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DIABETIC FOOT AMPUTATION;
FREQUENCY OF DIABETIC NEPHROPATHY AMONG PATIENTS

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ABSTRACT… Introduction: Diabetic foot lesions have remained a major cause of morbidity in patients with kidney failure. Foot complications are more than twofolds in diabetic nephropathy patients, and the rate of amputation is 6 to 10 times higher in diabetic nephropathy patients in comparison to the general diabetic population. **Objectives:** To determine the frequency of diabetic nephropathy in patients undergoing diabetic foot amputation. **Study Design:** Observational cross-sectional study. **Setting:** Surgical Department Unit-II, Sheikh Zayed Medical College and Hospital Rahim Yar khan. **Material and Methods:** The duration of the study was 2 years from Dec-2013 to Dec-2015. A total number of 73 patients were included in this study. Patients who were admitted to the department of surgery for amputation of the foot or the leg having the history of diabetes regardless of their age and sex were selected for this study. Data analyses were carried out using SPSS Version17 software. Quantitative variables were presented as Mean and standard deviations. Frequency and percentages were computed for qualitative variables. **Results:** The mean age of the patients was 57.51±7.61 years. Out of 73 cases, there were 43(58.9%) males and 30 (41.1%) females. Previous history of amputation was observed in 26 (35.62%) cases, 48 (65.75%) patients were hypertensive. Out of 73 patients, Forty (54.79%) had controlled diabetes and 33 (45.21%) had uncontrolled diabetes. Twenty seven patients (36.99%) were diagnosed for diabetic nephropathy. The incidence of nephropathy was high in patients with advancing age. This incidence was in 26 (56.62%) patients with age 51 to 60 years and 18 (39.13%) in patients having age more than 60 years. **Conclusions:** Lower extremity amputations are strongly associated with nephropathy in diabetic patients. It is very important to check and improve the renal function in patients with diabetic foot ulcers who are hypertensive, increasing age and long duration of DM to prevent lower limb amputations.

Key words: Diabetes mellitus (DM), Nephropathy, Diabetic foot amputation.

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INTRODUCTION

"Diabetes mellitus is a metabolic disorder causing high blood sugar levels because of defect in insulin secretion, or its action on receptors or both".[1] worldwide prevalence of diabetes mellitus is increasing day by day.[2] Diabetes has affected about 26 million population in the United States and in Pakistan, incidence of diabetes mellitus is about 17- 22%.[3,4]

Two main causes of Diabetic complications are macro-vascular and microvascular. Macrovascular complications like stroke, ischemic heart disease, peripheral vascular disorders leading to ulcers, gangrene and ultimately amputation. Microvascular complications are eye disorders (e.g. retinopathy, glaucoma, cataract and corneal disease), kidney disease (nephropathy), and nerve damage (neuropathy).[5] 2% of diabetic patients will develop foot ulcers every year.[6] Foot Ulceration is common in diabetic patients that can lead to toe, fore foot or below knee amputation.[7] Main risk factors are the peripheral vascular disease, peripheral neuropathy and infection for the development of foot ulcer and later on amputation. There are certain other risk factors which causes increase rate of amputation in diabetics like previous history of amputation, nephropathy and first fasting blood glucose (FBG) > 200 mg/dl at admission.[8,9]

20-30% of diabetic patients will develop Diabetic Nephropathy.[10,11] Foot complications are twofold common in patients with diabetic nephropathy. Rate of amputation is 6-10 times higher in patients with diabetic nephropathy as compare to general diabetic patients who do not have nephropathy.[12]

There are many reports in literature on the risk factors for diabetic foot complications. However, little data is available on the risk factor especially nephropathy, for amputation in diabetic Foot.

We want to conduct this study to determine the frequency of nephropathy among patients undergoing diabetic foot amputation so that appropriate recommendations can be suggested for its better management in future.

OBJECTIVES

To determine the frequency of diabetic nephropathy in patients undergoing diabetic foot amputation.

MATERIAL AND METHODS

It was an observational cross-sectional study. The study was conducted at surgical department Unit-II Sheikh Zayed Medical College and Hospital Rahim Yar khan. The duration of the study was 2 years from Dec-2013 to Dec-2015. A total number of 73 patients were included in this study. Patients who were admitted to the department of surgery for amputation of foot or leg having the history of diabetes regardless of their age and sex were selected for this study. Following patients were excluded: Patients with severe hepatic / renal insufficiency, vasculitis and trauma of the foot. The study was conducted after the permission from the ethical committee of the hospital. A written informed consent regarding procedure was taken from the patients.

A detailed history regarding age, sex, duration of DM, diabetic control, medications and previous history of amputation was taken from every patient. Investigations like CBC, blood sugar levels, ser um creatinine, Blood urea, Lfts, HBSAg, Anti-HCV and CUE to see proteinuria were performed. Diabetic Nephropathy was labeled when serum creatinine levels were >1.1 mg/dl.

