

**PROTEIN ENERGY WASTING AND ASSOCIATED FACTORS AMONG CHRONIC
KIDNEY DISEASE PATIENTS AT ST. PAUL’S HOSPITAL MILLENNIUM MEDICAL
COLLEGE, ADDIS ABABA, ETHIOPIA**



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Abstract

Background: Protein energy wasting is a major issue in patients with chronic kidney disease (CKD), adversely affecting morbidity, mortality, functional activity and quality of life. Assessment of nutritional status in CKD patients is important to ensure patients normal protein stores and avoid metabolic complications. However, in Ethiopia there are very few studies that have assessed prevalence of Protein energy wasting (PEW) and its associated factors among CKD patients. **Objectives:** To assess protein energy wasting and associated factors among chronic kidney disease patients at adult OPD St. Paulo's Hospital Millennium Medical College, Addis Ababa Ethiopia, March1 to April15, 2019.

Methods: An institution based cross sectional study was conducted from March to April 2019. Data were collected using structured interviewer administered questionnaire, anthropometric measurements and laboratory data were collected from patient files. The subjective global assessment tool was used to collect additional nutritional related data. Data were entered to Epi-data version 3.1 and analyzed using SPSS version 20. Both bi-variate and multivariable logistic regression analysis was performed to identify associated factors. P values <0.05 was considered to declare statistical significance.

Results: The prevalence of protein energy wasting in CKD patients was 23.4%. Patients who were advised to reduced salt consumption by a doctor were 76% less likely to have protein energy wasting compared to those who were not advised to reduced salt consumption [AOR=0.24,95% CI:(0.06, 0.92)]. Odds of PEW among chronic kidney patients who were at CKD stage 4 and 5 was 2.2 times higher than odds of PEW among patients at stages 1-3 [AOR=2.2,95% (CI:1.01, 4.8)]. Furthermore, as subjective global assessment score increase by one unity the odds of having PEW was1.24 times higher. **Conclusion:** The prevalence of protein energy wasting among CKD patients was high and associated with CKD stages, subjective global assessment score and advised to reduce salt consumption. Interventions that address nutritional problems and lifestyle factors in CKD patients need to be implemented together with medical treatment.

Keywords: Chronic kidney disease, Protein energy wasting, Body mass index, Body weight loss, Serum albumin, Total serum cholesterol, Glomerular filtration rate.

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LIST OF ACRONYMS AND ABBREVIATIONS

AOR	Adjusted odd ratio
AKI	Acute kidney infection
BMI	Body mass index
BP	Blood Pressure
BUN	Blood Urea Nitrogen
CAD	Coronary artery disease
CI	Confidence interval
CKD	Chronic kidney disease
COR	Crude odd ratio
CVD	Cardiovascular disease
DASH	Dietary Approaches to Stop Hypertension
DC	Data collection
DM	Diabetes Mellitus
eGFR	Estimated Glomerular filtration rate
FH-KD	End Stage Kidney Disease
FMOH	Federal Ministry of Health
GFR	Glomerular filtration rate
HD	Hemodialysis
HTN	Hypertension
ISRNM	International Society of Renal Nutrition and Metabolism
MAMC	Mid Arm Muscle Circumference
MDRD	Modifications of Diet in Renal Disease
MNA	Mini Nutritional Assessment
NEOERICA	Opportunities for Early Renal Intervention by Computerized Assessment
OPD	Outpatient department
PEW	Protein energy wasting
SGA	Subjective Global Assessment
US	United States
USRDS	United States Renal Data System
VIF	Variance inflation factor
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background

Chronic kidney disease (CKD) is defined as reduction of kidney function that an estimated Glomerular filtration rate (eGFR) < 60 ml/min/1.73m², increased urinary albumin excretion (albuminuria defined as > 30 mg of urine albumin per gram of urine creatinine) or both for > 3 months(1). National Kidney Disease Education Program, define kidney as, it regulate the composition and volume of blood, remove metabolic wastes in the urine, and help control the acid/base balance in the body. It also produces erythropoietin needed for red-blood cell synthesis and activates vitamin D needed for calcium absorption and bone health(2)

Chronic kidney disease (CKD) is a world-wide public health problem associated with adverse outcomes of kidney failure, cardiovascular disease (CVD), and premature death.(3)There is an increasing incidence and prevalence of patients with kidney failure requiring replacement therapy, with poor outcomes and high cost(4).The risk of all cause and cardiovascular mortality, kidney failure, cardiovascular disease and hospitalizations is higher among diabetic patients with CKD (5).Obesity, hypertension and diabetes resulted due to changes in life style and urbanization has led to an increased risk of CKD. Years of high blood pressure can damage the delicate filters in the kidney, leading to less efficient removal of waste products from the kidney(6).In the United States, the prevalence of CKD is approximately 30% among adults with hypertension and 17% among obese adults(7).

The International Society of Renal Nutrition and Metabolism (ISRNM) panel has described PEW as a state of decreased body stores of protein and energy fuels. It describes a progressive loss of adipose tissue and lean body mass, with cachexia constituting the severe form of protein energy wasting (PEW).This deterioration of the clinical nutritional status is characterized by low visceral proteins levels (serum albumin, prealbumin), cholesterol and decreased anthropometric measurements (8).

Protein energy wasting (PEW) is common in patients with chronic kidney disease (CKD) and is associated with adverse clinical outcomes, especially in individuals receiving maintenance dialysis therapy. A multitude of factors can affect the nutritional and metabolic status of CKD

patients requiring a combination of therapeutic maneuvers to prevent or reverse protein and energy depletion(9).

There is a high prevalence of protein-energy malnutrition in both non-dialyzed patients with advanced chronic renal failure and in those individuals with end-stage renal disease who are receiving maintenance hemo-dialysis or chronic peritoneal dialysis therapy. Approximately one-third of maintenance dialysis patients have mild to moderate protein-energy malnutrition, and about 6 to 8 percent of these individuals have severe malnutrition. These statistics are of major concern because markers of protein-energy malnutrition are strong predictors of morbidity and mortality(10).

The Dietary Approaches to Stop Hypertension (DASH) diet is a dietary pattern promoted by the US National Institutes of Health for prevention and control of arterial hypertension. The DASH diet is rich in fruits, vegetables, whole grains, and low-fat dairy foods; it also includes meat, fish, poultry, nuts, and beans, whereas sugar-sweetened foods and beverages, red meat, and added fats are limited. Both the DASH and Mediterranean diets appear to represent dietary patterns useful for primary prevention of CVD and CKD. Nutritional education leading to improved dietary habits also forms the basis for more specific dietary interventions in patients with CKD(11).

Consumption of grain or wholegrain bread fibers decreases the incidence of CKD, either by reducing the postprandial hyperglycemic peak, by lowering albumin-urea, or by reducing other risk factors. The increasing incidence and prevalence of CKD needs the development of effective, patient centered therapeutic strategies. Diet has a vital role in optimizing CKD prognosis by increasing the quality of life and decreasing morbidity(12).

Accordingly, the minimum protein and energy requirements for patients on maintenance hemo- and peritoneal dialysis are 1.2 g/kg of ideal body weight per day and 30–35 kcal/kg of ideal body weight per day based on physical activity level, respectively. In addition to conventional strategies to improve dietary nutrient intake, monitored, in-center provision of high-protein meals or supplements during hemodialysis is a feasible strategy and should be advocated in patients at risk (13).

However, in Ethiopia there are few studies on the prevalence of protein energy wasting (PEW) and its associated factors among CKD patients. And also no more nutritional education during intervention of CKD patients to improved dietary habits. This research deals to determine prevalence of protein energy wasting and associated factors among chronic kidney disease patients and provide the finding to improve the patients' treatment outcome.

1.2 Statement of the Problem

The increasing prevalence of chronic kidney disease has become a public health issue worldwide and reached epidemic levels over the last few decades. According to recent report, It has been estimated that is 8-16% of world population have chronic kidney disease. Its Complications include increased all-cause and cardiovascular mortality, kidney-disease progression, acute kidney injury, cognitive decline, anemia, protein energy wasting, mineral and bone disorders, and fractures which have huge impact on global economic growth(14).

The health and economic burdens of CKD are high. Patients with CKD are at increased risk for cardiovascular disease (CVD) and end-stage renal failure. Adverse changes in nutrition are prevalent with decreasing renal function and are a strong indicator of adverse outcomes in patients with CKD(15). Approximately 1 in 3 adult with diabetes and 1 in 5 adult with high blood pressure may have chronic kidney disease. CKD is estimated to be more common in women than in men (16% vs 13%) and in non-Hispanic blacks than in non-Hispanic whites (18% vs 13%) (16).

Developing countries now face a double challenge. Besides acute infectious illnesses, they are experiencing the growing problem of chronic diseases, including CKD. In most of sub-Saharan Africa, the vast majority of patients hospitalized with CKD quickly die because of lack of means for treatment. By 2020, the burden of diabetes and cardiovascular diseases would have increased by 130% in Africa, with concomitant increases in the incidence of CKD and ESRD which contribute to increase adverse changes in their nutritional status (17).

A systematic review of 98 studies conducted in African continent show that, the overall prevalence was 15.8% for CKD stages 1–5 and 4.6% for CKD stages 3–5 in the general population (18). Protein-energy wasting (PEW) is common in patients with chronic kidney disease (CKD) and is associated with an increased death risk from cardiovascular diseases. The associated factors for PEW are not fully understood but the results of different literatures have associated protein energy wasting with certain factors such as Metabolic conditions, poor appetite, inadequate nutrient intake, insulin resistance, infection, and oxidative stress(9).

Globally, meta-analysis observational studies (published during 2000-2014) from the International Society of Renal Nutrition and Metabolism (ISRNM) conducted five studies, patients with CKD stages 3-5 reported PEW prevalence ranging from 11% to 54%. Finally, 90 studies from 34 countries reported, the 25th-75th percentiles range in PEW prevalence among dialysis studies was 28-54%. Large variation in PEW prevalence across studies remained even when accounting for moderators(19).

A study conducted in Europe reported that, 26% had moderate PEW (SGA 3-5), and less than 1% had severe PEW (SGA 1-2). Muscle wasting and loss of fat tissue were the most frequent alterations according to the SGA subscales, especially in those aged >80 years. The prevalence of PEW was higher among women, increased with age(20). A study conducted among patients with CKD at Mulago hospital, Kampala-Uganda: show that prevalence of PEW among CKD patients was 47.3% compared to 21.3% among the non-CKD participants(21).

In Africa, a study conducted at HKM teaching hospital in Cotonou in Sub Saharan based on different tools assessment MNA score, SGA score, and ISRNM criteria reported that 42.75%, 36.24% ,and 14.09% of CKD patients were experienced protein energy wasting respectively(22).

