T.C.

YEDİTEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF NUTRITION AND DIETETICS

EVALUATION OF NUTRITIONAL PARAMETERS IN HEMODIALYSIS PATIENTS AND DETERMINING THE STATUS OF MALNUTRITION

MASTER'S THESIS

Diğdem DOĞAN

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SUPERVISOR

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ONAY

Bu tez Yeditepe Üniversitesi Lisansüstü Eğitim-Öğretim ve Sınav Yönetmeliğinin ilgili maddeleri uyarınca yukarıdaki jüri tarafından uygun görülmüş ve Enstitü Yönetim Kurulu'nun 24./12./2015. tarih ve 2015/32-07....sayılı kararı ile onaylanmıştır.

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ALP	Alkaline Phosphatase
BMI	Body Mass Index
CKD	Chronic Kidney Disease
CT	Computed Tomography
CVD	Cardiovascular Disease
DEI	Daily Energy Intake
DPI	Dietary Protein Intake
ESPEN	European Society for Parenteral and Enteral Nutrition
ESRD	End Stage Renal Disease
Fe	Iron
GFR	Glomerular Filtration Rate
Hb	Hemoglobin
HBV	High Biological Value
HD	Hemodialysis
HDL	High Density Lipoprotein
HDP	Hemodialysis Patient
IU	International Unit
IgA	Immunoglobulin A
K	Potassium
LDL	Low Density Lipoprotein
Mg	Magnessium
MHD	Maintenance Hemodialysis
MD	Maintenance Hemodialysis
MRI	Magnetic Resonance Imaging
Na	Sodium
NKF-K/DOQI Initiative	National Kidney Foundation Kidney Disease Outcomes Quality
NRS-2002	Nutritional Risk Screening-2002

NRSTs	Nutritional Risk Screening Tools
P	Phosphorus
PD	Peritoneal Dialysis
PEM	Protein Energy Malnutrition
PEW	Protein-Energy Wasting
PTH	Parathyroid Hormone
RDI	Recommended Daily Intake
REE	Resting Energy Expenditure
RRT	Renal Replacement Therapy
SGA	Subjective Global Assessment
T. cholesterol	Total Cholesterol
UIBC	Unsaturated Iron Binding Capacity
UNA	Urea Nitrogen Appearance

ABSTRACT

This study was carried out in the Tunceli State Hospital, to assess the nutritional status of hemodialysis patients by using Nutritional Risk Screening 2002 (NRS-2002) form and assess probable association between biochemical parameters and malnutrition in this population. In our study, 50 hemodialysis patient were assessed using demographic, medical history, anthropometric indices including dry weight, height, body mass index (BMI), biochemical measurement including hemoglobin (Hb) (g/dl), total protein (g/dl), albumin (g/dl), total cholesterol (mg/dl), triglycerides (mg/dl), etc. Statistical analyses were performed using SPSS version 16.0 statistical software package. In our study, according to NRS-2002 form among 50 patients, 46% suffered from malnutrition. Our findings indicated a significant difference between patients' gender and the malnutrition (p=0,042). We did not find any significant difference between mean age and malnutrition. Mean age of malnourished hemodialysis (HD) patients was higher than well nourished patiens. We found significant difference between mean BMI and malnutrition (p<0,001). Mean BMI of malnourished HD patients was lower than well nourished patiens. In our study, there were statistically significant difference between BMI groups in malnourished patients (p=0,001). 34,8% of malnourished patients were below 18.5. 56,5% of malnourished patients were normal range of BMI. We found no significant difference between mean duration of hemodialysis and malnutrition. In our study, there was no statistically significant difference between mean of evaluated biochemical parameters levels and NRS-2002 form. There were statistically significant differences in mean t. protein, albumin, ferritin, ALP and UIBC levels in evaluated biochemical parameters of the study groups who follow the CKD diet and who do not. Therefore, in our study, we could not find adequate relationship between biochemical parameters (such as albumin, hemoglobin, cholesterol, and creatinine) and malnutrition revealed that these parameters could not provide accurate information about nutritional status of these patients. Furthermore, NRS-2002 can still be the best tool assessing the nutritional status of hemodialysis patients, because it can recognize various degrees of malnutrition that may remain undetected by a single laboratory assessment.

Key words: Chronic Kidney Disease, Hemodialysis, Malnutrition, Biochemical Parameters, NRS-2002 Form

ABSTRACT (Turkish)

Bu çalışma, NRS-2002 formu kullanarak hemodiyaliz hastaların beslenme durumlarını değerlendirmek ve bu hastalarda biyokimyasal parametrelerle malnutrisyon arasındaki olası ilişkiyi değerlendirmek için Tunceli Devlet Hastanesinde gerçekleşti. Çalışmamızda, 50 hemodiyaliz hastası demografik, tıbbi geçmişi, antropometrik ölçümler, kuru ağırlık, boy, vücut kitle indeksi (BKİ), biyokimyasal ölçümler, hemoglobin (Hb) (g/dl), total protein (g/dl), albümin (g/dl), total kolesterol (mg/dl), trigliserid (mg/dl) vb kullanılarak değerlendirildi. İstatistiksel analiz SPSS 16.0 versiyonu ile yapılmıştır. Çalışmamızda, NRS-2002 formuna göre 50 hastanın % 46'sı malnutrisyonlu olarak tespit edilmiştir. Hastaların cinsiyeti ve malnutrisyon arasında istatistiksel olarak anlamlı fark bulunurken hastaların yaşı ve malnutrisyon arasında anlamlı fark bulunamadı. Fakat, malnutrisyonlu hastaların yaş ortalaması malnutrisyonu olmayan hastalardan daha yüksekti. BKİ ortalaması ile NRS-2002 formu arasında istatistiksel olarak anlamlı fark vardı ($p<0,001$). Malnutrisyonlu hemodiyaliz hastalarının BKİ ortalaması malnutrisyonu olmayan hastalardan daha düşüktü. Çalışmamızda, malnutrisyonlu hastaların BKİ grupları arasında istatistiksel olarak anlamlı fark vardı ($p=0,001$). Fakat, malnutrisyonlu hastaların %34,8' inin BKİ 18,5 altında bulunurken, %56,5 normal aralıktaydı. Hemodiyaliz süresi ile malnutrisyon arasında istatistiksel olarak anlamlı fark bulamadık. Çalışma grubunda değerlendirilen biyokimyasal parametreleri ve NRS-2002 formu arasında istatistiksel olarak anlamlı fark saptanmadı. Diyet yapan ve yapmayan hastaların değerlendirilen biyokimyasal parametrelerin içinde t. protein, albumin, ferritin, ALP ve UIBC seviyelerinde istatistiksel olarak anlamlı fark bulduk. Bu nedenle, çalışmamızda biyokimyasal parametrelerle (albumin, hemoglobin, kolesterol) malnutrisyon arasında önemli derecede ilişki bulunamamıştır. Ayrıca, NRS-2002 formu diyalize giren son dönem böbrek yetmezliği olan hastalarda beslenme durumunu değerlendirmek için hala en iyi araçtır, çünkü o, tek bir laboratuvar değerlendirmesi tarafından yapılamayan malnutrisyonun farklı derecelerini tanımlayabilir.

Anahtar Kelimeler: Kronik Böbrek Yetmezliği, Hemodiyaliz, Malnutrisyon, Biyokimyasal Parametreler, NRS-2002 Form

1. INTRODUCTION and PURPOSE

Chronic kidney disease (CKD) is emerging in the 21st century as a global public health issue. Currently, more than 1 million patients with end-stage renal disease (ESRD) are on renal replacement therapy (RRT) worldwide, with as many as 2 million predicted to require therapy by 2010 (1). CKD is a slow, progressive, and irreversible loss of kidney function. When the kidneys can no longer adequately remove the metabolic degradation products, dialysis treatment should be initiated. Hemodialysis (HD) is the most common renal treatment today (2). Protein-energy malnutrition (PEM) is a relatively common problem, especially among adult patients with chronic renal disease who undergo hemodialysis (HDP). As the presence of PEM is one of the strongest predictors of morbidity and mortality in HDP, it is critical that dietitians accurately assess PEM in these patients (3).

The cause of malnutrition is multifactorial and includes: inadequate food intake, hormonal and gastrointestinal disorders, dietary restrictions, drugs that alter nutrient absorption, insufficient dialysis, and constant presence of associated diseases. Furthermore, uremia, acidosis, and HD procedure per seare hypercatabolic and associated with the presence of an inflammatory state (2).

Several methods have been used to evaluate nutritional status in HDP for PEM, such as the nutritional risk screening (NRS-2002), subjective global assessment (SGA), anthropometric parameters, biochemical blood/urine values. However, a single, accepted best-practice method of PEM detection does not currently exist. While some techniques may work well in research situations, they are often not practical in clinical situations because they require expensive equipment or too much time. Therefore, this study offers a recommendation to detect PEM inexpensively by combining methods (e.g. NRS-2002, anthropometric measures, and biochemical blood/urine values) in a clinical setting (4). Serum albumin is a type of biochemical parameters and it is generally used with the aim of evaluating the nutritional status of overall community. At the same time, it is said that such factors that are not directly associated with the nutritional status such cases as infection, inflammation, the matter of hydration, deficiency of protein in peritoneal or urinary organs, and the illnes of acidemia (5).

This study aims to assess the nutritional status of hemodialysis patients by using NRS-2002 form and determining the malnutrition assess probable association between biochemical parameters and malnutrition in this population.

2. LITERATURE REVIEW

2.1. Structure and Functions of the Kidney

The kidneys are paired organs, 11-14 cm in length in adults, 5-6 cm in width and 3-4 cm in depth. They lie retroperitoneally on either side of the vertebral column at the level of T12 to L3. The renal parenchyma comprises a outer cortex and an inner medulla. The functional unit of the kidney is the nephron, of which each contains approximately one million. Each nephron is made up of a glomerulus, proximal tubule, loop o Henle, distal tubule and collecting duct. The renal capsule and ureters are innervated via T10-12 and L1 nerve roots, and renal pain is felt over the corresponding dermatomes (6).

The kidney normally carry out several essential functions. Maintain a constant extracellular environment, which is required for adequate cell function and is achieved by excreting numerous metabolic waste products (eg, urea, creatinine, and uric acid) and by adjusting urinary excretion of water and electrolytes to match net intake and endogenous production. The kidneys regulate the excretion of water and solutes (eg, sodium, potassium, and hydrogen) by changing tubular reabsorption or secretion. Secrete multiple hormones that participate in the regulation of systemic and renal hemodynamics (eg, renin, angiotensin II, adenosine, prostaglandins, nitric oxide, endothelin, and bradykinin); red blood cell production (erythropoietin); and calcium, phosphorus, and bone metabolism (1,25-dihydroxyvitamin D3). Catabolize peptide hormones. Synthesize glucose (gluconeogenesis) in fasting conditions (7).

The kidney help maintain normal body function and homeostasis by directly interacting with other organ systems, including the cardiovascular, nervous (eg, brain), gastrointestinal tract (eg, liver), blood, pulmonary, and muscular systems (7).

2.2. Chronic Kidney Disease

Chronic kidney disease (CKD) is currently a public health problem, with adverse outcomes of kidney failure, cardiovascular disese (CVD), and premature death. Chronic Kidney Disease is defined by Kidney Disease Quality Outcome Initiative (K/DOQI) as kidney damage or glomerular filtration rate (GFR) <60 mL/min/1.73 m² for 3 months or more, regardless of cause (8). CKD encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR). The term chronic renal failure applies to the process of continuing significant irreversible reduction in nephron number and typically corresponds to CKD stages 3-5. End stage renal disease represents a stage of CKD where the accumulation of toxins, fluid, and electrolytes normally excreted by the kidneys results in the uremic syndrome. This syndrome leads to death unless the toxins are removed by renal replacement therapy, using dialysis or kidney transplantation (9).

2.3. Signs and Symptoms of CKD

The basic functions of the kidney are to regulate fluid, electrolyte and hormone balance, and to facilitate waste product excretion from protein metabolism. With progressive decline in kidney function, hallmarked by a sustained decrease in glomerular filtration rate (GFR), the kidney's ability to perform these functions becomes progressively impaired. In particular as GFR decreases, solutes usually excreted by the kidney accumulate in the body and blood (plasma) concentrations increase (10). These solutes include urea and creatinine from protein metabolism. As the basic functions of the kidney are progressively impaired, the incidence of renal-related conditions such as uraemic toxicity increases with decreasing GFR. With advanced deterioration in kidney function, symptoms of uraemic toxicity are primary indicators to commence renal replacement therapy (11).

The main signs of renal loss are blood hypertension and anemia. There are also neurological signs (irritability and tremors), cardiovascular (pulmonary edema), endocrine (hyperglycemia and weight loss), and metabolic (weakness). Other important information supplied by the Brazilian Society of Nephrology are the manifestations of renal disease that people can present such as pain at urination, low back pain, weakness, and nausea (12).

The diagnosis and management of CKD is defined in five stages by the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF-K/DOQI) clinical practice guidelines (11) (Table 1).

Tablo 1 Classification of CKD according to (NKF-K/DOQI) Clinical Practice Guidelines (11).