Data analyses were carried out using SPSS Version17 software. Quantitative variable like age, blood sugar levels and creatinine level were presented as Mean and standard deviations. Frequency and percentages were computed for qualitative variables like gender, controlled or uncontrolled Diabetes, presence or absence of nephropathy, and previous history of amputation.

RESULTS

Seventy-three patients with foot ulcer were included in this study. Age distribution is shown in Figure-1. The mean age of the patients was 57.51±7.61 years. Out of 73 cases, there were 43 (58.9%) male and 30 (41.1%) female. 41.9% (18/43) male patients developed nephropathy while 30% (9/30) female patients developed nephropathy (Chi-Square test 1.06 p=0.30**)** which is statistically insignificant**.** Previous history of amputation was observed in 26 (35.62%) cases and 48 (65.75%) patients were hypertensive. Treatment compliance was observed in 76.71% cases. Out of 73 patients, 40 (54.79%) had controlled diabetes and 33 (45.21%) had uncontrolled diabetes as shown in Table-I. Frequency of nephropathy in patients undergoing diabetic foot amputation is presented in Figure-2 i.e. 27 patients (36.99%) developed nephropathy. Regarding age group rate of nephropathy was 45.9% (17/37) in 51-60 years of patients, 38.1% (8/21) in above 60 years of age and 13.3% (2/15) in 41-50 years of age patients as shown in Table-II. Rate of nephropathy was 41.9% in male and 30% in female (p=0.30). According to duration of disease, rate of nephropathy was significantly high in those cases whose duration of disease was above 10 years (p=0.003) as presented in Table-III. Similarly rate of nephropathy was high in hypertensive patients as compare to non hypertensive patients (50% vs. 12%; p=0.001) as shown in Table-IV. In patients with controlled diabetes, nephropathy was developed in 30% (12/40) cases while in uncontrolled diabetes, nephropathy was developed 45.5% (15/33) cases.

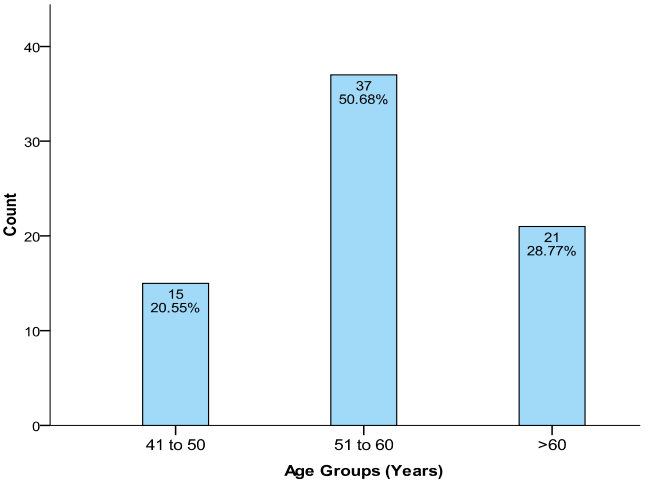

Figure-1. Age distribution of the patients n=73

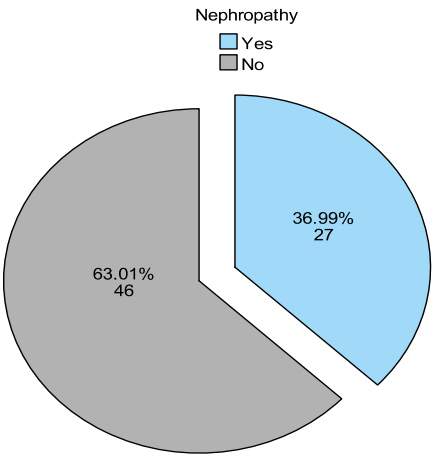

Figure-2. Frequency of nephropathy in patients undergoing diabetic foot amputation n=73

Variable		Value
Age (Years) mean±SD.		57.51±7.61
Gender	Male	43 (58.90%)
	Female	30 (41.10%)
Duration of disease n years(mean±SD)		8.44±3.32
FBS mg/dl (mean±SD)		230.51±42.42
RBS mg/dl (mean±SD)		385.15±77.49
Blood urea mg/dl (mean±SD)		123.66±91.60
Serum Creatinine mg/dl (mean±SD)		1.518±0.77
Previous history of amputation		26 (35.62%)
Hypertension		48 (65.75%)
Diabetes	Controlled	40 (54.79%)
	Uncontrolled	33 (45.21 %)
Nephropathy		27 (36.99%)

Table-I. Demographic and clinical data of patients.

