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Original Research Article

Prevalence and risk factors of diabetic foot ulcer at a tertiary care hospital among diabetic patients

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ABSTRACT

Background: Foot ulceration is preventable, and relatively simple interventions can reduce amputations by up to 80%. The objective of the present research was to study the prevalence and risk factors of diabetic foot ulcer among diabetic patients
Methods: Present study was hospital based cross sectional study carried out at outpatient department of General Medicine for a period of January 2018 to June 2018 among 200 diabetic patients. All eligible patients willing to participate were included in the present study. Diabetic foot ulcer was diagnosed as per the standard criteria and based on the physician acumen. An attempt was made to identify the risk factors like smoking etc. The diagnosed patient was given appropriate treatment.
Results: Males were more than females. majority of the patients were found in the age group of 51-60 years (35.5%). Majority of the diabetic patients were from rural area i.e. 84.5%. Majority were illiterate i.e. 69%. 21.5% were found to be smokers. 40% were using alcohol regularly. 36.5% were overweight and 14% were obese. Prevalence of diabetic foot ulcer among diabetic patients was found to be 16%. Age, residence, literacy, duration of diabetes and obesity were not found to be significantly associated with DFU. Diabetic foot ulcer was found to be significantly associated with being male, tobacco chewers, tobacco chewers + smokers, alcoholics, smokers + alcoholics, Family history of diabetes, and insulin users.
Conclusions: Prevalence of diabetic foot ulcer among diabetic patients was very high. Tobacco use, alcohol use, mixed of tobacco and alcohol use, and family history of diabetes were significant risk factors for diabetic foot ulcer.

Keywords: Alcohol, Diabetic foot ulcer, Smokers

INTRODUCTION

There are an estimated 42 million cases of diabetes mellitus in India. Thus, Indian ranks number in the top ten countries with high diabetes burden.[1,2]

Diabetes is a metabolic disorder which affects not only carbohydrate but also protein and fat metabolism. Diabetes is also associated with acute as well chronic complications. Almost most of the organs, tissues and systems are affected due to long standing diabetes mellitus. Thus, adult and elderly with long standing diabetes patients often present to the clinics with multiple complications. Among all these well-known complications, diabetic foot ulcer is the most common. It affects as many as 15% of patients with diabetes mellitus during their lifetime.[2]

Diabetic people are prone to develop diabetic foot ulcer. But risk factors for this are many. Walking barefoot i.e. without shoes or appropriate foot protection is one such risk factor which is related to social and cultural

practices. Lack of proper health infrastructure delays the time the patient to be seen and increases the risk of foot amputation. If the patient is poor, then he may not be able to afford the cost of repeated physician visits. In addition to these factors, smoking, tobacco use in any form and alcohol use increase the risk of diabetic foot ulcer.[3]

If diabetic foot ulcer is neglected there is no choice but to ampute the foot. This results into distorted body image, may lead to loss of employment, may also lead to dependency on others, impacts the finances by increasing the cost of health care and also affects the psychology of the patient.[4]

Diabetic foot ulcer puts enormous social impact on the patient. The patient may get isolated socially, he may lose his prior social role, stigma and discrimination are common.[5]

Like other complications of diabetes mellitus, diabetic foot ulcer is also easily preventable. Proper care by diabetic patient has shown to reduce the incidence of diabetic foot ulcer as well as consequent foot amputation by about 80% which is a great advantage for the patient as well as society. Simple measures like control of blood sugar, appropriate diet, staying away from addictions like smoking, tobacco in any form, proper foot care, regular checkup, good hemoglobin levels, controlled blood pressure levels, controlled lipid levels etc.[6,7]

To prevent the complications like diabetic foot, it is very essential that the patient should go for regular checkup and proper and adequate treatment.[8]

Hence present was undertaken to identify the risk factors and prevalence of diabetic foot ulcer in our present settings, so that patients can be made aware and can be managed adequately.

METHODS

The study was a hospital based cross sectional study. Present study was carried out at outpatient department of General Medicine. The study was carried out for a period of January 2018 to June 2018. Only patients willing to participate were included in the present study after their verbal informed consent after explaining them the nature of the study. Patient confidentiality will be maintained. The patients diagnosed with diabetic foot ulcer were given appropriate treatment, follow up and health education. The study patients were not subjected for any kind of invasive procedure for the present study purpose.