Stage	Description	GFR (mL/min/1.73m2)
CKD 1	Kidney damage with normal GFR	≥90
CKD 2	Kidney damage with mildly decreased GFR	60-89
CKD 3	Moderate decrease in GFR	30-59
CKD 4	Severe decrease in GFR	15-29
CKD 5	Kidney failure	<15 or dialysis

The stages defined as "pre-dialysis CKD" are associated with a 3.2- and 5.9-fold increased risk of death associated with Stage 4 (GFR 15-29 ml/min) and Stage 5 (<15 ml/min) respectively (13). A patient progressing to Stage 4 CKD has a kidney function less than 30% of normal, and is expected to require renal replacement therapy (RRT, in the form of transplant, or more commonly, dialysis) within the next 6 to 18 months. At this stage, the focus of the medical treatment shifts from slowing the decline of renal failure to managing the metabolic disturbances and preparing the patients for RRT. Ideally, this requires the provision of multidisciplinary care to prevent complications (such as anaemia, malnutrition and acidosis), treat comorbidities (including cardiovascular disease and diabetes) and manage symptoms (including nausea, hypertension and fluid balance) (14).

Kidney damage may be detected either directly or indirectly. Direct evidence may be found on imaging or on histopathological examination of a renal biopsy. A range of imaging modalities including ultrasound computed tomography (CT), magnetic resonance imaging (MRI) and isotope scanning can detect a number of structural abnormalities including polycystic kidney disease, reflux nephropathy, chronic pyelonephritis and renovascular disease. Renal biopsy histopathology is most useful in defining underlying glomerular disease such as immunoglobulin A (IgA) nephropathy or focal glomerulosclerosis. Indirect evidence for kidney damage may be inferred from

urinalysis. Glomerular inflammation or abnormal function can lead to leakage of red blood cells or protein into the urine which in turn may be detected as proteinuria or haematuria. Urinary abnormalities may have alternative causes unrelated to kidney dysfunction and there are methodological issues associated with their measurement (15).

2.4. Risk Factors for CKD

Epidemiology reveals an association between a number of clinical characteristics and the development of chronic kidney disease. For many potential risk factors, the supporting evidence is inconclusive, of poor methodological quality or does not clearly establish a causal relationship. Decisions regarding risk factor modification should be taken on an individual basis (15).

Risk factors for CKD can be grouped into three broad categories of risk factors: fixed, behavioural and biomedical (Table 2). Many of the risk factors for CKD also apply to other chronic diseases such as cardiovascular disease and diabetes, which in turn are risk factors for CKD. Many people have multiple risk factors, which can considerably increase the risk of developing CKD (16).

Tablo 2 : Risk Factors for Chronic Kidney Disease (16).

Fixed	Behavioural	Biomedical
Family history and genetics	Tobacco smoking	Diabetes
Increasing age	Physical inactivity	High blood pressure
Previous kidney disease or injury	Poor nutrition	Cardiovascular disease
Low birth weight		Overweight and obesity
Male sex		Systemic kidney inflammation

2.5. Hemodialysis Treatment

Chronic renal disease is commonly the end stage for the sufferers of kidney diseases. Sufferers who are at the this stage have some acceptance. Therapy with dialyses (this can be both hemodialysis of peritoneal dialysis), kidney transplant or death are the acceptances for sufferers. No matter what the cause of the failure, the person with kidney disease have some problems physiologically. The possiblity of regular physiological functions as homeostasis of water and minerals (sodium, sulfate potassium, calcium, chloride, phosphorus, magnesium,), and excrement of the casual metabolic load of various hydrogen ions will no longer go on. The finished toxic products of nitrogen metabolism (creatinine, uric acid, urea, among others) collect in tissue and blood. The production of erythropoietin and 1,25 dihydroxycholecalciferol (calcitriol) can be carried on with the help of kidneys and at the end-stage kidneys failure to do this. The ways of dialysis eliminate nitric finished-products of demolishment and begin the adjustment of the salt, water, and acid-base mixing which is related to the renal failure (17).

Hemodialysis is a procedure that depends on a dialyzer (capillary filter) to filter the blood. In the procedure, patients' blood is withdrawn from one vein, through an arteriovenous fistula or a catheter and taken directly by tubes to a filter connected to a machine. This filter can extract blood, waste and excess of water and salts. After filtering, clean blood is then returned to patients (12). Treatments are most commonly scheduled three times weekly and last 3 to 4 hours. The treatment is performed predominantly as "center hemodialysis" in a hospital-based or freestanding dialysis unit. In this setting patients' dialyzers are commonly reprocessed. Thus, a given patient may reuse his/her dialyzer multiple times. Hemodialysis may be performed at home as "home hemodialysis" after the patient and an assistant (often the spouse) undergo several weeks of training. Home hemodialysis encourages patient independence and allows freedom to schedule dialysis to meet patient convenience. Those treated with home hemodialysis seem to enjoy a better quality of life and are reported to have better survival compared to center hemodialysis. Recently, home hemodialysis has been performed as a daily treatment given as either short daytime or slow nighttime dialysis (18).

Dialysis is an disabled treatment for the abounding abnormalities that occur in the kidney diseases because it has not the function to correct the working of endocrine. symptoms of starting dialysis for the kidney disease are experiential and can be changed among physicians. Some of the sufferers begin the dialyses treatment when remnant glomerular filtration rate (GFR) downs below 10 mL/min /1.73 m2 body surface area. Other sufferers begin treatment when the sufferer lose the durability to continue habitual and everyday workings. Most of the doctors go along that when the indications like nausea, vomiting, anorexia, fatigability, diminished sensorium and indications pericardial friction rub, refractory pulmonary edema, metabolic acidosis, foot or wrist drop, asterixis) of uremia, the sufferers had better to get start the dialysis treatment (17).

2.6. Nutritional Status in Hemodialysis Patients

Nutritional status is an important predictor of the clinical outcomings in end-stage renal disease (ESRD) sufferers, mostly in patients who are on chronic hemodialysis (19). Daily monitoring of the sufferers nutritive habits with the help of the using of anthropometric precaution, biochemical parameters, and dieting habits and keeping in touch is essential in the first stage of the determination and deterring. The National Kidney Foundation Kidney Disease Outcomes Quality Initiative (KDOQI) Clinical Practice Guidelines for Nutrition advise that a group of measures be used to daily evaluate nutritive habits. Use of a variety of evaluating means is essential because some of the classic anthropometric and biochemical cautions are used to evaluate nutritive habits may be affected by various catabolic factors for example anorexia, inflammation, acidosis and dialysis-related losses (20).

Over the course of last decade, chronic renal failure in relation to nutritional deficiency is becoming a major issue in nutritional studies among the health professionals. 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. It is imperative to note that inadequate nutrition before dialysis contributes to the prognosis of the patients. Seres (2003) reported that altered nutritional status accounts for 50% of the responses to any therapy. This implies that undernutrition has notable impact on the prognosis and outcome of the disease. It is, however, disheartening to note that little attention is paid to the nutritional status of

hemodialysis patients particularly in developing countries. Reviewed literature pointed to the fact that hemodialysis has different effects on both catabolic rate and clearance of toxins, and also have different effects on the nutritional status of the patients (21).

ESRD patients may be often affected by relevant complications or co-morbidities, such as diabetes, obesity, congestive heart failure, coronary disease, lower limb ischemic disease, and infections, which may negatively influence dietary food intake and nutritional status. Moreover, ESRD is associated with loss of appetite and reduced food intake, especially when toxins removal by hemodialysis is inadequate. In addition, the level of physical activity or geographical, cultural, and traditional factors may induce changes in the dietary habits of the general population, including hemodialysis patients. Thus, the assessment of quality and quantity of food intake is another important step in the management and treatment of HD patients (22).

Kidney's having exclusive function in the nutritive metabolism and the kidney disease requires a good nutrition. If they don't take nourishment requlary and enough amount, they are possible to face morbidity and mortality. To have low energy and to balance negative nitrogen was notified during the therapy of dialysis. Malnourishment is a common phonemenon among more than two thirds of patients and that is why this problem is essential. Dialysate fluid leads patients to lose a huge amount of protein and when this fact is composed with the malnutrition they become unable to the required diet. In addition, many hemodialysis patients are malnourished at the beginning of their therapy (23).

If they take precaution beforehand this will be a good approaching for the first step. Obediance to the dieat is also important. The methods of showing the obediance of sufferers who have chronic kidney disease should have the stabilization for the blood level of urea, nitrogen, potassium, creatinine and phosphorus and during the dialysis treatment their weight should be observed. The patients with hemodialysis should have obediance to their dietary and medication rules this is so important that being well and healthy depend on this (23). KDOQI advise that having 35 kcal/kg for a daily energy or regulated body weight/day for consistent maintenance dialysis sufferers whose age are below 60 years old and 30–35 kcal/kg standard or regulated body weight/day for those age 60 and older. These advisements are rest on metabolic researches which monitores that 35 kcal/kg was essential to maintain neutral nitrogen stability and body digestion.

Patients who are in their 60 years old or older may be more calm and their lean body mass may be lower. So they are supposed to be have 30-35 kcal/kg body weight. Energy intakes should be arranged according to the patients being involved to the fitness programs, catabolic or underweight (20).

To have enough amount of protein is also essential in order to guarantee the balance of nitrogen both positively and negatively. The KDOQI Nutrition Guidelines advise that 1.2 g/kg standard or arranged body weight for the clinically consistent HD patient with 50% or more than %50 from high biological value (HBV) sources. HBV protein or animal protein is used more efficiently and provides the required essential amino acids (20).

All of the energy which taken as fat should be 25–35% of all of calories with monounsaturated fat supplying up to 20% of calories and polyunsaturated fat up to 10% and a decrease in pure fat to <7% all of the calories. It is advised that total dietary cholesterol <200 mg/day and much more dietary fiber (24).

To control sodium and fluid is also important in the sustainance of HD. The decline of sodium occurs when the glomerular filtration rate (GFR) drops below below 15 ml/min/1.73 m2, the kidneys start to fail in compensating and excrete sodium declines, this case lead to the retention of sodium. Because of the fact that GFR drops within the beggining of the first few months on HD to 1–2 ml/min/1.73 m2 and the patient gets become oliguric or anuric, diet and dialysis are the keys of controlling fluid balance and sodium. Patients should take sodium for HD 2–3 g/day while the advisement fluid taking is 750–1000 mL plus urine output and, generally it should not be more than 1500 mL/ day containing that in food. They aim to maintain the interdialytic weight gains and having the control of blood pressure (25).

When the GFR drops, the kidneys can not filter potassium, and fecal potassium excretion gets more and more. Potassium removal while HD averages between 70 and 150 mEq for each treatment. The advised dietary potassium constriction is 2–3 g/day or 40 mg/kg edema free body weight and should be personalised depend on serum lab assess. Nutritional counseling concerning food sources of potassium and sufferer education regarding to complications of hyperkalemia are essential for helping the patient avoid much more potassium levels during the time of the interdialytic period.

The main sources of potassium are fruits, vegetables and dairy along with nuts, seeds, nut butters and dried beans and peas. While the main cause of hyperkalemia may be nourishment habits factors that are not related to diet such as medications, hyperglycemia, metabolic acidosis and dialysis not being adequate can also lead to notable serum levels and should be researched if dietary causes can be precluded (26).

In CKD, the drop in GFR emerge in advanced phosphorus retention and the advanced production of 1- 25 dihydroxy-vitamin D3[1,25-(OH)2D3] or calcitriol, the living form of vitamin D. If calcitriol decreases this case may be result in reduced intestional calcium absorption, reduced mineral reabsorption/excretion by the kidneys, increased bone turnover and increased parathyroid hormone (PTH) production. secondary hyperparathyroidism may arise because of these metabolic changes, and also hyperphosphatemia, renal osteodystrophy and raised PTH levels. dialysis patients is generally should have dietary calcium intake in about 500 mg/day when they are limited with the high phosphorus foods. dialysis (PD) patients, it will be easy to use ≤17 mg phosphorus/kg ideal or according to their ideal body weight . Phosphorus is not neccessary to be locate on food labels, and consuming of food with phosphate additives help to hidden sources of phosphorus outside generally known high phosphorus foods. In addition the phosphates which are not organic are used as food additives are 100% absorbable when we compared the 50–60% absorption rate from naturally happening phosphorus (26).

A good nourishment is a major component in the healing and the maintenance the health of dialysis patient. The diet for stage 5 CKD presents many challenges for the patient with maintenance dialysis that conclude lifestyle changes in nourishment habitual. Getting used to taking new medications for example phosphorus binders with meals, and generally having to mix the renal diet with other dietary modifications such as diabetes. The diet should be prepared specifically for each patient to help increase compliance and maintain the required amount of intake while having an equal amount of protein, sodium, potassium, phosphorus and fluid needings (26). Recommended dietary nutrient intake for hemodialysis patients are shown below (Table 3) (27).

Tablo 3 : Recommended Dietary Nutrient Intake for Hemodialysis Patients (27).

