ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF MEDICINE, DEPARTMENT OF ANATOMY

Anthropometric Assessment of Magnitude of Malnutrition and Severity among Hemodialysis Patients in Selected Governmental Hospitals, Addis Ababa, Ethiopia

BY: Degu Getu (BSc)

April, 2019
Addis Ababa, Ethiopia

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Thesis submitted to Department of Anatomy, School of Medicine, College of Health Sciences, Addis Ababa University for the partial fulfillment of the requirements for the Degree of Masters of Science (MSc.) in Human Anatomy.

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Addis Ababa, Ethiopia

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Declaration

This is to certify that the thesis prepared by Degu Getu, entitled, ***"Anthropometric Assessment of Magnitude of Malnutrition and Severity among Hemodialysis Patients in Selected Governmental Hospitals, Addis Ababa, Ethiopia"*** and submitted in partial fulfillment of the requirements for degree of Masters of Science in Anatomy complies with the regulation of the University and meets the accepted standards with respect to originality and quality. This thesis has not been presented for degree any other University, and that all sources of materials used for the thesis have been fully acknowledged.

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Acknowledgement

First and foremost All Glory goes to God who was and is beside me in my life. I would like to thank and express my deepest gratitude to my Advisor, Mr. Abay Mulu for his constructive and unreserved guidance. I would also like to extend my sincere thanks to my co- advisor Dr. Abdelmoniem Ibrahim. I am grateful for your assistance in reviewing my proposal and thesis.

My special thanks also goes to Addis Ababa University, Department of Anatomy for letting me grasp the knowledge and opportunity to do this thesis work.

I am also grateful to Saint Paul Hospital Millennium Medical College, Menilik II Hospital and Zewditu Memorial Hospital for their cooperation during data collection period.

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List of Abbreviations and Acronyms

AMA Arm Muscle Area

BMI Body Mass Index

CKD Chronic Kidney Disease

DRERC Department Research Ethics Review Committee

ESRD End Stage Renal Disease

HD Haemodialysis

IRB Institutional Review Board

ISRNM International Society of Renal Nutrition and Metabolism

KDOQI Kidney Disease Outcomes Quality Initiative

MAMC Mid-upper Arm Muscle Circumference

MHD Maintenance Hemodialysis

MUAC Mid-Upper Arm Circumference

NKF National Kidney Foundation

PEW Protein Energy Wasting

SGA Subjective Global Assessment

SPSS Statistical Package for the Social Sciences

SSA Sub-Saharan Africa

TSF Triceps Skinfold Thickness

WHO World Health Organization

Abstract

Background : Chronic kidney disease is a worldwide public health problem and one of the chronic non communicable diseases which affects over 500 million people worldwide. End stage renal disease refers to a state of advanced chronic kidney disease, where lifelong dialysis or kidney transplantation is necessary to sustain a reasonable quality of life and survival. Malnutrition is common and the major risk factor of mortality of hemodialysis patients. Anthropometry, edema- free weight, body mass index, and subjective global assessment are valid and clinically useful tools for overall nutritional assessment.

Objective : To assess magnitude of malnutrition among hemodialysis patients using upper arm anthropometry in selected Addis Ababa Governmental hospitals, Addis Ababa, Ethiopia

Methods and Materials : Institution based cross sectional study was conducted from May 1 to September 30, 2018 on a total of 80 patients from dialysis units of three selected Addis Ababa Governmental Hospitals. Nutritional status was assessed by Anthropometric and biochemical measurements. The ISRNM criteria were used to diagnose Malnutrition. The data was entered into Epi data 3.1 and analyzed using IBM SPSS Statistics version 21. The results were summarized in the form of proportions and tables. Analysis was carried out to determine the relationship between dependent and independent variables.Means between groups were compared by Independent t-test.

Result: The mean age was 38.91±13.00 years with a sex ratio of 1.67 in favor of men. The mean Body mass index was computed 20.31±3.73kg/m^2, mean Mid upper arm circumference (20.37±2.40 cm), mean Mid upper arm muscle circumference (19.408± 3.449 cm), and the mean arm muscle area was (31.4± 9.58 cm^2). The study revealed that Malnutrition was noted in 15% of the patients according to ISRNM criteria of malnutrition or protein energy wasting, while 30% of the female patients were malnourished. BMI and other upper arm anthropometric measurements were significantly correlated with each other and with ISRNM parameter.

Conclusion : Malnutrition is high among maintenance hemodialysis patients in Addis Ababa and it was more common in female patients than their male counterparts. The upper arm anthropometric measurements were significantly correlated with ISRNM and, with each other in describing the nutritional status of the maintenance hemodialysis patients and can be helpful in determining nutritional status.

Key Words : Hemodialysis; Malnutrition; ISRNM; Anthropometry

1. Introduction

1.1 Background

Chronic kidney disease (CKD) is a worldwide public health problem and one of the chronic non communicable diseases which affects approximately 1 in 10 adults, or over 500 million people worldwide (1).

Over 2 million people worldwide currently receive treatment with dialysis or a kidney transplant to stay alive, yet this number may only represent 10% of people who actually need treatment to live. Only 20% are treated in about 100 developing countries that make up over 50% of the world population (2).

Given the high costs of treating End Stage Renal Disease (ESRD), provision of dialysis and transplantation services is limited in low and middle income countries and virtually non-existent in many parts of Sub Saharan Africa (SSA) (3).

CKD affects mainly young adults aged 20–50 years in SSA and is primarily due to hypertension and glomerular diseases, unlike developed countries, where CKD presents in middle-aged and elderly patients and is predominantly due to diabetes mellitus and hypertension. Presentation is usually late, with 47.5% in ESRD requiring dialysis at presentation and severely ill with co-morbidities (3).

CKD is a pathophysiologic process with multiple etiologies, resulting in the inexorable attrition of nephron number and function and frequently leading to ESRD. In turn, ESRD represents a clinical state or condition in which there has been an irreversible loss of endogenous renal function, of a degree sufficient to render the patient permanently dependent upon renal replacement therapy (dialysis or transplantation) in order to avoid life-threatening uremia (4).

ESRD refers to a state of advanced CKD with estimated glomerular filtration rate (GFR) being <10 ml/min per $1.73m^2$ where lifelong renal replacement therapy (dialysis or kidney transplantation) is necessary to sustain a reasonable quality of life and survival (4).

Patients who reach CKD stage 4 (estimated GFR 30 mL/min/1.73 m2) should receive timely education about kidney failure and options for its treatment, including kidney transplantation,

peritoneal dialysis, hemodialysis (HD) in the home or in-center and conservative treatment. HD substitutes for functions of the kidney, by cleaning and filtering blood to temporarily rid body of harmful wastes, extra salt and extra water. It helps control blood pressure and keeps the proper balance of important electrolytes in the body (4).

HD has made survival possible for more than a million people throughout the world who have ESRD with limited or no kidney function (5).

In Ethiopian governmental hospitals; hemodialysis was the only renal replacement therapy provided to adults with end-stage renal disease (6) till St. Paul Hospital Millennium Medical College started Renal Transplantation in 2018.

HD patients experience a 3 to 4 times a higher mortality rate compared to their peers without chronic kidney disease (CKD) (7).

Malnutrition

Malnutrition is common and the major risk factor of mortality of ESRD patients (8). ESRD results loss of appetite or anorexia which is evidenced by decreased dietary protein intake and decreased dietary energy intake, which are hallmarks of kidney failure. Reasons for protein energy malnutrition include disturbances in protein and energy metabolism, hormonal derangements, anorexia, nausea and vomiting related to uremic toxicity. Patients with chronic end-stage renal disease often show signs of protein-energy malnutrition in relation to an imbalance between inadequate nutritional intakes, catabolism and increased needs. Many causes contribute to its development, first of all anorexia and various comorbidities that are added to the various dietary restrictions laid down (9).

Several large studies in ESRD patients, treated either by HD or by peritoneal dialysis, have shown that a poor nutrient intake, as well as several clinical and biochemical markers of PEW are associated with increased morbidity and mortality (10).

Anthropometry, edema- free weight, body mass index (BMI), and subjective global assessment (SGA) are valid and clinically useful tools for overall nutritional assessment (11).

