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Research Article

Effect of Nutritional Counseling in the Form of Individualized Meal Plan on Serum Albumin Level among Hemodialysis Patients

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Abstract

Introduction: Serum albumin is the most commonly used malnutrition marker in clinical practice as hypoalbuminia is considered to be a malnutrition risk among the patients on hemodialysis (HD), and a strong predictor of death. Low serum albumin levels are due to low intakes of energy and protein or insufficient energy intake resulting in poor protein utilization.

Purpose: This was a prospective, clinical trial hospital based (intervention) study to evaluate the effect of nutritional counseling in the form of individualized meal plan on serum albumin level among HD patients.

Methods: The study was conducted on Maintenance Hemodialysis patients (MHD) attending Dr Salma Hemodialysis & Transplant Center outpatient clinic, Khartoum. 134 adult patients (males & females) were divided into a test group (n = 77) and a control group (n = 57). The test group after nutritional counseling, consumed individualized diets for a period of 6 months that provided adequate amounts of energy and protein according to the recommendations of the National Kidney Foundation while the control group continued consuming their usual diets. Serum albumin was determined at baseline and every 2 months. Data were analyzed using SPSS.

Results: Serum albumin increased gradually from 3.14 g/dl at baseline to 4.32 g/dl at 6 months with test group. (The study shows big differences in increasing of serum albumin level during the study with intervention group compared with control. (the mean test group was (3.1,3.3, 3.9 and 4.3) and the mean of control group was (3.2, 3.16, 3.19 and 3.84) in baseline, 2 - 4 - 6 months respectively.)

Conclusion: The study demonstrated that effective nutritional counseling rendered to MHD patients in the form of individualized meal plans that provided adequate energy and protein was effective in the control and improvement of serum albumin level among these patients. Therefore, nutritional counseling by qualified dietitians should be mandatory in renal units as part of the medical therapy management to reduce the incidence of hypoalbuminemia among HD patients.

Keywords: *Serum Albumin; Hemodialysis; Hypoalbuminemia; Individualized Meal Plan*

Introduction

Optimal nutritional status is a major issue in the long-term management of (HD) patients and is a prerequisite for better prognosis of HD patients [1]. The Kidney Disease Outcomes Quality Initiative (KDOQI) recommend the use of standardized practices in renal nutrition as a central and integral part of the dietary management of end stage renal disease (ESRD) patients on HD. A dietitian with renal experience should be responsible for the ongoing evaluation of patient's nutrition status and the development of plans for dietary care [2]. This ensures appropriate assessment of the nutrition status and timely identification of patients at risk [3].

Assessment of the nutrition status is therefore an integral part of the nutrition management. Several parameters should be evaluated together including history of weight loss, dietary protein and energy intakes, subcutaneous fat mass and muscle mass and body mass

index (BMI), subjective global assessment (SGA) used by health officials to score protein–energy nutrition status. and several biochemical markers (serum albumin, prealbumin, and transferrin) have been used to evaluate visceral protein stores. Of these, serum albumin has so far been the most commonly used [4]. It is the one measure of total body protein, both muscle and visceral which is the most frequently used marker of protein status and is the standard recommended by KDOQI [5,6]. To be used in assessing the nutritional status among CKD [7-9]. It is a strong marker for the evaluation of malnutrition among HD patients [10-12]. It is unlikely that a decreased albumin results in an increased in morbidity and mortality [13]. Which has been shown for ESRD patients whose albumin is below 40 g/d, and result in an excess risk of death.

Low albumin level is a strong predictor of mortality and morbidity among hemodialysis patients. It is surrogate markers of PEM which is common among ESRD patients on HD with an estimated prevalence of 10 - 70% and it undoubtedly contributes to increased risks of morbidity and mortality [14-15]. It is compounded by the fact that these patients loose large amounts of protein in the dialysate fluid (which lead to hypoalbuminemia among this group) (most previous studies showed that the amount of amino acids lost into the dialysate during one dialysis session can range from 4 to 13g [16-18]. and do not consistently take the recommended amounts of energy and protein for ESRD patients on HD. They are in need of individualized meal plans but they rarely consult a dietitian. In other words, a special diet is needed for ESRD patients on HD. Recommended daily nutrients intake for an adult on HD are: protein 1.2 gm/kg body weight (50% of high biological value); energy for an adult < 60 years 35 kcal/kg and for an adult > 60 years or obese 30 kcal/kg; the minerals (mg/kg/day) - sodium 2 - 4, potassium 40 and phosphorous 17; fluids depends on fluids output + 500ml [8].

Materials and Methods

Patients and study design

This was intervention study to evaluate the effect of individual meal plan on the serum albumin level among hemodialysis patients. The study was carried out in the one of the largest Hemodialysis and Transplant Center in Khartoum (Dr Salma Hemodialysis and Transplant Center). Complete coverage of all ESRD patients on regular hemodialysis and dialyzed at Dr Salma Hemodialysis and Transplant Center Participants were chosen from the patients who fulfilled the following inclusion criteria : (ESRD patients on regular HD (three times weekly), dialyzed four hours per session, Patients, who dialyzed for at least 3 months, Both genders ,More than 18 years of age, consent given for participation in the study, Absence of active underlying disease (e.g., collagen vascular disease), Absence of active infection (free from infections and inflammations)and Not hospitalized during the month preceding the study).