Macronutrient and fiber	
Dietary protein intake (DPI)	• 1.2 g/kg/d for clinically stable patients (at least 50% should be of high biological value)
Daily energy intake (DEI)	• 35 kcal/kg/d if <60 years • 30–35 kcal/kg/d if 60 years or older
Total fat	25–35% of total energy intake
Saturated fat	<7% of total energy intake
Polyunsaturated fatty acids	Up to 10% of total calories
Monounsaturated fatty acids	Up to 20% of total calories
Carbohydrate	Rest of calories (complex carbohydrates preferred)
Total fiber	"/>20–25 g/d
Minerals and Water (Range of Intake)	
Sodium	750–2000 mg/d
Potassium	2000-2750 mg/d
Phosphorus	800-1000 mg/d
Calcium	<1000 mg/d
Magnesium	200–300 mg/d
Iron	10-18 mg/d
Zinc	15 mg/d
Selenyum	55 µq/d
Water	Usually 750–1500 mL/d
Vitamins (Including Dietary Supplements)	
Vitamin B1 (thiamin)	1.1–1.2 mg/d
Vitamin B2 (riboflavin)	1.1–1.3 mg/d
Pantothenic acid	5 mg/d
Biotin	30 µg/d
Niacin	14–16 mg/d
Vitamin B6 (pyridoxine)	10 mg/d
Vitamin B12	2.4 µg/d
Vitamin C	75–90 mg/d
Folic Acid	1–5 mg/d
Vitamin A	800-1000 µg/d
Vitamin D	1000-1500 IU
Vitamin E1	400–800 IU

2.7. Causes of Malnutrition in Hemodialysis Patients

Malnutrition in End Stage Renal Disease (ESRD) patients is very common affecting ~10.0-70.0% of hemodialysis patients. Malnutrition in HD patients is strongly associated with increased mortality and morbidity (28).

The methods of dialysis cause to the deprivation of nutrients in dialysate and during the time of hemodialysis the catabolism rises accordingly. Lim and the workers seem to think that when we think about the all of the process of the hemodialysis there will be a rising so this can be regarded as an event regarding to metabolism. The dialysis procedure itself results in losses of nutrients into dialysate and, independent of these losses of nutrients, appears to result in an increase in catabolism during hemodialysis. This also be linked to the losses of amino acid during the time of dialysis treatment. ESRD is a widespread phonemenon and there is acidosis in metabolism in these patients. This can also be regarded to the catabolism which rises up (29).

Dialysate leads amino acids to perish and dialyses which have higher drain also make patients to lose vitamin. Indications of uremia which comprises anorexia and vomiting can not be throughoutly controlled on people who have to get the dialysis treatment. This occurance make energy and protein to be taken less. Falkenhagen and the workers shows that patients of hemodialysis who have a diet according to themselves have the risk of malnutrition about protein and calorie. Patients have changeable diets according to the dialysis they are objected to for example ESRD, hemodialysis or peritoneal treatments have not the same nourishment habits. Being objected to the serum leptin or some other factors may be the reason of sufferers having reduced appettite but this information Patients with ESRD treated with either hemodialysis or peritoneal dialysis demonstrate altered patterns of food intake. The cause of reduced appetite is not entirely understood, but elevated serum has not been proved yet. These factors may be the reason of malnutrition of sufferers (30).

The cause of malnutrition is multifactorial and includes: inadequate food intake, hormonal and gastrointestinal disorders, dietary restrictions, drugs that alter nutrient absorption, insufficient dialysis, and constant presence of associated diseases. Furthermore, uremia, acidosis, and HD procedure per seare hypercatabolic and associated with the presence of an inflammatory state (31).

Many causes could lead to malnutrition. However, it seems that the most important one is the decreased nutrients intake. Poor nutrients intake could be due to anorexia from uremia, the dialysis procedure, and/or acidemia. Inadequate intake is also caused by comorbid physical illnesses affecting gastrointestinal function, depression, other psychiatric disturbances, organic brain disease, or socioeconomic factors (32).

2.8. Nutritional Risk Screening (NRS)–2002

European Society for Parenteral and Enteral Nutrition (ESPEN) developed The Nutritional Risk Screening-2002 (NRS-2002) in 2002. They aimed to screen the means of showing the nutrition of patients and the status of the disease. The status of the disease can be linked to the needings and this will be a help for determining the malnutrition this occasion also help them to determine if there is a risk for malnourishment according to the arguments. Exclusive results may be regarded to the nutritional criteria and authors worked on it to determine it exactly. They wanted to find a means of predicting clinical results and this was not the same as Nutritional Risk Screening Tools (NRSTs) which has already exist. BMI is a way of measuring the level of malnutrition and this means the current weight loss and the changes in the taking of food. Clinical and functional results are linked and these are always used in NRSTs because of the changeables. Nutrition effect the level of the disease and the results and also help to come to a conclusion (33).

2.8.1. Components of the NRS-2002

There are two indicating phases for NRS-2002. The first one of it has 4 questions which are less food intake, BMI, the status of weight loss and how the seriousness of the illness. If the patient has been seen as losing weight then the later indicating should be taken into consideration. If all of the questions are no the patients need to be treated each week again (33).

The later indicating of the patient's state is generally in two aspects, they are nutritional and the status of the disease. Nutritional status regars with namely BMI, the habit of diet and the state of the losing weight of the patient. Illness change the score of the disease of patients. If the exclusive illness has not been in the table, then clinical assessment have the task of scoring the disease. In general the patients who have a chronic disease are in the mild category if they have one or more than one difficulty.

They have the illness but they are also have the power of walking and meeting their basic requirements. Patients who are confined to bed and regardingly whose protein requirements are more in order that synthetic feeding may be possible. Patients who need a special care are in the severe category (33).

If the score is 3 or more than 3 the patients are in the category of the risky malnutrition and they are in need of a specific support for nutrition. The specific nutritional they will take is not specified. If patients have 0-2 scores they should be treated weekly (33).

2.9. Nutrient Losses During Dialysis

The hemodialysis process itself may be developed by wasting by compensator nutrients and also by warning protein catabolism. Hemodialysis rises the urea nitrogen appearance (UNA or net urea generation), increases the whole of the protein breakdown, and increases negative nitrogen stability. The bioincompatible which has dialyzer membranes may stimulate the release of cytokines, such as interleukin-1, which may be the result of the increased protein catabolism (34).

In general hemodialysis treatment that use a low-flux cuprophane membrane, 4 to 9 of free amino acids vanish the dialyzer during fasting and 8 to 10 g if patients keep on eating during the procedure. Peptides are also distract in a range of 2 to 3 g per dialysis, thus leading to a net amino acid of 10 to 13 g per dialysis. With high-flux dialyzers in fasting patients, about 8 g of free amino acids are removed during a routine hemodialysis treatment. Also, using the membranes with an increased transmissivity to protein may decrease albumin as high as 25 g per session if the highest ultrafiltration rates are used during hemodiafiltration (34).

By the time hemodialysis with glucose-free dialysate, an average of 20 to 30 g of glucose perishes into the dialysate. If a dialysate including 200 mg/dL (11 mmol/L) of glucose monohydrate (180 mg/dL of anhydrous glucose) is used there is a net absorption of 10 to 30 g of glucose during the time of each dialysis (34).

Lack of water-soluble vitamins in hemodialysis patients end up with basicly from the lackness of the enough nourishment, losses into dialysate, or changed vitamin synthesis or metabolism or a possible presence of inhibitors to the actions of the vitamins. The lack of water soluble vitamins in the patients of hemodialysis may result

mostly from the lack of the nourishment dialysate losses or changed vitamin synthesis or metabolic factors or the possiblity of inhibitors to the activity of vitamins. Hemodialysis and peritoneal dialysis are two factors which perish the bioactive compounds or water soluble vitamins. There would be a less reducement by decreasing urinary excretion and may be partially changed by the vitamins which can be found on normal diet. If patients don't nourish enough, the case of malnutrition will be more. actually, the content of various vitamins in typical meals ingested by MHD sufferers is not much more than the Recommended Dietary Allowances of the Food and Nutrition Board but the needing for water-soluble vitamins may be changeable for the new types of dialyzers used. The more porous, high-flux dialyzers remove greater amount of vitamins. either intradialytic supplementation or convective dialysis methods associated with reinfusion of regenerated ultrafiltrate might alleviate some of the detrimental changes of losses of water soluble vitamins and other compounds (34).

2.10. Biomarkers of Nutritional Status

Biochemical assessment offers the advantages of being readily available in most clinical settings, it is objective, and it requires only minimal patient cooperation. CKD and dialysis procedures each can influence nutritional status, limiting nutrient intake due to anorexia, dietary restrictions, socioeconomic constraints, or impaired gastrointestinal (GI) motility. In addition, CKD also exerts an indirect effect on nutritional status by increasing requirements and impairing the body's ability to down-regulate resting energy expenditure (REE) and protein turnover. Biochemical evaluation advise the advantages of being already convenient in most clinical enviroment but it can be changeable from person to person. Biochemical testing provides essential insights into proficiency of protein and taking energy, the presence of inflammatory or oxidative stress, and nutritional adequacy over time. The Kidney Disease Outcome Quality Initiative (KDOQI) nutrition practice guidelines advise the use of a panel of nutritional parameters because no single index throughoutly emphasizes all aspects of habits of eating. The KDOQI nutrition guidelines advise a battery of anthropometric, clinical, and dietary evaluation additionally the biochemical parameters (35).

2.10.1. Serum Albumin

The blood contains mostly albumin as protein, and it is already present on most biochemistry panels, and is therefore widely used as a nourishment and inflammatory marker. The half-life of serum albumin is nearly 20 days, making it a good means for use in monthly nutritional assessments but relatively unresponsive to strong changes in nutritional or inflammatory status. The level of serum albumin has been use generally for evaluating the habits of eating and without chronic renal failure (CRF). Malnutrition is most accustomed in the end-stage renal disease (ESRD) population, and hypoalbuminemia can predict mortality risk when available at the time of initiation of chronic dialysis as well as during the time of the course of maintenance dialysis (MD). The next is that nutritional interventions that keep or increase serum albumin concentrations may be have association with advanced long-term survival, although there is no proof for it in randomized, prospective clinical trials. Serum albumin levels may fall a bit with a long duration decrease by taking energy and protein. On the contrary, serum albumin levels may decrease acutely with in- flammation or acute or chronic stress and enhance the later resolution or recovery. No matter how benefical they are, serum proteins like albumin, transferrin, and prealbumin levels be more prone to change in the habits of nutrition and don't need to be related with the changes in other nourishing parameters and be affected by the factors that not correlated with the nutritional factors. Some factors that are not related with nutrition which are available in population conclude infection or inflammation, hydration status, peritoneal or urinary albumin losses, and acidemia, hypoalbuminemia in MD sufferers and they should be observed regularly (36).

2.10.2. Serum Prealbumin

Serum prealbumin (transthyretin) has been used for people with or without CRF as a sign of protein-energy nourishment status. It has been advised that serum prealbumin may be more prone than albumin as an indicator of nutritional status, because it has a half-life of about 2 days and is therefore very eager to the last events, mostly calorie and protein insufficients. The first indicator of changes in nourishment and inflammatory points. Prealbumin may not be related with changes in other nourishment parameters and it is not a positive acute-phase reactant (ie, serum levels decreasing in response to inflammation or infectionWhat is more advices fort he daily

using of the serum prealbumin levels as a signal are accustomed by the fact that prealbumin levels are enhanced in kidney diseases it would be result from the impaired kidney. Based on available evidence, serum prealbumin is considered to be a valid measure of protein-energy nutritional status in individuals undergoing MD. There is insufficient evidence to conclude that prealbumin is a more sensitive or accurate index of malnutrition than is serum albumin (36). 2.10.3 Serum CreatininePrealbumin is useful for the patients who have severe illness or later starting of nourisment problems. A reduced muscle mass appears to be the most valid criterion for the presence of PEW. A popular term, sarcopenia, has been used to describe the loss of muscle mass that occurs mostly in older patients. so sarcopenia, if we define it, should not be used to the PEW of sufferers with kidney disease unless this loss of muscle mass happens in an older individual. Despite the fact that not much more studies have been published about prealbumin levels to results in MD patients than have been published according to the albumin levels. There are some studies that shows prealbumin levels less than 30 mg/dL are regarded with enhanced risk and regarded with other indices of PEM. According to the proof, serum prealbumin is thought to be a level measure of protein-energy nutritional status in individuals undergoing MD (36).

2.10.3. Serum Creatinine

A reduced muscle mass appears to be the most valid criterion for the presence of PEW. A popular term, sarcopenia, has been used to describe the loss of muscle mass that occurs in elderly patients. Hence, sarcopenia, by this definition, should not be applied to the PEW of patients with kidney disease unless this loss of muscle mass occurs in an elderly individual (37).

Creatinine is the breakdown product of creatine phosphate in muscle. To diagnose low muscle mass or muscle loss in a correct way is not easy. A sloping muscle mass has been related with decreased risk of mortality in CKD and patients of dialysis. Sloping muscle mass in these patients is generally evaluated by the serum creatinine level due to being easily available, cost effective and reliable. In these days to evaluate the presence of expedited muscle protein catabolism we do not have useful for clinical, clinically useful, uniform and reproducible measures of lost muscle mass and ways to do these. There are some studies that advise measures of muscle mass but they are not in a direct way. These are serum creatinine, the measure which is not direct is indefinite

for mostly the patients who don't receive the same doses of dialysis. Nevertheless, for many diseases clinical and prognasic importance should be taken into consideration when there is a loss of muscle. And this case was known and the panel thinks that there should be a clinical criteria for the diagnosis. Emphasis is used for evaluating the loss of muscle mass as impaired salt and water regulation because of the fact that there are limits for evalutating the differentiation in body weight. Muscle mass determines the amount of the creatinine production and function of the kidney. Under stable kidney function, creatinine is typically produced at a relatively regular rate by the body depending on the total amount of muscle mass. Low lean muscle mass has been associated with increased risk of mortality in CKD and dialysis patients. Lean muscle mass in these patients is commonly assessed by the serum creatinine level due to its easy availability, cost-effectiveness and reliability nature (37,38).

