OSTEOMYELITIS IN PATIENTS WITH DIABETIC FOOT ULCERS

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ABSTRACT

Objective: To determine the frequency of factors leading to osteomyelitis in diabetic foot ulcers patients.

Material & Methods: It was a cross sectional, descriptive study conducted in the department of medicine, Bacha Khan Medical Complex, Mardan and Hayatabad Medical Complex, Peshawar from June, 2014 to May, 2015. A total of 217 patients were included. This was a multicentre study project with data collection from various medical, surgical and orthopedic units of Bacha Khan Medical Complex, Mardan and Hayatabad Medical Complex, Peshawar. All patients between ages of 18 to 65 years of either sex whether admitted through outpatients or emergency with either type I and type II diabetes having osteomyelitis in diabetic foot ulcers were included in the study. Patients who had foot ulcer of less than one month duration, complicated fractures associated with ulcers or osteomyelitis caused by diseases other than diabetes mellitus were excluded from the study. Data was analyzed in SPSS version 16. Mean + SD was calculated for quantitative variables like age. Frequencies and percentages were calculated for categorical variables like risk factors and gender.

Results: The study results show that 4%, 38% and 48% patients were in age range of 31-40 years, 41-50 years and 51-60 years respectively. Mean age was 51 years with SD ± 1.26. Fifty-five percent patients were male and 45% patients were female. Forty-seven percent patients had Peripheral neuropathy, 46% patients had peripheral artery disease while 7% patients had foot deformities.

Conclusion: Peripheral neuropathy; peripheral arterial diseases are recognized risk factors for foot ulceration. These risk factors should be taken into consideration while educating diabetic patients.

Key Words: Diabetes, foot ulcer, osteomyelitis.

INTRODUCTION

Diabetes Mellitus (DM) is now one of the most common non-communicable diseases globally. Between 2009 and 2034, the number of people with diagnosed and undiagnosed diabetes will increase from 23.7 million to 44.1 million in US.[1] Complications from diabetes, such as coronary artery and peripheral vascular disease, stroke, diabetic neuropathy, amputations, renal failure and blindness are resulting in increasing disability, reduced life expectancy and enormous health costs for virtually every society.[2]

Foot ulcers are a common complication of diabetes mellitus, and these lesions frequently become infected.[3] Patients with DM frequently require minor or major amputations of the lower limbs (15-27%), and in more than 50% of cases, infection is the preponderant factor.[4] Diabetic foot infections include cellulitis, abscess, necrotizing fasciitis, septic arthritis, tendonitis and osteomyelitis. Staphylococcus aureus and beta-hemolytic Streptococci are the major pathogens in the acute skin and soft tissue infections.[5]

Several risk factors predispose diabetic patients to developing bone infection (osteomyelitis). Peripheral neuropathy is a significant independent risk factor for diabetic foot ulceration.[6] In a study, 12% of patients with diabetic ulcer had osteomyelitis while 20% of diabetic foot infections were associated with osteomyelitis.[7] In another study, in United States, 10% of diabetic patients had signs of neuropathy at the time of diagnosis, and 40% developed signs of neuropathy within the first decade of diagnosis of diabetes.[8]

Peripheral artery disease is a known major risk factor for diabetic foot ulcers and was diagnosed in 49% of the subjects studied with a new foot ulcers.[9] In one prospective study, a strong relationship between foot deformity (fixed hammer/claw toes and hallux limitus) and ulceration was found. Hallux valgus was present in 23.9% of feet, hammer/claw toes in 46.7%, and hallux limitus in 24.4%.[10]

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The present study was designed to determine the frequency of various risk factors among patients presenting with osteomyelitis in diabetic foot ulcers. A thorough literature search suggested variation in risk factors for the development of osteomyelitis among different populations. The study results will provide us with local magnitude of the problem and the results of this study not only will add more knowledge in the existing body of literature but will also guide local researchers and physicians about future research strategies regarding the frequency of various risk factors in our setup that lead to development of osteomyelitis in diabetic foot ulcers, and strive for prevention of risk factors in diabetic foot wounds patients.

MATERIAL AND METHODS

It was a cross sectional, descriptive study which was conducted from June 2014 to May 2015. A total of 217 patients were included in the study using Non-probability consecutive sampling technique. This was a multicentre study project with data collection from various medical, surgical and orthopedic units of Bacha Khan Medical Complex, Mardan and Hayatabad Medical Complex, Peshawar. The study was conducted after approval from hospitals ethical and research committee. The purpose and benefits of the study was explained to the patient and a written informed consent was obtained.

All patients between ages of 18 to 65 years of either sex whether admitted through outpatients or emergency with either type I and type II diabetes having osteomyelitis in diabetic foot ulcers were included in the study. Patients who had foot ulcer of less than one month duration, complicated fractures associated with ulcers or osteomyelitis caused by diseases other than diabetes mellitus were excluded from the study. Detailed history and thorough clinical examination (specifically for neuropathy, peripheral arterial disease, foot deformities) followed by routine baseline investigations was done for all the included patients.

Data was analyzed in SPSS version 16. Mean + SD was calculated for quantitative variables like age. Frequencies and percentages were calculated for categorical variables like risk factors and gender. All results were presented in the form of table and graphs. Post-stratification chi-square test was applied. P value of ≤ 0.05 was taken as statistically significant.