Anthropometric monitoring of the same patient longitudinally may provide valuable information concerning changes in nutritional status for that individual. There is evidence that maintenance hemodialysis patients (MHD) who have larger body-weight-for-height measurements are more likely to survive, at least for the subsequent 12 months. Patients in the lower 50th percentile of weight-for-height clearly have a reduced survival rate. One study indicates that MHD patients who are in the upper 10th percentile of body weight-for-height have the greatest 12-month survival rate (11).

Malnutrition is a complication in CKD known to affect quality of life and prognosis although not often diagnosed. It is associated with rapid progression to ESRD and mortality. Early identification and treatment will slow down progression to ESRD and mortality (12).

Despite the established awareness of their high cardiovascular risk, CKD patients still have inadequate risk factor assessment, modification and intervention. Malnutrition is one of the common features of CKD, although not usually diagnosed.

The consequences of malnutrition include reduced quality of life, sleep disorder, depression, erythropoietin hypo responsiveness, increased susceptibility to infections and aggravation of heart failure. There is therefore, justification to incorporate nutritional assessment as part of managing CKD patients even in early stages because malnutrition starts early in the course of CKD (12).

PEW presents as low serum albumin and serum cholesterol levels, low BMI, and reduced dietary protein intake. High BMI is associated with increased survival in most patients on dialysis (13).

Patients with chronic ESRD often show signs of protein-energy malnutrition in relation to an imbalance between inadequate nutritional intakes, catabolism and increased needs. Many causes contribute to its development, first of all anorexia and various comorbidities that are added to the various dietary restrictions lay down.

Many methods are available for the assessment of nutritional status of haemodialysis patients, but albumin concentration and BMI are most frequently employed. In a study done in Serbia; traditional anthropometric parameters triceps skinfold (TSF), mid-upper arm circumference

(MUAC) and mid-arm muscle circumference(MAMC) were found to be independent predictors of all-cause mortality and mid arm circumference was the most predictive one (14).

The criteria to diagnose protein-energy wasting include a serum albumin of less than 3.8 g/L, serum pre-albumin of less than 30 mg/dL, and serum cholesterol less than 100 mg/dL (15).

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: (1) biochemical measures (serum albumin, prealbumin, transferrin and cholesterol); (2) measures of body mass (body mass index), unintentional weight loss and total body fat), (3) measures of muscle mass (total muscle mass, mid-arm muscle circumference area and creatinine appearance) and (4) measures of dietary intake (dietary protein and energy intake) (16).

1.2 Statement of the Problem

HD patients experience a 3 to 4 times a higher mortality rate compared to their peers without CKD (7).

Because of a dearth of national registries and representative surveys, estimating the burden of ESRD in low and middle income countries is difficult and this has resulted in a lack of reliable statistics. The estimated prevalence of CKD in SSA is 13.9%, which is similar to global estimates of 13.4% (17) but the magnitude of ESRD in Ethiopia also has not been studied (6).

Renal replacement therapy was accessed by approximately 1.8 million people worldwide in 2004; less than 5% of the dialysis population was from SSA. In many African countries, chronic dialysis is not sustainable, with patients unable to afford dialysis beyond the first 2-3 months.

Despite the established awareness of their high cardiovascular risk, CKD patients still have inadequate risk factor assessment, modification and intervention. Malnutrition is one of the common features of CKD, although not usually diagnosed. The prevalence of malnutrition in previous studies varied between 28-65% depending on criteria used in diagnosis (12).

The consequences of malnutrition include reduced quality of life, sleep disorder, depression, erythropoietin hypo responsiveness, increased susceptibility to infections and aggravation of heart failure.There is therefore, justification to incorporate nutritional assessment as part of managing CKD patients even in early stages as this study showed that malnutrition starts early in the course of CKD (12).

When compared to the demographically adjusted general population, dialysis patients experience greater signs and symptoms of wasting, malnutrition, morbidity, and mortality (11).

1.3 Significance of the study

Among maintenance dialysis patients, protein energy malnutrition has been recognized as one of the most significant predictors of adverse outcomes. Anthropometry, edema- free weight, BMI, and subjec SGA are valid and clinically useful tools for overall nutritional assessment (11).

Protein-energy wasting is a common complication and an important predictive factor for mortality in chronic dialysis patients. Therefore, nutritional status needs to be regularly assessed in these patients, by using several methods (10).

Nutritional assessment is an inevitable process towards sustenance of patients with chronic renal failure. It is a process that helps to identify patients at nutritional risk, particularly among those with systemic disease that can adversely affect prognosis and outcome of disease (18).

Anthropometric assessment of nutritional status of a patient gives accurate result about nutritional status of the patients. And it is useful in identifying malnutrition and several measures of dietary intake will be utilized in hemodialysis patients and the clinician will be able to to provide affordable health care services for hemodialysis patients.

In Ethiopia no previous studies have been done so far. So the purpose of this multicenter study is to find out the nutritional status of the Ethiopian hemodialysis patients.

This study helps those hemodialysis service staffs who are giving this therapy to patients to be critical of those changes in these parameters and act upon it. These assessed and quantified change will also help policy makers to develop and implement a strategy to prevent malnutrition or a plan to make patients to arrive and to maintain the optimal level of nutritional status.

2. Literature Review

Chronic non-communicable diseases (CNCDs) account for around 60% of deaths globally with 80% of these deaths occurring in low and middle-income countries. CKD is one of these CNCDs and affects approximately 1 in 10 adults, or over 500 million people worldwide (19).

The national health and nutrition examination survey has estimated the prevalence of chronic kidney disease in the United States as 26 million (20). Unfortunately, lack of functioning registries in most of Sub-Saharan Africa has resulted in a lack of reliable statistics. However, there is a general impression that it is at least 3–4 times more frequent than in developed countries. Chronic kidney disease affects mainly young adults aged 20–50 years in Sub-Saharan Africa and is primarily due to hypertension and glomerular diseases, unlike developed countries where chronic kidney disease presents in middle-aged and elderly patient (3).

ESRD is the most severe form of CKD, and is also known as kidney failure. This is because at this stage, death is an inevitable consequence unless renal replacement therapy is instituted. Renal Replacement Therapy is comprised of treatment to replace, in part, the kidney function that has been lost so that life can be sustained. This is done with either dialysis therapy or a kidney transplant.

The estimated prevalence of CKD in SSA is 13.9%, which is similar to global estimates of 13.4% (17). By 2030, more than 70% of patients with end-stage renal disease are estimated to be living in low-income countries, such as those in SSA. This estimation is alarming in view of the fact that the global prevalence of maintenance dialysis has doubled since 1990, and that renal replacement therapy was accessed by 1·8 million people worldwide in 2004 with less than 5% of that population coming from SSA (21).

Despite continuous improvements in dialysis therapies and the addition of several novel classes of pharmacotherapy during the last 20 years, the mortality of ESRD patients remains alarmingly high worldwide, with an annual mortality of approximately 20% (22).

Nutritional health is one of the most important considerations in patients with chronic kidney disease especially in those who are undergoing MHD. Advanced kidney disease and renal replacement therapy lead to a number of metabolic and nutritional derangements, which can be termed as PEW of CKD. PEW is associated with major adverse clinical outcomes and is

considered to be a significant co-morbid condition leading to increased rates of hospitalization and death in patients undergoing MHD.

PEW is highly prevalent in patients undergoing MHD patients. Many different diagnostic tools were used in the separate studies so the actual prevalence of PEW in MHD patients varies widely, ranging from 20% to 60% (23).

Malnutrition is a relatively common problem in patients undergoing hemodialysis and is also associated with increased morbidity and mortality in the affected patients, as described in a recent Dialysis Outcomes Quality Initiative. (11).The presence of protein-energy malnutrition (PEM) is one of the strongest predictors of morbidity and mortality in ESRD patients receiving MHD therapy (22).

Since early 1980s, malnutrition has emerged as a determinant of survival in this population. Its frequency varies according to the method of evaluation. (9) Nutritional assessment is an inevitable process towards sustenance of patients with chronic renal failure. It is a process that helps to identify patients at nutritional risk, particularly among those with systemic disease that can adversely affect prognosis and outcome of disease (18).