2.10.4. Serum Total Cholesterol

Cholesterol is a lipoprotein that functions as a precursor for the synthesis of steroid hormones, bile acids, and vitamin D. Serum cholesterol (and several other blood lipids and lipoproteins; such as, total cholesterol, LDL cholesterol, HDL cholesterol and triglycerides) are indicators of patients´ nutritional status. Indeed, cholesterol has been proposed as assessment criterion for malnutrition and protein-energy wasting (PEW) (39).

Markers of protein nutritional status (serum albumin, prealbumin, and creatinine) determine the low serum total cholesterol is related withand with mortality in most, but not for the all of them. Serum cholesterol is mainly useful as a monitoring main as its being sensitive and being low in taking energy and protein. chronic inflammation regards also serum cholesterol. If the level of the colesterol is low and CPR is elevated, it is suggested that there are inflammatory stress and anorexia, however if both of them are in an elevated level they will be more elevated levels of both of them are reflective and cardiovascular illnesses (40).

The possibility of death can be related with the cholesterol in dialysis patients, but the association between lipid levels and mortality in patients who have chronic kidney disease (CKD) and are not treated with dialysis. The relationship between lipid abnormalities (higher total cholesterol, LDL cholesterol, and triglycerides and lower HDL cholesterol) and increased possibility of deathcan be found easily in today's

people living. By this way, studies that have been achieved by some studies have documented and enhanced mortality related with lower total cholesterol level in patients who had chronic kidney disease (CKD) and and they are treated by renal therapy. Because of the fact that there is a high level death possibilty which is experienced by patients with CKD and the preponderance of cardiovascular results which are in charge of this, the observed inverse association between summation cholesterol and mortality in patients with CKD has been a competitive issue in these days (41).

Contrary to the general population, a high cholesterol level in the CKD and dialysis population is associated with improved survival. However, this association seems to only be true in patients who are inflamed and/or malnourished, which suggest that low levels of cholesterol may be a surrogate marker of inflammation and/or malnutrition (42).

3. MATERIALS AND METHODS

3.1. Study Subjects

Dialyzed patients are grouped into two groups, one is dialyzed on Monday, Wednesday, Friday, while the other is dialyzed on Tuesday, Thursday, Saturday. Patients in two groups are selected to be involved in the study. Fifty (50) patients with ESRD who are admitted to the dialysis unit at Tunceli State Hospital. All those who participated met the following inclusion criteria: 1) female or male; 2) age 18 years or older; 3) hemodialyzed for at least three months with continuing dialysis two and three times a week; 4) not hospitalized. Each patient was interviewed to evaluate malnutrition (NRS-2002). Routine clinical markers of malnutrition such as serum albumin, total protein and total cholesterol were measured.

The approval of the ethics committee in the hospital was obtained. The subject who participated in this study provided informed consent. All patients were informed about the nature of the study.

3.2. Data Collection

NRS-2002 form is going to be applied to hemodialysis patients. There are two indicating phases for NRS-2002. The first one of it has 4 questions which are less food intake, BMI, the status of weight loss and how the seriousness of the illness. If the patient has been seen as losing weight then the later indicating should be taken into consideration. If all of the questions are no the patients need to be treated each week again. The later indicating of the patient's state is generally in two aspects, they are nutritional and the status of the disease. Nutritional status regars with namely BMI, the habit of diet and the state of the losing weight of the patient. Illness change the score of the disease of patients. If the exclusive illness has not been in the table, then clinical assessment have the task of scoring the disease. In general the patients who have a chronic disease are in the mild category if they have one or more than one difficulty. They have the illness but they are also have the power of walking and meeting their basic requirements. Patients who are confined to bed and regardingly whose protein requirements are more in order that synthetic feeding may be possible. Patients who need a special care are in the severe category.

If the score is 3 or more than 3 the patients are in the category of the risky malnutrition and they are in need of a specific support for nutrition. The specific nutritional they will take is not specified. If patients have 0-2 scores they should be treated weekly.

Biochemical parameters hemoglobin (g/dl), urea (mg/dl), creatinine (mg/dl), protein (g/dl), albumin (g/dl), ferritin (ng/ml), vitamin B12 (pg/ml), calcium (mg/dl), phosphorus (mg/dl), alkaline phosphatase (U/L), total cholesterol (mg/dl), triglycerides (mg/dl), potassium (mEq/L), sodium (mEq/L), iron (µg/dL), UIBC µg/dL were measured in this hemodialysis patients. General Questionnaires were going to be applied to the same patient. The questionnaire included the patient's name, age, sex, weight and height (anthropometric measurements), BMI, education level, history of dialysis time, compliance of CKD diet, hemodialysis session, etc. Nutrition education about CKD diet were given to HD patients over a year ago. Then, they were asked compliance of CKD diet.

3.3. Statistical Analysis

Statistical analyses were performed using SPSS version 15.0 statistical software package. Descriptive statistics; number and percentage were expressed for categorical variables. Rates among independent groups of categorical variables were tested by chi square analysis. Monte Carlo simulation was performed when the conditions were not proper. When comparison numerical variables between independent two groups, Student t test was used when the numerical variables provide normal distribution condition, Mann Whitney U test was used when the numerical variables do not provide normal distribution condition. The relationship between numerical variables were analyzed by Pearson Correlation analysis when parametric test conditions were provided, when the parametric test condition were not provided, it was analyzed by Spearman Correlation analysis. P values < 0.05 were considered statistically significant.

4. RESULTS

In this study, a total of 50 subjects, 54% of patients were male and 46% were female. Education levels; 20% of patient were illiterate, 20% were literate, 28% were graduates of primary schools, 30% were graduates of secondary- high school, 2% were graduates of universities. 50% of the patients had no previous diet instruction and 50% of the patients were following CKD diet. Body mass index of the patient, 20% of patients were below 18.5, 42% were at the range of 18.5- 24.9, 38% were 25 and above 25. Duration of hemodialyses; most of patients (56%) have been on dialyses more than 3 years while 44% of patients have been on dialyses for less than 3 year. 74% of the patients had other diseases. Demographic characteristics of the hemodialysis patients are shown below Tables 4.

Tablo 4: Demographic Characteristics of the Hemodialysis Patients

Variables	Categories	N=50	%
Gender	Female	23	46
	Male	27	54
Education level	Illiterate	10	20
	Literate	10	20
	Primary school	14	28
	High school	15	30
	University	1	2
CKD Diet	Yes	25	50
	No	25	50
BMI (kg/m2)	<18.5	10	20
	18,5- 24,9	21	42
	≥25	19	38
Duration of HD	<3 year	22	44
	≥3 year	28	56
Other Disease	Yes	36	72
	No	14	28
NRS-2002 Form	≤3 Score	23	46
	<3 Score	27	54

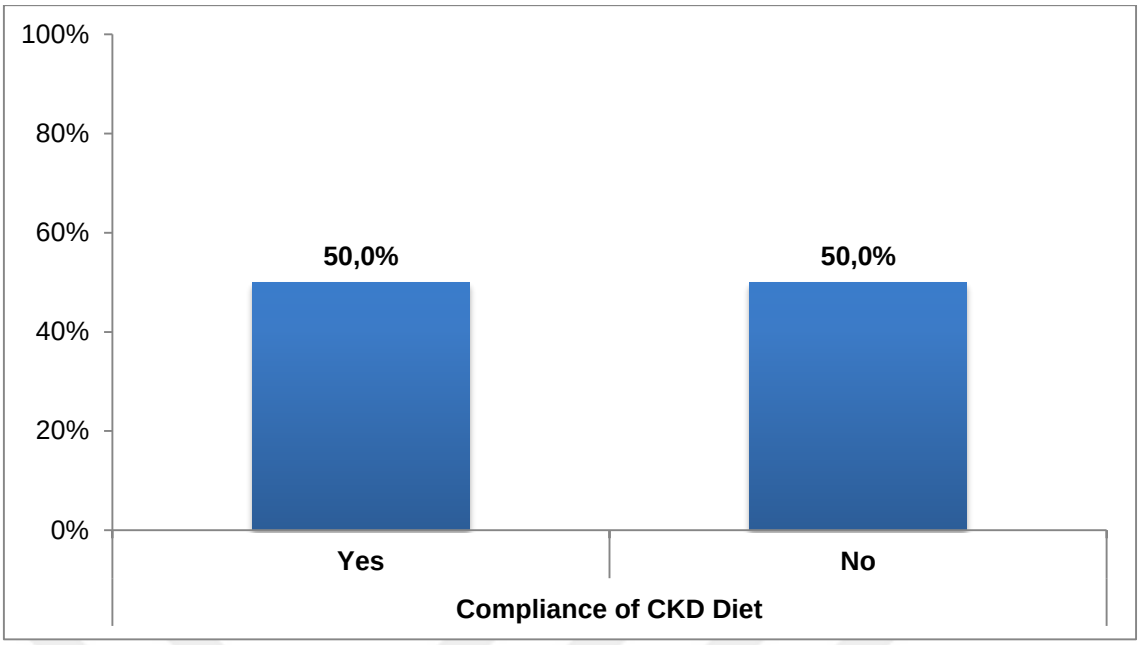

Figure 1: The Ratio of Compliance to Diet of the Working Group

The patient' age ranged from 18 to 90 years with a mean of 57,7 years and 30 (60%) were older than 55 years old, while the remaining 20 (40%) were 55 years old and younger. Mean BMI was 23,2 ± 5,1. The duration of hemodialysis ranged from 0,5 to 16 years with a mean duration of 4,4 ± 4,0 years. 10% of the patients were receiving dialysis treatment twice a week, 90% of the patients were receiving dialysis treatment 3 times a week. Demographic and anthropometric parameters of the working group were summarized in Table 5. Mean serum t. protein, albumin, folate, calcium, t. cholesterol, potassium, sodium, iron and UIBC were within normal range (Table 6).

Tablo 5 : Mean±SD of Quantitative Factors in HD Patients

Variables	Mean	SD	Minimum	Maximum
Age (year)	57,7	18,5	18	90
Height (cm)	167,5	9,5	145	195
Weight (kg)	64,7	14,7	27	96,2
BMI (kg/m2)	23,2	5,1	12,8	38,5
Duration of HD (year)	4,4	4,0	0,5	16
HD Session (week)	2,9	0,3	2	3

Tablo 6 : Mean±SD of Biochemical Parameters in HD Patients

Variables	Mean	SD	Minimum	Maximum	Normal Range (For Reference)
Hemoglobin (g/dl)	11,2	2,0	4,2	15,8	11,5-16,5
Urea (mg/dl)	157,6	43,2	82	278	12-43
Creatinine (mg/dl)	7,9	2,6	3,4	14	0,5-1,4
T. Protein (g/dl)	6,8	0,5	5,7	8	6,2-8,3
Albümin (g/dl)	3,9	0,3	3,3	4,6	3,5-5,4
Ferritin (ng/ml)	1386,5	577,0	39,8	2000	4,63-204
Vitamin B12 (pg/ml)	1540,2	686,0	299	2000	150-883
Calcium (mg/dl)	8,8	0,7	6,8	10,3	8,4-10,2
Phosphorus (mg/dl)	5,4	1,5	2,7	9,7	2,5-4,9
ALP (U/L)	320,7	273,5	61	1236	25-270
T. Cholesterol (mg/dl)	163,3	36,2	100	271	0-200
Triglycerides (mg/dl)	188,0	123,1	14	744	55-150
Potassium (mmol/L)	5,0	0,9	3,4	7,3	3,5-5,1
Sodium (mEq/L)	135,4	3,6	125	143	135-148
Iron (mg/dL)	107,8	53,5	27	243	50-170
UIBC (mg/dL)	144,0	90,9	6	321	110-370

Among fifty (50) patient, 23 (%46) of patient were malnourished according to NRS-2002 form and are shown below Table 7. and Figure 2.

Tablo 7 : Prevalence of Malnutrition according to NRS-2002 Form

		N=50	%
NRS-2002 Form	<3	27	54,0
	≥3	23	46,0

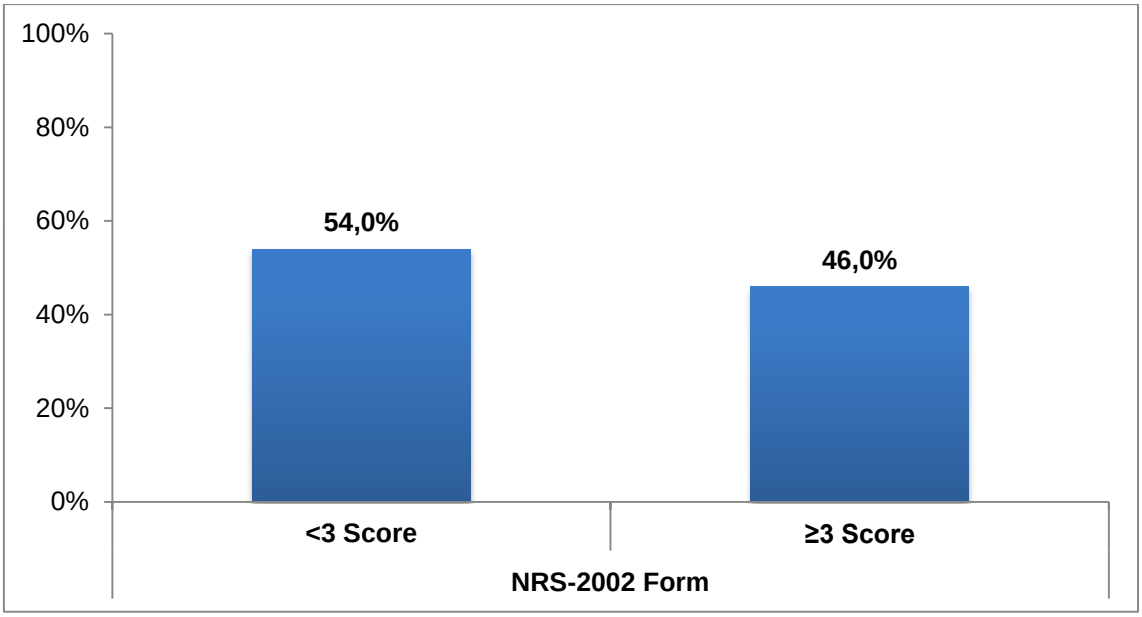

Figure 2 : Prevalence of Malnutrition according to NRS-2002 Form

Nutritional status based on NRS-2002 form and gender distribution of the patients is shown in Table 7. We found statistically significant difference between patients' gender and the NRS-2002 form (p=0,042). 30,4% of malnourished patients were female while 69,6% were male and are shown below Table 8. and Figure 3.