RESULTS

The age and gender distribution of the 217 included patients is shown in Table 1. Risk factors distribution among the participating individuals with diabetic foot ulcers complicated by osteomyelitis is shown in Table 2. Risk factors stratification in different age groups and genders is shown in Table 3 & 4.

Table 1: Age and gender distribution

Age	Frequency & Percentage
31-40 years	30(14%)
41-50 years	83(38%)
51-60 years	104(48%)
Total	217(100%)
Gender	
Male	119(55%)
Female	98(45%)
Total	217(100%)

Table 2: Risk factors

Risk factors	Frequency & Percentage
Peripheral neuropathy	102(47%)
Peripheral artery disease	100(46%)
Foot deformities	15(7%)
Total	217(100%)

Table 3: Stratification of risk factors with age

Risk Factors	Age in years			Total
	31-40	41-50	51-60	
Peripheral neuroppathy	14	39	49	102
Peripheral artery disease	14	38	48	100
Foot deformities	2	6	7	15
Total	30	83	104	217

Chi Square test was applied and P value was calculates as 0.003

Table 4: Stratification of risk factors with gender

Risk factors	Male	Female	Total
Peripheral neuropathy	56	46	102
Peripheral artery disease	55	45	100
Foot deformities	8	7	15
Total	119	98	217

Chi Square test was applied in which P value was 0.003

DISCUSSION

Foot ulcers are a common complication of diabetes mellitus, and these lesions frequently become infected.[10] Patients with DM frequently require minor or major amputations of the lower limbs (15-27%), and in more than 50% of cases, infection is the preponderant factor.[4] Diabetic foot infections include cellulitis, abscess, necrotizing fasciitis, septic arthritis, tendonitis

and osteomyelitis. Staphylococcus aureus and beta-hemolytic Streptococci are the major pathogens in the acute skin and soft tissue infections.[11]

Our study shows that 14% patients were in age range 31-40 years, 38% patients were in age range 41-50 years, and 48% patients were in age range 51-60 years. Mean age was 51 years with SD ± 1.26. Fifty five percent patients were male and 45% patients were female. Forty seven percent patients had Peripheral neuropathy, 46% patients had peripheral artery disease while 7% patients had foot deformities. Similar results were found in another study conducted by Hinchliffe RJ et al[11] in which 12% patients were in age range 31-40 years, 40% patients were in age range 41-50 years, and 48% patients were in age range 51-60 years. Sixty percent patients were male while 40% patients were female. Fifty percent patients had peripheral neuropathy, 46% patients had peripheral artery disease while 4% patients had foot deformities.

Several risk factors predispose diabetic patients to developing bone infection (osteomyelitis). Peripheral neuropathy is a significant independent risk factor for diabetic foot ulceration. In one study 12% of ulcer patients had osteomyelitis while 20% of diabetic foot infections were associated with osteomyelitis.[12] In another study, in United States, 10% of diabetic patients had signs of neuropathy at the time of diagnosis, and 40% developed signs of neuropathy within the first decade of diagnosis of diabetes.[13] Loss of protective sensation places a patient at a 7-fold increase risk of ulceration and unrecognized trauma. Peripheral artery disease (PAD) is also a significant independent risk factor for diabetic foot ulcers.[6] PAD was diagnosed in 49% of the subjects in one study done on 1229 patients presenting with a new foot ulcer.[9] Another independent risk factor for osteomyelitis is structural deformity of the foot. In one prospective study, a strong relationship between foot deformity (fixed hammer/claw toes and hallux limitus) and ulceration was found. Hallux valgus was present in 23.9% of feet, hammer/claw toes in 46.7%, and hallux limitus in 24.4%.[14]

A multi-centre study conducted in India, Germany and Tanzania on 613 patients showed that neuropathy was common in all centers. We found sensory loss in 51% of our patients. Many national and international studies showed wide variations in the percentage of sensory neuropathy in patients with diabetic foot ulcer. In a study it is reported to be 20-40%[12], while Abbott CA et al[13] found it in 44% of their patients. Poorly controlled blood sugar, due to poor compliance or resistance of diabetes, had a direct effect on the outcome of the disease resulting in amputation or nonhealing ulcer. Duration of diabetes also had a direct effect on the outcome of the disease. Patients with longer duration of diabetes had more prevalence of neuropathy and angiopathy and were more prone to development of foot ulcer. Researchers[14] have reported that up to 28% diabetic foot end up with amputation; 20.9% of our patients had to be treated with amputation. Peripheral arterial disease was a frequent risk factor for foot ulcer in Germany (48%), in India and Tanzania it was 12% and 13% respectively.[15]

In our study distal pulses were completely absent in 62.8% patients, comparable with the data available showing 50% of cases having peripheral vascular disease.[5] Infection was seen in 85.7% of our patients which is consistent with a study conducted in Sudan.[17] A community based patients cohort study[12] revealed that the main cause of foot ulceration in diabetic patients was pressure from footwear (55%) but we did not assessed this factor in over study.

CONCLUSION

For diabetic foot ulcer peripheral arterial disease is the main recognized factor. So this risk factor should remain pivotal in diabetic foot care protocol.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Khan A: Idea and main contributor.

Mehr MT: Manuscript writing.

Marwat MA: Followup and supervision.

Amanullah: Followup and statistics.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL