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Profile of Obesity and Comorbidities and their Correlation among Hemodialysis Patients, Elbasan

Brunilda Elezi[1], Skender Topi[2], Erjona Abazaj[3]

[1]University "Aleksander Xhuvani", Faculty of Technical Medical Science, Elbasan, Albania; [2]Rectors of "Aleksander Xhuvani" University of Elbasan, Albania, Chief of Surgery Department, Professor of Faculty of Technical Medical Sciences, "Aleksander Xhuvani" University, Elbasan, Albania; [3]Institute of Public Health, Tirana, Albania

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***Correspondence:** Brunilda Elezi, Faculty of Technical Medical Science, University "Aleksander Xhuvani", Elbasan, Albania. E-mail: brunildaxibraku@hotmail.com
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Abstract

INTRODUCTION: Nowadays, obesity is a major public health problem for both undeveloped and developing countries. In Albania, the data about the prevalence of obesity and correlation between obesity and comorbidity diseases among persons undergoing dialysis process are not enough. We do not know how body mass index (BMI) affects diabetic or cardiovascular disease (CVD) patients among dialysis patients. Therefore, this study aims to assess the prevalence of obesity, correlations with demographic data, biochemical parameters, morbidity as well as predictive BMI capabilities in patients with diabetes and CVD over a 3-year period in chronic hemodialysis patients.

METHODOLOGY: This is a cross-sectional study performed at Elbasan Dialysis Center, where we analyzed a clustering samples with about 160 patients who have undergone the dialysis process during the periods 2016–2018. Purposive sampling was performed, and data of the patients participating in this study were obtained from record files of dialysis center, and also, we adopted a standardized questionnaire to obtain other data from patients. The subjects were divided a priory into four categories based on the BMI. Kaplan-Meier estimate were used to find the correlation between BMI with their prognostic abilities like CVD and diabetes mellitus type 2 (DMT2). Software SPSS version 20.0 is used to analyze and evaluate the data and $p < 0.05$ was considered statistically significant.

RESULT: Over all 160 patients, men present a high number compared to female 73.1% and 26.9%, respectively. The mean age resulted 52.7 ± 15.6 years and age groups 50–59 years old and 60–69 years old with 29.4% and 34.3%, respectively, were the most frequent in this study. About the category of BMI index 8.8% patients resulted underweight, 45% were in normal weight, 28.2% were pre-obese and 6.6% were obese. We observed significant correlations between BMI and some of the demographic data such as: gender, age, place of residence, educational level, smoking, and alcohol consumption for $p < 0.05$. Changes in patient survival rates between BMI with DMT2 and CVD are not statistically significant $p > 0.05$. In terms of mortality, a strong significant correlation was observed with the age of 50–69 years and with the index of hemoglobin, urea and creatinine after dialysis with $p < 0.05$.

CONCLUSION: In the paradoxical epidemiology, the overweight becomes chronic on hemodialysis patients and serves as a protective factor which is associated with better survival, but we were not found significant association between the BMI and some of the variables analyzed. This study presents a small number of chronic patients on hemodialysis center in Elbasan city. There is a need to better understand the reverse epidemiological causes in individuals on dialysis, which can help us, improve the poor outcome in this population.

Introduction

Nowadays, obesity is a major public health problem for both undeveloped and developing countries. Many obese individuals present the metabolic syndrome, which itself consists on resistance toward the absorption of stimulated glucose, glucose intolerance, hyperinsulinemia, hypertriglyceridemia, the low level of high-density lipoprotein cholesterol, and hypertension [1]. The concern about obesity, especially in patients who undergo to the process of hemodialysis remains controversial and confusing [2]. Being overweight, particularly obesity in internal organs contributes to increased risk of metabolic and cardiovascular complications in patients with chronic kidney disease [3]. According to Calle *et al*., a high body-mass index is directly related with the increased risk of cardiovascular which is associated with higher mortality in the general population [4]. Several epidemiologic studies have shown the effect of obesity in some populations in particular to the people where chronic diseases are more frequent [5], [6], [7], [8]. Geriatric population and patients with cardiovascular system problems present the most concern regarding the obesity [9], [10].