Tablo 8 : Comparison Between Gender and NRS-2002 Form

		NRS-2002 Form				
		≥3 Score		<3 Score		
		N	%	n	%	P
Gender	Female	7	30,4	16	59,3	**0,042**
	Male	16	69,6	11	40,7	

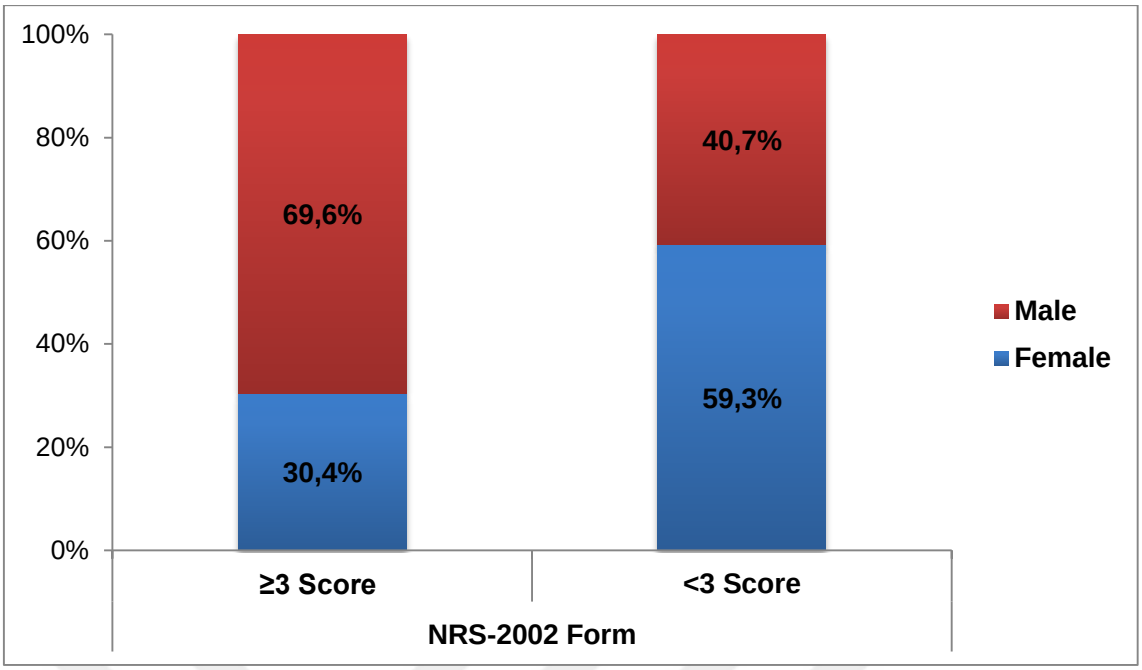

Figure 3: Percentage Distribution of Patients Based on Gender according to NRS-2002 Form

Mean age of malnourished HD patients' was 59,8±22,2 while HD patients without malnutrition was 55,9±15,0. We did not any statistically significant difference between mean age of malnourished patients and mean age of well-nourished patients. However, mean age of malnourished HD patients was higher than well-nourished patiens and are shown below Table 9. and Figure 4.

Tablo 9 : Comparison of Mean±SD of Patients' Age according to NRS-2002 Form

	NRS-2002 Form				
	≥3 Score		**<3 Score**		
	Mean±SD	**Min-Max**	**Mean±SD**	**Min-Max**	**P**
Age	59,8±22,2	18-90	55,9±15,0	19-82	0,470

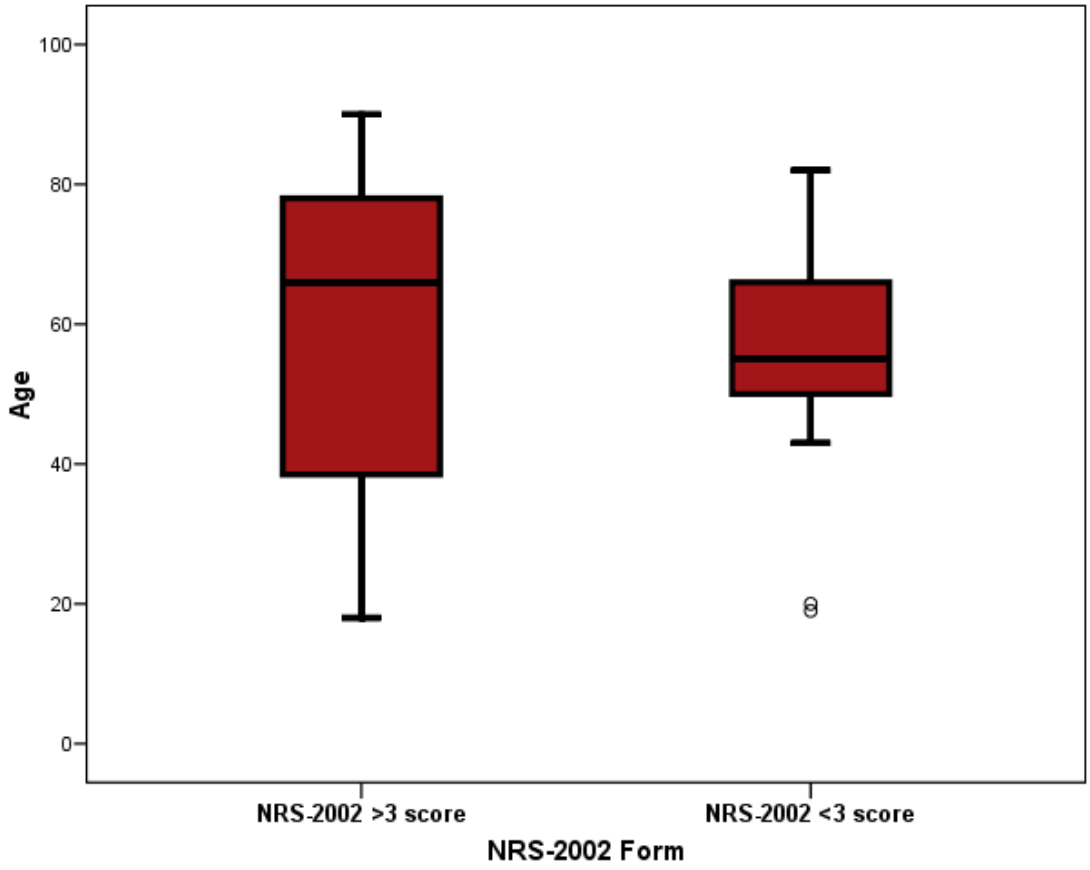

Figure 4 : Comparison of Mean±SD of Patients' Age according to NRS-2002 Form

Mean BMI of malnourished HD patients' was 20,2 ± 3.8 while HD patients without malnutrition was 25,7 ± 4,7. We found statistically significant difference between mean BMI of malnourished patients and mean BMI of well-nourished patients (p<0,001). Mean BMI of malnourished HD patients was lower than well-nourished patiens and are shown below Table 10. and Figure 5.

Tablo 10 : Comparison of Mean±SD of BMI according to NRS-2002 Form

	NRS-2002 Form						
	≥3 Score			**<3 Score**			
	Mean	**SD**	**Median**	**Mean**	**SD**	**Median**	**P**
BMI	20,2	3,8	19,2	25,7	4,7	26,2	**<0,001**

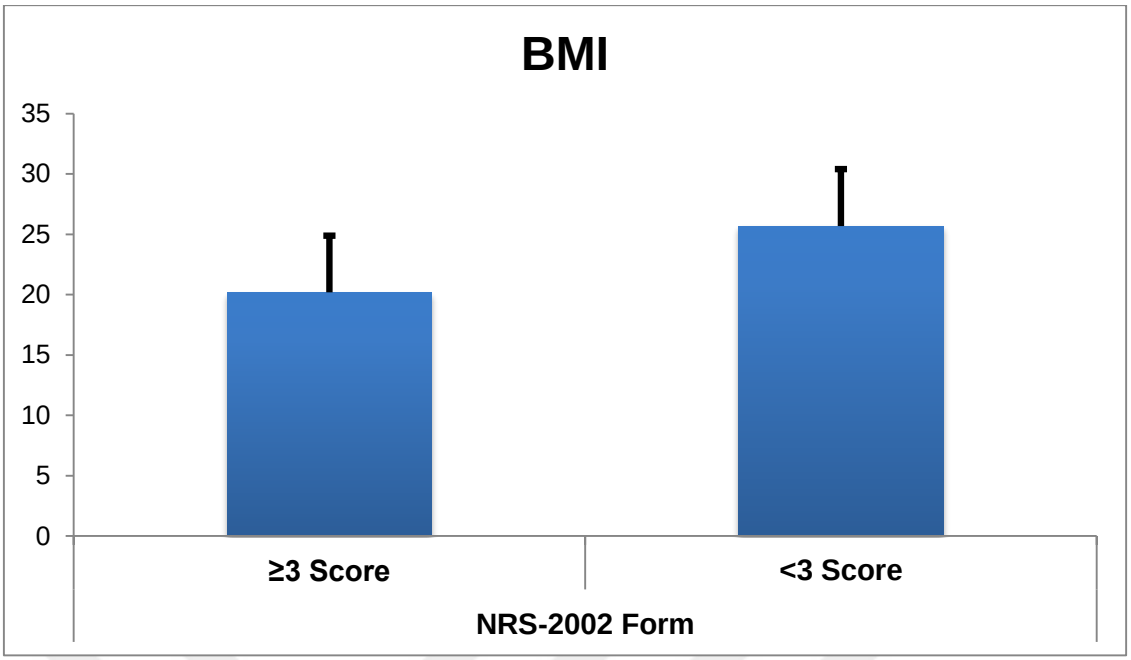

Figure 5 : Comparison of Mean±SD of BMI according to NRS-2002 Form

There were statistically significant difference between BMI groups in malnourished patients (p=0,001). 34,8% of malnourished patients were below 18.5, 56,5% were at the range of 18.5- 24.9 and 8,7% were 25 and above 25 and are shown below Table 11. and Figure 6.

*T***ablo 11 :** Comparison Between NRS-2002 Form and BMI Groups

		NRS-2002 Form				
		≥3 Score		<3 Score		
		n	%	n	%	P
BMI	<18,5	8	34,8	2	7,4	0,001
	18,5- 24,9	13	56,5	8	29,6	
	≥25	2	8,7	17	63	

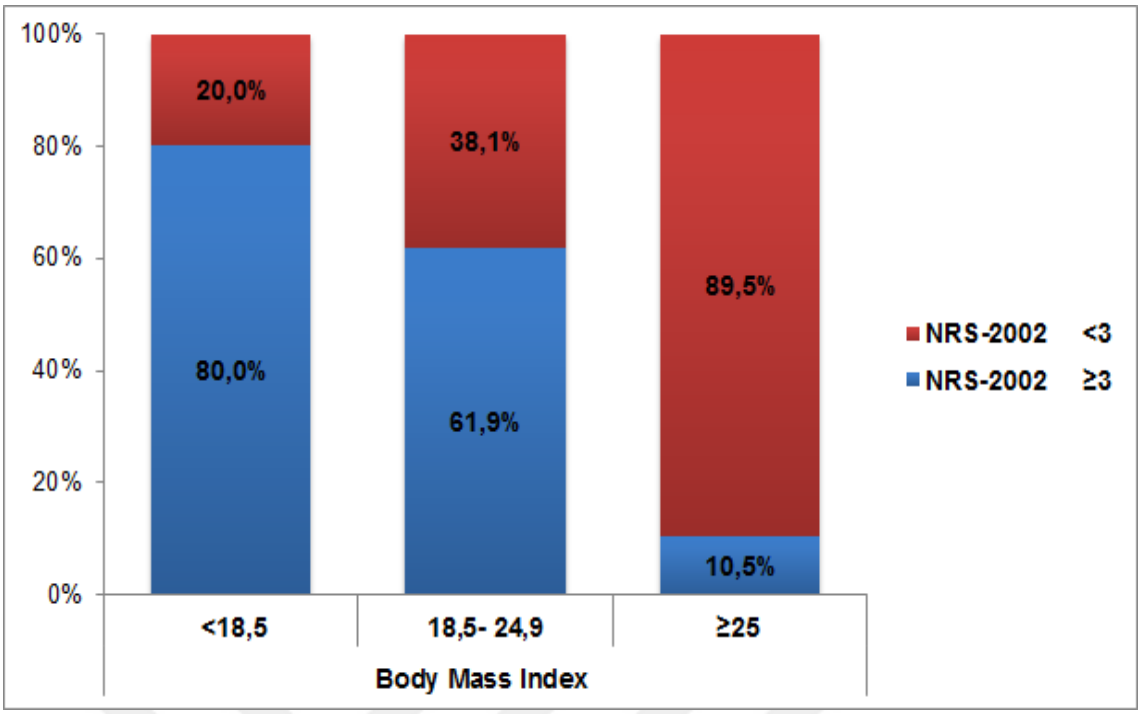

Figure 6 : Percentage Distribution of Malnourished and Well-Nourished HD Patients according to BMI Groups

Mean duration of hemodialysis for malnourished patients was 4,2±4,2 years while well nourished patients was 4,6±3,9 years. We found no statistically significant difference between mean duration of hemodialysis of malnourished patients and mean duration of hemodialysis of well-nourished patients. However, mean duration of hemodialysis of malnourished HD patients was lower than well-nourished patiens and are shown below Table 12.

