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PROTEIN-ENERGY STATUS IN PATIENTS RECEIVING DIALYSIS

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Abstract

In patients with chronic renal failure (CRF) the therapy consists of renal replacement therapy (RRT) including dialysis, peritoneal dialysis and kidney transplantation. Assessment and monitoring of nutritional status are the key elements of the optimal treatment of kidney patients; they are carried out using methods ranging from simple measurements to comprehensive forms which include anthropometric, biochemical and subjective assessment methods of the patients' nutritional status. To prove protein-energy malnutrition - PEM - malnutrition-inflammation score - MIS, a comprehensive test of malnutrition and inflammation syndromes is used. The sum of these 10 MIS components ranges from 0 to 30 indicating a higher degree of severity. The test consists of 10 parts, each with four severity levels from 0 (normal) to 3 (very severe). MIS score values determine the presence or absence and the degree of PEM. The aim of this study is to review the dialysis patients' PEM at a hospital in Croatia.

The study, which was approved by the hospital ethics committee, was conducted in March and April 2015 on a population of patients (70) included in the chronic dialysis program (at least three months) and older than eighteen. The study encompasses data on the patients' history, physical examination, laboratory test results (serum albumin and TIBC - total iron binding capacity), and BMI - Body Mass Index. For the diagnosis based on the three parameters it is necessary that two of them be positive.

The results show that 16 patients (23%) have PEM, whereas 54 patients (77%) do not have it. The patients on dialysis with the proven PEM have been given oral therapy with preparations for enteral nutrition: between meals (at least 1 - 2 hours after a meal), in the last hour of dialysis (1-2 hours after a meal on dialysis), and a late meal (around 10 p.m.).

The assessment of the dialysis patient's nutritional status should be carried out twice a year. The treatment of these patients is very complex and requires constant cooperation of nurses, doctors and patients. Good education and cooperation of patients and their families can be helpful in achieving good results and in facilitating dialysis process for patients.

***Key words**: Nutrition, Dialysis, Protein-energy malnutrition, Assessment of nutritional status*

1. Introduction

Chronic kidney disease (CKD) is one of the most common diseases today. In patients with kidney failure the therapy consists of renal replacement therapy including: hemodialysis (HD), peritoneal dialysis (PD), and kidney transplantation. This procedure is used to remove blood waste products such as: urea, potassium, creatinine, and excess liquid that sick kidneys cannot eliminate from the body. Poor appetite, nausea and vomiting can lead to malnutrition in patients with kidney disease. Therefore, nutrition plays a major and significant role. In order to prevent and treat protein-energy malnutrition (PEM), it is necessary to conduct a timely assessment of the patient's nutritional status [1].

One of the indicators of PEM is the level of serum albumin as the main nutritional marker that represents a major predictor of mortality in hemodialysis patients; it is an indicator of the body protein amount. Low serum albumin values are predictors of poor outcome for the patients in all stages of chronic renal failure (CRF). Another frequently used parameter is determination of the total iron binding capacity (TIBC), which represents a measure of the concentration of transferrin. Transferrin is a reliable indicator of nutritional status only in the kidney patients with adequate supplies of iron and the routine therapy with erythropoietin. TIBC varies in metabolism disorders. In addition to the two mentioned

parameters - regular monitoring of the patient's body weight or body mass index (BMI) and keeping records - make an essential part of the patient's nutritional status assessment. The loss of more than 5 - 10% of body weight is considered to present a risk of developing malnutrition [3, 4].

In the early stage of the disease the patient needs education provided by a departmental nurse. Recommendations on diet and consumption of fluids should be repeated several times to patients. They should be asked to repeat what they hear and should be given brochures, leaflets and other necessary and easily understandable literature. Such patients are frightened and bewildered because their life has completely changed. Nurses are also encouraged to ask questions and ask the patients what they do not understand since only good cooperation and education can improve the quality of life of patients. The treatment supported by adequate diet is organized according to the patients' blood tests using the individual approach. The diet should be adjusted so that it is acceptable, the safest and financially accessible to patients. Such a diet should provide enough protein (due to its loss during hemodialysis); provide enough calories (to prevent degradation of normal muscle tissue); limit salt intake (to control blood pressure, a sense of thirst, and edema formation); control the intake of potassium (to prevent hyperkalemia and cardiac arrhythmias); control fluid intake (for the occurrence of chronic hyperhydration and edema formation); regulate the balance of calcium and phosphorus in the blood (eliminate the occurrence of bone disease and metastatic calcification) [10].