Sample size

Based on the findings of the previous study it was found that the prevalence of diabetic foot ulcer among diabetic patients was 15%.[9,10]

Using this prevalence with 95% confidence interval with 5% precision and alpha error of 5% the sample size came out to be 196. It was rounded to 200.

Inclusion criteria

- Patients attending the outpatient department of General Medicine
- Patients willing to participate in the present study
- Patients aged 19 years and above.

Exclusion criteria

- Patients found to be suffering from severe systemic illness.
- Debilitated patients who cannot participate.

All eligible patients willing to participate in the present study were included in the present study. The data from patients was taken in the pre-designed, pre-tested, semi structured study questionnaire for the present study.

Diabetic foot ulcer was diagnosed as per the standard criteria and based on the physician acumen. An attempt was made to identify the risk factors like smoking etc.

The diagnosed patient was given appropriate treatment. If required, the patient was advised investigations. The patients were given health education to prevent further progression of the disease.

Statistical analysis

The data was entered in the Microsoft Excel work sheet. Descriptive data was expressed in proportions. Statistical tests like chi square test and odds ratio were applied to study association between risk factors and the disease.

RESULTS

Males were more than females. majority of the patients were found in the age group of 51-60 years (35.5%) followed by 41-50 years (23.5%). Similar trend was found for males and females.

Table 1: Age and sex wise distribution of study subjects.

Age (years)	Male		Female		Total	
	No.	%	No.	%	No.	%
19-30	11	84.6	02	15.4	13	6.5
31-40	19	65.5	10	34.5	29	14.5
41-50	21	44.7	26	55.3	47	23.5
51-60	34	47.9	37	52.1	71	35.5
61-70	19	54.3	16	45.7	35	17.5
> 70	107	53.5	93	46.5	200	100

Table 2: Distribution of study subjects as per their socio-demographic variables.

Socio-demographic variables		Number	%
Residence	Urban	31	15.5
	Rural	169	84.5
Education	Illiterate	138	69
	Up to Intermediate	39	19.5
	Higher	23	11.5

Majority of the diabetic patients were from rural area i.e. 84.5%. this is because the present medical college where the study was carried out is in the rural area. Majority were illiterate i.e. 69%.

Table 3: Distribution of study subjects as per their habits.

Habits		Number	%
Smoking	Yes	43	21.5
	No	157	78.5
Alcohol	Yes	80	40
	No	120	60
Tobacco chewing	Yes	25	12.5
	No	175	87.5
Smoking + chewing tobacco	Yes	15	7.5
	No	185	92.5
Smoking + alcohol	Yes	41	20.5
	No	159	79.5

Around 21.5% were found to be smokers. 40% were using alcohol regularly. 12.5% were tobacco chewers. 7.5% were smoking tobacco as well as chewing tobacco. 20.5% were found to be smokers as well as using alcohol.

Table 4: Distribution of study subjects as per the BMI.

Variable		Number	%
BMI (kg/m^2)	Underweight (< 18.5)	10	5
	Normal (18.5-24.99)	89	44.5
	Overweight (25-29.99)	73	36.5
	Obese (≥30)	28	14

Around 44.5% of the study subjects were having normal body mass index. Only 5% were underweight. 36.5% were overweight and 14% were obese.

Table 5: Prevalence of diabetic foot ulcer.

Diabetic foot ulcer	Number	Percentage
Yes	32	16
No	168	84
Total	200	100

Prevalence of diabetic foot ulcer among diabetic patients was found to be 16% while 84% of the diabetes patients were not having diabetic foot ulcer.

Table 6 shows association between various factors and diabetic foot ulcer (DFU). Age, residence, literacy, duration of diabetes and obesity were not found to be significantly associated with DFU. Prevalence of DFU was 24.3% among males compared to only 6.5% among females and this difference was statistically significant. Males were four times more prone to develop DFU. Prevalence of DFU was 39.5% among smokers compared to only 9.6% among non-smokers and this difference was statistically significant. Smokers were 6.19 times more prone to develop DFU.

Prevalence of DFU was 44% among tobacco chewers compared to only 12% among no tobacco chewers and this difference was statistically significant. tobacco chewers were 5.7 times more prone to develop DFU.

