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A Diabetic Foot Survey

Sailaj Ranjitkar[1]; Eli Pradhan[2]; Sujan Paudel[3]; Shreya Pradhan[4]; Subodh Dhakal[5]
[1]Consultant Orthopeadician, Norvic International Hospital, Kathmandu, Nepal [2]Consultant Ophthalmologist, Tilganga Institute of Ophthalmology, Kathmandu Nepal [3]Consultant Orthopeadician, Scheer Memorial Hospital, Banepa, Kathmandu, Nepal, [4]Medical Officer, Kathmandu medical College, Sinamangal, Kathmandu Nepal, [5]Associate Professor, Kathmandu medical College, Sinamangal, Kathmandu Nepal

Abstract

Introduction: Diabetic foot has been defined by the International Working Group on the Diabetic foot and World Health Organisation as a Diabetic patient's foot, associated with neuropathy, ischaemia or both, which has lead to ulceration, infection and/or deep tissue destruction An association of diabetic retinopathy with risk factors of Diabetic foot ulcer has been seen. Hence it is important to assess diabetic patients for risk factors leading to diabetic foot and tally these risks with diabetic retinopathy to help early diagnosis and management of diabetic foot and diabetic retinopathy.
Methodology: This is a community based survey of a cohort of randomly presented patients examined on a first come first service basis limited to maximum of 100 patients to be reviewed in a day in a free health camp in Jaishi Dewal, Kathmandu, Nepal. The data of the patients were noted in a proforma documenting risks of diabetic foot and diabetic retinopathy. Results: Out of the 82 patients reviewed in the medical camp 38 were diabetic (type 2) with a mean age of 60.29 years being more common in females. Risk of Diabetic foot did have a definite association with level of education more common in the lesser educated and occupation (commonest in housewives). Awareness of risk of diabetic foot was only among 39.5% of the diabetic patients. Diabetic retinopathy was also seen only among 18.4% of the diabetic patients, being more common in the educated.
Conclusion: Education and awareness programmes towards diabetic foot protocol are important despite the level of education or occupation. In diabetic patients, it is important to screen for risks of diabetic foot especially if patient has a history of hypertension and also screen for diabetic retinopathy.

Key Words: Diabetic Foot, Risk Factors, Diabetic Retinopathy

Introduction:

Diabetic foot has been defined by the International Working Group on the Diabetic foot and World Health Organisation as a Diabetic patient's foot, associated with neuropathy, ischaemia or both, which has lead to ulceration, infection and/or deep tissue destruction.[1] In developed countries foot ulcers have been seen to be prevalent in 4 to 10% of diabetic patients.[2] It has also been noted that approximately 15% of diabetic patients will develop ulcers in their lower extremity throughout their diabetic life history.[3, 4] Diabetes has been seen to be the commonest cause of non-traumatic lower limb amputation in US and Europe.[5,6] Diabetes and ethnicity has a significant contribution to the rate of lower limb amputation, being more common

Corresponding Author: Dr Sailaj Ranjitkar, MBBS, FRCSed, MSC, FRCSed (Trauma and Orth), MCh (Trauma and Orth) Email: sailaj_r@yahoo.com Contact no: 977 9803999980

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in Mexican, Native and African Americans than Caucasians.[5,7] The commonest cause of lower limb amputation in diabetic patients is foot ulcer.[8,9,10] The risk factors that could cause diabetic foot ulcerations are peripheral neuropathy, vascular disease, limited joint mobility, foot deformities, abnormal foot pressures, minor trauma, a history of ulceration or amputation, and impaired visual acuity.[11,12,13]

There is good evidence that Diabetic foot ulcer (DFU) is associated with Diabetic retinopathy especially if serum creatinine is elevated.[14] An association of diabetic retinopathy with risk factors of Diabetic foot ulcer (sensory neuropathy and neuropathy with vascular foot disease, foot deformity, prior history of ulcer and amputation) has also been seen.[15] Hence it is important to assess diabetic patients for risk factors leading to foot ulcers or diabetic foot and tally these risks with diabetic retinopathy to help early diagnosis and management of diabetic foot and diabetic retinopathy.