2. Materials and Methods

The Ethics Committee of the General Hospital in Varaždin, has given the approval for this study. The study aims to show the importance of nutrition and detection of malnutrition in patients undergoing dialysis at the hospital. The assessment of nutritional status is conducted twice a year.

2.1 Materials

The study was conducted on a population of seventy patients included in the chronic dialysis program at the General Hospital - Varaždin, Croatia, in March and April 2015. The program of data analysis and processing included the patients who did not suffer from acute inflammation. The criterion for the selection was the length of treatment in the chronic hemodialysis program (at least three months) and their age (older than eighteen).

Patients voluntarily agreed to participate, and they answered the questions individually upon their arrival to the regular dialysis program. The anonymity of data was ensured.

2.2 Methods

The test i.e. the method used was Malnutrition - inflammation score (MIS) or a comprehensive test of malnutrition and inflammation syndrome with the purpose of confirming the protein-energy status of a dialysis patient at the General Hospital Varaždin. The test consists of 10 parts, each with four severity levels: from 0 (normal) to 3 (very severe). The sum of these 10 MIS components ranges from 0 to 30 indicating a higher degree of severity. MIS score values determine the presence or absence and the degree of the PEM syndrome [9].

The conducted part of the test contains: personal history data, physical examination, laboratory results for serum albumin and serum TIBC and BMI, or more precisely:

- The concentration of serum albumin < 40g/L is one of the indicators of PEM in hemodialysis patients. It is determined in the laboratory of the General Hospital.

- The recommended value of TIBC in hemodialysis patients is > 44 mmol/L. It is also determined in the General Hospital laboratory.

- The determination of BMI, which is a ratio of body weight in kg to the square height in meters, is carried out at the hemodialysis department. The calculated BMI is compared to the standards and then it is estimated whether the person is underweight, of normal weight, overweight, or obese [11].

3. Results and Discussion

In March and April 2015, 74 patients were treated in the chronic dialysis program at the dialysis center of the General Hospital. The data analysis and processing was not carried out for four patients hospitalized due to their acute inflammation process. The data analysis and processing was carried out for 70 patients treated in the chronic dialysis program.

Protein-energy malnutrition and inflammation are common in patients with chronic renal failure. In case of the aggravation of renal function and the development of uremic syndrome, a parallel deterioration in nutritional status and inflammation appears. Numerous factors contribute to the development of protein-energy malnutrition in uremic patients. The patients do not consume sufficient amount of quality food for the several following reasons: anorexia caused by uremia, disordered sense of taste, associated diseases, emotional stress or mental illness, inability to prepare food, or financial difficulties. Protein-energy malnutrition is contributed significantly by the catabolism caused by associated diseases. Dialysis treatment removes a variety of nutrients, such as: amino acids, proteins, glucose, water soluble vitamins, and other bioactive substances [2].

The data obtained show that the process of dialysis was used to treat more men (55%) than women (44%). According to the Croatian Registry for Renal Replacement Therapy (CRRRT) for 2012, 59% of patients were men and 41% women (Figure 1).

Figure 2 shows that the percentage of the youngest patients aged 25 to 35 is 3%, whereas 6% of patients belong to the age group of 35 - 45 years of age.

In patients of these age groups a fast pre-transplant assessment is carried out and if all the results meet all the criteria, the patient is placed on the waiting list for a kidney transplant. The process of dialysis must be initiated because the patients cannot be placed on the transplant waiting list without dialysis (a legal requirement), i.e. in the pre-dialysis phase, when they are still being treated without dialysis, a kidney transplant is not possible [8]. Since Croatia joined/became a member of the Eurotransplant, patients' transplants have significantly speeded up, so the waiting for donor organs has been reduced [5]. This has also significantly increased the number of transplants in Croatia.