Among the 156 chronic renal failure patients who were on HD treatment and dialyzed at Dr Salma Hemodialysis and Transplant Center, during the study period, 145 fulfilled the inclusion criteria and were enrolled in this study. The patients were divided into 2 groups: test group (n = 83) and control group (n = 62).

After the intervention period, the sample decreased to 134 patients (77 test and 57 control). Some died; others opted for transplant and changed to peritoneal dialysis.

Method of data collection

Data was collected on day one for each patient (baseline), during study period and after intervention. The medical records of the patients were reviewed by the researcher for co-morbid conditions and medical history of the participants. This was examined to check the presence of chronic diseases such as DM, HTN, IHD, hepatitis profile, duration of the problem, treatment, duration on dialysis (per months), number of dialysis sessions per week and duration of dialysis in hours. The medical records were reviewed for all participants (test group and control group) at baseline study and at every 2 months for biochemical results.

A questionnaire was used to collect data (on baseline) through direct interviews by the researcher. Each subject was interviewed with a structured questionnaire during their dialysis session. It was used to collect the Demographic characteristic of the sample and some Medical characteristic of the sample.

Nutritional status assessment

Intervention

Eighty-three HD patients who were included in the study as test group received conventional nutritional counseling and individual meal plan to achieve adequate protein and calories intake. Monitoring was done during 6 months of follow up. The individual meal plan was designed and explained to patient and their families by the following ways:

Educational lecture: Educational lecture was given exclusively to the test group. It was presented by the researcher to the patients and their families during their dialysis session by using a data-show to educate the patients and their families on the nutritional needs to provide appropriate food with adequate calories and protein to the patients.

Presentation included all the important information needed to be known by ESRD patient on HD. It was concentrated on calorie and protein needed, fluids limitation, intake of sodium, potassium and phosphorus in foods. Information was provided in a simple way and was explained by pictures for more understanding.

Pamphlets: were prepared and distributed to all intervention group participants after the lecture and all the summary information that was presented was found in the sheet which the researcher called it general instruction sheet for renal patients on HD.

Individualized meal plans: Individual meal plan was designed individually to all intervention group participants after analysis of the full information that helped the researcher to conduct the meal plan. The meal plan was based on: patient's economic status, medical history, diet history, like and dislike, chewing and swallowing status, food allergies, blood investigation result, age, weight, height and sex. (Food exchange list was used to help patients for food substitutes if participant unable to follow the meal prescribed according to like and dislike or socio economic reasons).

After calculation of all nutrients needed by each participant, individual meal plan for the whole week was designed by researcher, typed, organized, color printed and given to participant with full explanation of uses.

The meals planned were designed only for intervention patients, whereas control patients continued to receive their usual care.

Biochemical parameters

Serum biochemical data were obtained for the participants at the Clinical Chemistry Laboratory at Dr Salma Hemodialysis and Transplant Center using standardized methods [19].

Blood samples were drawn from the patients under fasting conditions just before the beginning of a dialysis session and measured serum albumin at baseline and every two months during intervention period till the end of the study for all participants.

The following parameters were determined: serum albumin with normal values ranging from 3.5 to 5.5 g/L,

Serum albumin: It is done by using test principle, Colorimetric assay. At a pHvalue of 4.1, albumin displays a sufficiently cationic character to be able to bind with bromocresol green (BCG), an anionic dye, to form a blue-green complex.

$$\text{Albumin} + \text{BCG} \xrightarrow[\text{pH 4.1}]{} \text{Albumin-BCG complex}$$

The color intensity of the blue-green color is directly proportional to the albumin concentration in the sample and is measured photometrically.

Medications

All the participants from both groups (test and control group) took their medications, such as receiving antihypertensive, phosphate binder's erythropoietin, iron medications and supplementation of vitamins B, C, D during the study, which were recommended by their physicians.

Follow up

Each patient was monitored during three consecutive dialysis sessions during the study period (baseline-2-4-6 months).

Statistical Analysis

All analyses were performed using SPSS statistical software package program (version 17.0 for Windows; SPSS Inc., Chicago, IL, USA). The results are presented as frequencies and percentages for categorical variables and mean [+ or -] standard deviation (SD) were calculated for all continuous variables. For com¬parison and differences between means data were analyzed using the 't' test and ($\chi 2$) qui squire test. A 'p' value of less than (<) 0.05 was considered statistically significant.

Results

Demographic characteristic of the study sample

For the demographic characteristic of the study participants, test and control, Males represented a higher percentage than the females. The age group distribution of subject shows that most of the patients (46.3%) were in the active age group of 30 - 45 yrs. (49.4% test and 42.1% control). The majority (31.3%) had higher secondary school education (29.9% test and 33.3 % control), followed by 17.9% university graduates (23.4% test and 10.5% control), the rest were illiterate or with low educational level.