Prevalence of DFU was 60% among tobacco chewers + smokers compared to only 12.4% among no tobacco chewers and non-smokers and this difference was statistically significant. tobacco chewers + smokers were 10.5 times more prone to develop DFU.

Prevalence of DFU was 30% among alcoholics compared to only 6.7% among non-alcoholics and this difference was statistically significant. Alcoholics were six times more prone to develop DFU.

Prevalence of DFU was 43.9% among smokers + alcoholics compared to only 8.8% among no smokers + alcoholics and this difference was statistically significant. smokers + alcoholics were 8.1 times more prone to develop DFU.

Prevalence of DFU was 23.5% among Family history of diabetes compared to only 10.4% among no Family history of diabetes and this difference was statistically significant. Family history of diabetes were 8.1 times more prone to develop DFU.

Prevalence of DFU was 37.5% among insulin users compared to only 11.9% among no insulin users and this difference was statistically significant. insulin users were 4.4 times more prone to develop DFU.

As per duration of diabetes the subjects were equally divided i.e. 49.5% were with more than five years of diabetes duration compared to 51.5% with duration of diabetes of less than five years. Majority patients with foot ulcer had duration of less than one year compared to duration of more than one year.

Majority of the patients were using oral hypoglycemic drugs. Only 13.5% were using insulin. Majority had no history of recurrent ulcers and only 5.5% had past healed ulcers. 42.5% of the patients had family history of diabetes.

Table 6: Association of various factors with diabetic foot ulcer.

Factors		Diabetic foot ulcer		Chi square	P value	Odds Ratio (95% CI)
		Yes	No			
Age (years)	19-30	5 (38.5%)	8 (61.5%)	5.897	0.206987	-
	31-40	5 (17.2%)	24 (82.8%)			
	41-50	6 (12.8%)	41 (87.2%)			
	51-60	10 (14.3%)	60 (85.7%)			
	> 60	5 (12.5%)	35 (87.5%)			
Sex	Male	26 (24.3%)	81 (75.7%)	10.5	0.0003070	4.654 (1.822-11.89)
	Female	6 (6.5%)	87 (93.5%)			
Residence	Urban	6 (19.4%)	25 (80.6%)	0.08283	0.3868	1.32 (1.4934-3.531)
	Rural	26 (15.4%)	143 (84.6%)			
Education	Illiterate	21 (15.2%)	117 (84.8%)	0.05851	0.4044	0.8322 (0.3739- 1.852)
	Literate	11 (17.7%)	51 (82.3%)			
Smoking	Yes	17 (39.5%)	26 (60.5%)	20.4	0.000003143	6.19 (2.752- 13.92)
	No	15 (9.6%)	142 (90.4%)			
Tobacco chewing	Yes	11 (44%)	14 (56%)	14.37	0.00007506	5.762 (2.315- 14.34)
	No	21 (12%)	154 (88%)			
Smoking + chewing tobacco	Yes	9 (60%)	6 (40%)	19.95	0.000003967	10.57 (3.442- 32.43)
	No	23 (12.4%)	162 (87.6%)			
Alcohol use	Yes	24 (30%)	56 (70%)	17.75	0.00001262	6 (2.534-14.21)
	No	8 (6.7%)	112 (93.3%)			
Smoking + alcohol	Yes	18 (43.9%)	23 (56.1%)	27.32	<0.0000001	8.106 (3.551- 18.5)
	No	14 (8.8%)	145 (91.2%)			
Family history of diabetes	Yes	20 (23.5%)	65 (76.5%)	5.299	0.01067	2.641 (1.211-5.762)
	No	12 (10.4%)	103 (89.6%)			
Overweight and obese	Yes	19 (18.8%)	82 (81.2%)	0.8149		1.533 (0.7115- 3.302)
	No	13 (13.1%)	86 (86.9%)			
Duration of diabetes	> 5 years	14 (14.1%)	85 (85.9%)	0.2672	0.3026	0.7595 (0.3548- 1.626)
	< 5 years	18 (17.8%)	83 (82.2%)			
Use of insulin	Yes	12 (37.5%)	20 (62.5%)	11.27	0.0003945	4.44 (1.889- 10.43)
	No	20 (11.9%)	148 (88.1%)			

Table 7: Distribution of diabetic patients as per various attributes of diabetes.