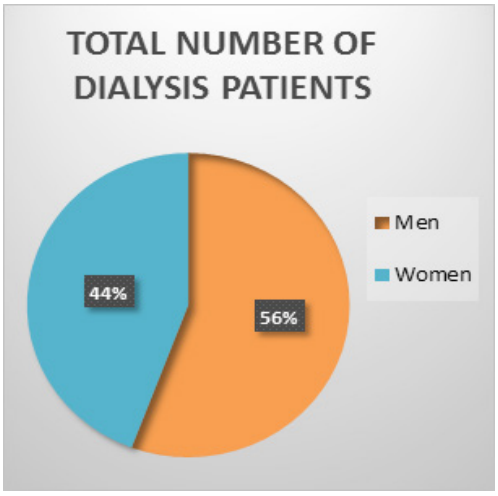

Figure 1. Overview of the total number of dialysis patients

The transplant is also carried out in dialysis patients in the age groups of 45 - 55 and 55 - 65 years of age (13 - 21%), and, therefore, the number of patients is not large. There is a far greater number of patients in the age groups of 65 - 85 years of age (23 - 26%) and older, because some patients do not give their consent for the transplant due to their age, and in some the transplant is contraindicated (Figure 2).

According to the length (years) of the dialysis treatment at the General Hospital, the groups consist of patients dialyzed from 1 to 5 years (40% of patients), followed by the patients treated from 5 and 10 years (23%), as shown in Figure 3.

CRRRT data for 2012 state that the survival of patients after one year from the replacement of renal function in the period 2008 - 2012 was 90.3%, after 2 years 82.9%, and after 5 years 58.2%. The number of patients who survived in 10 and 15 years was reduced by half. By extending the length of treatment the survival of patients reduces [6].

When a patient decides for a dialysis treatment, it is necessary to enable vascular access using either arteriovenous fistula (AVF), or temporary or permanent central venous catheters (CVC). The quality of dialysis depends on the quality of the vascular access; therefore, a great advantage is given to AVF as the best, optimum and safe. CVC can lead to infections and complications leading to increased use of protein and increased concentrations of inflammatory parameters that can add to PEM [7]. 81% of patients have arteriovenous fistula, while 19% of patients have central venous catheter (Figure 4).

The serum albumin level is often used in clinical research and practice to monitor nutritional status of patients with chronic kidney disease. The concentration of serum albumin < 40 g/L is one of the indicators of PEM in hemodialysis patients. Relevant studies indicate an increased mortality rate in patients who have the serum albumin level < 35 g/L. They are more prone

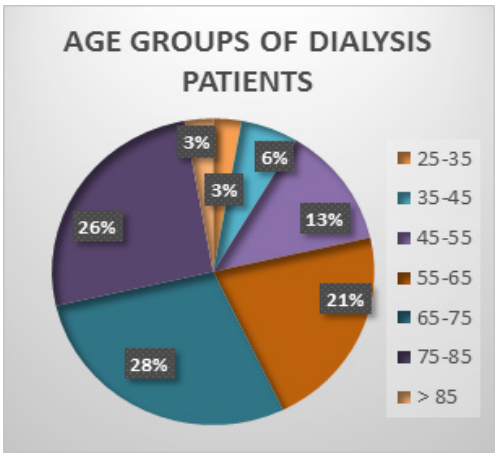

Figure 2. Overview of the patients according to their age

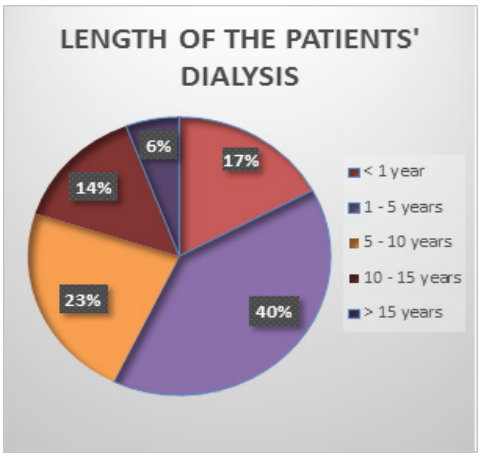

Figure 3. Overview of the length of the patients' dialysis

to infections and cardiovascular complications. Therefore, in hemodialysis patients with albumin levels below 38 g/L, the intake of nutritional preparations with high protein content (8 g/100 mL) is recommended. Continuous use of these products reduces the number of hospitalizations of hemodialysis patients [1].

