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Infections in Immunocompromised Patients from Diabetes Mellitus

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Abstract: **Infections are more common in patients with diabetes mellitus. Increasing of infections in patients with diabetes mellitus is conditioned by an immunodepressive condition resulting from immune damage.**
Objective: To give some information and correlation about diabetes mellitus and infection in diabetic patients.
Material: We have studied 30 patients with diabetes mellitus hospitalized at the service of Endocrinology in University Hospital Center, Tirane, Albania.
Method: We analyzed data collected from the above materials synthetically. Student's t test and one-way Anova tests is used.
Results: Males were 17 patients. Study time was march-september 2015. Mean level of WBC in males resulted 13.12±4.456/mm³ compared to females 7.54±3.503/mm³ (p=0.001); mean level of hemoglobin in males was 10.88±2.205 mg/dL compared to females 12.38±1.758 mg/dL (p=0.047); mean level of urea in males was 52.41±25.162 mg/dL compared to females 33.85±16.072 mg/dL (p=0.028); mean level of creatinine in males was 1.18±0.393 mg/dL compared to females 0.92±16.072 mg/dL (p=0.048). Among the diagnosis taken in the study was noticed that mean age is 61.4±10.4 years (p=0.061), mean level of WBC is 10.7±4.9 (p=0.029), mean level of hemoglobin was 11.5±2.1 mg/dL (p=0.051), mean level of urea was 44.4±23.3 mg/dL (p=0.006), mean level of creatinine is 1.1±0.4 mg/dL (p=0.00).
Conclusions: Soft tissue infections are the most common complication in patients with diabetes mellitus. From the study it was noticed that among gender there are changes in leukocytes, hgb, urea and creatinine. Among the diagnosis taken in the study resulted changes in age, leukocytes, hgb, urea and creatinine.

Keywords: **Infections, diabetes mellitus, leukocytes, hemoglobin.**

1. INTRODUCTION

Diabetes mellitus (or diabetes) is a chronic disease associated with deficiency of insulin secretion by the pancreas or action [1]. There are three types of diabetes: 1) type 1 diabetes; 2) type 2 diabetes; and 3) gestational diabetes [2]. Infections are more common and serious complication in patients with diabetes mellitus which potentially increases their morbidity and mortality [1]. So some type of infection occur more frequently in patients with diabetes mellitus including: skin and soft tissue infections (foot infections, phlegmone, necrotizing fasciitis etc.), urinary tract infection, respiratory tract infections, yeast infections, and surgical site infections [3]. Patients with diabetes mellitus are reported to experience 21% more infection than non-diabetic population [4]. It should be noted that urinary tract infections (UTI) are more common in patients with diabetes mellitus than non-diabetic [5]. One of the causes of increased prevalence of infections are defects in immunity [6]. Most of the results regarding hyperglicemic interaction and immune function are questionable and hyperglycemic and/or hyperinsulinemic with immunosuppressive mechanisms remain unclear. Hyperglicemia may compromise the immune system in these patients group. Increasing of infections in patients with diabetes mellitus is conditioned by an immunodepressive condition resulting from immune damage (damage of innate and adaptive

immunity). Diabetes affects the damage of neutrophils function such as phagocytes, chemotaxis, and production of cytokines which are diminished. While hyperglicemia and Th-2 reduce the Th-1 dependent immune system. The aim of our study is to represent the mutual influence between diabetes mellitus and infections.

2. MATERIAL AND METHODS

This study is done at University Hospital Centre "Mother Teresa" between 1 March 2015 and 31 September 2015. We included in this study 30 patients, with type 1 and 2 diabetes mellitus hospitalized at the service of Endocrinology UHC. We analyzed and synthesized the data collected from the above materials synthetically. All the data are thrown into tables and graphics by age group-hospitalization period and diagnosis. From a total of 30 patients, 17 were males and 13 were females. We have used Student's test and one-way Anova tests.

Statistical analysis: Continues variables are summarized by mean values and standard deviation for statistical analyses and we used SPSS 20 software. For the analysis of two independent variables we calculated correlation coefficients and significance. Values are reported as the mean Std. Dev. $P<0.05$ was considered statistically significant.

3. RESULTS

From a total of 30 adult patients, 17 (56.7 %) were males and 13 (43.3 %) females. Mean age was 61.4±10.4 years with range from 36-74 years old.