A considerable number of patients undergoing dialysis are obese or much more than obese [11], [12]. However, in some epidemiologic studies, dialysis patients have demonstrated a paradoxically inverse association between obesity and mortality [5], [13], [14], [15], [16], [17]. This making the relationship between weight and outcome among these patients to be complexed [18], [19]. Overweight in this group of patients is usually associated with improved survival [20]. However, differences in mortality between

different age groups of body mass index (BMI)-based dialysis patients have not been well studied [5].

In our country, there is no complete data on the correlation that exists between obesity and concomitant diseases in people who undergo the dialysis process. Hence, we do not know how BMI affects patients with Diabetes or those with cardiovascular disease (CVD) among dialysis patients. The aim of this study was to assess the prevalence of obesity, correlations with demographic data, biochemical parameters, morbidity as well as predictive BMI capabilities in patients with diabetes and CVD over a 3-year period in chronic hemodialysis patients.

Methodology

This is a cross-sectional study performed at Elbasan Dialysis Center, where we analyzed a clustering samples with about 160 patients who have undergone the dialysis process during the periods 2016–2018. Before to apply this study, we have communicated with the Head of Hemodialysis Center in Elbasan and after we explained to medical staff the purpose of the study and the path we would choose for data collection we have required permission. After obtaining the permit we started with collection of data. Purposive sampling was performed, and data of the patients participating in this study were obtained from record files of dialysis center, and also, we adopted a standardized questionnaire to obtain other data from patients. Inclusion criteria of this study were: patients receiving HD in Elbasan Dialysis Center; patients who were more than 18 years or older at the time of HD initiation; and patients who had been undergoing long HD, 2–3 times a week for more than 1 years. Demographic and epidemiological information was collected regarding age, sex, occupation status, diabetes, BMI, dialysis modality, and dialysis doses. Data were also obtained on the 1st day of the dialysis treatment process, ethnicity, marital status, living conditions, medical history, history of concomitant diseases (atherosclerotic heart disease, including ischemic heart disease, myocardial infarction, and cardiac arrest, other cardiac diseases, including pericarditis and cardiac arrhythmia, hypertension, cerebrovascular disease, peripheral vascular disease, chronic obstructive pulmonary disease, alcohol, smoking, and cancer).

The subjects have divided a priory into four categories based on the BMI (underweight <19, normal 19–25, pre-obese 25–30 and obese ≥30 kg/m^2). Software SPSS version 20.0 is used to analyse and evaluate the data. The epidemiology data are Epidemiological data are presented in frequency, mean, standard deviation and percentage. Survival analyses using the Kaplan-Meier test were performed to determine the relationships between BMI with all triggers, mainly with CVD and diabetes Mellitus Type 2 (DMT2). A multi logistic regression analysis for BMI and biochemistry parameters obtained from patients during the study period and p values <0.05 were considered statistically significant.

Results

The mean age in this study was 52.7 ± 15.6 years. Of the patients included in this study, 73.1% (117 cases) were male, and 26.9% (43 cases) were female. In this study, the most common age groups were 50–59 years and 60–69 years with 29.4% (47 cases) and 34.3% (55 cases), respectively (Table 1).

Table 1: Distribution of patients by age-groups

Variables	Frequency	%	p value
Gender			0.002
Female	43	26.9%	
Male	117	73.1%	
Age group			0.001
18–39 age	15	9.4%	
40–49 age	15	9.4%	
50–59 age	47	29.4%	
60–69 age	55	34.3%	
≥70 age	28	17.5%	

The average in this study was 52.7 ± 15.6 years. Age groups are 50–59 years and 60–69 years with 29.4% (47 cases) and 34.3% (55 cases), respectively, A significant relationship was observed between overweight and age Chi-square 1.94 (0.58–2.15) p = 0.001. As stated earlier, we applied a BMI split to the patients in this study, where four categories of BMI were defined. The categories are: Underweight <19 kg/m^2, normal weight 19–25 kg/m^2, pre-obese 25–30 kg/m^2 and obese ≥30 kg/m^2. In the following table, we present demographic data of the analyzed cases based on their BMI (Table 2).