Tablo 12 : Comparison of Mean±SD of Duration of HD according to NRS-2002 Form

	NRS-2002 Form						
	≥3 Score			**<3 Score**			
	Mean	**SD**	**Median**	**Mean**	**SD**	**Median**	**p**
Duration of Hemodialysis	4,2	4,2	3	4,6	3,9	3	0,653

Nutritional status based on NRS-2002 form and distribution of patients who follow the CKD diet and who do not are shown in Table 12. We found no statistically significant difference between CKD diet and NRS-2002 form. 56,5% of malnourished patients were following the CKD diet while 43,5% were not following the CKD diet and are shown below Table 13. and Figure 7.

Tablo 13 : Comparison Between CKD Diet and NRS-2002 Form

		NRS-2002 Form				
		≥3 Score		<3 Score		
		n	**%**	**n**	**%**	**p**
CKD Diet	Yes	13	56,5	12	44,4	0,395
	No	10	43,5	15	55,6	

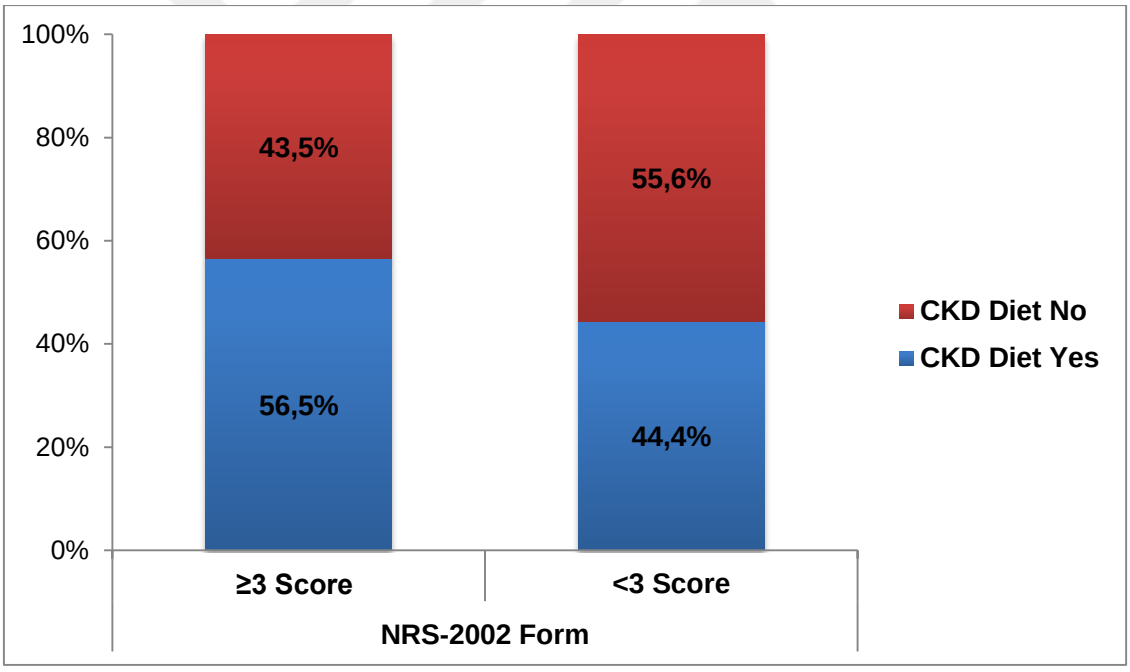

Figure 7 : Percentage Distribution of HD Patients Who Follow the CKD Diet and Who Do Not according to NRS-2002 Form

There was no statistically significant difference in mean of biochemical parameters of the study groups who malnourished and well-nourished patients. All biochemical parameters of well-nourished patients were higher than patients with malnutrition (Table 14).

Tablo 14 : Comparison of Mean ±SD of Biochemical Parameters of Patients according to NRS-2002 Form

	NRS-2002 Form						
	≥3 Score			**<3 Score**			
	Mean	**SD**	**Median**	**Mean**	**SD**	**Median**	**P**
Hemoglobin	10,8	2,2	10,9	11,6	1,8	11,7	0,170
Urea	152,0	37,3	150	162,4	47,8	144	0,572
Creatinine	7,5	2,5	7,1	8,3	2,6	8,1	0,268
T.protein	6,8	0,6	6,8	6,9	0,5	6,8	0,569
Albumin	3,8	0,3	3,8	4,0	0,3	4	0,237
Ferritin	1383,7	573,5	1650	1388,8	590,9	1583	0,953
VitaminB12	1558,3	689,6	2000	1524,7	695,6	2000	0,897
Calcium	8,8	0,7	8,9	8,7	0,7	8,7	0,783
Phosphorus	5,2	1,4	5,1	5,6	1,5	5,5	0,253
ALP	269,0	202,0	153	364,8	319,5	295	0,355
T. cholesterol	154,8	35,2	148	170,6	36,1	174	0,092
Triglycerides	174,5	143,2	159	199,6	104,5	166	0,126
Potassium	4,8	0,7	4,7	5,2	1,1	5,1	0,127
Sodium	136,3	3,6	136	134,7	3,4	135	0,119
Iron	113,3	51,3	108	103,1	55,8	88	0,345
UIBC	140,6	96,0	122	146,9	88,1	168	0,830

There were statistically significant differences in mean t. protein, albumin, ferritin, ALP, UIBC level in evaluated biochemical parameters of the study groups who follow the CKD diet and who do not (p=0,003 p=0,013 p=0,008 p=0,011 p=0,008). There were no statistically significant difference in evaluated other biochemical parameters levels of study group who follow the CKD diet and who do not. (Table 15, Figure 8-9-10-11-12).

Tablo 15 : Comparison of Mean ±SD of Biochemical Parameters according to Patients Who Follow The CKD Diet and Who Do Not

	CKD DIET						
	Yes			**No**			
	Mean	**SD**	**Median**	**Mean**	**SD**	**Median**	**p**
Hemoglobin	11,1	1,7	10,9	11,4	2,3	11,4	0,559
Urea	151,0	47,9	144	164,2	37,7	171	0,154
Creatinine	8,3	2,6	8,1	7,6	2,6	6,9	0,321
T.Protein	7,0	0,5	7,1	6,6	0,5	6,6	**0,003**
Albumin	4,0	0,3	4	3,8	0,3	3,8	**0,013**
Ferritin	1207,6	542,2	1264	1565,4	564,9	1688	**0,008**
VitaminB12	1416,8	737,5	2000	1663,5	620,5	2000	0,214
Calcium	8,7	0,6	8,8	8,9	0,8	9	0,377
Phosphorus	5,6	1,6	5,2	5,3	1,3	5,2	0,470
ALP	225,7	181,0	144	415,8	318,0	388	**0,011**
T. cholesterol	160,7	40,7	159	166,0	31,7	166	0,388
Triglycerides	200,0	157,3	161	176,1	76,9	159	0,734
Potassium	5,0	0,9	4,8	5,0	1,0	4,8	0,824
Sodium	135,4	3,8	136	135,4	3,5	135	1,000
Iron	99,1	55,9	86	116,5	50,7	111	0,165
UIBC	177,5	84,8	208	110,5	85,7	97	**0,008**

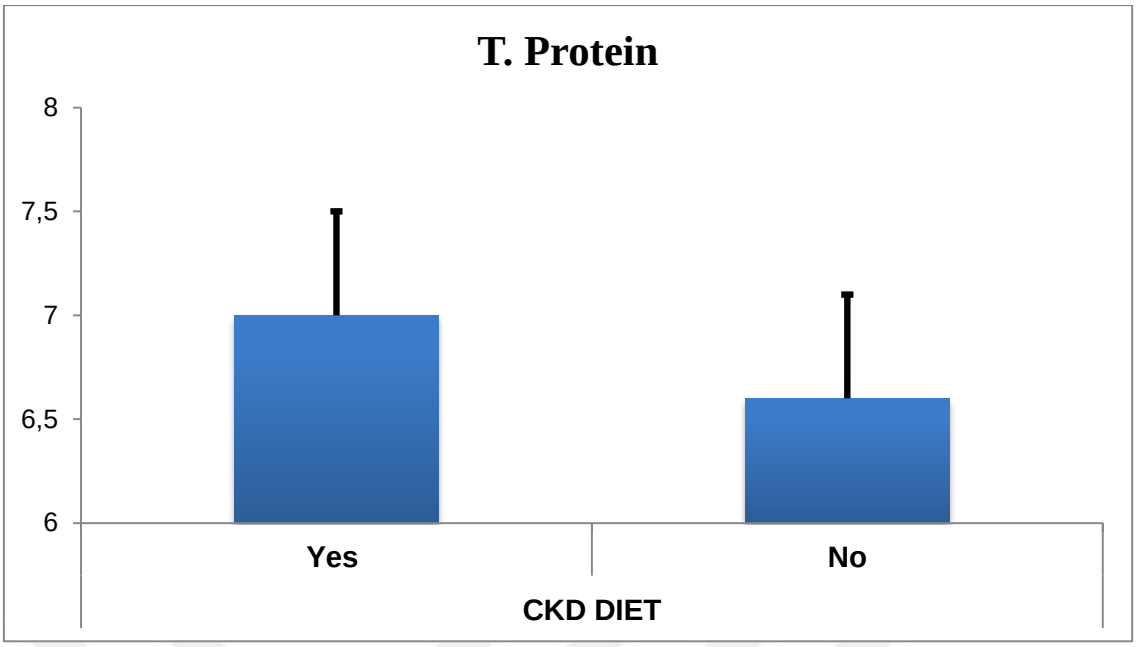

Figure 8 : Comparison of Mean ±SD of T.Protein Level according to Compliance of CKD Diet

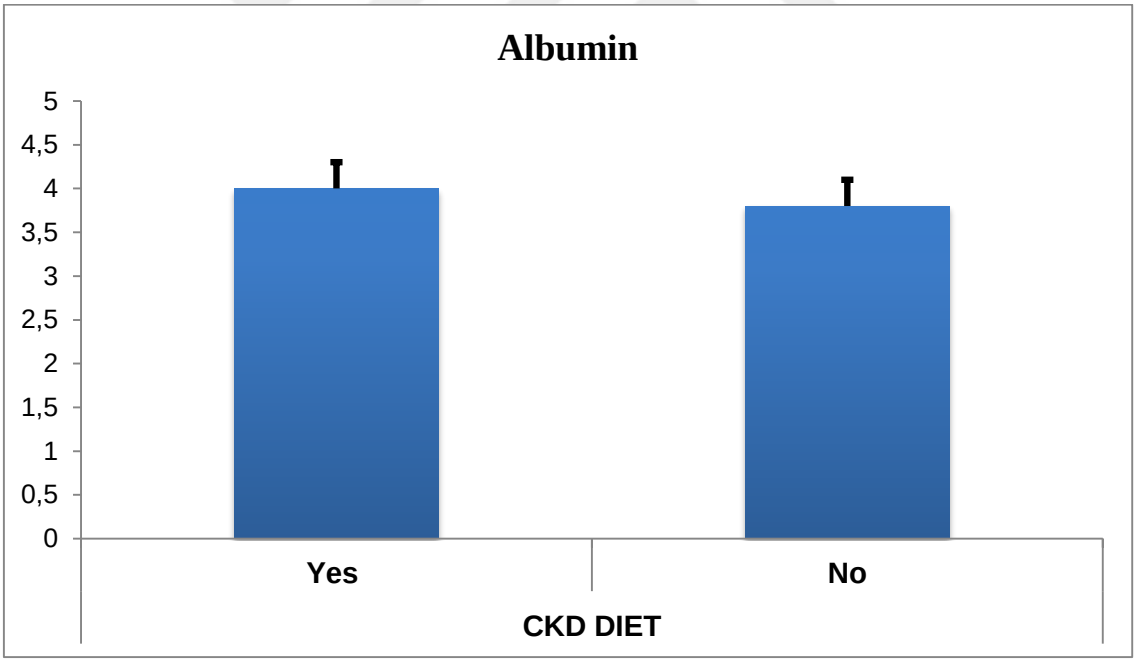

Figure 9 : Comparison of Mean ±SD of Albumin Level according to Compliance of CKD Diet