Medical profile of the participants

The medical characteristics of the study participants are shown that 53.7% of the participant had hypertension (61.0% test and 43.9% control), while only 3.0% had diabetes mellitus and hypertension (1.3% test and 5.3% control) and the rest 43.3% did not have any co-morbid disease (37.7% test and 50.9% control).

The mean durations of dialysis periods were 57.08 ± 36.16 months for both groups (61.77 ± 38.84 test and (50.75 ± 31.42 control group).

Biochemical evaluation of the study patients

Serum albumin: Study shows that at baseline, there was no significant difference in the biochemical markers (Serum albumin) between the two groups (P = 0.461).

During the intervention period, serum albumin increased in the test group and there was a significant difference in groups, however the increase in albumin was significantly higher when test group was compared with control group during the whole period of the study (P < 0.05). (Figure 1).

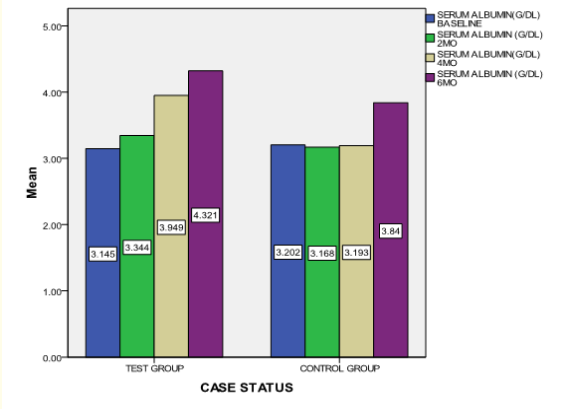

Figure 1: *Nutritional status differences of the study patients according to changes in serum albumin during each study period (n = 134).*

The Nutritional status differences according to changes in serum albumin levels in the study during each study period before and after the intervention with both studied groups (test and control) are very clear in (Figure 1). The study shows big differences in increasing of serum albumin level during the study with intervention group compared with control.

Discussion

NKF-DOQI [6] recommended higher energy and protein intakes by MHD patients (30 - 35 kcal/kg/day and 1.2g protein/kg/day) because of dialysis losses of amino acids, peptides, negligible amounts of proteins, metabolic acidosis and co-morbid conditions. Thus, the dietary treatment to control the disease needs more energy and protein to meet the extra needs for body repair functions and immunity [20].

Intakes of energy and protein for hemodialysis patients are not reaching these recommendations, based on previous studies that reported lower than the recommended intake levels of energy and protein by MHD patients in Korea [21], in Brazil [22], and in the USA [23]. This is the reason why malnutrition is frequently observed among MHD patients.

Serum Albumin

Serum albumin is probably still the most commonly used malnutrition marker in clinical practice as hypoalbuminia is considered to be a malnutrition risk among the patients [24-27], and a strong predictor of death [25,28]. Low serum albumin levels are due to low intakes of energy and protein or insufficient energy intake resulting in poor protein utilization [29].

In this study, baseline serum albumin levels were similar in both groups and were within the range of 2.5 - 4.7 g/dl reported earlier in Sudan [30], however values obtained were below the 4.0 g/dl recommended by NKF/DOQI for adults on MHD [31], which reflects the high incidence of hypoalbuminia among both groups. After 6 months serum albumin levels increased in the test group but not in the control one; the difference was highly significant within the test group ($P = 0.000$) and between the test and control groups ($P = 0.000$). This is explained by the higher intake of energy and protein by the test group which showed gradual increases in the albumin level during the intervention period. Results agreed with that reported by [32].

Contrary to the above, the National Kidney Foundation does not consider serum albumin level a sensitive indicator for the assessment of the nutritional status of MHD patients. It might be affected by anti-nutritional factors e.g. inflammation, hydration status and anabolic or catabolic processes [25] and a drop in serum albumin lags behind the onset of malnutrition and is seen only when PEM manifests itself overtly [26], and that was the reason of excluded all anti-nutritional factors that can affect on serum albumin level from the studied samples in this study.

The study showed that proper nutritional counseling by a dietitian to MHD patients on the intake of individualized meal plan can result in a better nutritional status.

Conclusion

This article highlights the rationale for using the individual dietetic counseling with enough calories and protein intake is help in improving serum albumin level as a marker of nutritional status among HD patients.

The results of this study show that using individual meal plan as a nutritional intervention and educational tool to increase dietary protein and energy intake to recommended levels by NKF KDOQI guidelines did cause an increase in serum albumin level. This suggests that patients are able to understand and utilize high calorie high protein diet to meet their recommended protein and calorie intake and achieve an improvement in their albumin level. Therefore, nutritional counseling by qualified dietitians should be mandatory in renal units as part of the medical therapy management to reduce the incidence of hypoalbuminemia among HD patients.

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