In the Table 3, we present comorbidity diseases such as diabetes mellitus type 2 and CVDs amidst patients undergoing dialysis for the period 2016–2018.

The highest number of cases is observed for CVD compared to diabetes. In the Figure 1, it is shown the survival of patients with BMI in diabetic and CVD cases.

Kaplan Meir survival was used to analyze survival in relation to BMI parameters for cases of patients with type 2 diabetes mellitus (Figure 1) and cases with CVD (Figure 2). BMI has viewed as an important factor in mortality in both the general population and the population that performs dialysis or those suffering from CVD.

The following Figure 3 shows the incidence of deaths by BMI for all 160 patients for this study at the Elbasan Dialysis Center.

Mortality of dialysis patients during our study period 2016–2018 was 23.1% (37/160 cases). The highest number of cases was observed for the BMI category - normal weight 45.9% (17/37 cases) and for

Table 2: Baseline characteristics of study according to demographic data and different BMI

Characteristic	Underv weight	Normal weight	Overweight	Obese	Chi-square 95% *P* value
Age, mean (Std), y					1.94 (0.58–2.15) 0.001
18–39	2	6	6	1	
40–49	3	10	1	1	
50–59	2	28	14	3	
60–69	6	24	18	7	
≥70	1	13	12	2	
Gender					2.43 (1.07–3.19) 0.002
Female	3	22	12	6	
Male	13	59	39	6	
Residence area					3.17 (0.12–5.08) 0.005
Rural area	6	38	19	4	
Urban area	8	40	29	7	
Living condition					1.67 (0.56–3.04) >0.5
Living with family	15	72	46	12	
Living alone	9	5	9	5	
School level					3.86 (1.07–4.45) 0.023
Without education	2	6	7	0	
Primary education	9	28	18	3	
Secondary	1	43	21	8	
University	4	4	4	1	
Marital statue					
Single	2	7	1	4	1.2 (0.5–2.7) >0.5
Widow	0	8	5	0	
Divorced	0	6	0	1	
Married	14	60	45	7	
Occupation					0.48 (0.01–1.99) >0.5
Unemployed	9	47	34	5	
Employed	0	5	3	1	
Invalid	7	29	14	6	
Monthly income[1]*lek					0.82 (0.03–2.61) >0.5
Low income (<200.000)	9	53	26	8	
Moderate (200.000–400.000)	7	25	18	4	
High income (>400.000)	0	3	7	0	
Smoking					2. 46 (0.95–4.19) 0.001
Yes	5	15	6	1	
No	11	66	45	11	
Alcohol use[2]*					4.07 (2.18–7.75) 0.004
Yes	6	45	26	2	
No	10	29	25	9	

*lek=the currency money in Albania

the pre-obesity category 37.8% (14/37 cases). Based on the statistical processing, no correlation was found regarding BMI and mortality/survival of the cases analyzed in this paper (Pearson Correlation −0.065, p = 0.413). Events of deaths according to BMI of 160 patients in this study take into Elbasan Dialysis Center (Figure 4).