The value of serum albumin in dialysis patients' > 40 g/L is found in 57% of patients, which does not indicate the presence of PEM, i.e. these patients are well nourished. 31% of the patients have the level of albumin from 39 to 35 g/L; in this group of patients there is a medium to moderate malnutrition; the recommendation for these patients is to take nutritional preparations with high protein content (8 g/100 mL). The continuous use of the preparations reduces the number of hospitalizations of hemodialysis patients. 12% of patients have albumin level from 34 to 30 g/L, which corresponds to the 12% of patients on dialysis. These patients are severely malnourished (Figure 5).

Transferrin is a reliable indicator of nutritional status only in kidney patients with adequate supplies of iron and the established erythropoietin therapy. Transferrin saturation should be between 30 and 40%. TIBC varies in metabolism disorders. The recommended value of TIBC in dialysis patients is > 44 mmol/L. TIBC values > 44 mmol/L of the examined patients are found in 52% of dialysis patients, 31% of patients have the level of 44 - 35 mmol/L, and 17% of patients have 35 - 26 mmol/L, which makes 17%. Patients with anemia, according to the attending physician, receive Fe up to three times a week during dialysis (Figure 6).

19% of dialysis patients at the General Hospital have BMI < 18.50 kg/m^2, which means the patients in this group are malnourished. 57% of patients have 18.50 - 25 kg/m^2 and are of normal weight. 14% of patients have 25 - 30 kg/m^2 and are overweight. 10% of the patients have >30 kg/m^2 and are obese (Figure 7).

PEM is associated with inflammation, spending energy supplies when standing in one place, low serum values of albumin and pre-alb umin, loss of muscle mass with or without weight loss, and poor clinical outcome [5].