Malnutrition in hemodialysis patients world wide

Signs of malnutrition and chronic inflammation have been reported in 30 and 60% of European dialysis patients respectively (22). In a study done in Iran; 10% of the patients had a BMI less than 19 Kg/m^2, 56.9% between 19-25 kg/m^2, 26.2% between 25-30 kg/m^2, and 6.9% $\geq$30 kg/m^2.(15). In a study done in India; mean BMI was computed as 20.86 $\pm$ 2.48 kg/m^2 in females and 21.58$\pm$ 2.47 kg/m^2. In other study done in India, 52.94% females and 16.67% males were moderately malnourished (11). 11% males were severely malnourished. BMI was significantly correlated with the weight (r=0.8326 and 0.8160 in females and males respectively). MUAC below 12.5 cm indicates severe degree of malnutrition. Majority cases from both genders reflected severe degree of malnutrition as their MUAC values were below 12.5cm (24).

In another study done in India, Hyderabad; 27% of hemodialysis patients were undernourished and remaining 73% of the patients were normal body type as per international BMI standards (25).

In a study done in Brazil Sao Paulo Fifty-nine percent (n =204) of the patients had a BMI between 18.5 and 25, 35% (n = 120) were overweight or obese BMI $\geq$ 25, and only 6% (n =20) were underweight. MAMC < 90% was associated with higher mortality (26).

In study done in hemodialysis population in South China, the patients with malnutrition were 68%, and 8% had severe malnutrition. The mean value of BMI was 21.6 ± 3.1 kg/m^2 and the MAC reflected the thickness of subcutaneous fat and muscle, and the mean value was 25.78±4.09 cm (27). The anthropometrical mean values were as follows; BMI 22.8 ± 8.1 kg/m^2, MAC 26.7 ± 4.0 cm, TSF 10.8±6.4 mm, MAMC23.3±3.5 cm (10).

The national kidney foundation (NKF) considered the BMI for hemodialysis patients as above 23kg/m^2 and below 23kg/m^2 so according to this category 54.4% (n=36) had BMI below 23kg/m^2 and 43.9% (n=29) had BMI above 23kg/m^2. In a study done in Pakistan; it was concluded that most of the patient were at risk of malnutrition. About 54% of patients in this study have a BMI of less than 23 kg/m^2, a result that suggest a high risk of mortality (28).

Malnutrition of hemodialysis patients in Africa

PEM has been reported in 20% to 50% of patients treated with hemodialysis in several studies. In Senegal, a cross-sectional study of 142 cases in three hemodialysis centers in Dakar showed a prevalence of under-nutrition of 43.2% (9).

In a study done in a teaching Hospital in Southern Nigeria; the prevalence of malnutrition in pre-dialysis CKD patients was 46.7%.(12) while in a study done in Morocco; the mean of BMI for all patients was 23 ± 4 kg/m^2 (for females 23 ± 4 kg/m^2 and for males 24 ± 4 kg/m^2). 71% patients had a normal nutritional status and 29% patients were considered to be malnourished (29).

Malnutrition of hemodialysis patients in Ethiopia

Dialysis for ESRD has been available in Ethiopia for less than a decade. Hemodialysis is available in Ethiopia for the wealthy living in Addis Ababa and each dialysis session costs about

US$100 (1700 Birr), a price that does not include any other costs of care (6). Three governmental hospitals in the literature are reported to provide limited maintenance hemodialysis services in the capital: St. Paul's Millennium Medical College Hospital, Zewditu Memorial Hospital and Menilik Hospital.

Renal replacement therapy is an extremely scarce treatment modality in Ethiopia and accessible to only few wealthy urban dwellers. Long term survival in those undergoing dialysis is very low and can be attributable to various medical conditions.

In a retrospective study done in Ethiopia; from a total of 190 patients using hemodialysis; forty-one (45%) deaths occurred during dialysis treatment; 21 of the deaths occurred within the first 90 days of starting dialysis. Thirty-six deaths occurred at the hospital and the remaining 5 occurred at home. Survival at three month and one year was 61.5% and 42.1% respectively. (6). But no pevious studies has been done regarding the nutritional status of hemodialysis patients in Ethiopia.

3. Objective

3.1 General Objective

- To assess magnitude of malnutrition among hemodialysis patients using anthropometry in selected Addis Ababa Governmental hospitals, Addis Ababa, Ethiopia

3.2 Specific Objectives

- To measure the anthropometry of hemodialysis patients in selected Addis Ababa Governmental hospitals.
- To determine magnitude of malnutrition among hemodialysis patients in selected Addis Ababa Governmental hospitals.
- To measure severity level of malnutrition among hemodialysis patients in selected Addis Ababa Governmental hospitals.

4. Method and Materials

4.1 . Study Area

This study was conducted in Addis Ababa; capital city of Ethiopia with population number of 3.238 million according to Ethiopia Demographics Profile 2017. The city has ten sub cities and 116 woredas. Among the 51 hospitals, 6 are owned by Addis Ababa City Administration Health Bureau, 4 by Federal Ministry of Health, 1 by Addis Ababa University, 3 by Nongovernmental organization, 3 by Defense Force and Police and 34 are owned by private. The study was conducted in dialysis units of three public hospitals in Addis Ababa, Ethiopia; Zewditu Memorial Hospital, St. Paul Millennium Medical College Hospital and Menilik II Referral Hospital.

4.2. Study period

The study was conducted from May 1 to September 30, 2018.

4.3. Study design

Institution based Cross- sectional study was employed.

4.4. Population

4.4.1. Source population

All ESRD patients who were on maintenance hemodialysis in Addis ababa

4.4.2. Sample population

ESRD patients who were on maintenance hemodialysis in the selected health facilities (St. Paul's Millennium Medical College Hospital, Menilik II Referral Hospital, and Zewditu Memorial Hospital) were used as a sample.

4.5. Inclusion criteria

All ESRD patients on maintenance hemodialysis who had been on hemodialysis at the selected governmental hospitals during the period of May to August 2018 G.C; who gave informed consent to participate.

4.6. Exclusion criteria

- Hemodialysis patients who didn't have complete records.
- Hemodialysis patients who had body deformity and who were unable to respond

4.7. Sample size and sampling technique

Sample size = 80

Due to small number of patients on hemodialysis all (80) End Stage Renal Disease patients on maintenance dialysis who fulfilled the inclusion and exclusion criteria were recruited to the study.

- **44** patients from St. Paul Millennium Medical College Hospital
- **16** patients from Menilik II Referral Hospital.
- **20** patients from Zewditu Memorial Hospital

4.8. Data collection techniques and tools

I. **Questionaire**:

A structured questionnaire was used to collect patient variables including socio-demographic factors, risk factors, and clinical features. The questionnaire was prepared in English and translated to Amharic language and checked for its consistency by back translation to English by different individual.

II. Anthropometric Measurement

1. **Dry Weight (Wt.)**

Electronic weighing scale was used to obtain the weight. The scale was placed on a hard floor surface. Patients were asked to remove their heavy outer garments. Weight was measured in all patients and taken to the nearest 0.1 kg.

2. **Height (Ht.)**

Height was measured in all participants, with the patients bare footed and head upright. The height was measured with the measuring rod attached to the electronic weighing scale. The height was reported to the nearest 0.5 cm.

3. **Body mass index (BMI).**

Body mass index was calculated based on the following formula:

BMI= Weight in kilograms/Height in meters^2

4. Mid Upper Arm Circumference (MUAC).

Mid upper arm circumference was measured with a flexible non stretchable measure tape. The patients were asked to stand with his/her feet together, shoulders relaxed, and arms hanging freely at the sides. The midpoint on the posterior aspect of the upper arm was established between the acromial and olecranon and marked. The measuring tape was placed around the upper arm at midpoint and pulled snugly enough to ensure contact with the arm. The measurement was recorded to the nearest centimeter. Three measurements of MUAC were obtained and the average was calculated (30).

5. Triceps Skin-Fold Thickness (TSF)

Triceps skin-fold thickness was measured with a body fat caliper (Harpenden Skin fold Calipers). The TSF was measured in the midline of the posterior aspect of the arm, over the Triceps muscle, at a point midway between the lateral projection of the Acromion process of the Scapula and the inferior margin of the olecranon process of the Ulna. A fold of skin with subcutaneous adipose tissue was grasped gently with the thumb and forefinger. With the jaws of the caliper perpendicular to the length of the fold, they were closed around the skin-fold. The skin-fold thickness was measured to the nearest 1 mm. The measurement was repeated three times and the average was calculated (30).

6. Mid-Arm Muscle Circumference (MAMC)

Mid-arm muscle circumference was calculated from the MUAC and the TSF by the following formula: MAMC (cm) = MUAC (cm) – [3.1415 x TSF (cm)] (30).