Table 3: Presence of comorbidity condition among different BMI dialysis

Diabetes mellitus	Underweight	Normal weight	Pre obese	Obese
Diabetes Mellitus Tip 2 *P*>0.05				
No	0	5	4	1
Yes	2	12	8	3
Cardio vascular disease *P*>0.05				
No	1	8	6	1
Yes	15	72	45	12

Based on multi logistic regression analysis for BMI and biochemistry parameters obtained from patients during the study period, we can say that a strong significant correlation was found for Chi-square 5.08 hemoglobin index, p = 0.024; for urea index after Chi-square dialysis 60.2, p = 0.001 and for create level after Chi-square dialysis 2.77, p = 0.042. For other biochemical indices, no significant association was observed. Biochemical indexes are very import ant in everyone's life. This importance is further enhanced for patients undergoing dialysis. The following table shows the characteristics of the biochemistry values obtained during the study period. Laboratory data for both urine and creatinemia are obtained both before and after the dialysis process. We have calculated their average for each of the indexes.

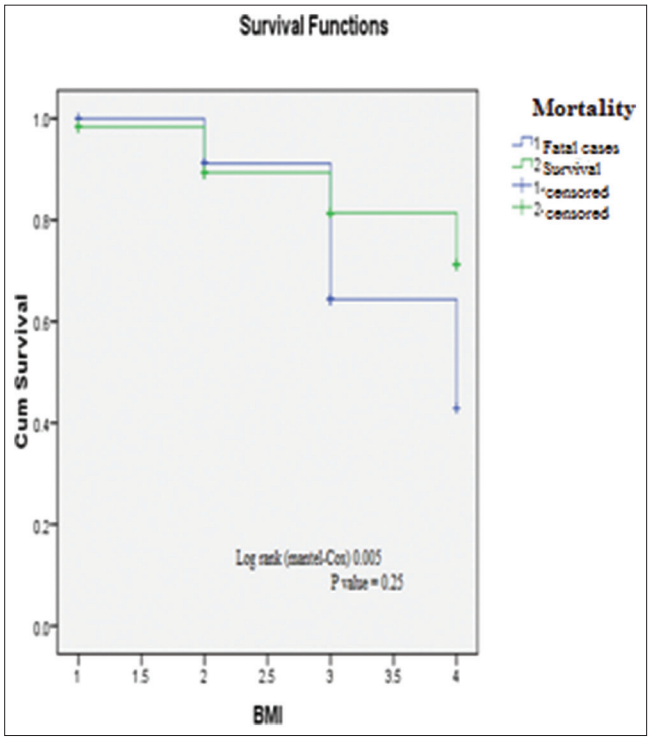

Figure 1. Survival curve of patients with diabetes and BMI at baseline

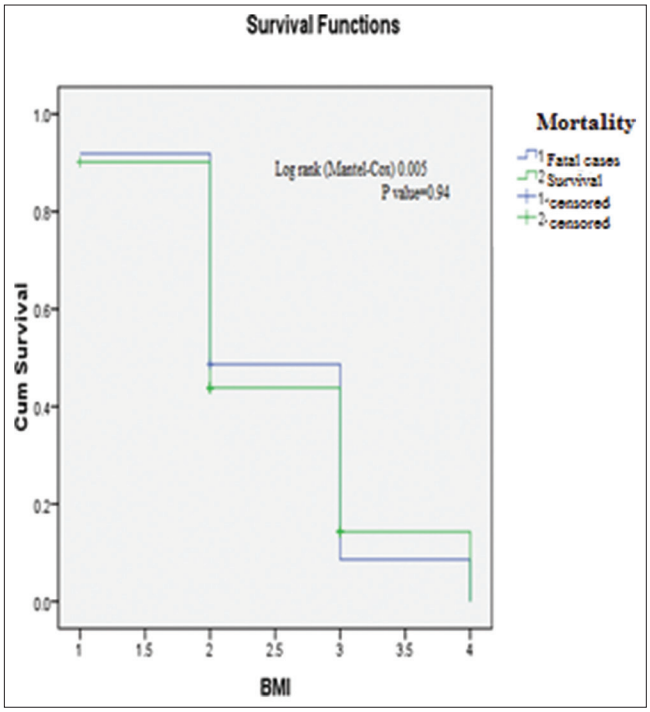

Figure 2. Survival curve of patients with cardiovascular diseases and BMI at baseline

