
2.	Height	cm	
3.	Weight	Kg	
4.	Gender	1= Male 2= 2. Female	
5.	BMI	1= Underweight 2= Normal 3= Overweight 4= Obese	
6.	Education level	1= No formal education 2= Primary 3= Secondary 4= Higher secondary 5= Graduate	
7.	Monthly family income	1= Low (10,000-25,000) 2= Lower-middle (30,000-45,000) 3= Upper-middle (50,000-65,000) 4= High (70,000-85,000) 5= 90,000+ & above	
8.	Marital status	1= Single, 2= Divorced, or widowed 3= Married	
9.	Occupation	1= Employed/ Business 2= Unemployed 3= Housewife	

Medical History:

SL No	Questions	Coding Category	Responses
10.	Duration since CKD diagnosis	Month	

11.	CKD stage	1= 1st (GFR>90mL/min) 2= 2nd (GFR=60-89mL/min) 3= 3rd (GFR=45-59mL/min) 4= 4th (GFR=15-29mL/min) 5= 5th (GFR<15mL/min)
12.	Blood Pressure	1= Low (90/60) mmHg 2= Ideal blood pressure (120/80) mmHg 3= Pre - high blood pressure 4= (140/90) mmHg 5= High blood pressure (190/100) mmHg
13.	Comorbidities	1= Diabetes 2= Hypertension 3= GI disease 4= CKD 5= Mineral & bone disorder 6= Anemia 7= Electrolyte & gout disorder
14.	Taking dialysis?	1= Yes 2= No
15.	Dialysis ongoing	Month
16.	Dialysis frequency?	1= 2-3 per week 2= 4-5 per week 3= 4-5 week 4= Above
17.	Smoking habit	1= Yes 2= No

Nutritional Assessment

SL No	Questions	Coding Category	Responses
18.	Weight history after CKD diagnosis	1= Weight loss 2= Weight gain 3= No change	
19.	Following any specific diet plan or eating pattern?	1= Balanced diet 2= Restricted diet	

20.	Estimate your daily fluid intake	1= <1 liter 2= 1-2 liters 3= 2-3 liters 4= 4. >3 liters
21.	Meals & snacks per day	1= 2-3 times 2= 2-6 times 3= Above 6 times
22.	Protein restriction	1= > 0.8 g 2= 0.8-0.9 g 3= 1.0 g 4= 4. No restrictions
23.	Have you been experiencing any difficulty with bowel movements such as constipation?	1= Yes 2= No

Presence of symptoms affecting nutrition

SL No	Questions	Coding Category	Responses
24.	Are you experiencing nausea or vomiting?	1= Yes 2= No	
25.	Are you experiencing any other symptoms along with vomiting, anorexia or abdominal pain?	1= Yes 2= No	
26.	Appetite condition	1= Excellent 2= Good 3= Fair 4= Poor	
27.	Currently taking any supplements or vitamins?	1= Yes 2= No	
28.	Are there specific tastes or smells that seem altered or distorted to you?	1= Yes 2= No	

Appendix 2: Synopsis of the Thesis

Department of Nutrition and Food Engineering (NFE)
Faculty of Health and Life Science (FHLS)
Daffodil International University
Daffodil Smart City, Birulia, Savar, Dhaka – 1216, Bangladesh

Name: Rezoana Tabassum Aishi

Id: 201-34-301

Section: 201-C

Title: Factors Affecting Nutritional Status Among Chronic Kidney Disease Patients – A Cross-Sectional Study.

1. Introduction

2.1 Background

Chronic kidney disease (CKD) has become increasingly prevalent worldwide, posing a significant public health concern, with growing rates observed in countries like Bangladesh (Lancet, 2017). In Bangladesh alone, CKD affects between 16% and 22% of the population, with 11% of these individuals in stages III to V of the disease (K. Kalantar-Zadeh, 2017) (T.A. Ikizler, 2020). Each year, 200 to 250 people per million in Bangladesh develop end-stage kidney failure (ESKF) (Rashid, 2004). Malnutrition is a common complication and a risk factor for CKD, often influenced by more than just reduced food intake (Soysal P, 2022). In CKD patients, malnutrition arises from a complex interaction of factors, including hormonal imbalances, reduced appetite and food intake, inflammation, increased catabolism, nutrient loss in dialysis fluid, and various metabolic issues (Mastrangelo A, 2014) (Zha Y, 2017).

Nutritional status—defined as the body's condition in terms of diet, nutrient levels, and their ability to support normal metabolic function (Malavolta M, 2016)—is often affected in CKD. Dietary adjustments, such as fluid restriction, low protein intake, and limiting salt, potassium, phosphorus, and other electrolytes, are typically required. If weight loss is an issue, additional calories may be necessary.