In Ethiopia, there is no national level data but studies from Addis Ababa, at Black Lion Hospital revealed significant prevalence of PEW (20%) in chronic kidney disease patients. There was significant lowering of serum albumin, BMI and mid arm muscle circumference (MAMC) among all groups of CKD patients when compared with controls $p < 0.05$. The prevalence of protein energy wasting increased with advancing stage of CKD. Sixty three point two percent (63.2%) of patients with GFR < 15 ml/min/1.73m² had lowest BMI values < 18.5 kg/m². Biochemical and anthropometric parameters deteriorated as kidney function decreased(23).

Malnutrition is a common problem in most late-stage CKD patients because of the metabolic and endocrine disturbances that lead to poor appetite and weight loss. The clinical consequence of PEW may be severe and requires rapid and effective treatment since it is associated with increased hospitalization rates; poor wound healing, increased susceptibility to infection, increased overall and cardiovascular mortality rate (24).

Efforts to address non communicable diseases in Ethiopia have not specifically targeted CKD patients. Also, there is limited studies in Ethiopia were conducted to estimate the magnitude of PEW and its determinants which is an important step towards planning effective intervention strategies. Therefore this study was conducted to determine prevalence of protein energy wasting and associated factors among chronic kidney disease patients.

CHAPTER TWO: LITERATURE REVIEW

Protein-energy wasting (PEW), a term proposed by the International Society of Renal Nutrition and Metabolism (ISRNM), refers to the multiple nutritional and catabolic alterations that occur in chronic kidney disease (CKD) and associate with morbidity and mortality. (8)ISRNM provides the consensus statement of current knowledge on the etiology of PEW syndrome in CKD. Though are insufficient food intake (true under nutrition) due to poor appetite and dietary restrictions, uremia-induced alterations such as increased energy expenditure, persistent inflammation, acidosis, and multiple endocrine disorders that render a state of hyper-metabolism leading to excess catabolism of muscle and fat. In addition, co-morbid conditions associated with CKD, poor physical activity, and the CKD stages further contributed to PEW(25). According to the International Society of Renal Nutrition and Metabolism (ISRNM) expert panel, the diagnosis of PEW can be made using four main diagnostic criteria:

The expert panel recommended that at least three of the four diagnostic categories (and at least one test in each of the selected category) must be abnormal for the diagnosis of PEW (8).

Table 1: Protein Energy Wasting: Diagnostic Criteria

Criteria proposed by the International Society of Renal Nutrition and Metabolism expert panel to classify the nutritional status of CKD patients

1	Serum Chemistry Serum albumin < 3.8 g/ 100 ml (Bromocresol Green) Serum pre-albumin (trans-thyretine) < 30 mg/ml Serum cholesterol < 100 mg/100 ml
2	Body Mass BMI <23 kg/m ² for dialyzed pts and <18.5 kg/m ² for non-dialyzed pts Unintentional weight loss over time: 5% over 3 months or 10% over 6 months Total body fat percentage <10%
3	Muscle Mass Muscle wasting: reduced muscle mass 5% over three months or 10% over 6 months Mid-arm muscle circumference area: reduction > 10% in relation to 50th percentile of National Health and Nutrition Examination Surveys II(NHANES II)
4	Dietary Intake Unintentional low dietary protein intake < 0.8 g/kg/day for 2 months for dialysis patients <0.6 g/kg/day, for patients with CKD stage 2-5 Unintentional low dietary energy intake (DEI) < 25 kcal/kg/day for 2 months.

2.1 Etiology of Protein-Energy Wasting in chronic kidney disease Patients

2.1.1 Socio-demography as a cause of PEW

A NEOERICA cohort study reported that the overall prevalence of CKD stage 3–5 was 8.5% and was higher in females, 10.6% versus 5.8% in males. In addition, the numbers of those aged ≥ 70 years increased as eGFR fell; 76.7% of persons with $eGFR \leq 30$ ml/min/1.73 m² were aged ≥ 70 years(26).

A two surveys conducted in USA and Japan (N = 1188 and 382, respectively) reported that, kidney function declined with age in both countries and indicating that the age related decrement in kidney function was larger for women. The decline associated with aging was also more prominent in African-Americans than white Americans (27).

A case- control study conducted among 120 pre-dialysis CKD and 40 age matched control subjects in a teaching hospital in Southern Nigeria reported that, the mean age of the CKD subjects was 48.8 ± 16.6 years with a male: female ratio of 1.7:1 and prevalence of malnutrition in the CKD subjects was 46.7%, higher than 27.5% observed in the controls ($p=0.033$). It was significantly commoner in elderly patients ($p=0.047$) but not significantly different between males and females ($p=0.188$) (28).

Family history of kidney disease (FH-KD), present in 18.7% of participants, was associated with a higher prevalence of CKD than its absence: 42.5% vs. 12.6% by MDRD ($P<0.001$). Furthermore, obesity that was reported in 14.5% of participants was associated with a high prevalence of CKD compared with lack of obesity: 45.2% vs. 13.7% by MDRD (29).

An institutional based cross sectional study conducted at Zewditu Memorial hospital among 320 participants, overall prevalence of CKD was 39 (12.2%). Gender result illustrates CKD more prevalent on males than females: 24 (62%) vs 15 (38%). CKD cases related to incorporates 7 (17.9%) cases of Diabetic mellitus, 23 (58.9) of Hypertension and 9 (23.1%) of patients with cardiac problem. Kidney infection history consists of 113 (35.3%) of the respondents. CKD prevalence was higher among participants with history of kidney infection encompasses 35 (89.7%) (30).

2.1.2 Anorexia as a cause of PEW

Anorexia, defined as the loss of the desire to eat, is relatively common in CKD patients, has detrimental effects on the nutritional status, the quality of life and survival, occurring in one-third of cases. Anorexia reduces oral energy and protein intakes, thus contributing to the development of malnutrition(31). The CKD-associated factors, such as metabolic acidosis, intestinal edema or increased uremic toxin levels, are involved in the development of dysbiosis which cause nausea and vomiting. Moreover, drugs (antibiotics, proton pump inhibitors and iron supplements) and dietary restrictions (reduced dietary fiber intake) further alter the microbiome(32).

Increased total ghrelin levels in CKD are primarily due to decreased degradation of ghrelin in the kidney. Acylated ghrelin promotes food intake while des-acyl ghrelin induces negative energy balance. A study conducted among 40 hospitalized children from 2013 to 2014 show that, 33 (82.5%) of them experienced anorexia (33).

A study conducted in Niger, among 65 patients reported that there were history of hypertension and diabetes in 90.8% and 4.6% respectively. The prevalence of under-nutrition was 29.30%, the mean BMI was 21.60 ± 4.47 kg/m². Eighteen patients (27.7%) had anorexia, and the mean serum creatinine level was 106.32 ± 44.219 g/dl. They concluded that there is a statistically significant relationship between under-nutrition and anorexia and co-morbidities. Biologically, the levels of albumin ($p = 0.03$), and urea ($p = 0.001$) were also associated with under-nutrition. On the other hand, they did not observe any significant relationship between under-nutrition and serum creatinine (34).

2.1.3 Co-morbidity conditions as a cause of PEW

Patients with CKD secondary to diabetes mellitus have a higher incidence of PEW than those without diabetes. The degree of insulin resistance and/or insulin deprivation seems to play the most critical role in this process. Patients with CKD also often have protein depletion because of gastrointestinal disturbances (e.g., diabetic gastro-paresis, nausea and vomiting, bacterial overgrowth in the gut, pancreatic insufficiency, and impaired intestinal protein absorption)(35).

A Review study conducted in France, it is estimated that almost 40% of patients with end-stage renal failure have diabetes. Diabetes and renal disease are both risk factors for cardiovascular morbidity and mortality. Diabetes and chronic renal disease are closely linked deterioration of renal function modifies the clearance of hypo-glycaemic treatments and reduces renal neoglucogenesis, and induce insulin resistance(36).

Contraindicate of this, case report among impact of Diabetes on the nutritional status of CKD patients in India reports that, better nutritional status was found in the CKD patients with Diabetes Mellitus (DM) than the CKD patients without DM which may be due to their normal appetite/ polyphagia, hence allowing a better food intake among CKD patients with Diabetes Mellitus. Where about 88% of CKD patients without diabetes were anorexic and about 55% and 25% of CKD patients with Diabetes Mellitus had polyphagia and normal appetite respectively. Weight gain in CKD with DM patients may be due to increase in fat mass which is subsequent to lipogenic effect of insulin(6).

2.1.4 CKD stage as a cause of PEW

A review conducted by Kidney International (2006) concluded that, Protein energy malnutrition (PEM) is highly prevalent in patients with chronic kidney disease (CKD) and is a strong predictor of morbidity and mortality. PEM is reported to be present in as many as 37–48% of CKD patients(37).

A case-control study conducted in a teaching hospital in Southern Nigeria reported that, the prevalence of malnutrition was significantly higher in patients ≥ 65 years of age compared to those aged less than 65 years ($p=0.047$). There was a significant increase in prevalence of malnutrition across CKD stages 2 to 5 from 30.8% to 69.2% ($p=0.020$). But, no significant observed difference in the proportions of patients with malnutrition based on gender.(28).

A cross-sectional study conducted at Mulago hospital, Kampala-Uganda show that, PEW was associated with the stage of CKD, they concluded CKD patients with stage 4 were 6.4 times more likely to develop PEW compared to stage 1 CKD(21).

2.1.5 Risky life style as a cause of PEW in CKD

Cigarette smoking and alcohol consumption increased the risk of CKD progression and cardiovascular risk. Chronic alcohol consumption has been linked with hypertension and therefore indirectly with CKD. But, there is no specific evidence for alcohol consumption in patients with CKD. However, the NHMRC Australian Guidelines recommend to reduce health risks from drinking alcohol be applied to patients with early CKD(38).

A randomized controlled clinical trial study conducted in USA, reported that, 49% of CKD patients never smoked, 33% and 18% of them had history of past and current smoking respectively(39).

Physical inactivity is a long-standing clinical problem among CKD patients especially those undergoing dialysis treatment. Regular physical exercise is mandatory for the prevention and treatment of obesity, diabetes and insulin resistance which are increasing factors of new onset and of progression of CKD(40).

Physical inactivity could be one of the factors that may worsen the inflammatory status, and it contributes to etiology of PEW and cardiovascular mortality in CKD patients. A study conducted in Brazil, reported that exercise is important to reduce inflammatory cytokines which often caused anorexia that reduced food intake of CKD or ESRD patients and improving protein utilization, serum albumin levels, muscle strength even in CKD patients on a low-protein diet. But, increased muscle mass with exercise training is described less commonly(41).

Chronic kidney disease (CKD) patients represent a particularly sensitive and vulnerable population, because the ability to regulate sodium and water metabolism progressively fails as kidney function declines(42). However, dietary salt reduction counseling and plan are not well known during the intervention of CKD patients in Ethiopia. A descriptive cross-sectional survey of 471 patients conducted in Nepal reported that, more than a quarter of subjects 26.7% did not know the need of salt intake reduction(43).