Discussions

In the United States of America, according to Flegal *et al*., obesity has reached epidemic proportions and continues to be a growing problem worldwide [21]. More than 2.5 billion adult people worldwide have a high BMI (BMI> 25 kg/m^2) according to the 2017 World Health Organization report [22]. Overweight individuals were estimated to be approximately 1.9 billion and 650 million obese [22], [23]. The epidemic of overweight and obese individuals is being associated with an increasing number of patients with end-stage renal disease (ESRD). This number is expected to double over the next decade [24], [25], driven by the aging of the population and increased prevalence of diabetes mellitus [26] and hypertension [27]. This will occur mainly in developing countries where poverty is many times more evident [28], [29]. Considering the great impact that obesity has on individuals on dialysis as well as other concomitant diseases, this study was undertaken to examine the correlation between obesity and morbidity in hemodialysis patients, Elbasan. This study analyzed the data of 160 patients who underwent a hemodialysis process in Elbasan for 2 years. Table 1 shows the demographic data of 160 cases obtained in this study based on the breakdown of the BMI by the patient. The mean age in this study was 52.7 ± 15.6 years. In terms of gender and BMI values, according to Park *et al*., there is a different body structure between women and men, which affects the effect of BMI on mortality [1].

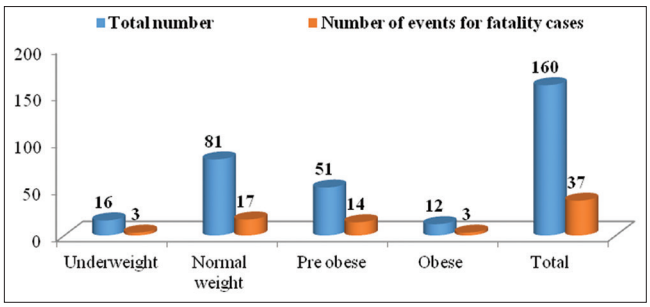

Figure 3. Graphical display of mortality rates by BMI

Men and women also have different proportions of skeletal muscle mass and fat (body composition) that may affect BMI and serum creatinine levels in patients with Hemodialysis (HD) [2], [30]. According to Freitas *et al*., fat mass change in females is a result of hormonal and reproductive factors [11]. Various studies have reported a higher prevalence of BMI in females than in males. According to these studies, in the general population, overweight in female's ranges from 42% to 60% [11]; whereas in males, it ranges from 27.5% to 40% [31], [32]. The same was reported by Postorino *et al*. in a study conducted in 2009, in a population of dialysis patients where obese women made up 60% of the study population while obese men 24% [33]. Increased BMI is