Various attributes		Number	%
Duration of diabetes	> 5 years	99	49.5
	< 5 years	101	51.5
Duration of foot ulcer	> 1 year	05	2.5
	< 1 year	27	13.5
Use of oral hypoglycemic drugs	Yes	179	89.5
	No	21	10.5
Use of insulin	Yes	27	13.5
	No	173	86.5
Recurrent ulcers	Yes	15	7.5
	No	185	92.5
Past healed ulcers	Yes	11	5.5
	No	189	94.5
Family history of diabetes	Yes	85	42.5
	No	115	57.5

DISCUSSION

The prevalence of diabetic foot ulcer was 24.3% in males and only 6.5% in females in this hospital based cross sectional study. It was found to be associated with smoking, tobacco chewing, alcohol use, family history of diabetes and insulin use.

Dalem Pemayun TG et al, found that 16.2% were having diabetic foot which is similar to the present study.[10] The mean age in their study was 54.3±8.6 years. The patients were not aware about the causes of ulcer. Most of the patients had ulcers before admission. We also found that 32 patients had ulcers prior to admission. 36.3% of the patients underwent amputations of leg.

Liaofang Wu et al, studied 296 patients.[11] They found that 42% of the patients had foot deformity which is more than the finding of the present study.

They noted that most common abnormality in foot was hallux valgus. 12.5% patients gave history of ulceration. 35.1% of the patients were low risk and 49% of the patients were at high risk.

Al-Maskari F et al, in their study had 49% with diabetes and 35% with hypertension.[12] 86% had type 2 diabetes. They noted that being male, low level of literacy, prolonged duration of diabetes mellitus, having type 2 diabetes mellitus, and microalbuminuria were the most common risk factors for DFU. We also found that prolonged duration of diabetes mellitus was a significant risk factor for DFU.

Nyamu PN et al, studied 1780 diabetic patients and found that the prevalence of DFU was 4.6% which is very compared to the prevalence found in the present study which is 16%.[13] In their study 47.5% of the ulcers were neuropathic, 30.5% were neuroischemic and 18% were ischemic. We did not study the ulcer types in the present study. Lack of proper blood sugar control, hypertension, lack of proper self care and infections were significant risk factors in their study. While we found that tobacco use, alcohol use were significant risk factors for DFU.

Al-Rubeaan K et al, found that the prevalence of diabetic foot complications was 3.3 (3.2-3.4%).[14] The prevalence of diabetic foot ulcer was 2.1%, that of gangrene of foot was 0.19% and that of amputations of foot was 1.1%. But we found a very high prevalence of 16% in the present study. The authors found that the prevalence of complications of foot was associated with duration of diabetes and increasing age. But we found that the diabetic foot ulcer was not associated with duration of diabetes and increasing age. But authors noted that insulin use was associated with the foot complications which is similar to the present study findings. Other similar findings were association with smoking.[14]

Zhang P et al, carried out a systematic review and meta analysis and found that the prevalence of diabetic foot ulcer prevalence globally was 6.3%.[15] We found a very high prevalence of 16% in our settings. The authors reported a higher prevalence in males which is similar to the present study. They also noted that increasing age, more duration of diabetes and smoking were associated with the diabetic foot ulcer.[15]

Pemayun TG et al, found that 16.2% were having diabetic foot which is similar to the present study.[10] The mean age in their study was 54.3±8.6 years. The patients were not aware about the causes of ulcer. Most of the patients had ulcers before admission. Authors also found that 32 patients had ulcers prior to admission. 36.3% of the patients underwent amputations of leg.

Wu L et al, studied 296 patients.[11] They found that 42% of the patients had foot deformity which is more than the finding of the present study. They noted that most common abnormality in foot was hallux valgus. 12.5% patients gave history of ulceration. 35.1% of the patients were low risk and 49% of the patients were at high risk.

CONCLUSION

Prevalence of diabetic foot ulcer among diabetic patients was very high. Tobacco use, alcohol use, mixed of tobacco and alcohol use, and family history of diabetes were significant risk factors for diabetic foot ulcer. All diabetic patients should stop using alcohol and tobacco in any form to prevent the occurrence of diabetic foot ulcer.

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