2.2 Conceptual frame work

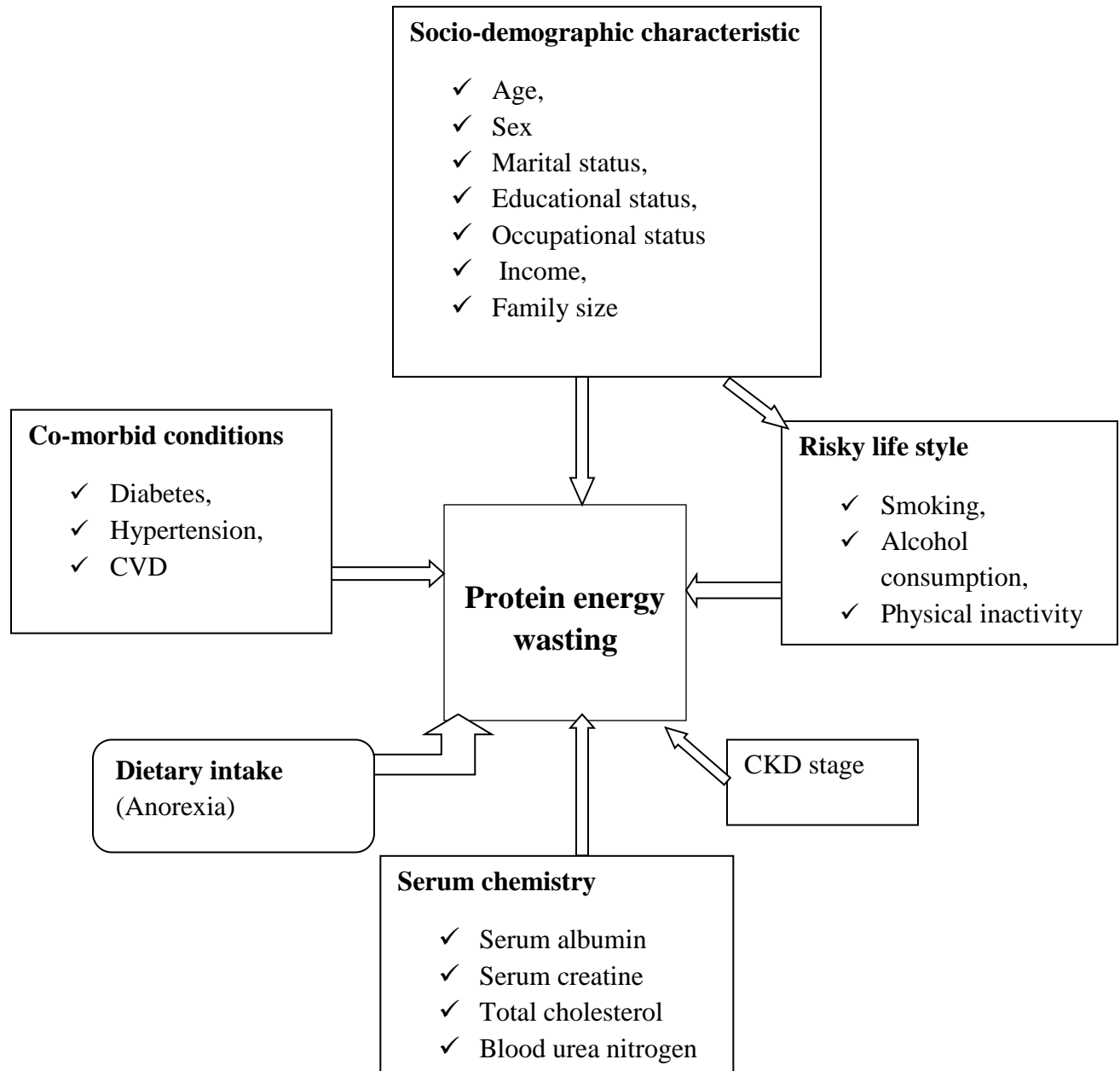


Figure 1: Conceptual frame work developed after reviewing different literatures

2.3 Significance of the study

Current studies are revealing that developing countries like Ethiopia now faced double burden of both communicable and non-communicable diseases like CKD which obstacles developmental of countries. The current treatment guidelines for CKD recommend changes in diet and lifestyle, however, these recommendations are general, and the optimal dietary approach of CKD is not clear, yet.

PEW is highly prevalent in CKD and linked with co-morbidities such as cardiovascular disease, and associated with lower quality of life, increased hospitalizations and increased in risk of death. There is only one study that assessed the magnitude of protein energy wasting (PEW) among Ethiopian CKD patients which not consider associated factors. However, understanding the nutritional particularities of the patient with CKD is extremely important, as it can lead to effective therapeutic strategies.

The finding of this study will enhance the capacity to look for possible alternative solutions to health service with regard to prevalence of protein energy wasting and associated factors among CKD patients which is associated with poor CKD treatment outcome.

Also, it contributes to increase the knowledge about dietary intervention and nutritional support to be effective in correcting PEW and improving the outcomes in patients with CKD.

This study will also useful to provide baseline information and directions for further research activities on similar problems.

CHAPTER THREE: OBJECTIVES

3.1 General objective

To assess protein energy wasting and associated factors among Adult CKD patients attending regular follow up at St. Paulo's Hospital Millennium Medical College, Addis Ababa Ethiopia, March 1 to April 15, 2019.

3.2 Specific objectives

To assess the prevalence of Protein Energy Wasting (PEW) among Adult CKD patients attending regular follow up at St. Paulo's Hospital Millennium Medical College, Addis Ababa Ethiopia, March 1 to April 15, 2019.

To identify factors associated with protein energy wasting among chronic kidney disease patients at St. Paulo's Hospital Millennium Medical College, Addis Ababa, Ethiopia, March 1 to April 15, 2019.

CHAPTER FOUR: METHODS AND CLIENTS

4.1 Study area and period

Addis Ababa is the capital city of Ethiopia found at 526km far from Jimma town. According to the data obtained from Addis Ababa City Administration Health Bureau there are 11 public and 34 private hospitals in Addis Ababa, providing different services for the public. St. Paul's Hospital Millennium Medical College among the public hospitals was selected purposively. St. Paul's Hospital Millennium Medical College is a referral hospital in Addis Ababa under the guidance of the Ethiopian Federal Ministry of Health (FMOH). Currently it has 392 beds with an annual average of 200,000 patients and a catchment population of more than 5 million. There is over 1,300 clinical and non-clinical staff in over 15 departments, most recently launching its new hemo-dialysis unit. Adult renal unit averagely treat 30-40 patients per day by 3 nephrology students (residents), around seven nurses, and 3 porter. The study was conducted for a period of two months from March 1 to April 15, 2019.

4.2 Study design

An institutional based cross-sectional study was conducted

4.3 Population

4.3.1 Sources of population

All chronic kidney disease patients who have follow up at adult OPD St. Paulo's medical hospital was Source of population.

4.3.2 Study population

All randomly selected individuals enrolled in the study were study population

4.4 Eligibility criteria

4.4.1 Inclusion criteria

All chronic kidney disease patients who have follow up at adult OPD St. Paulo's hospital at least for the past three months.

4.4.2 Exclusion criteria

Exclusion criteria were presences of edema, body deformity, pregnancy, newly diagnosed and inability to respond to questions.

4.5 Sample size determination and Sampling technique

4.5.1 Sample size determination

Sample size was determined by considering 95% confidence level (CL) for both objectives separately by using single population proportion formula as stated below.

$$n = \frac{(Z_{1-\alpha/2})^2 p (1-p)}{d^2}$$

n = minimum sample size,

$Z_{1-\alpha/2}$ = significance level at $\alpha = 0.05$

d = margin of error (5%)

For the first objective, by using expected prevalence =0.2, calculated sample size was n=246

For the second objective sample size was calculated by using the prevalence of different associated factors that get from literatures.

Table 2: Associated Variables for Sample size determination

Associated Variables	95% confidence level	P	1-p	Calculated Sample	Reference used
CKD with DM	“	17.9%	0.821	226	29
CKD with HTN	“	58.9%	0.411	372	29
Anorexia	“	82.5%	0.175	222	32

Then, the larger sample size (372) was taken to address both dependent and independent variables.

The expected number of source population in the study period (N), Based on the Health Management Information System reports of the St. Paulo's hospital the average number of CKD patients coming to the Hospital with a total of 6 weeks were 750. Since the source population is less than 10,000, correction formula is used.

The sample size was determined by using the following formula

$$n = \frac{n_o}{1 + \frac{n_o}{N}}, \text{ Where: } N = \text{Population size}$$

$$n = 249$$

Non-respondents 10% = $249 \times 10\% = 24.9$

By considering 10% non-response rate, thus, the total sample size was $n = 274$

4.5.2 Sampling techniques

A systematic random sampling method was employed to select individual during their follow up period. To select individual participants, K value was determined (interval). So, $k = 750/274 = 2.7 \sim 3$, the starting participant was randomly selected from 1-3 by using lottery method. Data were collected from every 3rd patient.

4.6 Data collection procedures

4.6.1 Structured questionnaire

Structured questionnaire developed in English after reviewing different literature was used for data collection. Data were collected using structured interviewer administered questionnaire and anthropometric measurements. A structured questionnaire was used to collect socio-economic and demographic data, family history of chronic disease, presence of co-morbidities, risky Life style behavior, and dietary practice was assessed using a semi-quantitative dietary history method.

4.6.2 Anthropometric Measurement

The anthropometric measures of weight and height were measured using standardized techniques.

A. Weight (Wt.):

The body weight was measured in a digital anthropometric weighing scale. The scale was placed on a hard flat floor surface. Weighing scales were validated with known weight object every morning and checked against zero reading after weighing every participant. The patient was positioned in the center of the equipment, with light clothing, no shoes, erect, with feet together and arms extended along the body. Weight was measured in all patients in this way and was taken to the nearest 0.1 kg.

B. Height (Ht.):

Height was measured, using a portable stadiometer to the nearest 0.1cm. Height was measured in all participants, with the weight distributed between the feet, heels together, in an upright posture, with head free of props and looking straight ahead at a fixed point at eye level. Based on weight and height, Body mass index was calculated as following formula:

$$\text{BMI} = \text{Weight in kilograms} / \text{Height in meters}^2$$

C. Unintentional weight loss:

Unintentional weight loss was calculated using the following formula from the previous three month weight and the current weight.

$$\text{Percentage of weight change} = \frac{\text{previous weight} - \text{Present weight}}{\text{Previous weight}} \times 100$$

Significant weight loss was defined as weight loss of $\geq 5\%$ of body weight over 3 months.