Methodology:

This is a community based survey of a cohort of randomly presented patients examined on a first come first service basis limited to maximum of 100 patients to be reviewed in a day. A medical camp was organised in Jaishi Dewal, a small locality in the heart of Kathmandu, Nepal on the ------. This free health camp, focussing on diabetic patients was advertised using banners and by word of mouth. It was managed and financially supported by a local social-service club. The patients were reviewed with the help of a team of Physicians, ophthalmologists, Orthopaedicians, a Dietician, para-medical and nursing staff and the club's members. The programme included an educational section to make the local community aware of Diabetes Mellitus and its management presented on power point by a consultant Physician and a Dietician. Awareness towards complications of Diabetes focussing on Diabetic retinopathy and Diabetic foot was also presented by an Ophthalmology and an Orthopaedic consultant.

The data of the patients was collected in a proforma after taking consent, which stored details like age, sex, height, weight, Body mass index (BMI), type of Diabetes (if previously known), years of Diabetes, random blood sugar, systolic and diastolic blood pressure (BP), level of education, occupation, use of tobacco products, whether under treatment for Diabetes, awareness of diabetic foot, history of foot problems and foot surgery in the past, foot examination clinical findings (looking for risks of diabetic foot and its presence) and findings for Diabetic retinopathy.

The criteria for diagnosing a patient newly with Diabetes Mellitus was if the random blood sugar (capillary blood using a glucometer) was 200mg/dl and above.[16] If random blood sugar was between 140mg/dl and 199mg/dl the patients were advised to confirm if they were diabetic using fasting and post-prandial blood sugar and HBA1C and following up with an endocrinologist in their respective hospital. Similar advice was also given to the newly diagnosed diabetic patients.[16]

Risk of Diabetic foot was analysed on the basis of neuropathy (loss of fine touch over the heel, big toe and little toe, loss of proprioception over first metatarsophalangeal joint), ischaemia (palpable arteria dorsalis pedis and posterior tibial artery), autonomic nervous system and microvascular circulation (skin texture and loss of hair on legs) and mechanical problem (foot deformity). [11,12, 13]

Diabetic retinopathy was diagnosed doing a fundoscopy and classified into mild, moderate, severe and proliferative diabetic macular retinopathy.

This data was transferred onto a SPSS21 data sheet for data analysis. For categorical variable, Chi Square test was used and for the violation of chi square assumption, Fisher Exact test was used.

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Results:

Among the patients who presented to the health camp we were able to collect data of 82 patients. Out of the total, 34 were previously diagnosed as diabetic patients and 4 were newly diagnosed in the health camp on the basis of the random blood sugar level.[16] Therefore, the data of 38 diabetic patients were analysed.

The mean age of the 38 diabetic patients was 60.29 years (95% CI: 55.90 to 64.67) with a male: female ratio of 1:1.38. The mean BMI was 27.25 (95% CI 25.64 to 28.86); mean random blood sugar 197.58 mg/dl (95% CI: 168.24 to 226.92), mean systolic and diastolic BP of 125 mm of Hg (95% CI: 117.92 to 132.08) and 77.11 mm of Hg (95% CI: 73.96 to 80.25) respectively. The level of education of these patients was variable ranging from illiterate to higher beyond bachelor level, highest frequency being illiterate (Table 1). The occupation of these patients was also variable highest being housewives (Table 1). Most of these patients were non-smokers (Table 2) and hypertension was the most common co-morbid condition although heart, lipid, kidney and thyroid pathologies were also present (Table 2)

Table 1: Demographic information of patients

Variables	Categories	Count	%
Sex of patient	Male	16	42.1%
	Female	22	57.9%
	Total	38	100.0%
Type of diabetes	Type 1	0	0.0%
	Type 2	34	89.5%
	Unknown (newly diagnosed DM)	4	10.5%
	Total	38	100.0%
Education level of patient	Illiterate	7	20.0%
	Literate	4	11.4%
	Primary level	1	2.9%
	Secondary level	5	14.3%
	Intermediate	6	17.1%
	Bachelor	6	17.1%
	Higher	6	17.1%
	Total	35	100.0%
Occupation of patient	Farmer	0	0.0%
	Government officer	1	2.8%
	Businessman	7	19.4%
	Labourer	1	2.8%
	Housewife	14	38.9%
	Self-employed	5	13.9%
	Unemployed	3	8.3%
	Others	4	11.1%
	Teacher	1	2.8%
	Total	36	100.0%

Note: 3 people (7.9%) of Education and 2 people (5.3%) of Occupation were unspecified.

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Table 2: Smoking and Comorbidities of patients

Variables	Categories	Count	%
Smokes or takes betel	Yes	10	27.8%
	No	26	72.2%
	Total	36	100.0%
Smokes and takes betel now	Yes	5	13.9%
	No	31	86.1%
	Total	36	100.0%
Co morbidities	Present	26	72.2%
	Absent	10	27.8%
	Total	36	100.0%
If present specify	HTN	15	57.7%
	Lipids	1	3.8%
	Peripheral neuropathy	1	3.8%
	HTN & peripheral neuropathy	2	7.7%
	HTN & lipids	1	3.8%
	Post nephrectomy donor	1	3.8%
	HTN & kidney	1	3.8%
	LIPIDS, heart & thyroid	1	3.8%
	HTN & heart	1	3.8%
	HTN, lipids, heart, anaemia & kidney	1	3.8%
	HTN, kidney & stroke	1	3.8%
	Total	26	100.0%

Note: There were 2 (5.3%) people were unspecified.

Considering the patients who were previously diagnosed with diabetes (no: 34), the mean years since being diagnosed with the disease was 99 months (95% CI: 59.34 to 138.88), all of them being non-insulin dependent. The remaining four newly diagnosed diabetic patients were non-insulin dependent too. Most of the patients (82.1%) were managed using tablets and 17.9% used insulin and tablets (Table 3).

Table 3: Treatment of Diabetes Mellitus patients

Variables	Categories	Count	%
Under treatment for diabetes	Yes	28	75.7%
	No	9	24.3%
	Total	37	100.0%
If having treatment of DM, specify	Tablets	23	82.1%
	Tablet & insulin	5	17.9%
	Diet control	0	0.0%
	Total	28	100.0%
If not having treatment of DM, specify	Nothing	3	33.3%
	Diet Control	6	66.7%
	Total	9	100.0%

Note: One patient (2.6%) was unspecified.

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Considering Diabetic foot, 15 (39.5%) were aware of the condition, 4 (10.5%) had foot problem in the past and 2 (5.3%) had had foot surgery. With relation to the skin condition, hair loss on leg, loss of palpable pedal pulse, loss of fine touch and proprioception in foot and foot deformity; risk to develop diabetic foot was seen in 17 (56.7%) patients (Table 4) with a male: female ratio of 1:2.4. ANS and microcirculation pathology (26.3%) was the commonest risk to develop Diabetic foot (Table 5).

Table 4: Cross tabulation of risks for Diabetic foot with Gender

Gender	Yes Count	%	No Count	%	Total Count	%	p value
Male	5	29.4%	7	53.8%	12	40.0%	
Female	12	70.6%	6	46.2%	18	60.0%	0.176
Total	17	100.0%	13	100.0%	30	100.0%	

Table 5: Types of risks for Diabetic foot

Risks for diabetic foot	Frequency	Percent
Vascular pathology	1	5.9%
ANS & microcirculation pathology	10	58.8%
Mechanical	1	5.9%
ANS, microcirculation and mechanical pathology	2	11.8%
ANS, microcirculation & neuropathy	2	11.8%
ANS, microcirculation, vascular & mechanical	1	5.9%
Total	17	100.0%

Risk of Diabetic foot did have a definite association with level of education (more common in the lesser educated) (Table 6) and occupation (commonest in housewives followed by businessman) (Table 6). Awareness of risk of Diabetic foot was only among 5 of the 17 patients who had the risk of Diabetic foot. None of the patients had Diabetic foot.

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Table 6: Diabetic foot with relation to education and occupation of patient

		Does patient have risk of diabetic foot					
		Yes Count	%	No Count	%	Total Count	%
Level of Education	Illiterate	3	17.6	2	15.4	7	20
	Literate	4	23.5	0	0	4	11.4
	Primary level	1	5.9	0	0	1	2.9
	Secondary level	2	11.8	2	15.4	5	14.3
	Intermediate	3	17.6	2	15.4	6	17.1
	Bachelor	2	11.8	4	30.8	6	17.1
	Higher	2	11.8	3	23.1	6	17.1
	Total	17	100	13	100	35	100
Occupation	Government	1	5.9	0	0	1	2.8
	Businessman	4	23.5	3	23.1	7	19.4
	Labourer	1	5.9	0	0	1	2.8
	Housewife	6	35.3	5	38.5	14	38.9
	Self-employed	1	5.9	3	23.1	5	13.9
	Unemployed	2	11.8	1	7.7	3	8.3
	Others	2	11.8	1	7.7	4	11.1
	Teacher	0	0	0	0	1	2.8
	Total	17	100	13	100	36	100

Diabetic retinopathy in either of the eyes was seen in 7 patients (18.4%) with a male: female ratio of 1.33:1 (Table 7). Retinopathy was seen more in the educated though not significant. (Table: 8). Out of the 17 patients who had risk of diabetic foot, 2 had an association with ANS and microcirculation as a risk of diabetic foot as well as diabetic retinopathy.