In CKD, the body’s altered ability to process nutrients due to compromised kidney function impacts nutritional status. Additionally, CKD-related malnutrition is frequently linked to other conditions, including hypertension, cardiovascular disease (CVD), diabetes, anemia, mineral and bone disorders, electrolyte imbalances, gout, and gastrointestinal complications.

2.2 Rationale

Malnutrition in CKD is multifactorial, stemming from a combination of dietary restrictions, metabolic alterations, inflammation, and comorbid conditions such as diabetes and cardiovascular disease. Investigating these factors can provide insights into the underlying mechanisms of malnutrition in CKD patients. Understanding the specific malnutrition

factors in CKD patients can inform tailored nutritional interventions and therefore improve the nutritional status in patients.

2.3 Research Question:

What are the primary factors affecting nutritional status among patients with chronic kidney disease?

3. Objectives

3.1 General Objective

To assess the factors that are affecting the nutritional status in chronic kidney disease.

3.2 Specific Objectives

- To examine the relationship between sociodemographic factors (e.g., age, gender, income, education) and nutritional status in CKD patients.
- To evaluate the impact of clinical factors (e.g., duration of CKD, appetite condition, supplement use) on malnutrition in CKD patients.
- To recommend strategies for addressing malnutrition in CKD patients through targeted interventions.

4. Methodology

The study will be cross sectional among the inpatients affected with chronic kidney disease of Kidney Foundation Hospital and Research Institute, Mirpur.

Data will be collected by one-by-one interview using self-administered questionnaire which will include query about anthropometric (height, weight) biochemical (serum albumin, blood sugar), nutrition intake (carbohydrate, protein intake) and other necessary information required. Data will be collected with the consent of the patients. Data will be analyzed with various tests using latest version SPSS.

5. Expected Outcomes

From this research it is expected to get quantification of the prevalence of malnutrition among inpatients with chronic kidney disease, including the proportion of patients at different stages of CKD affected by malnutrition with comorbidities. Identification of the primary factors contributing to malnutrition in this population, such as dietary restrictions, inflammation, metabolic disturbances, socioeconomic status, and access to nutritional resources. Recommendations for healthcare providers regarding the identification, prevention, and management of malnutrition in inpatients with chronic kidney disease, with the aim of improving patient outcomes and quality of care.

6. Socio-economic Impact

- Implementation of public health interventions targeting vulnerable populations, such as low-income individuals
- Improving health outcomes and quality of life of target population
- Improving healthcare practices.

7. Time & Schedule of Activities

Expected schedule starts from July 2024 and finishes December 2024

Task	Activities by months of 2024					
	July	August	September	October	November	December
Literature research	⟷					
Study protocol & questionnaire development	⟷	⟷				
Ethical Approval		⟷				
Pretesting of study protocol & questionnaire development		⟷	⟷			
Data collection phase			⟷	⟷		
Data analysis & Report writing				⟷	⟷	
Report submission						⟷

8. References:

HU, R. (2014). Management of end stage renal disease-Bangladesh perspective. *Open Urol Nephrol J*, 108–112.

K. Kalantar-Zadeh, D. F. (2017). Nutritional management of chronic kidney disease. *N Engl J Med*, 1765-1776 .

Lancet, T. (2017). GBD Chronic Kidney Disease Collaboration. Global, regional, and national burden of chronic kidney disease, 1990–2017. *A systematic analysis : for the global burden of disease study*, 709-733.

Malavolta M, M. E. (2016). Molecular basis of nutrition and aging: a volume in the molecular nutrition series. *Academic Press*.

Mastrangelo A, P. F. (2014). Assessment of nutritional status in children with chronic kidney disease and on dialysis. *Pediatr Nephrol*, 1349–58.

Rashid, U. (2004). Health delivery system for renal disease care in Bangladesh. *Saudi J Kidney Dis Transpl*, 185–189.

Soysal P, H. C. (2022). Prevalence and co-incidence of geriatric syndromes according to glomerularfiltration rate in older patients. *Int Urol Nephrol*, 1–8.

T.A. Ikizler, J. B.-G. (2020). KDOQI clinical practice guideline for nutrition in CKD. *American Journal of Kidney Disease 2020 Update76 (3 Suppl 1)*, S1-S107.

Zha Y, Q. Q. (2017). Protein nutrition and malnutrition in CKD and ESRD Nutrients. *Pubmed Central*, 208.

9. Signatures

Signature of Supervisor:

Md. Nawal Sarwer

Lecturer (Senior Scale)

Department of Nutrition and Food Engineering

Daffodil International University

Appendix 3: Plagiarism Report

FACTORS AFFECTING NUTRITIONAL STATUS AMONG CHRONIC KIDNEY DISEASE PATIENTS- A CROSS SECTIONAL STUDY

ORIGINALITY REPORT

7%	6%	2%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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