4.6.3. Subjective Global Assessment (SGA)

The subjective global assessment tool was used to assess nutritional status of study participants. The SGA is widely used in clinical settings to get a quick assessment of nutritional status. The SGA tool used in this study has seven components (weight change, dietary intake, gastrointestinal symptoms, co-morbidities, physical change which contains fat loss and muscle wasting). A patient is rated on a scale of 1 to 5 on each component. Total score ranges between 7 and 35, 7 being normal and 35 indicating the most severe malnutrition(44).

4.6.4 Laboratory data

The most recent data on laboratory markers, serum albumin, serum total cholesterol, serum creatinine, and BUN was taken from the patients file. Estimation of Glomerular Filtration Rate (GFR) based on age, sex, and creatinine was calculated separately for men and women by using the Modification of Diet in Renal Disease (MDRD) formula.

$$\text{GFR} = 186 \times (\text{scr} \times 0.0113)^{-1.154} \times (\text{AGE})^{-0.203} \times (0.742 \text{ if female}) \times (1.12 \text{ if black man}).$$

4.7 Study variables

4.7.1 Dependent variables

Protein energy wasting

4.7.2 Independent variables

- Socio-economic and demographic characteristics
 - ✓ Age,
 - ✓ Gender,
 - ✓ Marital status
 - ✓ Educational status,
 - ✓ Occupational status,
 - ✓ Family size,
 - ✓ Family income,
- Family history of chronic diseases like DM, HTN, CVD, CKD.
- History of presence of co-morbidities (DM, HTN, CVD, CKD).
- Dietary history (Loss of appetite, nausea and vomiting)
- Risky Life style (smoking states/tobacco use, excess alcohol consumption),
- Serum Chemistry (Serum albumin, Serum Total cholesterol, serum creatinine, BUN)
- Body mass index
- GFR/CKD stage

4.8 Operational and term definitions

Chronic kidney disease is defined as reduction of kidney function that an estimated Glomerular filtration rate (eGFR) $< 60 \text{ ml/min/1.73m}^2$, increased urinary albumin excretion (albuminuria defined as $> 30 \text{ mg}$ of urine albumin per gram of urine creatinine) or both for > 3 months (1).

PEW Was defined according to the International Society of Renal Nutrition and Metabolism (ISRNM) expert panel criteria as(8).

- ❖ Serum albumin $< 3.8 \text{ g/100ml}$,
- ❖ BMI $< 18.5 \text{ kg/m}^2$ and
- ❖ Weight loss $\geq 5\%$ of body weight in the past 3 months

Risky life style: people who have history of substance use, sedentary life style, and don't eat healthy diet.

Healthy diet: A patient who consumes only a diet that his/her doctor ordered to them according to their CKD stages properly.

Moderate exercise: Low-impact aerobic exercise classes, brisk walking, recreational team sports (volleyball, football, etc.).

Vigorous exercise: activity that causes large increases in breathing or heart rate like carrying or lifting heavy loads, digging or construction work, Running or jogging, etc

Sedentary: No exercise, motor or family dependent for ambulation

Low activity: if the patient can walk for up to around three kilometers per day ($\sim 3 \text{ km /day}$)

Active activity: If the individual can walk $\sim 11 \text{ km/day}$

Very Active: If the individual can walk $\sim 27 \text{ km/day}$

Anorexia: if the patients had loss of appetite or decreasing foods intake for two weeks or more.

4.9 Data Quality Management

Data qualities were ensured during tool development, data collection, entry, cleaning, and analysis. Questionnaire prepared in English was translated into local language Amharic for field work purpose and back to English for rechecking language consistency. Data collectors were selected from nurses already working in the CKD unit and experienced with data collection. The three BSC Nurses were trained on data collection techniques for one day including the procedure. Data collectors interviewed each individual using the local language version of the questionnaire. Pre-test was done among 14(5%) of the total sample size at RDDMH before the actual data collection to see for the accuracy of responses and to estimate time needed. Weighing scales were checked against zero reading after weighing every participant and validated with known weight object every morning. Collected data were checked for completeness and consistency on daily basis. Data were cleaned after data entry to evaluated outliers and missing values.

4.10 Data processing and analysis

The collected data were checked for completeness and consistency manually. Then data were entered into Epi-data version 3.1 and exported to SPSS software program version 20 for analysis. Data were checked for missing values and outliers before analysis. A one sample kolmogorov-smirnov test was used to assess normality of the data. Descriptive statistics were used to examine the frequency distributions of study variables. Mean, median, percentiles and standard deviation were calculated for continuous variables. To allow for comparisons with other studies PEW were analyzed using ISRNM criteria. Cross-tab test for independence was used to determine the association between PEW and certain nominal variables. Multi collinearity of the independent variables were checked by variance inflation factor and dropped the variable with VIF >10 from the multivariable analysis. Bivariable binary logistic regression model was used to check the association between each independent and dependent variable by estimating crude odds ratio with 95% CI. All independent variables with p-value of ≤ 0.25 were taken into the multivariable analysis. Statistical significance was declared at p value less than 0.05 with 95% confidence interval. Finally, data were summarized and presented using descriptive statistics, tables and graphs.

4.11 Ethical consideration

Ethical clearance was obtained from research ethics committee of Jimma University and submitted to St. Paulo's Hospital Millennium Medical College research director office with Support letter. Permission letters was obtained from St. Paulo's Hospital Millennium Medical College research director office to communicate with relevant bodies in the nephrology clinic. Finally, after explaining the study procedures for the study subjects, verbal consents were obtained from each individual patient during the data collection period.

4.12 Plan for result dissemination

The finding of the study will be disseminated to responsible bodies such as Jimma University institute of health, Federal Ministry of Health, Addis Ababa Health Bureau, Gulale zone health offices and St. Paulo's medical hospital management office. The study finding will also be submitted to professional journal for publication to serve as baseline for further studies.

CHAPTER FIVE: RESULT

5.1. Socio-economic and demographic characteristics of the study participants

In this study, 274 respondents were interviewed with a response rate of 100%. Of those respondents, 164(59.9%) were males, while 110(40.1%) of them females. The mean and standard deviation of age was 45.0 ± 14.6 years. Concerning educational status, 60(21.9%) of respondents did not attend formal education, whereas 74(27%) attended primary school followed by 50(18.2%) who attended secondary, 90(32.8%) who had a diploma and above. The majority of the respondents were married 160(58.4%) and 54(19.7%) were single. Majority of the study subjects were Oromo in ethnicity 96(35%) followed by Amara 81(29.6%) and Gurage 53(19.3%). On other hand, 82(29.9%) were government employees and 39(14.2%) of the respondents were merchants (Table: 3).

Table 3: Socio-economic and demographic characteristics of CKD patients attending adult OPD at St Paulo’s Hospital Millennium Medical College, Addis Ababa, Ethiopia, March 1 to 15 April, 2019 (n=274)

Characteristics	Response	
	Frequency	Percent
Sex		
Male	164	59.9
Female	110	40.1
Age		
18-34	75	27.4
35-49	101	36.9
50-64	60	21.9
≥ 65	38	13.9
Marital status		
Single	54	19.7
Married	160	58.4
Divorced	28	10.2
Widowed	24	8.8
Separated	8	2.9
Religion		
Orthodox	149	54.4
Muslim	54	19.7

Protestant	54	19.7
Catholic	17	6.2
Educational level		
Illiterate	60	21.9
Elementary	74	27.0
Secondary	50	18.2
Diploma	62	22.6
Degree and above	28	10.2
Occupational status		
Government employee	82	29.9
Merchants	39	14.2
House wife	37	13.5
Daily laborer	28	10.2
Farmer	33	12.0
NGO/private	29	10.6
Retired	26	9.5
Ethnicity		
Oromo	96	35.0
Amhara	81	29.6
Gurage	53	19.3
Tigre	22	8.0
Kafa	22	8.0
Family Monthly Income		
< 1500	80	29.2
1501-3500	69	25.2
3501-5000	52	19.0
> 5001	73	26.6
Family Size of household		
< = 2	27	9.9
2-5	117	42.7
> 5	130	47.4

5.2. Disease and risky life style related Characteristics of the respondents

Out of 274 patients 104(38.0%) had family history chronic disease with most reporting history of hypertension 44(42.3%) and diabetes mellitus 34(32.7%). Close to half, 69(41.6%) and 42(25.3%) of the respondents had history of HTN and DM respectively before they become sick chronic kidney disease. However, currently majority of the respondents 235(85.8%) had comorbidity conditions. Of those, HTN 116(42.3%), DM 36(13.3%), both HTN and DM 49(17.9%), other (CVD, Anemia) 34(12.4%). Majority of the patients 146(53.3%) had 1-5 years durations of CKD follow up at renal unit while only 70 (25.5%) had > 5 years duration of follow up. On other hand, 32(11.7%) of the respondents had history of smoking tobacco and the rest were non-smokers. From those smokers, 87.5% had history of smoking tobacco for more than 10 years and nobody currently smoke tobacco. Furthermore, 85(31.0%) of respondents had history of alcohol consumption and majority of them 96.5 % reported consuming alcohol for more than ten years. Currently 19(23.8%) drink at least more than two alcoholic drink rarely (**Table: 4**).

Table 4: Disease and health related characteristics of CKD patients attending renal unit at St Paulo’s Hospital Millennium Medical College, Addis Ababa, Ethiopia, March1 to 15 April, 2019 (n=274)

Characteristics	Response	
	Frequency	Percent
Family history of chronic disease	104	38
Diabetes mellitus	34	32.7
Hypertension	44	42.3
Chronic kidney disease	18	17.3
Other(CVD)	8	7.7
Any chronic disease they had before CKD	166	61
Hypertension	69	41.6
Diabetes mellitus	42	25.3

Acute kidney infection	31	18.7
Heart disease	5	3
Others(CVD, Anemia)	19	11.4
Any chronic disease currently present		
Only Chronic kidney disease	39	14.2
Diabetes mellitus	36	13.1
Hypertension	116	42.3
Diabetes mellitus and Hypertension	49	17.9
Others(CVD, combination of others)	34	12.4
Duration of CKD		
< 1	58	21.2
1-5	146	53.3
> 5	70	25.5
History of tobacco smoking		
No	241	88.3
Yes	32	11.7
Ever consumed alcohol like beer, wine, or local beverages like teji, tella, areke, etc		
No	189	69
Yes	85	31

5.3 Dietary practice and physical activity characteristics of the respondents

Regarding dietary practice, 77(28.1%) of the respondents were had history of eat foods from restaurants and of those 42(54.5%) used most of the time from restaurants. Majority of the respondents 146(53.3%) used solid oil for meal preparation in their household while 73(26.6%) used liquid oil. Out of the total, 234(85.4%) of respondents had history of eat fruit and vegetables. However, 88 (32.1%) of the respondents experienced loss of appetite. Among those 61(69.3%) of the respondents experienced loss of appetite most of the time while 19(21.6%), 8(9.1%) rarely and always experienced loss of appetite respectively.