Table 1. Population study according to the age and gender distribution

	Population study	Minimum age (years)	Maximum age (years)	Mean age (years)
Males	17	46	79	61.65±10.099
Females	13	36	74	61.08±11.206
Total	30	46	79	61.4±10.4

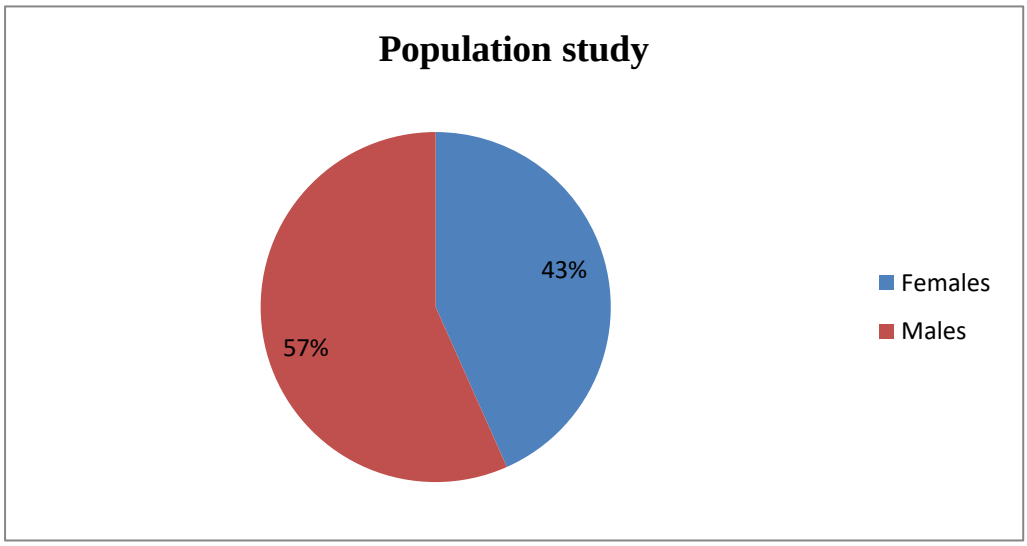

Figure 1. Gender distribution in the study population

Table 2. Distribution according to gender and mean level of age and analysis

	Males			Females			p value
Sex	No	Mean	Std. Dev.	No	Mean	Std. Dev.	
Age	17	61.65	10.099	13	61.08	11.206	0.885
DQ	17	11.59	4.874	13	11.77	13.700	0.96
WBC $10^3/mm^3$	17	13.12	4.456	13	7.54	3.503	**0.001**
RBC $10^6/mm^3$	17	4.00	0.791	13	4.23	0.725	0.419
HGB g/dl	17	10.88	2.205	13	12.38	1.758	**0.047**
Urea mg/dl	17	52.41	25.162	13	33.85	16.072	**0.028**
Kreatinina mg/dl	17	1.18	0.393	13	0.92	0.277	**0.048**

Table 3a. Differentes among diagnosis and analysis

	No	Minimum	Maximum	Mean	Std. Dev.
Age	30	46	79	61.4	10.4
DQ	30	2	55	11.7	9.5
WBC 10^3/mm³	30	2	23	10.7	4.9
RBC 10^6/mm³	30	3	6	4.1	0.8
HGB g/dl	30	6	16	11.5	2.1
Urea mg/dl	30	11	122	44.4	23.3
Kreatinina mg/dl	30	0	2	1.1	0.4

Table 3b. Diagnosis taken in our study

Diagnosis	Frequency	Percent
Diabetic foot	7	23.3
Diabetic wound	2	6.7
Gangrene	7	23.3
Infected ulcer	1	3.3
Phlegmone	3	10.0
Pulmonary infections	1	3.3
UTI	9	30.0
Total	30	100.0

We saw that among the diagnosis taken in the study was noticed that mean age was 61.4±10.4 years old (p=0.061), mean level of WBC is 10.7±4.9/mm³ (p=0.029), mean level of hgb is 11.5±2.1 mg/dL (p=0.051), mean level of urea is 44.4±23.3 mg/dL (p=0.006), mean level of creatinine is 1.1±0.4 mg/dL (p=0.00).

