
Influence of inflammation on nutritional status of dialysis patients

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Abstract

Malnutrition and inflammation are frequently observed in maintenance hemodialysis patients as risk factors for poor quality of life and increased morbidity and mortality. The causes and consequences of both are anorexia, hypoalbuminemia, muscle wasting, refractory anemia, and, possibly accelerated arteriosclerosis.

The aim of our study was to evaluate the influence of inflammation on parameters of nutritional status dialysis patients at the Department of Nephrology, Clinical Center Skopje.

We crosssectionally analysed 154 dialysis patients (93 men) which were then followed in a period of six consecutive months. A number of biochemical and anthropometrical parameters were evaluated as measures of nutritional status.

The mean (\pm SD) age of all patients was 54.8 ± 12.7 years and vintage (duration of dialysis therapy) from 7 to 288 months. CRP and serum albumin levels were significantly greater in men than in women (12.9 vs. 7.97, $p < 0.04$ and 40.2 vs. 38.8, $p < 0.02$, respectively). Triceps skin fold, mid arm circumference and body mass index measurements were statistically greater in women than in men ($p < 0.01$). CRP level strongly correlated only with serum concentration of cholesterol ($r = 0.49$, $p < 0.001$), and didn't correlate with serum albumin level.

In conclusion, the inflammation and reduced protein intake are independent contributors to a decreased serum albumin and anthropometrical parameters, but the adequate nutrition could blunt the influence of inflammation on parameters of nutritional status.

Key words: inflammation, CRP, nutritional status, dialysis

Introduction

Malnutrition and inflammation are common phenomena in maintenance hemodialysis (MHD) patients and a risk factor for poor quality of life and increased morbidity and mortality (1). The causes of both, malnutrition and inflammation, are anorexia, hypoalbuminemia, muscle wasting, refractory anemia, and, possibly accelerated arteriosclerosis (2,3). Indicators of malnutrition in MHD patients include decreased dietary protein and energy intake, reduced serum albumin and cholesterol levels, decreased body mass index, reduced mid arm muscle mass and skin fold thickness (1). The pro inflammatory conditions in dialysis patients such as frequent

contact with dialysis membranes, vascular accesses or dialysis fluid, are the main causes for inflammation to be more common in dialysis patients than in the general population (4). Inflammation causes decreased albumin gene expression, resulting in a decreased albumin synthetic rate with a consequence of reduced albumin concentration. Inflammation also has an important role in mediating loss of muscle mass through ubiquitin-mediated proteolysis of muscle mass (5). The aim of our study was to evaluate the influence of inflammation on parameters of nutritional status of MHD patients at Department of Nephrology, Clinical Center Skopje.

Patients and Methods

To explore the effects of C reactive protein (CRP) on parameters of nutritional status, we crosssectionally analysed 154 MHD patients (93 men) which were then followed in a period of six consecutive months. The mean (\pm SD) age of all patients was 54.8 ± 12.7 years and vintage (duration of dialysis therapy) from 7 to 288 months. The indicator of inflammation, CRP was measured monthly at the central laboratory. The lower limit of detection by the assay used was 6 mg/l. The biochemical and anthropometrical parameters of nutritional status in MHD patients were measured. Biochemical parameters: pre dialysis serum albumin (ref. value 35-50 g/l) and cholesterol (higher limit of ref. value being 5.5 mmol/l) levels were determined monthly. Anthropometrical measurements were performed immediately after the termination of a hemodialysis treatment, twice during the study. Body mass index (BMI) was calculated from patients height obtained at study entry and post dialysis weight. Triceps skin fold thickness (TSF) was measured using a conventional skin fold caliper and mid arm circumference (MAC) was measured with a plastic tape. All anthropometrical measurements were performed three times on the non-access-containing arm of each patient, and the three measurements were averaged to give the final result. Mid arm muscle circumference (MAMC) was calculated from the formula: $MAMC = MAC - (3.14 \times TSF)$ (6). We assessed protein intake of MHD patients by measuring protein catabolic rate (PCR). Student's t-test was used for group mean comparison between men and women. Person's correlation coefficient (r) was used to determine the significance and the strength of associations.

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Results

Our results showed that CRP level was significantly greater in men than in women (12.9 vs. 7.97, $p < 0.04$). Serum albumin level was significantly greater in men than in women (40.2 vs. 38.8, $p < 0.02$). Serum cholesterol level tended to be greater in men than in women ($p=NS$). Triceps skin fold measurements were statistically greater in women than in men (1.37 vs. 0.96, $p < 0.001$). Mid arm circumference and body mass index were greater in women, whereas mid arm muscle circumference was greater in men, but not statistically (Table 1).

Table 1. Laboratory and anthropometrical data, and a comparison between men and women

	men	women	p<
No. of patients	93	61	
CRP (mg/l)	12.9 ± 16.9	7.97 ± 10.9	0.04
albumin (g/l)	40.2 ± 4.0	38.8 ± 3.7	0.02
cholesterol (mmol/L)	3.7 ± 1.4	3.2 ± 1.5	NS
TSF (cm)	0.96 ± 0.3	1.37 ± 0.6	0.0001
MAC (cm)	26.3 ± 2.7	27.3 ± 4.4	NS
MAMC (cm)	23.27 ± 3.1	23.03 ± 3.5	NS
BMI (kg/m²)	23.03 ± 3.2	23.7 ± 4.7	NS

CRP level showed strong correlation only with serum concentration of cholesterol ($r = 0.49$, $p < 0.001$), and didn't correlate with serum albumin level. There was no correlation between CRP level and anthropometrical parameters (TSF, MAC, MAMC, BMI) of MHD patients in our study. The average value of protein catabolic rate (PCR) of the patients in our study was 1.01 ± 0.17 g/kg/d, value that showed adequate protein intake.

Conclusions

We can conclude that inflammation and reduced protein intake, each separately are contributing to a decrease in serum albumin concentration and anthropometrical parameters, but the adequate nutrition could blunt the influence of inflammation on parameters of nutritional status. The purpose of assessing malnutrition and inflammation, the two major indicators of poor outcome in dialysis patients, is to identify patients at risk for complications. We have to measure CRP value regularly in all dialysis patients, because it is an indicator of inflammation, and by increasing protein and calorie intake, it might be possible to modulate the effects of inflammation. It is likely that increased attention to a global measure of nutritional and inflammatory status will improve patient outcome.

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