Fourteen percent 39(14.2%) of the respondents reported that they engaged in moderate to vigorous scheduled exercise before they become sick. However, 59(21.5%) currently had exercise plan they set with their doctors and almost all of them 57(98.3 %) reported that they adhere to this plan. Majority of the patients 139(50.7%) reported they currently have an active activity level, while 19(6.9%) were sedentary (**Table 5**).

Table 5: Dietary practice and Physical activity characteristics of CKD patients attending adult OPD at St Paulo’s Hospital Millennium Medical College, AA, Ethiopia, March1 to 15 April, 2019 (n=274)

Characteristics	Response	
	Frequency	Percent
Eat foods regularly from restaurants		
Yes	77	28.1
No	197	71.9
Type of oil often used for meal preparation		
Liquid oil	73	26.6
Solid oil	146	53.3
Solid oil and Butter	55	20.1
Meat and meat product meals eat per week		
2-3 days per w/k	32	11.7
1 per 2wk	81	29.6

1 per month	74	27.0
only holiday	87	31.8
Advised to reduce salt intake		
Yes	257	93.8
No	17	6.2
Adhere to reduce salt intake		
No	38	14.8
Yes	219	85.2
Eat fruit and vegetables		
No	40	14.6
Yes	234	85.4
How often eat vegetables and fruits		
most of the time	76	32.5
Rarely	158	67.5
Have dietary plan set with doctor		
No	149	54.4
Yes	125	45.6
Adhere to your dietary plan		
No	15	12.0
Yes	110	88.0
History of anorexia or loss of appetite		
No	186	67.9
Yes	88	32.1
Moderate to vigorous intensity scheduled exercise before become sick		
No	235	85.8
Yes	39	14.2

Presence of exercise plan set with doctor			
No	215	78.5	
Yes	59	21.5	
Of those adhere to exercise plan			
No	1	1.7	
Yes	57	98.3	
Currently activity level of the respondents			
Sedentary or no exercise	19	6.9	
Low activity	116	42.3	
Active	139	50.7	

5.4. Anthropometric status and biochemical markers

Anthropometric and biochemical parameters were used to assess protein energy wasting among chronic kidney disease patients. In Body mass category, body mass index and unintentional weight loss were assessed. Regarding body mass index, 72(26.3%) had BMI <18.5 kg/m² and about 103(37.6%) of patients lost \geq 5% of their body weight in the past 3 months. In biochemical category, s-albumin, s-Creatinine, and Blood Urea Nitrogen were analyzed. About 105(38.7%) patients had s-albumin below the reference value (<3.8g/dl). Moreover, majority of the patients 225 (82.1%) had elevated serum Creatinine or above normal range (0.6 - 1.4 mg/dl). The interquartile range (IQR) of subjective global assessment score is 13 (9, 19) median, 25th, 75th percentiles respectively. These suppose that, 50% of the subjective global assessment score of the CKD patients found between 9 and 19.

Table 6: Anthropometric and biochemical marker characteristics of CKD patients attending adult OPD at St Paulo’s Hospital Millennium Medical College, Addis Ababa, Ethiopia, March1 to 15 April, 2019 (n=274)

Characterizes	Frequency	Percent
Protein Energy Wasting		
Yes	64	23.4
No	210	76.6
Serum Creatinine		
Normal (0.6 - 1.4 mg/dl)	48	17.9
Elevated (> 1.4 mg/dl)	225	82.1
Serum Albumin		
< 3.8 gm/dl	105	38.7
>= 3.8gm/dl	168	61.3
Blood Urea Nitrogen		
Normal (10-50 mg/dl)	102	37.2
Elevated (> 50 mg/dl)	172	62.8
CKD Stage		
Stage 1	13	4.7
Stage 2	41	15.0
Stage 3	80	29.2
Stage 4	70	25.5

Stage 5	70	25.5
Subjective global assessment score (median (IQR)	13 (9,19)	
Weight change over 3 months		
No weight change	81	29.6
< 5% of body weight	90	32.8
>= 5% of body weight	103	37.6
Body Mass Index		
< 18.5	72	26.3
18.5 - 29.5	195	71.2
> 29.5	7	2.6
Blood pressure		
< 90/60	1	0.4
90/60 - 130/90	118	43.1
> 130/90	155	56.6

The prevalence of protein energy wasting in CKD patients according to ISRNM criteria was 23.4%. The percentage was substantially higher in stage 4 (34.3%) and stage 5(31.4%), when compared to stage 3(17.5%), stage 2(7.3%) and 7.7% in stage 1.

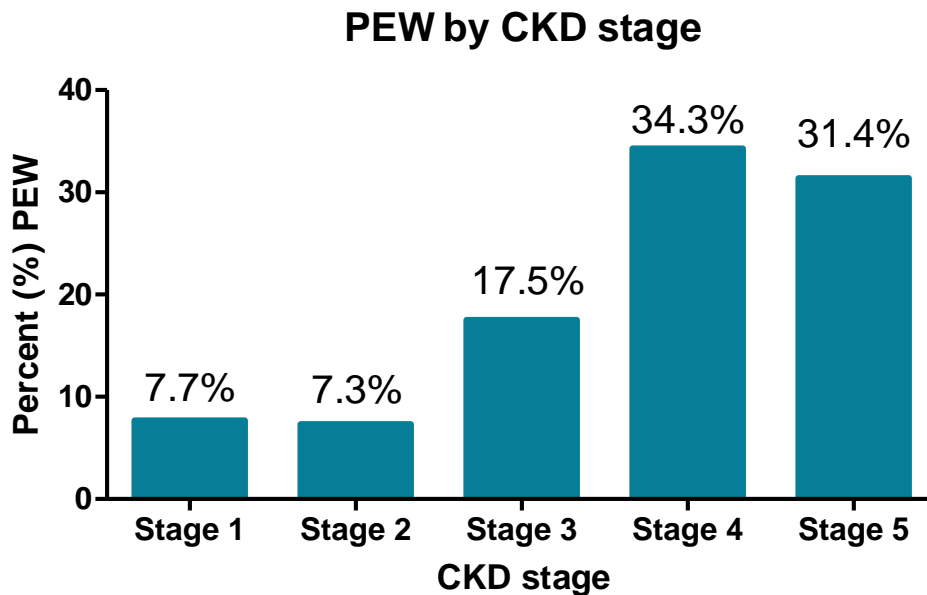


Figure 2: Prevalence of PEW according to the CKD stage of chronic kidney disease patients attending adult OPD at St Paulo’s Hospital Millennium Medical College, AA, Ethiopia, March 1 to 15 April, 2019 (n=274)

5.5 Correlation between SGA and some biochemical variables

SGA score had moderate association and was significantly correlated with kidney function biomarkers. Pearson correlation analysis showed that there was a significant positive correlation between SGA with BUN($r=0.36$, $P < 0.001$) and serum creatinine ($r= 0.33$, $P < 0.001$). On the other as is expected SGA scores were negatively correlated with serum albumin ($r= -0.44$, $P < 0.001$).

Table 7: Correlation between SGA and some biochemical variables among CKD patients attending adult OPD at St Paulo’s Hospital Millennium Medical College, Addis Ababa, Ethiopia, March1 to 15 April, 2019 (n=274)

	SGA	BUN	Serum Albumin	Serum Creatine
SGA	1			
BUN	0.36	1		
Serum Albumin	-0.44	-0.207	1	
Serum Creatine	0.33	0.569	-0.209	1

5.6. Factors associated with PEW among CKD patients

Bivariate and multivariable logistic regression analysis was performed to identify variables that are associated with PEW. Variables that were associated with PEW in a bi-variate logistic analysis were age, presence of any chronic disease before development of CKD, currently presence of any chronic disease, family monthly income, presence of exercise plan set prescribed by doctor, advised to reduced salt consumption by a doctor, history of anorexia, stage of CKD and subjective global assessment score. These variables were candidate for multivariable logistic analysis.

In the multivariable analysis, stage of CKD, subjective global assessment score and advised to reduced salt intake were significant associated factors of protein energy wasting among CKD patients. Odds of PEW among chronic kidney patients at stage 4 and 5 were 2.2 times higher than odds of PEW among patients at stages 1-3 [AOR=2.2, 95% (CI: 1.01, 4.8)]. Patients who were advised to reduced salt consumption by a doctor were 76% less likely to have protein energy wasting compared to those who were not advised to reduced salt consumption [AOR=0.24, 95% CI:(0.06, 0.92)]. Furthermore, as subjective global assessment score increase by one unity the chance to have PEW increase by 1.24 times.

Table 8: Binary logistic regression analysis of factors associated with PEW among CKD patients attending adult OPD at St Paulo’s Hospital Millennium Medical College, AA, Ethiopia, March 1 to 15 April, 2019 (n=274)

Variable	Protein Energy wasting		COR (95 % CI)	AOR (95 % CI)	P-value (for AOR)
	Yes n (%)	No n (%)			
Age					
18-34	11(14.7)	64(85.3)	1**		0.55
35-49	23(22.8)	78(77.2)	1.7(0.78, 3.78) *	1.22(0.5, 3.3)	0.7
50-64	14(23.3)	46(76.7)	1.8(0.74, 4.25) *	2.2(0.73, 6.4)	0.17
>65	16(42.1)	22(57.9)	4.2(1.7, 10.49) **	1.4(0.42, 4.43)	0.62
Presence of any chronic disease before dev’t of CKD					
No	19(17.6)	89(82.4)	1	1	
Yes	45(27.1)	121(72.9)	1.74(0.95, 3.18) *	1.9(0.86, 4.16)	0.11
Currently presence of co-morbidity					
No	11(28.2)	28(71.8)	1		
Yes	53(22.6)	182(77.4)	0.74(0.35, 1.59)		
Presence of exercise plan set with doctor					
No	59(27.4)	156(72.6)	1	1	
Yes	5(8.5)	54(91.5)	0.25(0.09, 0.64) **	0.45(0.14, 1.46)	0.184
Advised to reduced salt intake					
No	6(35.3)	11(64.7)	1	1	
Yes	58(22.6)	199(77.4)	0.54 (0.19,1.51) *	0.24(0.06, .92)	0.037

History of anorexia					
No	22(11.8)	164(88.2)	1	1	
Yes	42(47.7)	46(52.3)	6.8(3.7, 12.54)	1.69(0.74, 3.88)	0.212
CKD stage					
Stage 1-3	18(13.4)	116(86.6)	1	1	
Stage 4-5	46(32.9)	94(67.1)	3.2(1.72, 5.8) ***	2.2 (1.01, 4.8)	0.046
Duration of CKD follow up					
< 1yr	15(25.9)	43(74.1)	1		
1-5yrs	36(24.7)	110(75.3)	0.94(0.47, 1.89)		
> 5yrs	13(18.6)	57(81.4)	0.65(0.28, 1.52)		
Family Monthly Income					
<1500	26(32.5)	54(67.5)	1	1	
1501-3500	15(21.7)	54(78.3)	0.58(0.28,1.21) *	1.08(0.40, 2.92)	0.88
3501-5000	10(19.2)	42(80.8)	0.50(0.22, 1.14) *	0.62(.20, 1.91)	0.40
>5001	13(17.8)	60(82.2)	0.45(0.21, 0.96) **	0.82(0.29, 2.29)	0.70
SGA (Median (25thP, 75thP)	22(17,27)	11.0(8,16)	1.3(1.2, 1.34) ***	1.24(1.15, 1.33)	<0.001

*=p<0.25, **=p≤0.05, ***=p≤0.001 and 1=reference group.