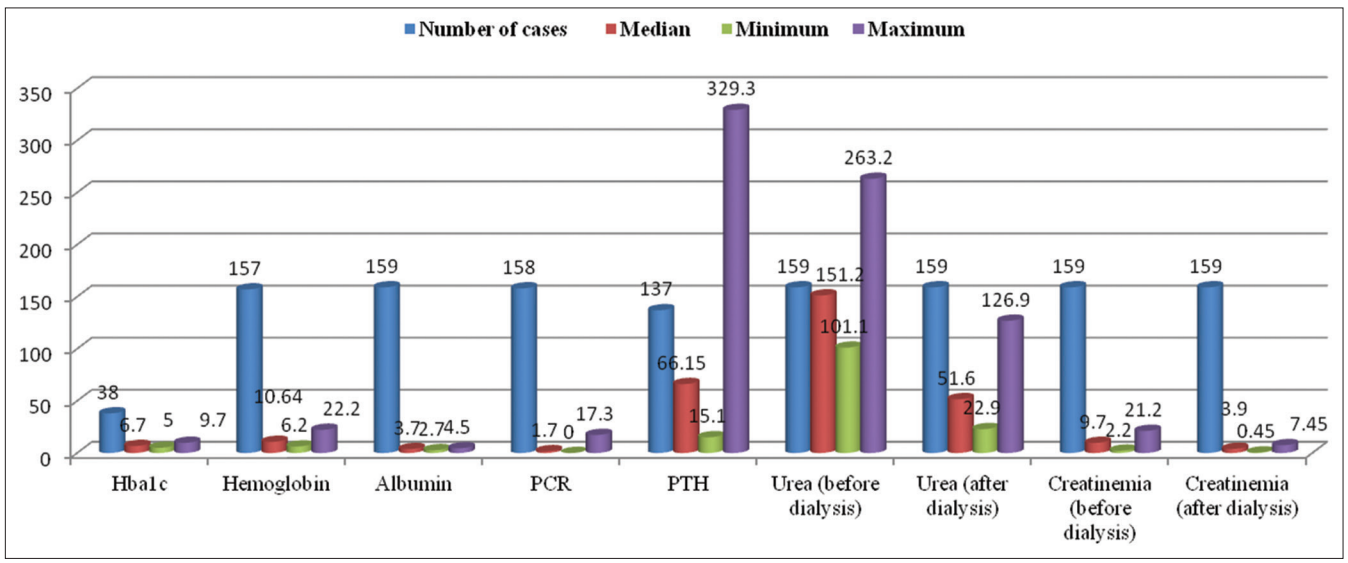

Figure 4. Characteristics of biochemical parameters of dialysis patients

a factor closely linked to cardiovascular mortality [33], a major cause of death in patients with hemodialysis [34], [35]. However, data on gender and survival in HD patients by BMI are scarce. In this study, 73.1% (117 cases) were male, and 26.9% (43 cases) were female. Thus, the relationship between males and females in our study was different from the studies mentioned above. This is because in this center we had a higher number of males than females. For this reason, the prevalence of BMI was consequently higher in men. There is a strong significant relationship between BMI and gender Chi-square 2.43 (1.07–3.19**)** p = 0.002. Other studies have highlighted the effect of age on increasing BMI. This increase is most noticeable after the fourth decade of life [11], [32], [36]. According to a study conducted by Ohkawa *et al*., adults lose about 6–7% of body mass within 20 years [36]. This spontaneous decrease in body mass is associated with an increase in body fat, and in particular redistribution of fat from the limbs to the abdominal area, thereby producing central obesity. The main factors that may affect these changes are genetic predisposition, eating habits, and decreased physical activity due to increasing age [36], [37], [38]. In this study, the most common age groups were 50–59 years and 60–69 years with 29.4% (47 cases) and 34.3% (55 cases), respectively. Similar results were observed, in this study, in which males and females aged 40 years and over present higher values of obesity. Furthermore, in this study, a significant relationship was observed between overweight and Chi-square age 1.94 (0.58–2.15**)** p = 0.001. 52.5% of patients live in urban areas and 47.5% in rural areas. The majority of patients had 8-year and secondary education with 36.2%, and 45.62%, respectively. 78.75% of patients were married, 59.4% were unemployed, and 60% were living on a very low income. Significant correlations were also observed for urban/rural residence, educational attainment, smoking, and alcohol consumption with BMI. No significant association with BMI was observed for other demographic data. Ekart and Hoys define obesity as a chronic disease that is widespread in the world and serves as a risk factor for type 2 diabetes and hypertension, which in turn are the leading causes of end-stage renal disease [39]. BMI is associated with metabolic disorders which can act as a risk factor for microvascular complications. Obese patients are therefore more likely to develop diabetic renal microvascular complications compared to patients with normal BMI [40], [41]. Some studies have reported that overweight and obesity may be protective for some ESRD patients, without seeing a direct link between BMI and Chronic Kidney Disease (CKD) in diabetic patients. As we have mentioned in the introduction to this article, there is a paradox regarding the effect of BMI on the general population and the population undergoing dialysis [2], [3], [4], [5], [6], [7]. According to many studies, obese individuals in the general population are highly prone to suffering from CVD, leading to increased mortality rates due to obesity [3], [4], [42]. The opposite occurs in populations undergoing dialysis, where a decrease in nutritional measures (such as a low BMI, a decrease in serum cholesterol, or creatinine concentration) is strongly associated with increased morbidity and mortality in dialysis patients [43], [44]. These paradoxical data are referred to as “reverse epidemiology” [45], [46] or as “risk factor paradox” [47], [48], [49]. According to Kamyar *et al*., understanding these terminologies does not necessarily imply that the principles of vascular pathophysiology are different in individuals with ESRD but may indicate that there are some other overlapping or more dominant factors that cause a significant reversal of the relationship between risk factors, and the result. According to Kamel *et al*., obesity at different stages of life is an independent predictor of major renal events in patients with type 2 diabetes [50]. For this reason, we require a good understanding of the reverse epidemiological causes in individuals with dialysis, which may help us to improve poor outcomes in this population [42]. In our study, the number of cases of type 2 diabetes mellitus and CVD was more observed for the category of normal body weight index and pre-obesity. Kaplan Meir survival was used to analyze survival to BMI parameters for cases of patients with type 2 diabetes mellitus (Figure 1) and cases with CVD (Figure 2). Although various studies have reported a significant association for survival between cardiovascular or diabetic diseases based on BMI [42], [43], [44], [45], [46], [47], [48], [49], in this study, we did not observe a statistically significant difference in survival and DMT2 and CVD. For both cases, the p-value was > 0.05. The mortality of dialysis patients during our study period 2016–2018 was 23.1% (37/160 cases). The highest number of cases was observed for the BMI category - normal weight of 45.9% (17/37 cases), and the pre-obesity category 37.8% (14/37 cases). Based on the statistical processing, no correlation was found regarding BMI, and mortality/survival of the cases analyzed in this paper (Pearson Correlation −0.065, p = 0.413). Based on multi logistic regression analysis for BMI and biochemistry parameters obtained from patients during the study period, we can say that a strong significant correlation was found for Chi-square 5.08 hemoglobin index, p = 0.024; for urea index after Chi-square dialysis 60.2, p = 0.001 and creatinemia index after Chi-square dialysis 2.77, p = 0.042. For other biochemical indices, no significant association was observed. In the statistical analysis of some of the mortality factors in the population performing the dialysis process, a strong significant association with mortality was observed for 50–59 and 60–69 years of age, with p values of 0.028 and 0.031, respectively. A strong association of mortality was also observed for patients with low creatinemia where the p = 0.038.