7. Mid-Arm Muscle Circumference Area (MAMA)

Mid-arm muscle area was also calculated from the MUAC and the TSF by the following formula: Mid-arm muscle area = $((MUAC-(3.1415 \times TSF))^2)/4\pi$ (30).

III. Laboratory measurement

Serum Albumin result was taken from monthly laboratory result.

4.9 Study variables

4.9.1 Dependent variable

Nutritional status

4.9.2 Independent variables

Gender	Age
Educational status	Occupational status
Weight	Height

4.10. Operational definition

Nutritional status: body's status of nutrition that is expressed according to certain scientifically tested parameters including weight, height, and other measurements or a combination of them.

Malnourished : patients who fulfill three ISRNM diagnostic criteria.

Hemodialysis: A medical procedure to remove fluid and waste products from the blood and to correct electrolyte imbalances by acting as artificial kidney.

Cut-off points

1. **WHO Weight classification**

<16 (Severe)

6-16.99 (moderate)

7-18.4 (mild)

18.5-24.99 (normal range)

>25 (overweight)

2. **Mid-upper arm circumference**

Male →Undernourished<23cm

Female → Undernourished <22cm

3. **Hypoalbuminemia (low serum albumin)** → <3.8 g/dl

4. **Mid arm muscle area reduction of 10%** → arm muscle area <28.9cm)

4.11. Data analysis and Interpretation

The data was checked after each data collection for completeness. The data was entered into EPI data manager version 3.1 and analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 21. The categorical data were expressed as percentages, and continuous variables were expressed as a mean and standard deviation. Pearson's correlation analysis was used to see the relation between different anthropometric variables. Anhropometric measurement means between the malnourished and normal groups and also between sex groups were compared by Independent t-test. A probability value of less than 0.05 was considered statistically significant.

4.12. Data quality control

To maintain data quality, training was given for 2 days for data collectors and for supervisors. Properly designed data collection materials was developed. Supervision was carried out daily to check completeness, consistency by both the supervisor and the principal investigator.

4.13. Ethical consideration

Ethical clearance was obtained from Department Research Ethics Review Committee (DRERC), Institutional Review Board (IRB) of St. Paul's Millennium Medical College and Addis Ababa Public Health Research and Emergency Management Core Process. This letter of ethical clearance as well as a letter of cooperation was sent for the respective hospitals. All the study participants were briefed with research activities and confidentiality of the information collected. Written informed consent was obtained from the patients before beginning of data collection.

5. Result

5.1 Socio demographic characteristics

In this study total of 80 patients were included, 50(62.5%) were male and 30(37.5%) were female patients. The mean age of the patients was 38.91±13.00 years, with a median age of 35 years. The mean age of female patient's was 34.10±13.00 years, while the mean for males was 41.8±12.24 years. Most of the patients 72(90%) reside in urban area. Almost half 41 (51.25%) of them were married. Forty five (56.25%) of the patients had attained higher education level and 25(31.25%) of attended their secondary school, while the rest had learnt primary education.

About 40% of the study participants were from Amhara ethnic group. A total of 47 (58%) of the patients were using hemodialysis treatment in St. Paul Hospital Millennium Medical College. The other 20 (25%) were utilizing the service at Zewditu Memorial Hospital while the rest 13 (16.25%) were at Menilik II Referral Hospitals. About 36 (45%) of the patients were unemployed.

Table 1. Socio demographic characteristics of hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

Patient Variable	Category	Number	Percent (%)
Age	18-29	18	22.5%
	30-39	27	33.8%
	40-49	16	20%
	50-59	13	16.3%
	60-69	4	5%
	70-79	2	2.5%
Educational level	Elementary	10	12.5%
	Secondary	25	31.25%
	Higher education	45	56.25%
Marital Status	Single	33	41.25%
	Married	41	51.25%
	Divorced	5	6.25%
	Widowed	1	1.25%

Ethnicity	Oromo	24	30%
	Amhara	32	40%
	Tigre	5	6.25%
	Other	19	23.75%
Religion	Orthodox	50	62.5%
	Muslim	16	20%
	Protestant	14	17.5%
Residence	Urban	72	90%
	Rural	8	10%
Job status	Employee	14	17.5%
	Merchant	5	6.25%
	Private	20	25%
	Student	1	1.25%
	Unemployed	36	45%
Hospital	St. Paul (SPHMMC)	47	58.75%
	Zewditu memorial	20	25%
	Menilik II	13	16.25%

5.2. Medical history

In this study; majority of the patients 57(71.25%) had started the dialysis in the previous 5 years, and most of the patients 69 (86.25%) utilized hemodialysis three times a week.

As medical history is shown in table 2, about 40% of the patients were hypertensive before diagnosis of end stage renal disease, while 21.25% of the patients had a history of diabetes mellitus and 10% of the hemodialysis patients had a history of both hypertension and diabetes mellitus. After the beginning of hemodialysis 49 (61.3%) of the patients had hypertension, 12(15%) of patients had diabetes 4(5%) patients had anemia, 1(1.25%) had Cardiovascular diseases, 3(3.75%) had Peptic ulcer disease, while 21 (26.25%) of the patients didn't have comorbid diseases.

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Table 2. Medical history of hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

Patient Variable	Category	Number	Percent (%)
Hemodialysis frequency per week	Once	1	1.25%
	Twice	8	10%
	Thrice	69	86.25%
	Alternate(2or3)	2	2.5%
Duration of Hemodialysis	Less than 1 year	18	22.5%
	1-5 years	57	71.25%
	5 years and more	5	6.25%
Disease history before ESRD diagnosis	Hypertension	32	40%
	Diabetes	17	21.25%
	Urinary tract infection	6	7.5%
	HTN & DM	8	10%
	Others	8	10%
	No disease	25	31.25%
Presence of other disease co-morbidities	Hypertension	49	61.25%
	Diabetes	12	15%
	CVD	1	1.25%
	PUD	3	3.75%
	Anemia	4	5%
	HTN & DM	8	10%
	Other diseases	2	2.5%
	No disease	21	26.25%

5.3. Anthropometric and Biochemical Characteristics

Body mass index (BMI) was computed 20.31±3.73kg/m^2 in all the patients; it was 20.67±3.45 kg/m^2 in males, and 19.70±4.14 kg/m^2 in females in this study. Mid upper arm circumference (MUAC) mean values were lower for female patients than males. The mean of Triceps skinfold thickness (TSF) was 12.503 ±5.6mm, while Mid upper arm muscle circumference's mean was (MAMC) 19.408± 3.449cm, and the mean arm muscle area (AMA) was 31.4± 9.58cm.

Table 3. Anthropometric and Biochemical Characteristics of hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

Variables	Total(N=80) Mean± SD	Female(N=30) Mean± SD	Male (N=50) Mean± SD	p-value
Age in years	38.91±13	34.10±13.00	41.8±12.24	0.72
BMI	20.31±3.73	19.70±4.14	20.67±3.45	0.263
MUAC	20.37±2.40	17.80±4.29	23.45±3.43	0.488
TSF	12.503 ±5.6	15.38±6.22	10.57±4.19	0.000
MAMC	19.408± 3.449	23.06±4.37	23.68±2.76	0.001
AMA	31.4± 9.58	28±11.00	33.45± 8.06	0.013
Serum Albumin	4.0±0.432	3.88±0.44	4.07±0.41	0.065

5.3.1 Body mass index

The magnitude of malnutrition based on the body mass index was 37.5%, 30 patients were in the malnutrition group. Half of the female patients and 30% of the male participants were malnourished while 39 (48.75%) of the patients were in normal BMI category, and 10 (12.5%) of them were overweight. There was no significant mean difference of body mass index (p=0.263) observed between male and female participants.

Table 4. Nutritional status based on Body mass index of hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

BMI	Patient				Total	
	Male		Female			
	N=50	%	N=30	%	N=80	%
<18.5	15	30%	15	50%	30	37.5%
18.5-25	28	56%	N=11	36.67%	39	48.75%
25-29.9	N=6	12%	N=4	13.33%	10	12.5%
>30	N=1	2%	N=0	0%	1	1.25%

5.3.2 Serum Albumin

About 28.75% of the patients had serum albumin lower than 3.8 g/dl. Low serum albumin was found in 40% and 22% of the female and male patients respectively. The mean serum albumin of female patients was lower than males but there was no significant mean difference of serum albumin (p=0.065) observed between male and female participants.