NB. Hosmer and Lemeshow's goodness-of-fit test has chi-square of 6.89 with p value of 0.55, omnibus test of p-value of <0.001.

CHAPTER SIX: DISCUSSION

The aim of this study was to assess level of protein energy wasting and its associated factors among CKD patients. The prevalence of protein energy wasting in CKD patients was 23.4%. CKD stage, subjective global assessment (SGA) score and receiving advice on salt reduction were significantly associated with protein energy wasting after controlling, age, family income, history of anorexia, presence of exercise plan and chronic disease before development of CKD.

There is only one study that has assessed protein energy wasting (PEW) among Ethiopian CKD patients. The prevalence of PEW seen in this study was comparable to what was reported for CKD patients in Addis Ababa at Black Lion Hospital 20% (23). However, the prevalence of PEW reported in both studies for Ethiopian CKD patients is much lower than what was reported from Mulago hospital, Kampala-Uganda which show that prevalence of PEW among CKD patients was 44% (21). This difference might be due to geographical and lifestyle variation among populations included in the study.

The finding of this study showed a significant association between stage of chronic kidney disease and protein energy wasting with high prevalence of protein energy wasting in advanced CKD stage. Odds of PEW among chronic kidney patients at stage 4 and 5 was 2.2 times higher than odds of PEW among patients at stages 1-3 [AOR=2.2, 95% (CI: 1.01, 4.8)]. This finding is similar with Ugandan study which reported that, the stage of CKD was associated with PEW, especially CKD patients with stage 4 were 6.4 times more likely to develop PEW compared to stage 1 CKD (21).

As renal function decrease with progression in CKD stage, inflammatory cytokines increase due to uremic toxin which often causes anorexia that reduces food intake of CKD patients thus predisposing patients to PEW (46).

This study showed a significant association between protein energy wasting and SGA score. SGA score had a significant positive correlation with BUN ($r=0.36$, $P < 0.001$) and serum creatinine ($r= 0.33$, $P < 0.001$) and was negatively correlated with serum albumin ($r= -0.44$, $P < 0.001$). A study conducted by National Kidney Foundation reported that a moderate to good level of agreement was found between the anthropometric parameters and presence of PEW evaluated by SGA(47).

Furthermore, for a unit increase in subjective global assessment score, the odds of being positive for PEW increase by a factor of 1.24 times [AOR=1.24, 95% (CI: 1.15, 1.33)]. SGA is a tool used by health care providers as a reliable, quick and easy method for protein-energy wasting (PEW) evaluation in chronic kidney disease (CKD) patients and aid in the prediction of nutrition-associated clinical outcomes (48). SGA is especially useful for quick screening of nutritional status in CKD patients when laboratory values are not available.

Moreover, SGA has been recommended by the National Kidney Foundation (NKF) Kidney Disease/Dialysis Outcomes and Quality Initiative (K/DOQI) for use in nutritional assessment in both the adult non-dialysis and dialysis population(49). The strong association seen between PEW and SGA score in this study indicate that SGA can be a valid tool in assessment of nutritional status in Ethiopian CKD patients.

The study also showed a significant association between protein energy wasting and advice to reduce salt consumption by a health profession. Patients who were advised to reduced salt consumption by a doctor were 76% less likely to have protein energy wasting compared to those who were not advised to reduced salt consumption [AOR=0.24,95% CI: (0.06, 0.92)]. Chronic kidney disease (CKD) patients represent a particularly sensitive and vulnerable population, because the ability to regulate sodium and water metabolism progressively fails as kidney function declines (42). High salt intake in CKD patients can hasten progression of CKD stages and also results in fluid overload which can lead to shortness of breath, hypertension, congestive heart failure, and edema(50).

Moreover, 6% of the study participants reported that they did not receive salt reduction counseling. A descriptive cross-sectional survey of 471 patients conducted in Nepal reported that, more than a quarter of subjects 26.7% did not know the need of salt intake reduction (43).

Although other studies have reported significant association between protein energy wasting and physical inactivity, but no significant association was found in this study. Physical inactivity is a long-standing clinical problem among CKD patients which may worsen the inflammatory status, and it contributes to PEW and cardiovascular mortality in CKD patients. A study conducted in Brazil, reported that exercise is important to reduce inflammatory cytokines which often caused anorexia that reduced food intake of CKD patients and improving protein utilization, serum

albumin levels, muscle strength even in CKD patients on a low-protein diet(42). But, counseling for exercise training in practical area is less common.

Strength of the study

The fact that this study has tried to assess PEW and associated factors among CKD patients could be mentioned as the strength of the study, because it is not much studied and explored in Ethiopia.

Limitations of the study

Even though this study addressed very important issues it should be highlighted with the following limitations.

- A cross-sectional design does not allow inferring cause and effect relationships.
- Due to time and financial constraints quantitative dietary data was not collected and laboratory data were taken from patient's file.
- Since the lifestyle and dietary habits were self-reported there might be over or under reporting.

CHAPTER SEVEN: CONCLUSION

Different study showed that the prevalence of protein energy wasting among CKD patients were considerably high. The present study also showed that patients with advanced stage of CKD and not advised to reduce salt consumption have the highest prevalence of protein energy wasting.

Even if factors of protein energy wasting are complex and are not limited these, present study isolated certain socio-demographic, co-morbidity, dietary, lifestyle and CKD stage factors that are linked with greater risk of protein energy wasting among this population.

Accordingly, CKD stage, subjective global assessment score and advised to reduce salt consumption were significantly associated with protein energy wasting. Interventions that address nutritional problems and lifestyle factors in CKD patients need to be implemented together with medical treatment.

CHAPTER EIGHT: RECOMMENDATIONS

Based on the findings of study the following recommendations were forwarded:

For federal ministry of health:

Formulate alternative policies targeted towards early prevention of protein energy wasting among not only CKD patients also for all chronic disease and strengthening the existing programs.

Hospital management:

The hospital arrange nutrition professional to the renal unit beside the physician for intervention and education program on recommended diet and lifestyle practice and follow its implementation

Health service provider:

Design education program that especially focus on dietary intake, healthy lifestyle practice and ongoing support for patients

Patient: Patients should attend the health information dissemination program of the hospital and try to implement recommendations as much as possible. Talk to their doctors about how to choose the right combination foods. Eat less salt diet, small amount at once and low protein with high energy diet. Bread, Fruits, Vegetables, Pasta and rice

Try to limit fats especially: saturated and trans-fats, use small amount of olive oil instead of butter and solid oil, limit alcohol, and eat heart-healthy foods such as fish, beans, vegetables and fruits.

For researchers

More extensive research should be done with large sample size and another study design to differentiate complex associate factor for protein energy wasting among CKD patients, their nutritional knowledge and overall health condition.

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ANNEX I: ENGLISH QUESTIONNAIRE

Information sheet and Consent form

Hello!!! My name is ChaltuMerga; I am a MSC student at Jimma University department of population and family health, for Master of Science (Msc) in human nutrition. I conduct a research for the partial fulfillment of the requirements for the degree of Master of Science (Msc) in human nutrition on Nutritional status and associated factors among chronic kidney disease patients who have follow up at adult OPD St. Paulo's medical hospital, AA, Ethiopia. I was received ethical clearance from Jimma University and Permission letters obtained from administrative body of St. Paulo's medical hospital management office.

The study will be conducted through interviewed structured questionnaire among chronic kidney disease patients who have follow up at St. Paulo's medical hospital, AA, Ethiopia. I would like to ask you to respond for the interviewed questionnaire. The data I get will be kept strictly confidential, and will not be disclosed to anyone. Giving response is voluntary, it is possible refuse to participate and jump questions which you are not interested to respond; I will respect any of your decision.

The finding of this study will provide information about nutritional status and associated factors among chronic kidney disease patients for responsible stakeholders to develop strategies and to take appropriate measures to solve the gaps and ensure the welfare of the public. This study will not have any harm for study participants. The interview takes approximately 20-30 min to complete. Do you have any questions about the study?

Consent form

Are you willing to respond for this study? 1. Yes 2. No

Thank you in advance for taking time out of your busy schedule to answer my questions.

Data requested by.....signature.....date.....

Structured questionnaire and Data abstraction format

Part I: Socio-demographic Characteristics

Sex	How old are you?	Religion	Educational status	Marital status	Occupation	Ethnicity	Family size
M=0	___yrs	Orthodox= 0	99. illiterate	Single=0	Government=0	Oromo=1	Male=_
F=1	___yrs	Muslim =1	999 Read/ write	Married=1	Merchant=1	Amhara=2	Female=_
		Protestant =2	Grade_____	Separated=2	Housewife=2	Gurage =3	Total=___
		Catholic =3		Divorced=3	Daily labor=3	Tigre =4	
		Other		Widowed=4	Farmer =4	Kefa=5	
		(specify) __			NGO worker=5	Other	
					Retired=6	(specify) __	

Monthly Family Income (in ETB) _____

Part II: Disease related Characteristics

No	Question	Response		Skip
10	Do you have family history of chronic disease?	0. No 1. Yes		
11	If yes to q. no 10, which one of the following is present in family?(select option that apply)		0. No	1. Yes
		Diabetes mellitus		
		Hypertension		
		Chronic kidney disease		
		Heart disease		
12	Did you have any chronic diseases before Chronic Kidney Disease?	0. No 1. Yes		If no→14

13	If yes to q. no 12, which one of the following chronic diseases did you have?(select option that apply)		0. No	1. Yes	
		Diabetes mellitus			
		Hypertension			
		Acute kidney disease/infection			
		Heart Disease			
		Anemia			
		Others, Specify____			
14	Do you currently have any of the chronic diseases listed below?		0. No	1. Yes	
		Diabetes mellitus			
		Hypertension			
		Hyperkalaemia			
		Heart disease			
		High cholesterol			
		Anemia			
		Others, Specify_____			
15	How long have you had CKD?	_____ Years			
16	Did you take all your medicine properly?	0. No 1. Yes		If yes→18	
17	If No to q. no 16, Which one of the following was the reason for your medication non adherence?	Too expensive Forgetfulness Feeling well without medications Physicians mode of approach Other reason, if any _____			