Table 7: Diabetic Retinopathy

Variables	Categories	Count	%
Does patient have right diabetic retinopathy	No	32	84.2%
	Yes	6	15.8%
	Total	38	100.0%
If yes, specify	Mild	3	50.0%
	Moderate	2	33.3%
	Proliferative diabetic macular retinopathy with macular oedema	1	16.7%
	Total	6	100.0%
Does patient have left diabetic retinopathy	No	31	81.6%
	Yes	7	18.4%
	Total	38	100.0%
If yes, specify	Mild	1	14.3%
	Moderate	5	71.4%
	Proliferative diabetic macular retinopathy	1	14.3%
	Total	7	100.0%
Retinopathy either eye	Yes	7	18.4%
	No	31	81.6%
	Total	38	100.0%

Table 8: Diabetic retinopathy with relation to education and occupation of patient

		Retinopathy either eye					
		Yes Count	%	No Count	%	Total Count	%
Education level of patient	Illiterate	1	20.0%	6	20.0%	7	20.0%
	Literate	0	0.0%	4	13.3%	4	11.4%
	Primary level	0	0.0%	1	3.3%	1	2.9%
	Secondary level	1	20.0%	4	13.3%	5	14.3%
	Intermediate	1	20.0%	5	16.7%	6	17.1%
	Bachelor	0	0.0%	6	20.0%	6	17.1%
	Higher	2	40.0%	4	13.3%	6	17.1%
	Total	5	100.0%	30	100.0%	35	100.0%
Occupation of patient	Farmer	0	0.0%	0	0.0%	0	0.0%
	Government	0	0.0%	1	3.3%	1	2.8%
	Businessman	1	16.7%	6	20.0%	7	19.4%
	Labourer	0	0.0%	1	3.3%	1	2.8%
	Housewife	1	16.7%	13	43.3%	14	38.9%
	Self-employed	1	16.7%	4	13.3%	5	13.9%
	Unemployed	1	16.7%	2	6.7%	3	8.3%
	Others	2	33.3%	2	6.7%	4	11.1%
	Teacher	0	0.0%	1	3.3%	1	2.8%
	Total	6	100.0%	30	100.0%	36	100.0%

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There was no association seen between risk of diabetic foot and diabetic retinopathy considering no statistical significance (Table 9). Similarly, no association was also seen in patients with 10 years or more of diabetes with risk of diabetic foot (Table 10) and Diabetic retinopathy (Table 11) but diabetic patients who had history of hypertension showed risk of developing Diabetic foot (Table 12). Hypertension in Diabetic patents however did not have association with Diabetic retinopathy (Table 13).

Table 9: ASSOCIATION OF DIABETIC RETINOPATHY WITH RISK OF DIABETIC FOOT

Cross tabulation

DOES PATIENT HAVE RISK OF DIABETIC FOOT	RETINOPATHY EITHER EYE				p value
	Yes		No		
	n	%	n	%	
Yes	2	50.0%	15	57.7%	1.00
No	2	50.0%	11	42.3%	
Total	4	100.0%	26	100.0%	

Table 10: ASSOCIATION OF 10 YEARS AND MORE OF DIABETES WITH RISK OF DIABETIC FOOT

Cross tabulation

10 YEARS AND MORE THAN 10 YEARS OF DIABETES	DOES PATIENT HAVE RISK OF DIABETIC FOOT				p value
	Yes		No		
	n	%	n	%	
Yes	4	28.6%	2	16.7%	0.652
No	10	71.4%	10	83.3%	
Total	14	100.0%	12	100.0%	

Table 11: ASSOCIATION OF 10 YEARS AND MORE OF DIABETES WITH DIABETIC RETINOPATHY

Cross tabulation

10 YEARS AND MORE THAN 10 YEARS OF DIABETES	RETINOPATHY EITHER EYE				p value
	Yes		No		
	n	%	n	%	
Yes	3	42.9%	6	23.1%	0.358
No	4	57.1%	20	76.9%	
Total	7	100.0%	26	100.0%	