Table 5. Nutritional status based on serum albumin of hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

Serum Albumin	Patient				Total	
	Male		Female			
	N	%	N	%	N	%
<3.8 g/dl	N=11	22%	N=12	40%	N=23	28.75%
≥3.8 g/dl	N=39	78%	N=18	60%	N=57	71.25%

5.3.3 Mid arm muscle area

About 43.75% of the patients had more than 10% mid arm muscle area reduction from mean reference of population. From the result, 63.3% of female patients were malnourished based on these criteria while 32% of the male patients had more than 10% reduction of muscle arm area.

Table 6. Nutritional status based on Mid arm muscle area reduction of the hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

AMA Reduction	Patient				Total	
	Male		Female			
	N	%	N	%	N	%
>10%(<28.9cm)	16	32%	19	63.33%	35	43.75%
≤10%	34	68%	11	36.67%	45	56.25%

5.4. Magnitude of malnutrition based on ISRNM

The ISRNM expert panel recommends at least one criterion in three of the four categories proposed (biochemical, body mass, muscle mass and dietary intake criteria) to be recognized for the diagnosis of protein energy wasting or malnutrition.

Regarding the body mass category, body mass index values ranged from 14.27-30.04 kg/m^2 and 30(37.5%) patients were presented with BMI<18.5 kg/m^2. About half (50%) of the females were malnourished while 30% of male patients were also in the malnourished group.

In Biochemical category the result of serum albumin was taken and analyzed. Totally 23(28.75%) of the patients had serum albumin below the reference value (3.8mg/dl). In which about 12(40%) of the female patients were with albumin <3.8 mg/dl and 22% of the male patients showed malnutrition based on Serum Albumin.

In muscle mass category, AMA was calculated from mid upper arm circumference and triceps skin fold thickness and it is found that 35(43.75%) of the patients had reduced mid arm muscle circumference area more than 10% when compared to 50th percentile of the reference population.

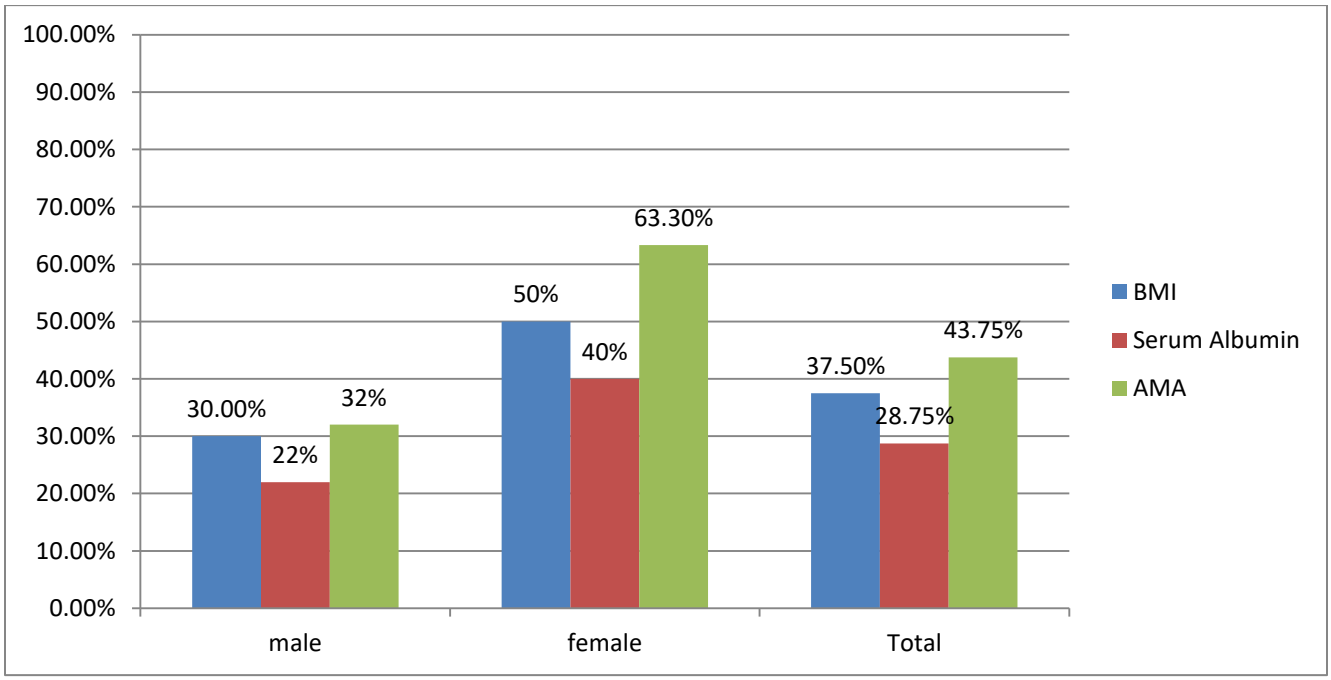

Figure. 1 Magnitude of malnutrition according to ISRNM criteria elements among hemodialysis patients in selected A.A. governmental hospitals, Addis Ababa, Ethiopia, 2018.

According to ISRNM criteria 12(15%) of the patients fulfilled the three criteria of malnutrition or protein energy wasting. While 9(30%) of the female patients were malnourished based on ISRNM criteria. As many as 15% of patients were classified as having malnutrition per ISRNM criteria (3criteria; 37(45%) of patients were classified as being at risk of malnutrition (1-2 PEW syndrome) and 32(40%) of the sample fulfilled no PEW criteria. Of the criteria employed, low AMA was the most frequently found derangement (43.75%), followed by low BMI (37.5%) and low serum albumin (28.75%) respectively.

5.5. Severity level of Malnutrition of hemodialysis patients based on BMI

In this study 10% of the patients are <16 Kg/m^2 were severely under nourished in which all were females and 13 (16.25%) of the patients were found in the (17-18.4 Kg/m^2) mild under nourished category. Ten of the males and 10% of the female patients are mildly undernourished. 9 (11.25%) of the patients were moderately under nourished (16-16.99 Kg/m^2) in which 8% males and 16.67% of the female patients grouped in this category .

Table 7. Malnutrition grades based on BMI of hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

Malnutrition Grade	Male		Female		Total	
	N	%	N	%	N	%
16 (Severe)	0	0%	8	10%	8	10%
6-16.99 (moderate)	4	8%	5	16.67%	9	11.25%
7-18.4 (mild)	10	20%	3	10%	13	16.25%

5.6. Upper arm anthropometry of hemodialysis patients

The anthropometric measurement result showed that Mid upper arm circumference (MUAC) values were lower for female patients with the mean value of 17.80±4.29cm than males with 23.45±3.43cm and the total mean and standard deviation was 20.37±2.40 cm. The mean of Triceps skinfold thickness (TSF) was 12.503 ±5.6mm, while Mid upper arm muscle circumference's mean was (MAMC) 19.408± 3.449cm, and the mean arm muscle area (AMA) was 31.4± 9.58cm. Based on MUAC measurement of the study 36(45%) of the patients utilizing hemodialysis service were undernourished, in which the magnitude was 23(46%) in males and 13(43.3%) in females.

Table 8. Mid upper arm circumference of hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

MUAC			
Sex		N	%
Male	Undernourished<23cm	23	46%
	Normal >23cm	37	54%
Female			
	Undernourished <22cm	13	43.33%
	Normal >22cm	17	56.67%
Total			
	Undernourished	36	45%
	Normal	44	65%

5.7. Correlation between Anthropometric variables

Mid-upper arm circumference and Body mass index had a positive correlation with every anthropometric measurement while Triceps skin fold thickness had a negative correlation with Mid-upper arm muscle circumference(r=-0.020) and Arm muscle circumference area (r=-0.048)

Body mass index had a significant strong correlation with mid upper arm circumference (r=0.793), mid upper arm muscle circumference(r=0.654) and arm muscle area(r=0.669). It was observed that triceps skin fold thickness had a moderate correlation (r=0.382) with body mass index and with Mid-upper arm circumference(r=0.454).

