

ORIGINAL PAPER

The Relationship of Chronic Renal Failure and Body Mass Index in Patients without Diabetes

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Introduction: Chronic renal failure (CRF) represents a serious medical problem. Numerous studies have shown increased body mass index (BMI) as an independent risk factor when it comes to the occurrence and development of CRF. **Material and methods:** The sample in our prospective study presents a total of 150 patients: 30 for each CRF stage (stages I-IV) and 30 patients in the control group. This study did not include patients in the terminal stage of chronic renal failure (stage V), as well as patients with newly diagnosed diabetes. Body mass index–BMI was calculated using the formula $BMI = \text{weight}/\text{height}^2$ (kg/m^2). In accordance with the K/DOQI guidelines patients were divided into four CRF stages. **Results:** In our study there is a predominance of female patients. The mean age of patients was 55.43 years. Most of the patients had a BMI between 25 and 30 kg/m^2 . We did not find significant correlation between BMI and the development or CRF. **Conclusions:** We did not find correlation between increased body mass index (BMI) and the occurrence or development of CRF in persons without diabetes. **Key words:** body mass index – BMI, chronic renal failure (CRF).

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1. INTRODUCTION

Chronic renal failure (CRF) represent an important public health problem due to the strikingly high incidence and prevalence of this disease in the world (1, 2). Together with an increased incidence of the disease also has increased the number of other pathological conditions caused by CRF including renal failure, cardiovascular diseases and lethal outcome. For a long time the evaluation and treatment of renal diseases were focused on the diagnosis and treatment of each identified renal disease. Studies conducted in the past 10 years have shown that adverse CRF outcomes can prevent or delay by reduction of risk factors and the inclusion of adequate therapy even in the early stages of renal failure, not taking into account the causes that led to the CRF (3). Results of researches and epidemiological studies suggest that increased

body mass index is an independent risk factor when it comes to the occurrence and development of CRF (4).

2. MATERIAL AND METHODS

One-year prospective clinical study (January 2011 to January 2012) conducted at the Clinical Center University of Sarajevo, Bosnia and Herzegovina, included 150 patients who were in various stages of chronic renal failure (stage I to IV). Each study group consisted of 30 patients, also with the control group of 30 healthy individuals. The study included all the information about age, complete laboratory analysis of patients with chronic renal failure and 30 individuals who does not have chronic renal failure. Patients who are excluded from the study were as follows: patients in the terminal stage of chronic renal insufficiency (stage V), patients with kidney transplant, patients with

unstable renal function, patients with newly diagnosed diabetes, polycystic kidney disease, hydronephrosis, renal anomalies, renal tumors and accompanying decompensating disease.

In the study, we used the medical records of patients that contained the necessary clinical, laboratory and demographic data. At admission to each patient were taken demographic and anthropometric data (gender, age, height and weight) as well as possible comorbidity. Estimate of creatinine clearance was performed using Cockcroft-Gault formula (5). BMI is calculated using the formula: $BMI = \text{weight}/\text{height}^2$ (kg/m^2). According to the classification of nutritional status based on BMI, proposed by the World Health Organization (WHO), the subjects of the study were classified into different groups of the nutritional status (6). The classification of patients according to stages of chronic renal insufficiency was performed in accordance with the criteria of Kidney Disease Outcomes Quality Initiative (K/DOQI) (1).

Results of the study were analyzed using descriptive statistics which includes determining the mean, standard deviation and standard error. Pearson correlation was used to assess the correlation. Statistically significant was considered values of the test with $p < 0.05$.

3. RESULTS

Of the total number of subjects (N=150) 71 were male and 79 female. The mean age of patients was 55.43 years, and the age structure of the sub-

jects of the study are shown in Table 1.

The mean BMI of the respondents by nutritional status according to the WHO classification is shown in Table 2.