Conclusion

In this study, 45% of patients undergoing hemodialysis at the Dialysis Center in Elbasan

presented a BMI at normal values, 34.8% of them were pre-obese and obese and only 8.8% were underweight. The factors that lead to this growth are numerous. In our study some of the factors that resulted in strong significant correlations were gender, age, place of residence, educational level, smoking and Alcohol**.** There was no significant association between BMI and concomitant diseases of dialysis patients. Regarding mortality, a strong significant association was observed with age 50–69 years and with post-dialysis cretinemia index. In paradoxical epidemiology, overweight becomes chronic on hemodialysis, as protective factors are associated with better survival. In our study, with a small number of chronic patients on hemodialysis, there was no significant association with some of the variables analyzed. There is a need to better understand the reverse epidemiological causes in individuals on dialysis, which can help us, improve the poor outcome in this population.

Recommendations

Obesity is recognized by its association with increased risk of CVD and mortality. However, in the paradoxical epidemiology, obesity becomes in chronic hemodialysis, a protective factor and is associated with better survival. Our study has a small population and cannot reach such a conclusion; further, studies with larger numbers are needed to support this concept with more center in dialysis. Hence, better examination of the reverse epidemiology is needed and may lead to improved survival. Therefore, further studies are needed to clarify the prognostic effect of abdominal obesity in dialysis patients in Albanian. We need nephrologist, nutritionist team work for: Getting the most benefit for the patient and more research for better evidence.

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