Table 10. Correlation between anthropometric measurement results of hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

		BMI	MUAC	TSF	MAMC	AMA
BMI	Pearson Correlation (r)	1	.793**	.382**	.654**	.669**
	Sig. (2-tailed)		.000	.000	.000	.000
MUAC	Pearson Correlation (r)	.793**	1	.454**	.831**	.853**
	Sig. (2-tailed)	.000		.000	.000	.000
TSF	Pearson Correlation (r)	.382**	.454**	1	-.020	-.048
	Sig. (2-tailed)	.000	.000		.858	.672
MAMC	Pearson Correlation (r)	.654**	.831**	-.020	1	.928**
	Sig. (2-tailed)	.000	.000	.858		.000
AMA	Pearson Correlation (r)	.669**	.853**	-.048	.928**	1
	Sig. (2-tailed)	.000	.000	.672	.000	

5.8. T-test between the means based on Sex

There was no significant difference of mean body mass index (p=0.263), mid-upper arm circumference (p=0.488) and serum albumin (p=0.065) observed between male and female patients, while significance difference of mean triceps skin fold thickness (p=0.001), mid upper arm muscle circumference (p=001) and arm muscle area (p=0.013) were detected between sex groups.

Table 11. T-test between the means of Female and male hemodialysis patients in selected Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, 2018

		T-test for Equality of Means between Males and Females			
	F test	Significance	T test	Degree of freedom	Significance (2-tailed)
BMI	3.364	.070	1.128	78	0.263
			1.077	52.731	0.286
MUAC	14.266	.000	0.780	78	0.438
			0.699	43.079	0.488
TSF	6.825	.011	-4.068	78	0.000
			-3.680	44.318	.001
MAMC	11.485	.001	3.440	78	0.001
			3.010	40.083	.004
AMA	4.321	.041	2.548	78	0.013
			2.361	47.787	.022
Serum Albumin	1.150	.287	1.870	78	0.065
			1.836	57.678	.072

6. Discussion

Malnutrition is a relatively common problem in patients undergoing hemodialysis. In this study, the nutritional status of patients on hemodialysis at the dialysis units of St. Paul Hospital Millennium Medical College, Zewditu Memorial Hospital and Menilik II hospital have been investigated based on ISRNM criteria, BMI and other upper arm anthropometric measurements to determine the magnitude of malnutrition and severity of malnutrition.

6.1. Magnitude of malnutrition based on ISRNM criteria

In this investigation, there were 80 patients enrolled and the magnitude of malnutrition ranged from 28.75% to 43.75%, when assessed with the different methods in isolation, these results match to cross-sectional study done in Benin in which prevalence varied between 14% and 42.95% depending on the measurement tool used (35).

When the criteria proposed by the ISRNM expert panel(32) were applied, only 12 (15%) of the patients fulfilled the three criteria of malnutrition or protein energy wasting, which is consistent to the study done in Japan with 15% of the sample patients having malnutrition (PEW) (33); But it is higher than the cross-sectional study done in Brazil (13.3%) and Benin (14.09%) of the sample assessed were considered malnourished (34, 35).

In contrast, 29% of the participants had protein energy wasting according to ISRNM criteria in a cross-sectional study done in Denmark (36), while 59% of patients were malnourished in study done in Malaysia (45).

As many as 15% of patients were classified as having malnutrition per ISRNM criteria (3criteria); 37(45%) of patients were classified as being at risk of malnutrition (1-2 PEW syndrome) and 32(40%) of the sample fulfilled no PEW criteria. which is lower than the study done in Spain in which 110 patients (23%) were classified as having PEW per ISRNM criteria (3 PEW criteria); 68% of patients were classified as being at risk of PEW (1-2 PEW syndrome) and only 9% of the sample fulfilled no PEW criteria. (38) This magnitude difference could result because of the difference of cut-off point of BMI used in this study and that of Spain, Denmark and Malaysia (38, 36, 45). The ISRNM criteria proposes BMI <23 Kg/m^2 as a malnutrition which is proposed based on American population and the study done in Spain used that cut off point. In case of this study; the Ethiopian population may not correspond to American population and used the World Health Organization (WHO) (BMI<18.5 Kg/m^2) cut-off point as a criteria.

Body Mass Index

In the current study finding malnutrition based on Body mass index was 37.5%.This finding was relatively higher than the result from cross sectional study done in Morocco and Niger in which (29%) and (29.23%) were considered to be malnourished respectively. The mean BMI of this study was 20.31+ 3.73 kg/m^2, which was lower than mean BMI index was 23+4.0 kg/m^2.in patients of Morocco while BMI averaged 21.60 ± 4.47 kg/m² in Niger. (29, 9) The difference is probably because of sample size taken in these studies.(Morocco, n=37 and Niger, n=65) which is lower than number of participants in this study (n=80) (29, 9).

In this study 37.5% had BMI < 18.5 kg/m^2while 48.75 % of the patients had BMI between 18.5-25 kg/m^2which was lower than magnitude of malnutrition from cross-sectional study done in Pakistan (Magnitude of malnutrition was 48% in which 48% had BMI < 18.5 kg/m^2, while 42% had BMI between 18.5-25 kg/m^2.) (39).

In current study the mean BMI was 20.31± 3.73 kg/m^2 which is lower than research study done in Romania (BMI 22.8 ± 8.1 kg/m2), **(**10) and in Brazil (24.2± 4.4 kg/m^2),(34), while it is greater than mean BMI of patients in cross-sectional study done in Nepal (19.6 ± 3.19 kg/m2), (40). This is probably due to difference in socioeconomic status of population in those countries.

Based on BMI criteria 50% of female and 30% of males were malnourished which shows slightly similar figure with a result from a study done in India with sample size of 69 patients undergoing maintenance hemodialysis showed that 52.94% females and 27.77% males were malnourished. The mean BMI was computed as (20.67+3.45 kg/m^2) in males and (19.70+4.14 kg/m^2) in females which is lower than from the result in India in which mean BMI was (20.86 ± 2.48 kg/m^2 in females and (21.58± 2.47 kg/m^2) in males (24).

Serum Albumin

Serum albumin is a valid and clinically useful measure of protein energy nutritional status in measuring visceral protein pool size (11). There were 28.75% of the patients who had serum albumin lower than 3.8g/dl. The result of this study showed lower value than shown in patients from cross-sectional study done in Spain in which low albumin was (46%) (37). The mean serum albumin in this study was 4.0±0.432 mg/dl, which was similar to cross–sectional study done in

Nepal (4.0 ± 0.3 mg/dl). (40). The mean serum Albumin was greater than mean albumin level from a cross-sectional research done in Morocco (3.8±0.55 g/dl) and Brazil (3.5±0.4 g/dl). (29, 34). This low serum in hemodialysis patients could be the result of sustained decrease in dietary protein and energy intake, decrease in the rate of albumin synthesis or as a result of increased albumin catabolic rate or albumin leakage through the dialysis membranes (11, 29, 41).

6.2. Severity of Malnutrition

In this study 10% of the patients were severely malnourished in which all were females.13 (16.25%) of the patients were found in the mild malnourished category. Severe malnutrition (10%) was higher compared to study done in Brazil with 6.7% of the patients in the severe group in sample size of 15 hemodialysis patients (34), but lower than the result found in study done in Yemen which is (20%) severely malnourished patients from 50 hemodialysis patients (37). This difference in result could be attributed to the difference in sample size of the studies.

6.3. Correlation of Upper Arm Anthropometric measurements

Anthropometry quantifies body mass, provides estimate of components of body mass, particularly the bone, muscle, and fat compartments, and gives information concerning nutritional status. Muscle area, diameter, or circumference is used to estimate muscle mass and, by inference, the fat free mass and somatic protein pool. Significant changes in these measurements reflect changes in body muscle and somatic protein mass and indicate a nutritionally compromised state (11).

Mid-Upper Arm Circumference

The mean mid-upper arm circumference (MUAC) of this study was 20.37±2.40 cm, which was lower than the mean MUAC from the study in China 25.75+4.09 cm (27), Niger 26.50 ± 4.09 cm (9), Romania 26.7 ± 4.0 cm (10).

In this study, strong correlation between BMI and MUAC (r=0.793) (p=0.000) was seen, which is similar to the study done in Nigeria (18), and Saudi Arabia (25) and there was also strong correlation between ISRNM and MUAC measurement(r=0.464) (p=0.000). The classification of mid upper arm circumference (MUAC) was used based on category used in a study done in Ethiopia by Abrhame (42) and which was also used in India (43).