Analysis of the average values of BMI through various stages of CRF showed a slight decrease in this parameter in accordance with the higher stages of renal disease (Table 3). Statistical analysis shows that there is a statistically significant difference in mean BMI values between the study groups ($p < 0.05$).

Analysis of the relationship between the nutritional status according to BMI and CRF stage is shown in Table 4

Statistical analysis of the body mass index–BMI in relation to the stage of renal failure indicates that there is no statistically significant difference or correlation ($p > 0.05$).

4. DISCUSSION

When it comes to gender representation of patients in the study there is evident predominance of women corresponding data from the literature (7). The obtained results showed that age of our subjects clearly indicates a link between older age of patients and pro-

	Age					
	N	Mean	SD	SEM	Minimum	Maximum
Control	30	45.63	15.062	2.750	20	75
I stage	30	48.43	12.800	2.337	20	67
II stage	30	59.07	10.712	1.956	32	80
III stage	30	61.03	14.327	2.616	19	81
IV stage	30	63.00	15.872	2.898	27	83
Total	150	55.43	15.397	1.257	19	83

Table 1. Mean age of patients involved in the study by each group. $U=9.616$; $DF = 4$; $p=0.0001$

	BMI	
	N	%
<20 underweight	2	1.7
20-25 normal weight	39	32.5
25-30 overweight	53	44.2
>30 obesity	26	21.7
Total	120	100.0

Table 2. BMI of the patients

	BMI					
	N	Mean	SD	SEM	Minimum	Maximum
Control	30	28.3728	4.05049	.73952	17.87	38.10
I stage	30	28.4321	4.35902	.79584	18.94	35.16
II stage	30	26.4039	3.55907	.64979	20.52	33.41
III stage	30	26.8390	4.58154	.83647	17.21	37.25
IV stage	30	25.7256	3.16379	.57763	20.76	34.34
Total	150	27.1547	4.06969	.33229	17.21	38.10

Table 3. Mean BMI of patients in each group $U=2.761$; $DF = 4$; $p = 0.030$

gression of chronic renal failure, which also corresponds to the literature data, according to which the prevalence of chronic renal failure varies significantly with age and was higher in the elderly (8).

The mean BMI of our patients was 27.1547 kg/m², values range from 17.21 to 38.10 kg/m². In our study, we concluded that the BMI values decrease with the development of chronic renal insufficiency. Review of the available

literature revealed that many authors suggest that there is a clear correlation between obesity and the development of chronic renal failure and that obesity is a risk factor for development of chronic renal failure, which can directly or indirectly lead to renal failure (9). In our study, we did not demonstrated a correlation between increased BMI and the occurrence of renal failure nor have we found significant correlation between increased BMI and the progression of chronic renal failure, which corresponds to the study by Brown et al (10). Results obtained in our study may be explained by the fact that obesity is commonly associated with diabetes, the most common cause of chronic renal failure, since our study did not include patients with diabetes.

5. CONCLUSION

We did not demonstrate significant correlation between increased body mass index and the occurrence or development of renal failure in patients who do not have diabetes.

CONFLICT OF INTEREST: NONE DECLARED

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		Group * BMI					
		N	BMI				Total
			<20 underweight	20-25 normal weight	25-30 overweight	>30 obesity	
Group	Control	N	1	6	12	11	30
		%	50.0	15.4	22.6	42.3	25,0
	I stage	N	0	11	15	4	30
		%	.0	28.2	28.3	15.4	25,0
	II stage	N	1	10	11	8	30
		%	50.0	25.6	20.8	30.8	25,0
	III stage	N	0	12	15	3	30
		%	.0	30.8	28.3	11.5	25,0
	IV stage	N	1	6	12	11	30
		%	50.0	15.4	22.6	42.3	25,0
	Total	N	2	39	53	26	120
		%	1,7	32.5	44.2	21.7	100.0

Table 4. Relationship between BMI and stage of CRF. $\chi^2=11.398$; $DF = 12$; $p=0.249$. $Rho=-0.166$; $p=0.070$