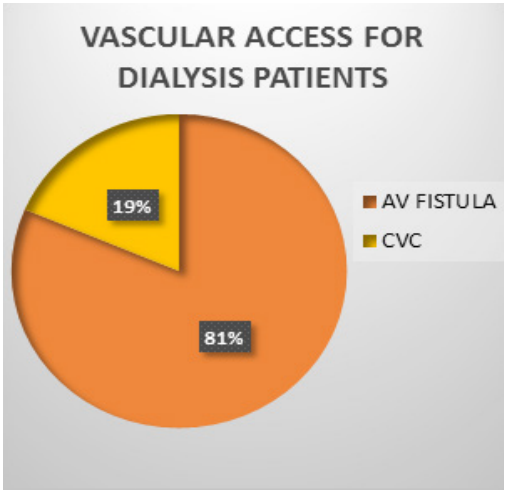

Figure 4. Overview of the vascular access for the patients

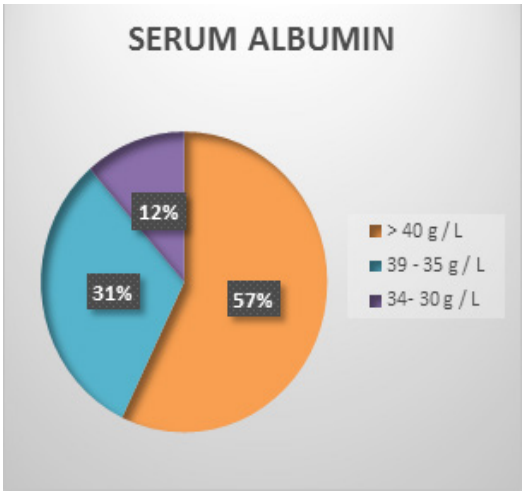

Figure 5. Overview of the serum albumin of dialysis patients

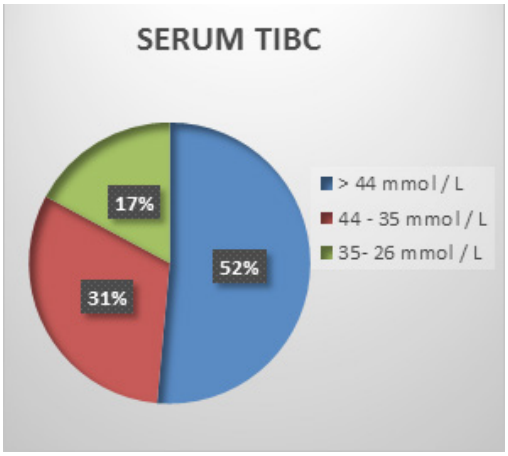

Figure 6. Overview of the serum TIBC of dialysis patients

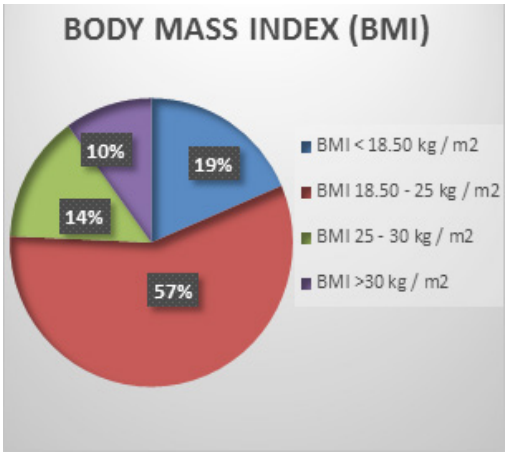

Figure 7. Overview of the body mass index of dialysis patients

These three parameters have been shown to diagnose PEM. In order to prove the presence of protein - energy malnutrition, two of the parameters have to be positive. According to all these indicators that are necessary for the detection of PEM, 23% of the patients have PEM, while 77% of patients do not have PEM (Figure 8).

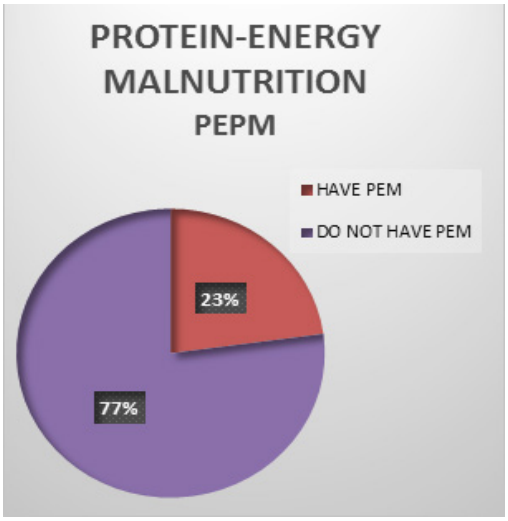

Figure 8. Overview of the PEM of dialysis patients

Patients on dialysis with the proven PEM were given the oral replacement therapy with enteral preparations containing: high-quality protein in the amount of 8 g/100 mL, carbohydrates, fats, vitamins and minerals in recommended values. This optimizes the nutrients intake. It is recommended to consume the preparations for enteral nutrition in the last hour of dialysis (1 - 2 hours after a normal meal on dialysis), between meals at home (at least 1 - 2 hours after a meal), and as late meal around 10 p.m. to avoid a prolonged period of starving by morning [10].

4. Conclusions

- Patients whose renal function is replaced by the dialysis process must follow the recommendations on nutrition. Education on nutrition and fluid intake provided to patients and their families is provided by a departmental nurse at the very beginning of the dialysis process. At the same time, at the very beginning of the treatment and later twice a year, the departmental nurse assesses nutritional status, which gives insight into the presence of PEM.

- The result of 23% is the percentage of malnourished dialysis patients obtained in this study. In case PEM is detected in the patient, it is necessary to immediately begin treatment with oral therapy - enteral preparations, as prescribed by the doctor.

- Good education, care and constant medical care provided by nurses to dialysis patients can produce excellent results and patient satisfaction. Dialysis patients need to accept and implement the recommendations given by their doctor and nurse who are included in the dialysis process.

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