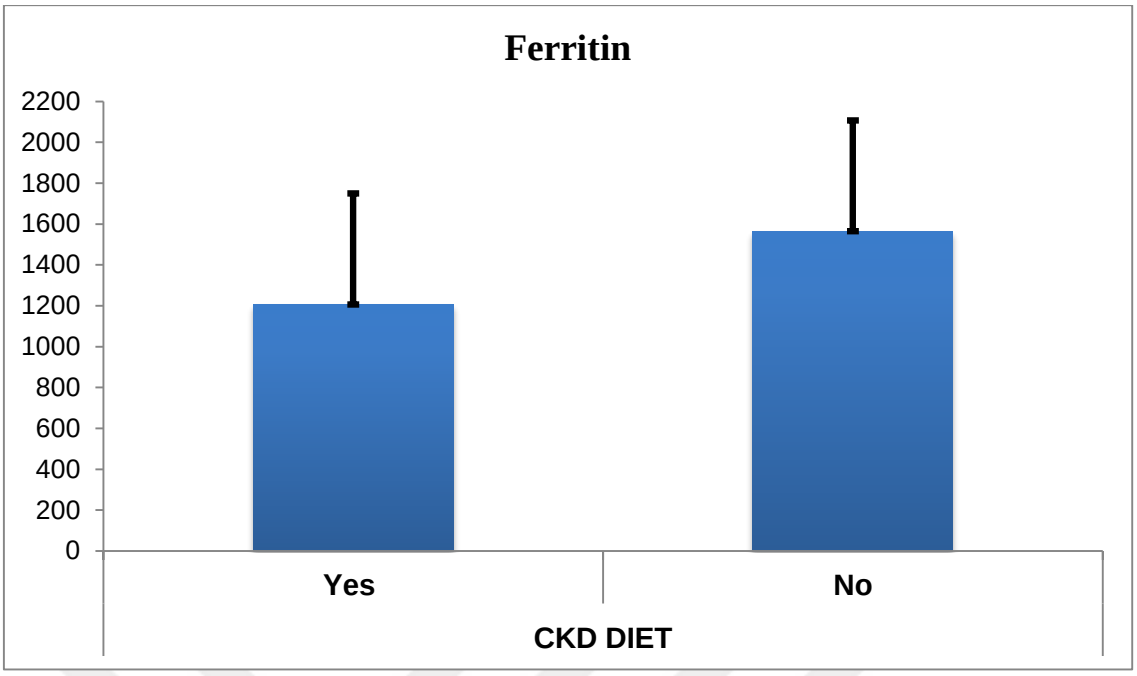

Figure 10 : Comparison of Mean ±SD of Ferritin Level according to Compliance of CKD Diet

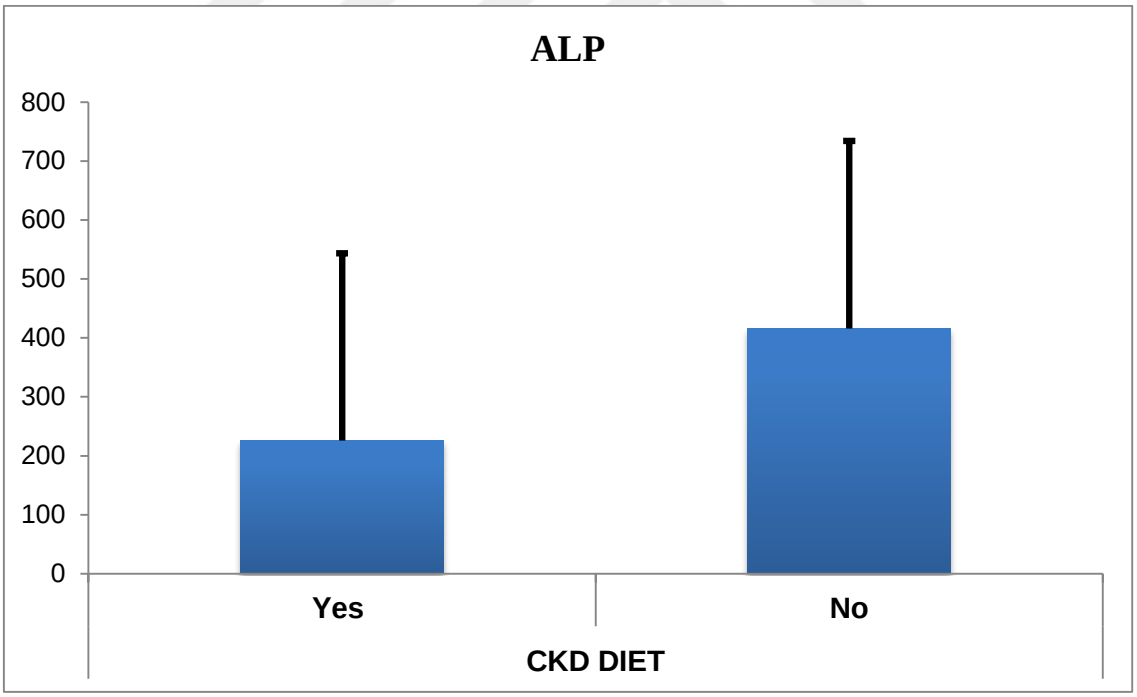

Figure 11 : Comparison of Mean ±SD of ALP Level according to Compliance of CKD Diet

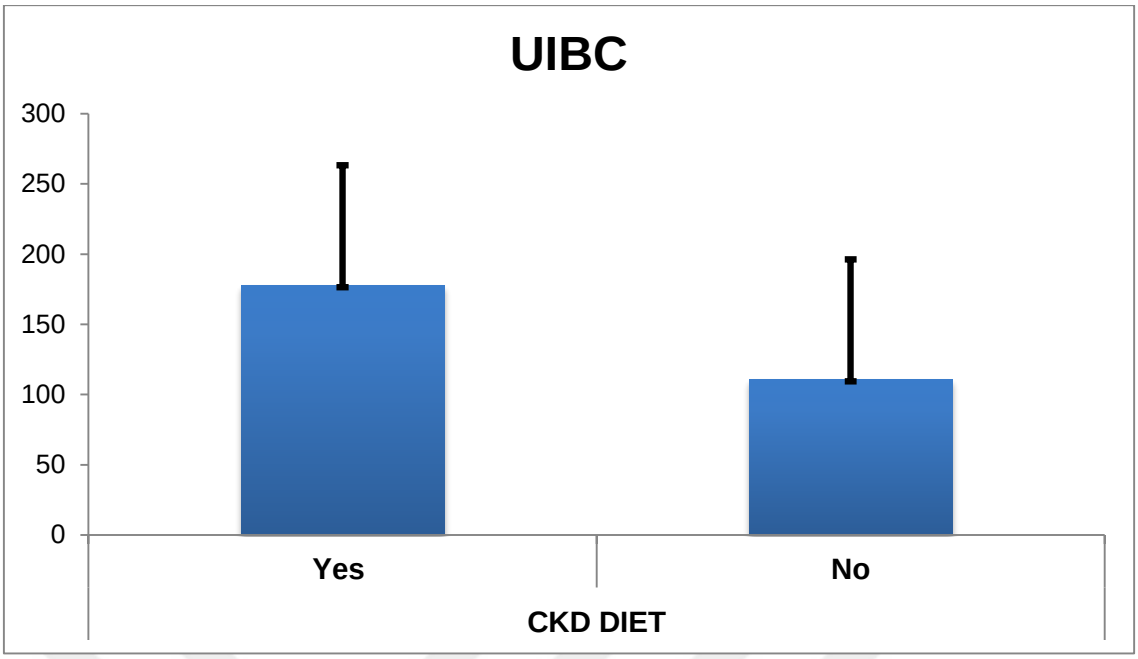

Figure 12 : Comparison of Mean ±SD of UIBC Level according to Compliance of CKD Diet

5. DISCUSSION and CONCLUSION

The main aim of this study was to evaluate of nutritional parameters of patients with ESRD undergoing hemodialysis in our hospital and possibility of malnutrition prediction based on biochemical parameters in them. In our study, among 50 patients, 46% suffered from malnutrition and this findings is supported bye the results of other studies. This is nearly similar to findings of Afshar et al. detected malnutrition in 40.7% of 54 patients undergoing hemodialysis in capital city of Iran (43). In another study by Tayyem et al. in Jordan, the malnutrition rate was 61.8 % among 178 patients undergoing hemodialysis (44). A study by Janardhan et al. in India using SGA, the malnutrition rate was 91% among 66 patients undergoing hemodialysis in their study (45). A study by Sedhain et al., among 54 patients, 66.7% of the patients suffered from mild to moderate malnutrition (46).

A study by Piccini et al. in Australian showed that out of 35 patient, 46% of patient were malnourished (47). In other study by Behrooz et al., 70% mild malnutrition, 20% had mild to moderate malnutrition and none were severe malnutrition among 48 hemodialysis patients (48). Tabibi study on 291 hemodialysis patients admitted to hospitals in Tehran, about 54% had mild to moderate malnutrition (49). Reema et al. showed that among 178 patient, 56.2% were moderatly malnourish, and

5.6% were severely malnourihed (50). Mehrotra and Kopple (51) showed that estimates of prevelance vary, but that the worlwide average is approximately 40%. Those researchers reported that the majority of patients were classified as having mild to moderate malnutrition, and 6% to 8% had severe malnutrition. In a study Swedish patients on hemodialysis, Qureshi et al. (52) showed that 51% were mildly malnourished, and 13% were severely malnourished. 34% were moderately nourished, and 20% were poorly nourished, in New York.

Many factor play a role in causing variations in the prevalence of malnutrition in different studies. These factors include variations between the countries that conducted those studies, sample heterogeneity, and diversity in dietary patterns, socioeconomic status, comorbidities, and medical care at hospitals from one country to another, or even within the same country. In addition, the dose and conditions of dialysis may influence the rate of developing malnutrition (53).

In our study, 69,6% of malnourished patients were male while 30,4% were female. Our findings indicated a statistically significant difference between patients' gender and the NRS-2002 form (p=0,042). This is nearly similar to findings of Piccini et al. in Australian detected 75% of malnourished patients were male while 25% were female (47). It appears that we should pay more attention to the nutritional status of male patients with ESRD undergoing hemodialysis.

We did not any statistically significant difference between mean age of malnourished patients and mean age of well-nourished patients. However, mean age of malnourished HD patients was higher than well-nourished patiens. Similarly, a study in Australia by Espahbodi et al. showed no significant association between malnutrition and patients' age (54). In another study by Piccini et al. in Australia, did not find any significant between malnutrition and patients' age. They also found mean age of malnourished HD patients was higher than well nourished patiens (47). A study by Ekramzadeh et al. detected malnutrition was more prevalent in older HD patients than younger ones, based on SGA results (55).

Aging is accompanied by physiologic changes that can negatively impact nutritional status. Sensory impairment, such as decreased sense of taste and smell, that occurs with aging may result in reduced appetite. Poor oral health and dental problems

can lead to difficulty chewing, inflammation, and a monotonous diet that is poor in quality, all of which increase the risk of malnutrition. Progressive loss of vision and hearing, as well as osteoarthritis, may limit mobility and affect the elderly people's ability to shop for food and prepare meals.

We found statistically significant difference between mean BMI of malnourished patients and mean BMI of well-nourished patients ($p<0,001$). Mean BMI of malnourished HD patients was lower than well-nourished patiens. In other study by Piccini et al. in Australia, found an independent inverse association between BMI and risk of malnutrition in HD patients (47). In our study, there were statistically significant difference between BMI groups in malnourished patients ($p=0,001$). 34,8% of malnourished patients were below 18.5, 56,5% were at the range of 18.5- 24.9 and 8,7% were 25 and above 25. 56,5% of malnourished patients were normal range of BMI. Because of this, BMI may be unreliable in the presence of confounding factors such as oedema or ascites, and may not identify significant unintentional weight loss if used as a single assessment (56). Furthermore, BMI and weight loss aren't the only indicators of malnutrition. A person can be overweight or obese and still be malnourished. This can be due to having a diet consisting of food and drink that's high in fat and sugar but low in essential vitamins and minerals.

We found no statistically significant difference between mean duration of hemodialysis of malnourished patients and mean duration of hemodialysis of well-nourished patients. However, mean duration of hemodialysis of malnourished HD patients was lower than well-nourished patiens. A study by Espahbodi et al. found no significant association between duration of hemodialysis and malnutrition (54). It may be attributed to the greater mortality rate in patients with longer duration of hemodialysis, which reduced their proportion in our study population, or the fact that longer duration of hemodialysis improves the patients' knowledge of their nutritional needs.

In our study, there was no statistically significant difference in mean of biochemical parameters of the study groups who well-nourished and malnourished patients. All biochemical parameters of well nourished patients were higher than patients with malnutrition. We did not find any statistically significant association between hemoglobin level and malnutrition. This is similar to findings of a study by

Gurreebun et al. on 141 patients undergoing hemodialysis in England. It may be due to other factors affecting hemoglobin levels in hemodialysis patients such as reduced erythropoietin production in unhealthy kidneys, severe hyperparathyroidism, acute and chronic inflammatory conditions, aluminum toxicity, reduced lifespan of red blood cells, and concomitant conditions like hemoglobinopathies, hemolysis, and limited access of patients to the recombinant erythropoietin or erythropoiesis-stimulating agents (ESAs) (57).

In our study, there was no statistically significant association between serum albumin level and malnutrition, which is similar to findings of Tapiawala et al. study on 81 patients in India (58); however, it is contrary to an American study on 52 patients, by Eustace et al. (59). The result of our study could possibly be affected by other factors such as proteinuria, which is frequent among renal failure patients, on serum albumin level. In addition, dialysis treatment can decrease plasma albumin level. Moreover, since albumin is an acute phase reaction protein and most patients under hemodialysis have various degrees of vascular inflammation, serum albumin level may be altered. Acidemia and hydration are other factors that affect serum albumin level. Thus, when we consider serum albumin level as a nutritional marker, it is necessary to evaluate the patient's clinical status such as concomitant conditions, quality of dialysis, acid-base status, and degree of proteinuria (60).