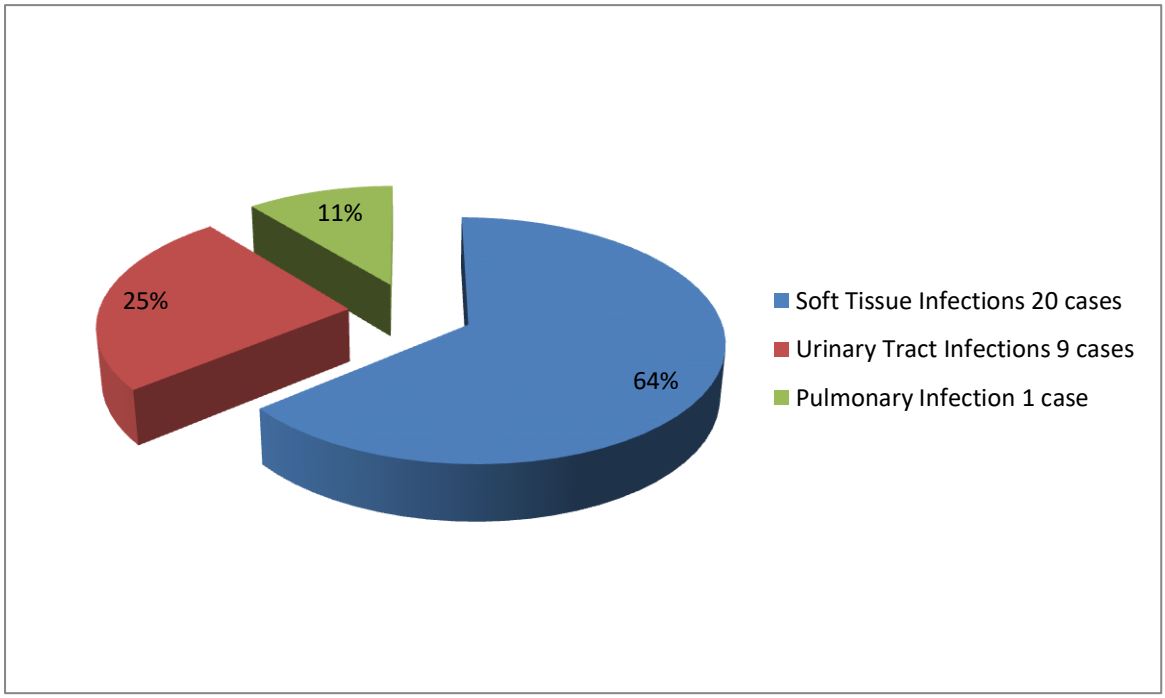

Figure 2. Diagnosis of infections in the study population

Refering the diagnosis patients with soft tissue infections had a higher frequency than others, and made of 64% of all the cases. Most of cases with soft tissue infections was identified in patients with unbalanced type 2 diabetes mellitus. After treatment with antibiotic and insulin patients returned to normality. In our study resulted 15 cases (50 %) residant in Tirana.

4. DISCUSSION

Diabetes is a serious and costly disease which is becoming increasingly common, especially in developing countries [8]. It is a very important step management and controlling the high level of glucose to prevent infections and other complications which can be fatal for this group of patients than non-diabetic. In our study most cases of infection were observed in patients with unbalanced type 2 diabetes mellitus treated with oral therapy. In our study we conclude that white blood cell count are higher in males than females. The result of this study are comparable with those reported by other study. Studies indicate the correlation between inflammation and diabetes mellitus. Findings show increased rates of white blood cell count in diabetic patients [9,10]. In our study we have noticed that hemoglobin levels are lower in males than females. So findings show that lower level of hemoglobin or anemia is common in patients with diabetes mellitus [11]. Several findings have confirmed the fact that: microangiopathy in diabetic patients may be more severe in subjects with lower level of hemoglobin. We have noticed that urea and creatinine levels are increased in males compared to females. So the results of our study were in accordance with various studies which showed that raised plasma urea and creatinine levels in diabetic patients may indicate a pre-renal problem [12,13]. Strong relationship of blood urea and creatinine levels was found with blood sugar level. In our study high serum creatinine level was seen more in males than females, which could be because of sorage of creatinine as a waste product in muscle mass and the presence of high muscle mass in males [12,14]. Refering the diagnosis patients with soft tissue infections had a higher frequency than others, and made of 64% of all the cases. Diabetic foot infections, defined as soft tissue or bone infection below the malleolli, are a common clinical problem in diabetic patients. Most infections occur in a site of ulceration or skin trauma. The most common factors are peripheral neuropathy, peripheral vascular disease, high plantar food pressures, limited joint mobility and impaired immunity. Studies show that a patient with diabetes mellitus has a risk of 15% to 25% to develop a foot ulcer [15]. The result of this study indicates that men had a higher risk than women for soft tissue infections which are comparable with those reported by other study. The influence of gender as a risk factor in diabetic foot ulceration). This higher risk appers to be the result of more severe neuropathy, decreased joint mobility, and higher foot pressures [16]. Also this group of patients has poor glycemic control compared to females. The study remains a bit limited due to the duration and the reduced number involved in it.

In conclusion: All patients with diabetes mellitus should undergo a systemic foot examination for at least once a year, and more frequently if risk factors for diabetic foot ulcers exist. Good control of blood glucose level helps to prevent progressive renal impairment and diabetic nephropathy, peripheral neuropathy, peripheral vascular disease and diabetic retinopathy.

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