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Table 12: ASSOCIATION OF HYPERTENSION WITH RISK OF DIABETIC FOOT
Cross tabulation

HYPERTENSION OF PATIENTS	DOES PATIENT HAVE RISK OF DIABETIC FOOT				p value
	Yes		No		
	n	%	n	%	
Yes	14	82.4%	4	30.8%	0.004
No	3	17.6%	9	69.2%	
Total	17	100.0%	13	100.0%	

Table 13: ASSOCIATION OF HYPERTENSION WITH DIABETIC RETINOPATHY
Cross tabulation

HYPERTENSION OF PATIENTS	RETINOPATHY EITHER EYE				p value
	Yes		No		
	n	%	n	%	
Yes	5	83.3%	17	56.7%	0.370
No	1	16.7%	13	43.3%	
Total	6	100.0%	30	100.0%	

DISCUSSION:

The prevalence of type 2 Diabetes Mellitus in Nepal is 8.4% [17] with higher prevalence in the urban population.[18] The prevalence of Diabetic retinopathy in Nepal has been seen to range from 19.3 to 78% [19,20] and the prevalence of Diabetic foot in Nepal was noted to be 21.4% .[21] Compared to these studies [17,18,19,20,21], this is a small pilot study in a small population. This can however be considered acceptable and representing a larger population considering patients were reviewed randomly from a population on a first come first service basis. Advertisement for the medical camp targeted to diabetic patients can be considered selection bias.

In this study, only type 2 diabetic patients have been reviewed, which however is the common type.[21,22] Diabetes Mellitus was seen to be more common in the female sex, the finding being comparable to other larger studies [15,21, 22] although diabetic foot was observed to be commoner in males.[23] In our study, risk of diabetic foot was seen to be more common in females, which does not match other larger studies.[23,24] The possible difference could be owing to the small sample studied. It is therefore a worthwhile question, why diabetic foot is more common in males[24] even though diabetes mellitus is more common in females. It may be due to gender inequality at work as only 26% of the paid employees are females and 8.3%of females fall in the paid labour category in Nepal.[25] In addition males are exposed to more trauma and may be wearing inappropriate footwear.[26] Thus, it may be important to consider protective gears[27,28] if the work place is influencing this male predominance of diabetic foot.

Awareness programmes[28] and education towards Diabetic foot care protocols[29] are vital too as only a small proportion of patients were aware of risks of diabetic foot in our study also considering that the commonest risk of diabetic foot noted was ANS and microcirculation pathology which is an important commonly influencing risk factor.[11,12,13]

Considering that Diabetic patients and patients with

risk of diabetic foot were mainly from the lesser-educated cohort and frequently more common among housewives, it becomes more compelling for us to approach these patients at the community level not only with local clinics but also with education programmes.[29]

Surprisingly, as diabetic retinopathy was more inclined towards the educated it can be suggested that awareness programmes are necessary even if people are educated. Diabetic retinopathy being more common among housewives also suggests the importance of education programmes at the community level.

As the number of smokers among the diabetic patients was small no positive findings was considered.

With relation to comorbidities, chance of risks of diabetic foot was seen to be significant if there was a history of hypertension. This finding has been supported by a previous study; which has also suggested hypertension as a risk factor to develop foot ulcers, gangrene and amputation in diabetic patients.[30]

Although our study has not shown significant association of hypertension with diabetic retinopathy there is evidence to prove the same.[31] Similarly, though no association was seen between patients who had 10 years or more of diabetes and risk of diabetic foot and diabetic retinopathy previous studies have shown good association between them.[32,33] This study has also not confirmed the association of Diabetic retinopathy and risk factors of Diabetic foot, though there is good evidence for the same.[15] These differences between available literature and our study are probably owing to the small sample size.

It does however show the importance to check all diabetic patients for risks of diabetic foot, and diabetic retinopathy and the importance of thinking of either, if one is present especially if accompanied with risk factors. This may help to diagnose either of the conditions early for earlier management.

CONCLUSION:

Education and awareness programmes towards diabetic foot protocol are important despite the level of education or occupation. In diabetic patients, it is important to screen for risks of diabetic foot especially if patient has a history of hypertension and also screen for diabetic retinopathy.

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