Mid-upper Arm Muscle Circumference and Arm Muscle Area

In this study; mean MAMC was19.40± 3.44, which was greater than the mean from a cross-sectional study done in India (MAMC =18.66 +4.24cm) (43), but lower than mean in Egypt (20.91+6.65cm)(31), Nepalese study (MAMC 20.26+2.15) (40), China (22.43 $\pm$ 3.26) (27), and Malaysia (22.83+ 3.66cm) (46), which could be as a result of variation of socioeconomic status of patients undergoing hemodialysis in those countries. In this study the mean AMA was 31.4± 9.58 cm^2 which is lower than the mean AMA 33.74+13.62 cm^2 in the study done in Malaysia (46) The MAMC was correlated with BMI (r= +0.58) in a study done in USA in which this study showed a correlation of BMI and MAMC (r=+0.654) (44) The reference population used to compare the AMA is the mean of a research study done in Ethiopia (47).

7. Conclusion

Malnutrition is high among maintenance hemodialysis patients in Addis Ababa and it was more common in female patients than their male counterparts. A greater number of patients were classified as being at risk of malnutrition based on elements of ISRNM criteria.

BMI showed a higher description of magnitude of malnutrition among the study participants, rather than ISRNM and also showed severely malnourished hemodialysis patients.

The upper arm anthropometric measurements were significantly correlated with each other in describing the nutritional status of the maintenance hemodialysis patients and can be helpful in determining nutritional status.

8. Limitation of Study

Other criteria of ISRNM were not assessed such as Dietary intake, creatinine appearance, and serum cholesterol.

The study was done on governmental hospitals and patients from private hospitals were not used as a sample.

There were limited similar studies and no study found in Ethiopia for comparison.

9. Recommendation

Based on the study finding of the current study early referral to a dietitian for nutritional counseling is recommended, especially for those who are severely malnourished

All hemodialysis patients should be assessed for malnutrition periodically and strict monitoring nutritional status during the first year of dialysis is recommended. BMI and other anthropometric reference levels in ISRNM criteria should be modified for Ethiopian hemodialysis patients.

This study was also cross-sectional study and it needs a longitudinal study to determine which of the parameters would better assess the nutritional status of dialysis patients.

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11. Annexes

Annex I. Informed Consent Form

Patient's information document

Dear participant!

My name is Degu Getu, I am collecting data for a research study intended to assess Upper arm anthropometry as assessment of nutritional status and severity among Hemodialysis patients in selected Addis Ababa governmental hospitals, which is expected to forward recommendations to solve the problem. You are selected to participate on this study. If you are willing to participate on this research, you need to sign the agreement form. After then you will be interviewed by the data collector. You do not need to write your name or to tell your name to the data collector and all your response and the results obtained will be kept confidentially by using coding system.

1. Procedures

You will be requested to give 5 ml (one tea spoon) and cooperate for some anthropometric measurements. Blood will be collected from one of your arm vein by experienced laboratory technician.

2. Risk and discomfort

You may have minor discomfort and pain during blood drawing and there may also be mild redness on the site where the shot was given. But this will be minimized, as the procedure will be carried out by experienced health professionals in the health facility with a standard aseptic condition.

3. Expected benefit

This study will assess Upper arm anthropometry as assessment of nutritional status and severity among Hemodialysis patients and based on the result, it helps in finding a solution for the problem.

4. **Incentives**

You will not be provided any incentives or payment to take part in this project.

5. Confidentiality and Privacy

Samples and information given by you will serve only for this study not for any other purpose and will be kept confidential. Information will be stored in a file, without your name, only code number is used. It will not be revealed to anyone except the principal investigator.

6. Right to refuse or withdraw

Participation in the study is voluntary, and refusal to participate involves no penalty or loss of benefits to which you are otherwise entitled. You have every right to accept or refuse participation in this study at any time.

Person to contact

This research is approved by Research Ethics Review Committee (DRERC). If you have any question, you can contact any of the following individuals and you may ask any time you want.

Investigator: - Degu Getu

Mobile: - 0921907962

E-mail :- degwhy@gmail.com

Code no----------

Consent Form

I am told that the aim of this study is to assess Upper arm anthropometry as assessment of nutritional status and severity among Hemodialysis patients in this Hospital and the information document has been given to me. I understood about the purpose of the study and I am told that blood sample will be collected from one of my arm and my height and weight will be measured.

I have agreed to participate in this study voluntarily. I have understood that I have every right to refuse participation in this study at any time and I will not be denied any benefit and services I am getting as a result.

I have understood that I will not be provided any incentives or payment to take part in this project. I have understood samples and information taken from me will serve only for this study not for any other purpose and will be kept confidential and also no personal information or name will be published

Agreement of participation

_____ _____

Name of participant Signature of participant

_____ _____

Name of witness signature of witness

_____ _____

Name of Investigator signature of Investigator

የመ ረጃ መ ስጫና በፍቃደኝነት ተሣ ትፎ መ ፈረሚ ያ

በጥናቱ ለሚሣተፉ የሚሠጥ መረጃ

ውድ ተሳታፊ!

ደጉ ጌቱ እባላለው። በአዲስ አበባ ዩኒቨርስቲ ጤና ሳይንስ ኮሌጅ የአናቶሚ ትምህርት ክፍል የድህረምረቃ ተማሪ ነኝ። የዚህ ጥናት አላማም በተመረጡ በአዲስ አበባ የመንግስት ሆስፒታሎች የሚገኙ የኩላሊት እጥበት ታካሚዎች ሰውነት አካላትን መጠን በመለካት የሰውነትን የአመጋገብ ሁኔታ እና መጠን ለመመርመር ነው።

እርስዎ በዚህ ጥናት ውስጥ እንዲሳፉ ተመርጠዋል።መረጃ ከተሰጠዎት በኋላ በዚህ ጥናት ላይ ለመሳተፍ ፈቃደኛ ከሆኑ የስምምነት ውል ይፈርማሉ። ከዛ በኋላ በመረጃ ሰብሳቢው ቃለ መጠይቅ ይደረግሎታል። ስሞትን እንዲፅፉም ይሁን እንዲናገሩ አይገደዱም፣ የሚሰጡት የትኛውም የግል መረጃ በሚስጥር የሚጠበቅ እና ለዚህ ጥናትና ምርምር ብቻ በሚያገለግል ቁጥር ይመዘገባል።

1. **የሚወሰዱ መረጃዎች እና ሂደቶች**

በዚህ ጥናት ላይ በደምዎ ያለውን የፕሮቲን(አልቡሚን) መጠን ለመለካት የደም ናሙና 5 ሚሊ ሊትር ይወሰዳል። እንዲሁም ሌሎች ልኬቶችን ለማወቅ የቁመት እና የክብደት፣ የክንድ ዙሪያ መጠኖን እንለካለን።

2. **አለመመቸት እና ህመም**

የደም ናሙና በሚወሰድበት ጊዜ ትንሽ ህመም እና መቅላት በተወሰደበት ቦታ ላይ ሊኖር ይችላል። ነገር ግን ይህንን በሰለጠኑ እና ልምድ ባላቸው የጤና ባለሙያዎች ስለሚወሰድ ህመም እንዲቀንስ ይደረጋል።

3. **የሚገኘው ጥቅም**

ይህ ጥናት የከላሊት እጥበት ህክምና በሚታከሙ የኩላሊት መድከም ያለባቸው ታካሚዎችን የሰውነት መጠንን እና ሁኔታን በመገምገም የአመጋገብ ችግር ቢኖር ለችግሩ መፍትሄ ለማግኘት ይረዳል::

4. **ጥቅማ ጥቅም**

በጥናቱ ውስጥ በመሳተፍዎ ክፍያም ይሁን ጥቅማ ጥቅም አይሰጥም።

5. **<u>ሚስጥር መጠበቅ</u>**

ከእርስዎ የሚወሰዱ መረጃዎች በሙሉ በሚስጥር ይያዛሉ። የጥናቱ ውጤት ሪፖርትም ወይንም ህትመቱ ስለ እርስዎ የሚገልፅ ማንኛውንም የግል መረጃ አያካትትም ።

6. **<u>በጥናት ውስጥ ተሣታፊ ያለመሆን መብት እና የማቋረጥ መብት</u>**

በዚህ ጥናት ውስጥ ተሣታፊ ለመሆን ፍቃደኝነቶን እንጠይቃለን። ከጥናቱ ውስጥ በሆነ ምክንያት ስለመቀጠልና ከጥናቱ ተሣታፊነት ለመውጣት ቢፈልጉ ለእርስዎ የሚደረገውን ማንኛውም እንክብካቤ በምንም ዓይነት አይቀንስም እንዲሁም አይቋረጥምም።