Part III: Risky lifestyle

	Question of Substance use	Response	Skip
18	Do you have history of Tobacco smoking?	0. No 1. Yes	If no→23
19	If yes to q. no 18, for how long you smoked tobacco?	_____yrs	
20	Are you currently a smoker?	0. No 1. Yes	
21	If yes to q. no 20, In a typical week on how many days do you smoke?	_____Days	
22	In a typical dayhow many cigarettes do you smoke per day?	_____Pieces	
23	Have you ever consumed an alcoholic drink such as beer, wine, or local beverage like tela, teji, areke?	0. No 1. Yes	If no→27
24	If yes to q. no 3.5, for how long you drink alcohol?	_____yrs	
25	Do you currently drink alcohol?	0. No 1. Yes	
26	If yes to q. no 25, how frequently have you had at least more than two alcoholic drinks?	0. Always 1. most of the time, 2. rarely, 3. never	

	Physical activities		
27	Do you do any moderate-to-vigorous intensity (Such as brisk walking, running, aerobics exercise) scheduled physical activity before you become sick?	0. No 1. Yes	If no→29
28	If yes to q. no 27, how many minutes per day you do moderate to intensity exercise?	_____min/day	
29	Do you have exercise plan you set with your doctor?	0. No 1. Yes	If no→31
30	If yes to q. no 29, do you adhere to your plan?	0. No 1. Yes	
31	What is your currently activity level?	0. Sedentary (no exercise) 1. Low Activity(~3 km /day) 2. Active(~11 km/day) 3. Very Active(~27 km/day)	
	Dietary related questions		
32	Do you eat foods regularly from restaurants?	0. No 1. Yes	If no→34
33	If yes to q. no 32, how often do you eat at restaurants?	Always, most of the time, rarely, never	
34	What type of oil or fat is most often used for meal preparation in your household?	0. Liquid oil 1. Solid oil 2. Butter 3. Don't know	
35	How many meals per week do you eat that were prepared from meat and meat product?	_____	
36	How much salt or salty saucedo you think you usually consume?	0. Too much	

		1. Just the right amount 2. Too little 3. Far too little			
37	Have you been advised to reduce salt consumption by a doctor or other health worker?	0. No 1. Yes	If no → 39		
38	If yes to q. no 37, do you adhere to your plan?	0. No 1. Yes			
39	Do you eat fruit and vegetables?	0. No 1. Yes			
40	If yes to q. no 39, How often do you eat vegetables/fruits?	Always, most of the time, rarely, never			
41	Do you have dietary plan you set with your doctor?	0. No 1. Yes	If no → 43		
42	If yes to q. no 41, do you adhere to your plan?	0. No 1. Yes			
43	Which type of protein content diet you commonly used?	Always	most of the time	rarely	never
	Bread, Pasta , rice, Fruits, Vegetables, etc				
	Meat, Poultry, Fish, Eggs, cheese, etc				
44	Do you have history of anorexia or loss of appetite?	0. No 1. Yes			
45	If yes to q. no 45, how often do you experience loss of appetite?	Always, most of the time, Rarely, 3. never			

Data abstraction format

Part I: Anthropometric measurements

Baseline Wt (before 3 or 6 months) -----

Current wt -----

Ht-----

BMI-----

Part II Clinical data (Scr, BUN, FBS, BP, CKD stage, etc.)

1. Fasting blood sugar value (mg/dl) _____

2. Serum creatinine _____

3. Blood urea nitrogen _____

4. Serum albumin _____

5. Total serum cholesterol _____

6. Hemoglobin _____

7. Blood pressure_____

8. GFR_____

9. CKD stage _____

SUBJECTIVE GLOBAL ASSESSMENT IN CKD PATIENTS

Patients related medical history

Weight change (overall change in the past 3 or 6 months)kg				
1	2	3	4	5
No wt change or gain	Minor wt loss (<5%)	wt loss 5-10%	wt loss 10-15%	wt loss >15%
Dietary intake				
1	2	3	4	5
No change	Sub-optimal solid diet	Moderate overall decrease	Hypo-caloric liquid	starvation
Gastrointestinal symptoms				
1	2	3	4	5
No symptoms	Nausea	Vomiting/moderate GI symptoms	Diarrhea	Severe anorexia
Functional capacity(nutritionally related functional impairment)				
1	2	3	4	5
None/improved	Difficulty with ambulation	Difficulty with normal activity	Light activity	Bed/chair ridden
Co-morbidity				
1	2	3	4	5
Dialysis <12months and healthy otherwise	mild co-morbidity	Age >75 or moderate co-morbidity	Severe co-morbidity	Very Severe multiple co-morbidity
Physical change				
Decreased fat stores or loss of subcutaneous fat((Recalled)				
1	2	3	4	5
None (No change)		moderate		severe
muscle wasting				
1	2	3	4	5
None (no change)		moderate		severe

ANNEX II: AMHARIC QUESTIONNAIRE

ምዕራፍ አንድ የአማርኛ ቃለ መጠይቅ

የመረጃ ወረቀትና የስምምነት ቅጽ

አሎ !!! ስሜ ጫልቱ መርጋ ይባላል በጅማ ዩኒቨርሲቲ በስነህዝብና በቤተሰብ ጤና መምሪያ የ2ኛ ድግሪ ተማሪ ነኝ። ይህም የሥነህዝብ አመጋገብ የ2ኛ ድግሪ ትምህርት ጥናት ነው። የማጠናው ምሥሪ የሰደደ የኩላሊት በሽተኞችን በቅዱስ ጳውሎስ ሆስፒታል በተመላላ ስነምግባርና ክፍል የሚመለሱትን ሲሆን ጥናቱም የታማሚ ወዎቹን የአመጋገብ እና የአመጋገብ ሁኔታዎችን እንዲሁ ምትክ የሆኑ ምክንያቶችን ነው። ከጅማ ዩኒቨርሲቲ የስነምግባር መሸኛ ደብዳቤ ተሰጥቶ ለቅዱስ ጳውሎስ ሆስፒታል አስተዳደር ቢሮ ሰጥቼ ጥናቱን እንደሰራ ፍቃድ ተፈቅዶልኛል። ጥናቱም የሚካሄደው ሥርዓት ደዱ የኩላሊት በሽተኞችን በቅዱስ ጳውሎስ ሆስፒታል ተመላላ ስነምግባርና ክፍል ለሚገኙት በቃለ መጠይቅ እና ክብደትና ቁመት በመለካት ነው። ጥያቄዎቹም ልስን ድትሰጡ ምን ፍላጎት ነው። የሚገኘው መረጃም በሚስጢር የሚያዝ እና ለሌላ ሰው የማይተላለፍ ነው። መልስ መስጠቱ በፋቃድ ደፈኝ ነት ላይ የተመሰረተ ነው። ያለ መመለስ መብት ያላቸው ሲሆን የተወሰኑ ጥያቄዎችን የማለፍ መብታቸው የተጠበቀ ነው። ውሳኔዎች ሁን አከብራለሁ።

የዚህ ጥናት ግኝት የሚያገለግል ደው ወይም የሚሰጠው ጥቅም ስርዓት ደዱ የኩላሊት በሽተኞችን የአመጋገብ ሁኔታዎችን ተያያዥ ምክንያቶችን በማጥናት ለባለ ድርሻ አካላት እስትራቴጂ በመንደፍ ለህዝብ ደህንነት ግድቶችን በማቃለል ተገቢ እርምጃዎችን ለመውሰድ ነው። ይህ ጥናት የጥናቱ ተሳታፊዎችን በምንም አይነት የማይጎዳ ነው። ቃለ መጠይቁን ለመፈጸም በግምት ከ20-30 ደቂቃ ይወስዳል። ስለ ጥናቱ ጥያቄ አሎት ወይ ?

የስምምነት ቅጽ

ለዚህ ጥናት ለመመለስ ፍቃድ ነዎት ወይ ? 1. አዎን 2 አይደለም

:- ጥያቄዬን ለመመለስ ድንኳንዎችን በማባከን ላይ ረገፍኝ ብብር በቅድሚያ አመሰግናለሁ።

መረጃው የተጠየቀው በ _____ ፊርማ _____ ቀን _____

ክፍልአንድ የማህበራዊ አኗኗርመረጃች

ጾታ	እድሜ	ሐይማኖት	የትምህርት ደረጃ	ያገባቸው ሁኔታ	የስራ ሁኔታ	ብሔር	የቤተሰብ ብዛት	የቤተሰብ ወርሐዊ ገቢ
ወ = 0 ሴ = 1	--- አመት	ኦርቶዶክስ = 0 ሙስሊም = 1 ፕሮቴስታንት = 2 ካቶሊክ = 3 ሌላ ----	99 የልተማሩ 999 ማንብ እና መፃፍ ብቻ ክፍል ----	ያገባ = 0 ያገባ = 1 የተለያዩ = 2 የተፋቱ = 3 ባል ወይም ሚስት የሞተባቸው = 4	የመንግስት = 0 ነጋዴ = 1 የቤት እመቤት = 2 የቀን ሰራተኛ = 3 ገበሬ = 4 የግል ድርጅት = 5 ጡረተኛ = 6	ኦሮሞ = 0 አማራ = 1 ጉራጌ = 2 ትግሬ = 3 ከፋ = 4 ሌላ ----	ወ ---- ሴት -- ጠቅላላ	---

የታካሚው ጤና መጠይቅ					
ቁ	ጥያቄ	መልስ			ይዘለሉ
10	ቀደም ሲል የታወቀ በቤተሰብ ስር የሰደደ በሽታ ነበረ ?	0. የለም 1. አዎ			
11	ለ10ኛው ጥያቄ አዎ ካሉት ከዚህ በታች ከተዘረዘሩት የትኛው ነው?		0. የለም	1. አለ	
		የስኳር በሽታ			
		የደም ግፊት			
		ስር የሰደደ የኩላሊት በሽታ			
	የልብ በሽታ				
12	የኩላሊት በሽታ ከመታመምህ/ሽ በፊት ሌላ ስር የሰደደ በሽታ ታመዉ ያውቃሉ?	0. የለም 1. አዎ			አደለም ካሉ 13ኛው ይዘለሉ
13	ለ12ኛው ጥያቄ አዎ ካሉት ከዚህ በታች ከተዘረዘሩት የትኛው ታም ያውቃሉ?		0. የለም	1. አለ	
		የስኳር በሽታ			
		የደም ግፊት			