We did not find any statistically significant association between serum lipid levels and malnutrition. A study by Sedhain et al. found no statistically significant association between nutritional status and lipid levels. However, lower total cholesterol and triglyceride observed in mild to moderately malnourished patients could be because of poor dietary intake (46). A study by Espahbodi et al. found no significant association between serum cholesterol level and malnutrition; it is probably due to this matter that cholesterol level as an indicator of energy-protein status is insensitive, unspecific, and is affected by other factors such as inflammation (54).

We found no statistically significant association between malnutrition and serum creatinine level. This is nearly similar to finding of Espahbodi et al. found no significant association between malnutrition and serum creatinine level that contradicted the findings of the study aforementioned (54).

There were statistically significant differences in mean t. protein, albumin, ferritin, ALP, UIBC levels in evaluated biochemical parameters of the study groups who follow the CKD diet and who do not. Mean t. protein, albumin and UIBC levels of patients who follow the diet was higher than who do not. Mean ferritin and ALP levels of patients who follow the diet was lower than who do not. There were no statistically significant difference in evaluated other biochemical parameters levels of study group who follow the CKD diet and who do not.

Therefore, in our study, we could not find adequate relationship between biochemical parameters (such as albumin, hemoglobin, cholesterol, and creatinine) and malnutrition revealed that these parameters could not provide accurate information about nutritional status of these patients. Furthermore, NRS-2002 can still be the best tool assessing the nutritional status of hemodialysis patients, because it can recognize various degrees of malnutrition that may remain undetected by a single laboratory assessment.

In conclusion, the nutritional assessment parameters were used in this study and NRS-2002 form was correlated with them. One main conclusion of this thesis is the relatively poor correlation of existing biomarkers of nutritional state to the current standard assessment method – NRS-2002. In addition, the prevalence of malnutrion in our study was found to be 46%. Most of the patients on maintenance dialyses failed to maintain the required dietary energy and protein intake. Finally, the nutritional status of HDP needs more attention and regular periodic nutrition assessment.

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7. APPENDICES

7.1. Ethical Approval

T.C.
İSTANBUL MEDİPOL ÜNİVERSİTESİ
GİRİŞİMSEL OLMAYAN KLİNİK ARAŞTIRMALAR ETİK KURULU

Sayı : 108400987-137
Konu: Etik Kurulu Kararı

03/03/2015

Sayın Diğdem DOĞAN

Üniversitemiz Girişimsel Olmayan Klinik Araştırmalar Etik Kuruluna yapmış olduğunuz "Hemodiyaliz Hastalarının Nutrisyonel Parametrelerde Değerlendirilmesi ve Malnutrisyon Durumunun Saptanması" isimli başvurunuz incelenmiş olup, etik kurulu kararı ekte sunulmuştur.

Bilgilerinize rica ederim.

Doç. Dr. Hanefi ÖZBEK
Girişimsel Olmayan Klinik Araştırmalar
Etik Kurulu Başkanı

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BAŞVURU BİLGİLERİ	**ARAŞTIRMANIN AÇIK ADI**	Hemodiyaliz Hastalarının Nutrisyonel Parametrelerde Değerlendirilmesi ve Malnutrisyon Durumunun Saptanması			
	KOORDİNATÖR/SORUMLU ARAŞTIRMACI UNVANI/ADI/SOYADI	Diğdem DOĞAN			
	KOORDİNATÖR/SORUMLU ARAŞTIRMACININ UZMANLIK ALANI	Diyet ve Obezite			
	KOORDİNATÖR/SORUMLU ARAŞTIRMACININ BULUNDUĞU MERKEZ	Tunceli			
	DESTEKLEYİCİ	-			
	ARAŞTIRMAYA KATILAN MERKEZLER	TEK MERKEZ ☒	ÇOK MERKEZLİ ☐	ULUSAL ☒	ULUSLARARASI ☐

İSTANBUL MEDİPOL ÜNİVERSİTESİ GİRİŞİMSEL OLMAYAN KLİNİK ARAŞTIRMALAR ETİK KURULU KARAR FORMU

	Belge Adı	Tarihi	Versiyon Numarası	Dili
Değerlendirilen Belgeler	ARAŞTIRMA PROTOKOLÜ/PLANI	26.02.2015		Türkçe ☒ İngilizce ☐ Diğer ☐
	BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU	26.02.2015		Türkçe ☒ İngilizce ☐ Diğer ☐
Karar Bilgileri	**Karar No: 126**	**Tarih: 03.03.2015**		
	Yukarıda bilgileri verilen Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu başvuru dosyası ile ilgili belgeler araştırmanın gerekçe, amaç, yaklaşım ve yöntemleri dikkate alınarak incelenmiş ve araştırmanın etik ve bilimsel yönden uygun olduğuna **"oybirliği"** ile karar verilmiştir.			

İSTANBUL MEDİPOL ÜNİVERSİTESİ GİRİŞİMSEL OLMAYAN KLİNİK ARAŞTIRMALAR ETİK KURULU	
BAŞKANIN UNVANI / ADI / SOYADI	Doç. Dr. Hanefi ÖZBEK

Unvanı/Adı/Soyadı	Uzmanlık Alanı	Kurumu	Cinsiyet		Araştırma ile İlişki		Katılım *		İmza
Prof. Dr. Şeref DEMİRAYAK	Eczacılık	İstanbul Medipol Üniversitesi	E ☒	K ☐	E ☐	H ☒	E ☒	H ☐	
Prof. Dr. Tangül MÜDOK	Histoloji ve Embriyoloji	İstanbul Medipol Üniversitesi	E ☐	K ☒	E ☐	H ☒	E ☐	H ☒	
Doç. Dr. Hanefi ÖZBEK	Farmakoloji	İstanbul Medipol Üniversitesi	E ☒	K ☐	E ☐	H ☒	E ☒	H ☐	
Yrd. Doç. Dr. Sibel DOĞAN	Psiko-onkoloji	İstanbul Medipol Üniversitesi	E ☐	K ☒	E ☐	H ☒	E ☒	H ☐	
Yrd. Doç. Dr. Hüseyin Emir YÜZBAŞIOĞLU	Protetik Diş Tedavisi	İstanbul Medipol Üniversitesi	E ☒	K ☐	E ☐	H ☒	E ☒	H ☐	
Yrd. Doç. Dr. İlknur KESKİN	Histoloji ve Embriyoloji	İstanbul Medipol Üniversitesi	E ☐	K ☒	E ☐	H ☒	E ☒	H ☐	
Yrd. Doç. Dr. Muhammed Fatih EVCİMİK	Kulak-Burun Boğaz	Özel Nisa Hastanesi	E ☒	K ☐	E ☐	H ☒	E ☐	H ☒	

* :Toplantıda Bulunma

7.2. Nutritional Risk Screening (NRS 2002)

	Table 1: Initial screening	Yes	No
1	Is BMI <20?		
2	Has the patient lost weight within the last 3 months?		
3	Has the patient had a reduced dietary intake in the last week?		
4	Is the patient severely ill ? (e.g. in intensive therapy)		

Yes: If the answer is 'Yes' to any question, the screening in Table 2 is performed.

No: If the answer is 'No' to all questions, the patient is re-screening at weekly intervals. If the patient e.g. is scheduled for a major operation, a preventive nutritional care plan is considered to avoid the associated risk status.

Table 2: Final screening			
Impaired nutritional status		**Severity of disease** (≈ increase in requirements)	
Absent **Score 0**	Normal nutritional status	Absent **Score 0**	Normal nutritional requirements
Mild **Score 1**	Wt loss >5% in 3 mths or Food intake below 50-75% of normal requirement in preceding week.	Mild **Score 1**	Hip fracture* Chronic patients, in particular with acute complications: cirrhosis*, COPD*. *Chronic hemodialysis, diabetes, oncology.*
Moderate **Score 2**	Wt loss >5% in 2 mths or BMI 18.5 - 20.5 + impaired general condition or Food intake 25-50% of normal requirement in preceding week	Moderate **Score 2**	Major abdominal surgery* Stroke* *Severe pneumonia, hematologic malignancy*.

Severe **Score 3**	Wt loss >5% in 1 mth (>15% in 3 mths) or BMI <18.5 + impaired general condition or Food intake 0-25% of normal requirement in preceding week in preceding week.	Severe **Score 3**	Head injury* Bone marrow transplantation* *Intensive care patients (APACHE>10).*
Score: +		**Score:**	**= Total score:**
Age	if ≥ 70 years: add 1 to total score above		**= age-adjusted total score:**
Score ≥3: the patient is nutritionally at-risk and a nutritional care plan is initiated **Score < 3:** weekly rescreening of the patient. If the patient e.g. is scheduled for a major operation, a preventive nutritional care plan is considered to avoid the associated risk status.			

NRS-2002 is based on an interpretation of available randomized clinical trials.

* indicates that a trial directly supports
the categorization of patients with that diagnosis. Diagnoses shown in *italics* are based on the prototypes given below.

Nutritional risk is defined by the present **nutritional status** and risk of impairment of present status, due to **increased requirements** caused by stress metabolism of the clinical condition.

A nutritional care plan is indicated in all patients who are

1) severely undernourished (score =3),
2) severely ill (score = 3),
3) moderately undernourished + mildly ill (score 2 +1), or
4) mildly undernourished + moderately ill (score 1 + 2).

Prototypes for severity of disease
Score = 1: a patient with chronic disease, admitted to hospital due to complications. The patient is weak but out of bed regularly. Protein requirement is increased, but can be covered by oral diet or supplements in most cases.

Score = 2: a patient confined to bed due to illness, e.g. following major abdominal surgery. Protein requirement is substantially increased, but can be covered, although artificial feeding is required in many cases.
Score = 3: a patient in intensive care with assisted ventilation etc. Protein requirement is increased and cannot be covered even by artificial feeding. Protein breakdown and nitrogen loss can be significantly attenuated.

7.3. General Questionaire

1. Cinsiyetiniz: 1 ( ) Kadın 2 ( ) Erkek

2. Yaşınız:

3. Boyunuz:

4. Kilonuz:

5. BMI: 1( ) <18.5 2( ) 18.5- 24.9 3( ) ≥25

6. Eğitim Durumunuz :

1( ) Okur- Yazar Değil 2( ) Okur-Yazar 2( ) İlkokul

3( ) Orta- Lise 4( ) Üniversite

7.Ne kadar zamandır hemodiyaliz tedavisi alıyorsunuz?

1( )3 yıl ve altı 2( )3 yıl ve üzeri

8. Haftada Kaç Kez Giriyorsunuz?

1( )2 2( )3

9.Kronik Böbrek Yetmezliği diyeti uyguluyor musunuz?

1( )Evet 2 ( )Hayır

10. Kronik Börek Yetmezliği Dışında Başka Bir Hatalığınız Varsa Var Olan Hastalıkları İşaretleyiniz.

1( ) Evet 2( ) Hayır

11. En Son Laboratuar bulgularınız nelerdir? Yazınız.

Hemoglobin (g/dl): ….....……..

Üre (mg/dl): …….....……..

Kreatin (mg/dl): ……..

T. Protein (g/dl): ……..……

Albümin (g/dl): ……

Ferritin (ng/ml): …….……..

Vitamin B12 (pg/ml): ……

Kalsiyum (mg/dl): ……...…..……

Fosfor (mg/dl): ……....….……

Alkalen fosfataz (Ü/L): ……

T. kolesterol (mg/dl): ……..….....…

Trigliserid (mg/dl): ……

Potasyum (K) (mEq/L): .....

Sodyum (Na) (mEq/L): .....

Demir (Fe) (µg/dL): .....

Unsaturated iron binding capacity (UIBC) µg/dL: .....

8. CURRICULUM VITAE

ÖZGEÇMİŞ

Kişisel Bilgiler

Adı	Diğdem	**Soyadı**	DOĞAN
Doğum Yeri	Turhal	**Doğum Tarihi**	21.06.1989
Uyruğu	T.C.	**TC Kimlik No**	20744124206
E-mail	dytdidem@hotmail.com	**Tel**	0506 327 10 04

Öğrenim Durumu

Derece	Alan	Mezun Olduğu Kurumun Adı	Mezuniyet Yılı
Doktora	-	-	-
Yüksek Lisans	Beslenme ve Diyetetik	Yeditepe Üniversitesi	2015
Lisans	Beslenme ve Diyetetik	Yeditepe Üniversitesi	2013
Lise	Sayısal	Turhal Sami Baklacı Anadolu Lisesi	2007

Bildiği Yabancı Dilleri	Yabancı Dil Sınav Notu (□)
İngilizce	50

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	Kurum	Süre (Yıl - Yıl)
Diyetisyen	Tunceli Devlet Hastanesi	2014-
Diyetisyen	Özel Hekimler Cerrahi Tıp Merkezi	2014-2014
Araştırma Görevlisi	Yeditepe Üniversitesi	2013-2014

Bilgisayar Bilgisi

Program	Kullanma becerisi
Microsoft Office Excel, Power Point, Word	Çok İyi
Windows Uygulamaları	Çok İyi

Diğer (Görev Aldığı Projeler/Sertifikaları/Ödülleri)

09-11 Şubat 2012	İstanbul Sağlık ve Beslenme Bienali
14-18 Nisan 2010	VII. Uluslararası Beslenme ve Diyetetik Kongresi