Age Groups (Years)	Nephropathy		Total
	Yes	No	
41 to 50	2(13.3%)	13(86.7%)	15
51 to 60	17(45.9%)	20(54.1%)	37
>60	8(38.1%)	13(61.9%)	21

Table-II. Frequency of nephropathy in patients undergoing diabetic foot amputation with respect to age groups
Chi-Square= 4.88 p=0.087

Duration of Disease (Years)	Nephropathy		Total
	Yes	No	
4 to 6	0(0%)	13(100%)	13
7 to 9	14(40%)	21(60%)	35
10 to 12	8(72.7%)	3(27.3%)	11
>12	5(35.7%)	9(64.3%)	14

Table-III. Frequency of nephropathy in patients undergoing diabetic foot amputation with respect to duration of disease
Chi-Square= 13.80 p=0.003

Hypertension	Nephropathy		Total
	Yes	No	
Yes	24(50%)	24(50%)	48
No	3(12%)	22(88%)	25

Table-IV. Frequency of nephropathy in patients undergoing diabetic foot amputation with respect to with and without hypertensive
Chi-Square= 10.18 p=0.001

DISCUSSION

In diabetic patients lifetime frequency of amputations is about 15%.[13] Amputations is a much-feared tragedy in the life of diabetic patients. 10% diabetic patients on renal replacement therapy have already history of toe, forefoot or below-ankle amputation.[14] German study shows that diabetes patients on dialysis, about 44% of patients have a history of amputation for peripheral arterial disease.[15] This supports our study in which the previous history of amputation was observed in 35.62% cases.

In this study, we note different parameters like duration of DM, blood glucose level at admission, the ulcer duration and extension, sex, age, diabetic control with oral or insulin treatment, Serum creatinine level, blood urea, nephropathy, previous amputation history, blood glucose control, and hypertension control. Karakoc at al shows that rate of nephropathy was high as age increases which is in accordance with our data i.e. rate of nephropathy was 56.62% in 51-60 years of age group patients and 39.13% in patients having age more than 60 years but 13.3% in 41-50years age group.[16] Bearing in mind, the role of age, duration of ulcer and infection before going to the physician and the lower extremity vascular involvement in amputation rate, it is compulsory to give more training to the diabetics to prevent the sore and how to take care of it at home. Furthermore teach them to visit the doctor as early as possible when they get any kind of sore or a cut on the foot.

This study shows that the rate of nephropathy was high in hypertensive patients as compare to non-hypertensive patients (50% vs. 12%; p=0.001). So doctors should guide the diabetic patients to control their blood pressure to decrease the rate of lower limb amputation. Our study showed frequency of nephropathy was 36.99% in patients undergoing diabetic foot amputation and it is comparable to 20 -30% of diabetic patients having nephropathy as shown by American diabetic care and Broumand B.[11,12] This indicated that worsening of kidney function would affect the treatment out come and prognosis of foot ulcers in patients with diabetic foot. It is very important to improve the kidney function in the treatment of patients with diabetic foot ulcers. According to duration of disease, rate of nephropathy was significantly high in those cases whose duration of disease was more than 10 years (p=0.003) because long standing DM will affect the kidney function more. Xiao et al studied the relationship between kidney function, therapeutic effect and prognosis of foot ulcers in diabetic patients. Granulation tissue and healing time of ulcer is prolonged with the deterioration of kidney function irrespective of the disease phase of foot ulcers.[17] Nather and colleagues found that nephropathy was a significant predictive factor for limb amputation.[18] Other studies have also found nephropathy to be a significant prognostic factor.[19,20,21] However, some investigators have disputed the predictive role of nephropathy.[22,23]

Advanced glycation end-products have been implicated in diabetic complications, and in nephropathy patients, their concentrations are high resulting in induction of proteinuria.[24] Impairment of wound healing is a major factor in Diabetic Foot, and advanced glycation end-products have also been implicated in this process. The blocking of advanced glycation end-products improves diabetic nephropathy as well as restoring effective wound healing in diabetic patients.[25]

Recent literature shows that Diabetic patients having nephropathy, there is increase

amputation rates who presented with ulcerated or gangrenous lower extremities.[26] There are 3 major pathogenesis i.e. neuropathy, ischemia, and infection for the development of ulcer, and gangrene leading to amputation. Nephropathy appears to be an important predictor of long-term outcome of the treatment of diabetic foot ulcer.[27] Increasing awareness of the condition and careful self-clinical examination of the diabetic patients is indispensable to avoid serious complication.

CONCLUSIONS

Lower extremity amputations are strongly associated with nephropathy in diabetic patients. It is very important to check and improve the renal function in patients with diabetic foot ulcers who are hypertensive, long duration of DM and increasing age to prevent lower limb amputations.

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2	Dr. Sultan Ahmed	Assisted and statistical data	
3	Dr. Hassan Mahmood Tabassum	Data collection	
4	Dr. Sadaf Lanjar	Helping writing