ጥያቄ ቢኖርዎት በዚህ ማግኘት ይችላሉ

ተጨማሪ መረጃ ካስፈለጎት በዚህ ስልክ ያነጋግሩ

የአጥኚ ስም ፡- ደጉ ጌቱ

ስልክ ፡- 0921907962

ኢሜይል ፡- degwhy@gmail.com

ይህ ጥናት በአዲስ አበባ ዩኒቨርስቲ ጤና ሳይንስ ኮሌጅ የአናቶሚ ትምህርት ክፍል የምርምር ስነምግባር አጣሪ ኮሚቴ (DRERC) የታየና የተረጋገጠ ነው።

የኮድ ቁጥር----------

በፍቃደኝነት ተሣትፎ መፈረሚያ

ይህ ጥናት በዚህ ሆስፒታል እየተመላለሱ የከላሊት እጥበት ህክምና በሚታከሙ የኩላሊት መድከም ያለባቸው ታካሚዎችን የአመጋገብ ሁኔታ ለይቶ ለማወቅ እንደሆነ ተነግሮኛል። እንደዚሁም መረጃው በፅሑፍ ተሰጥቶኛል። ስለጥናቱ ተረድቻለሁ : በጥናቱ ወቅትም ከእኔ የደም ናሙና እንደሚወሰድ እና የቁመት እና የክብደት መጠኔ እንደሚለካ ተነግሮኛል። በዚህ ጥናት ውስጥ ተሣታፊ ለመሆን በፍቃደኝነት ተሰማምቻለሁ። ከጥናቱ ውስጥ በሆነ ምክንያት ስለመቀጠልና ከጥናቱ ተሣታፊነት ለመውጣት ብፈልግ ለእኔ የሚደረገውን ማንኛውም እንክብካቤ በምንም ዓይነት ሊያሰናክለኝ እንደማይችል ተረድቻለሁ።

በዚህ ጥናት ውስጥ ተሣታፊ በመሆኔ ከሌሎች የተለየ እንክብካቤ ወይንም ክፍያ ወይንም የተለየ ስጦታ እንዳማይኖር ተረድቻለሁ።ከእኔ የሚወሰዱ መረጃዎች በሙሉ በሚስጥር እንደሚያዙ ተነገሮኛል የጥናቱ ውጤት ሪፖርት ወይንም ህትመቱ ስለ እኔ የሚገልፅ ማንኛውንም የግል መረጃ እንደማያካትት ተነግሮኛል ::

በጥናቱ ለመሣተፍ ስለመስማማቴ

_____	_____
የተሣታፊ ኮድ ስም	የጣት አሻራ/ፈርማ
_____	_____
የምስክር ስም	ፊርማ
_____	_____
የተመራማሪ ስም	ፊርማ

Annex II. Questionnaire

Part 1. Socio demographic characteristics

No	Question	Response	Skip
1	Age	…….. In years.	
	Sex	1. Male 2. Female	
2	Residence	1.Urban 2. Rural	
3	Religion	1. Muslim 3. Protestant 2. Orthodox 4. Others (specify)	
4	Ethnicity	1. Oromo 3. Amara 2. Tigre 4 .Others (specify)	
5	Marital status	1. Married 3. Divorce 2. Single 4. Widowed	
6	Educational status	1. Unable to read and write 3. Elementary (1-8) 2. Able to read and write 4.Secondary(9-12) 5. Higher Education	
7	Occupational status	1. Employee(GO/NGO) 4 .Student 2. Merchant 5. Others (specify)…… 3.House wife	

Part 2. Medical history

No	Question	Response	Skip
8	When was you diagnosed with end stage renal disease?	1. _____Date/Year	
8	Which hospital are you being treated?	1. St. Paul's Millennium Medical College Hospital 2. Menilik II Referral Hospital. 3. Zewditu Memorial Hospital 4. Other(mention)_____	
8	When did you begin hemodialysis	1. _____Date/Year	
9	How many times per week do you take dialysis?	1. once 3. Thrice 2. twice 4. Other specify _____	
10	Is there any other disease you have been diagnosed before beginning hemodialysis?	1. Hypertension 3. Cardiovascular diseases 2. Diabetes 4. Urinary tract infection 5. Other (mention)_____	
11	Have you been diagnosed and/or admitted to hospital with other diseases during hemodialysis?	1. Yes 2. No	
12	If yes; what was the diagnosis?	1. Hyper tension 2. Cardiovascular diseases 3. DM 4. Other (mention)_____	

Anthropometric measurement **Result**

1. Dry weight _____
2. Length _____
3. BMI _____
4. Mid upper arm circumference _____
5. Triceps skinfold thickness _____
6. Mid arm muscle circumference _____
7. Arm muscle area _____
8. Serum albumin _____

ጥያቄዎች

ክፍል፡ 1 .የማህበራዊ ሁኔታ

ቁጥር	ጥያቄ	መልስ	ይለፈኝ
1.	እድሜ	_____አመት	
2.	ፆታ	1. ወንድ 2. ሴት	
3.	መኖሪያ	1. ከተማ 2. ገጠ ር	
4.	እምነት	1. ሙስሊም 3. ፕሮቴስታንት 2. ኦርቶዶክስ 4. ሌላ (ግለፅ)_____	
5.	ብሄር	1. ኦሮሞ 3. ትግሬ 2. አማራ 4. ሌላ (ግለፅ)_____	
6.	የጋብቻ ሁኔታ	1. ያገባ 3. የተፋታ 2. ያላገባ 4. ባለቤቱ የሞተበት	
7.	የትምህርት ሁኔታ	1. ማንበብ እና መፃፍ የማይችል 2. ማንበብ እና መፃፍ የሚችል 3. የመጀመሪያ ደረጃ 4. የሁለተኛ ደረጃ 5. ከፍተኛ የትምህርት ተቋም	
8.	የስራ ሁኔታ	1. የመንግስት ሰራተኛ 2. ነጋዴ 3. የቤት እመቤት 4. ተማሪ 5. የግል ሰራተኛ 6. ሌላ (ግለፅ)_____	

ክፍል 2፡ የህክምና ታሪክ

9.	መቼ ነበር የኩላሊት የእጥበት መድከም እንዳለብህ ያወቅከው?	1. _____ቀን/አመት	
10.	የትኛው ሆስፒታል ነው እየታከምክ ያለሀው?	1. ቅዱስ ጳውሎስ ሆስፒታል ሚሊኒየም ሜዲካል ኮሌጅ 2. ዘውዲቱ መታሰቢያ ሆስፒታል 3. ዳግማዊ ሚኒሊክ ሆስፒታል 4. ሌላ (ግለፅ)_____	
11.	የኩላሊት እጥበት ህክምና የጀመርከው መቼ ነው?	_____ቀን/አመት	
12.	በሳምንት ምን ያህል ቀን የኩላሊት እጥበት ታካሂዳለህ?	1. አንዴ 2. ሁለቴ 3. ሶስቴ 3. ሌላ (ግለፅ)_____	
13.	የኩላሊት እጥበት ከመጀመርህ በፊት የታከምክበት/ የነበረብህ ሌላ ህመም አለ?	1. የደም ግፊት 4. የሽንት ቱቦ በሽታ 2. የስኪር በሽታ 5. ሌላ (ግለፅ)___ 3. የልብ በሽታ	
14.	የኩላሊት እጥበት ማካኄድ ከጀመርክ በኋላ የታከምክበት በሽታ አለ?	1. አዎ 2. የለም	
15.	የታከምክበት በሽታ ካለ ምን ነበር?	1. የደም ግፊት 3. የልብ በሽታ 2. የስኪር በሽታ 4. ሌላ------ ግለፅ	

<u>የሰውነት ቁመት እና ሌሎች መጠን መለኪያዎች</u>

<u>የሚለካው</u> <u>ውጤት</u>

1. የክብደት መጠን _____
2. ቁመት _____
3. ክብደት/(ቁመት)^2 _____ _____
4. የክንድ መሀከለኛ ዙሪያ _____
5. የክንድ የኋላ ጡንቻ ውፍረት _____
6. የክንድ ጡንቻ ዙሪያ _____
7. የክንድ ጡንቻ ስፋት_____
8. የደም አልቡሚን _____

Annex III. Figures that show Anatomical anthropometric measurements

figure 2. Measurement of Mid-Upper arm muscle circumference (MUAC) (right) and Triceps Skinfold Thickness (TSF) (left