		የልቆየ የኩላሊት በሽታ			
		የልብ በሽታ			
		ዳመናሲ			
		ሌሎች-----			
14	አሁን ከዚህ በታች ከተዘረዘሩት ሚታመሙት በሽታ አለ ?		0.የለም	1. አለ	
		የስኳር በሽታ			
		የደም ግፊት በሽታ			
		በደም ውስጥ የፖታሲየም መብዛት			
		የልብ በሽታ			
		ከመጠን በላይ ኮልስትሮል			
		ደም ማነስ			
		ሌላ -----			
15	ስር የሰደደ የኩላሊት በሽታ ከታመሙ ስንት ጊዜ ሆኗል?	-----አመት			
16	ሁሉንም የታዘዘላትን መድሀኒት በወቅቱ በስነስርዓት ይወስዳሉ ?	0.አይደለም 1.አዎ			
17	ለ16 ተኛ ጥያቄ አይደለም ካሉ መድሀኒቶችን እንዳይወስዱ ያደረገች ምክንያት ምንድነው?	0. በጣም ውድ ስለሆነ 1.ሁሌ ስለምረሳ 2. ባልወስድም ጤንነት ስለሚሰማኝ 3. ሀኬሜ በደንብ ስላላስረዳኝ 4.ሌላ ምክንያት ካለ ይግለጹ			
	አደጋ ላይ የሚጥል የአኗኗር ሑኔታ				
18	ያጨሱ ነበር?	0. አደለም 1.አዎ			አደለም ካሉ → 23 ይዘላሉ
19	ለ18 ጥያቄ አዎ ካሉ ለምን ያህል ጊዜ አጭሰው ያውቃሉ?	----- አመት			
20	በአሁኑ ሰዓት ሲጋራ ያጨሳሉ?	0.አደለም 1.አዎ			
21	ለ20ኛ ጥያቄ አዎ ካሉ በሳምንት ስንት ቀን ያጨሳሉ?	----- ቀን			
22	በቀንስ ምን ያህል ሲጋራ ያጨሳሉ ?	----- ስንት በቁጥር/ፖኬት/			
23	አልኮል ለምሳሌ :- ቤራ፣ወይን፣ጠጅ፣አረቄ፣ጠላ.....ይጠጡ ነበር ?	0.አደለም 1.አዎ			አይደለም ላካሉ →27 ይዘላሉ
24	ለ23 ጥያቄ አዎ ካሉ ለምን ያህል ጊዜ ጠጥተዋል?	----- አመት			

25	በአሁኑ ጊዜ አልኮል ይጠጣሉ?	0.አደለም 1.አዎ	
26	ለ25 ጥያቄ አዎ ካሉ በየ ስንት ጊዜ ቢያንስ ከ2 አልኮል በላይ ይጠጣሉ?	0.ሁልጊዜ 1.በአብዛኛው ጊዜ 2.አልፎ አልፎ 3.በጭራሽ	
የአካል አንቅስቃሴ ጥያቄዎች			
27	ከመታመም በፊት በየጊዜው የማያቋርጥ የአካል እንቅስቃሴ ያደርጉ ነበር	0.አደለም 1.አዎ	አይደለም ከሆነ →29 ይዝሉ
28	ለ27 ጥያቄ መልስ አዎ ከሆነ በየቀኑ ለምን ያህል ደቂቃ የአካል ብቃት እንቅስቃሴ ያድጋሉ	----- ደቂቃ /በቀን	
29	ከሀኪምዎ ጋር በመሆን ያዘጋጁት የአካል ብቃት እንቅስቃሴ ፕሮግራም አለዎት?	0.አይደለም 1.አዎ	አይደለም ካሉ →31 ይዝሉ
30	ለ29 ጥያቄ አዎ ካሉ የአካል አንቅስቃሴ ፕሮግራሙን በትክክል ያደርጋሉ ማለት ነው?	0.አይደለም 1.አዎ	
31	በአሁኑ ሰዓት ያሉት የአካል እረንቅስቃሴ ደረጃ ምን ላይ ነው ?	0.ምንም 1. በትንሹ (3ኪ.ሜ) 2.በቂ (እስከ 11 ኪ.ሜ) 3.ከበቂ በላይ(አስከ 27 ኪ.ሜ)	
የስነ ምግብ ጥያቄዎች			
32	ሁልጊዜ ከሆቴል ይመገባሉ ?	0.አይደለም 1.አዎ	አይደለም ካሉ →34 ይዝሉ
33	ለ32 ተኛ ጥያቄ አዎ ካሉ በየ ስንት ጊዜ ከሆቴል ይመገባሉ?	0.ሁልጊዜ 1.አብዛኛውን ጊዜ 2.አልፎ አልፎ 3.በጭራሽ	
34	በቤትዎ ውስጥ ምግብ ለማብሰል ምን አይነት ዘይት ይጠቀማሉ?	0.ፈሳሽ ዘይት 1.የረጋ ዘይት 2.ቅቤ 3.አላቅም	
35	በሰምንት ምን ያህል ቀን ከስጋና ከስጋ ተዋጽዎ የተዘጋጀ ምግብ ምግብ ይጠቀማሉ?	-----ቀን	
36	ምን ያህል ጩውና የምግብ ማጣፈጫ ቅመሞችን ይጠቀማሉ?	0.በጣም ብዙ 1.መጠነኛ 2.አነስተኛ 3.በጣም አነስተኛ	

37	በዶክተር ወይም በጤና ባለሙያ ጨው እንዲቀንሱ ተነግሮታል /ተመክረው ያውቃሉ?	0.አይደለም 1.አዎ	አይደለም ካሉ→39 ይዝሉሉ		
38	ለ37 ተኛ ጥያቄ አዎ ካሉ ከላይ የተመክሩትን ተግባራዊ ያደርጋሉ?	0.አይደለም 1.አዎ ነው			
39	አትክልትና ፍራፍሬዎችን ይመገባሉ?	0.አይደለም 1.አዎ			
40	ለ39 ጥያቄ አዎ ካሉ በየስንት ጊዜው አትክልትና ፍራፍሬ ይመገባሉ?	0.ሁልጊዜ 1.አብዛኛውን ጊዜ 2.አልፎ አልፎ 3.በጭራሽ			
41	ከሀኪምዎ ጋር በመሆን ያዘጋጁት የአመጋገብ ፕሮግራም አለዎት?	0.የለም 1.አለ	የለም ካሉ →43 ይዝሉሉ		
42	ለ41 ጥያቄ አዎ ካሉ የአመጋገብ ፕሮግራምን በትክክል ይተገብራሉ?	0.አይደለም 1.አዎ			
43	ምን ዓይነት ገንቢ ምግቦችን በቋሚነት ይጠቀማሉ?	ሁልጊዜ	አብዛኛውን ጊዜ	አልፎ አልፎ	በጭራሽ
	ዳቦ፣ ፓስታ፣ ፍራፍሬ፣ አትክልት ወ.ዘ.ተ				
	ስጋ ፣ ዶሮ ወጥ፣ አሳ፣ እንቁላል ፣ ወተትና የወተት ተዋጾ ወ.ዘ.ተ.....				
44	የማቅለሽለሽና የምግብ ፍላጎት መቀነስ ነበረት?	0.የለም 1.አለ			
45	ለ45 ጥያቄ አዎ ካሉ ለምን ያህል ጊዜ የምግብ ፍላጎት መቀነስ ነበረበት?	0.ሁልጊዜ 1.አብዛኛው ጊዜ 2.አልፎ አልፎ 3.በጭራሽ			

ምዕራፍ ሁለት

ክፍል አንድ ክብደትና ቁመት መለካት

የመነሻ ክብደት (ከ3 /6 ወር በፊት) ነበረው ክብደት -----

የአሁን ጌዜ ክብደት -----

ቁመት -----

የክብደት እና የቁመት መመጣጠን ልኬት -----

ክፍል ሁለት የምርመራ ውጤት

ከመመገብ በፊት ያለው የስኳር መጠን -----

የሴረም ክራቲን መጠን -----

በደም ውስጥ ያልተጣራ ናይትሮጂን መጠን-----

ሴረም አልቡሚን -----

ጠቅላላ የሴረም ኮሌስትሮል-----

ሂሞግሎቪን -----

የደም ግፊት መጠን -----

የኩላሊት የማጣራት መጠን -----

የቆየ የኩላሊት በሽታ ደረጃ -----

በቆየ የኩላሊት በሽታ ጥናት በ ግምታዊ አለማቀፍ አጠናን ዘዴ

ሀ. ከታማሚው ጤና ጋር የተያያዘ የህክምና ታሪክ				
የክብደት መቀየር (በጠቃላይ ባለፈው 3/6 ወራት ውስጥ የክብደት ለውጥ)-----ኪ.ግ				
1	2	3	4	5
ምንም አልተቀየረም	<5% መቀነስ()	5-10% መቀነስ	ከ10-15 % መቀነስ	ከ>15% መቀነስ
የአመጋገብ ሁኔታ				
1	2	3	4	5
ምንም አልተቀየረም	ትንሽ ምግብ መቀነስ	በመጠኑ መቀነስ	በጣም መቀነስ	እጅግ በጣም መቀነስ
የሆድ እቃ ህመም ምልክት				
1	2	3	4	5
ምንም ምልክት የለም	ማቅለሽለሽ	ማስመለስና መጠነኛ የሆድ ህመም ምልክት	ማስቀመጥ	ከባድ የምግብ ፍላጎት መቀነስ
በአበጋገብ ምክንያት የስራ መስራት አቅም ለውጥ ካለ				
1	2	3	4	5
የለም/ተሻሻሏል	የመንቀሳቀስ አቅም ማነስ/መቀነስ	መደበኛ እንቅስቃሴ የማይረግ ችግር	ቀላል እንቅስቃሴ ማድረግ አለመቻል	የአልጋ ቁራኛ መሆን
ተያያዥ በሽታ				
1	2	3	4	5

የኩላሊት እጥበት <12 ወር ወይም ሙሉ ጤነኛ መሆን	አነስተኛ ተያያዥ በሽታ ሲኖር	እድሜያቸው ከ75 አመት በላይ ወይም መጠነኛ ተያያዥ በሽታ ሲኖር	በጣም አደገኛ ተያያዥ በሽታ ሲኖር	እጅግ በጣም አደገኛና ብዙ ተያያዥ በሽታ ሲኖር
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ለ. የአካላዊ ምርመራ

የስብ ክምችት መቀነስ (የአይን ሽፋሽፍት ወደ ውስጥ መግባት ፣ የእጅ ጡንቻ መሳሳት

1	2	3	4	5
ምንም አልተቀየረም		መጠነኛ		በጣም መቀነስ

2. የጡንቻ መሳሳት ምልክት (አንገት ስር ያለ ፣ የእጅ ቁርጫፍ ማሳሰቢያ ፣ የጀርባ የጎድን አጥንት

1	2	3	4	5
ምንም አልተቀየረም		መጠነኛ		በጣም መቀነስ

ANNEX III: DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for masters of Human Nutrition (Msc) in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

Name of the student: Chaltu Merga

Date. _____ Signature _____

APPROVAL OF THE FIRST ADVISOR

Name of the first advisor: Dr. Meron Girma (PhD)

Date _____ Signature _____

APPROVAL OF THE SECOND ADVISOR

Name of the second advisor: Mr. Melese Sinaga (BSc, Msc)

Date _____ Signature _____