

FOOT ABNORMALITIES IN DIABETICS: PREVALENCE & PREDICTORS IN BASRAH, IRAQ

Abbas Ali Mansour¹, Husam Jihad Imran²

ABSTRACTS

Background: The diabetic foot abnormalities is clearly one of the most important complications of diabetes mellitus (DM) and is the leading cause of hospitalization with substantial morbidity, impairment of quality of life and engender high treatment costs. The aim of this study was to estimate the prevalence of diabetic foot abnormalities among patients with type 2 DM and the predictors of these abnormalities in Basrah, Iraq.

Patients and Methods: This was cross sectional study of patients attending the out patient clinic of two hospitals in Basrah (the General and the Teaching) for the period from January to the end of December 2005. All patients were having type 2 DM.

Results: The total number of patients was 182 (80 males and 102 females). Diabetic foot abnormalities were reported in 46.7% of patients. Most of patients were having more than one abnormality. Structural foot abnormalities reported in diabetic patients were prominent metatarsal heads in 36.2%, wasting in 11.5% hammer toes in 10.9%, pes cavus in 5.4%, claw toes in 3.8%, and amputees in 2.1%. While skin changes includes dryness of the skin in 17%, fissures in the skin in 14.7%, callosities in 14.2%, Tinea pedis in 13.7%, foot ulcer in 13.7%, and nails changes in 7.1%. Peripheral neuropathy and dermopathy were seen in 21.9% and 6% respectively.

Conclusions: Variables that predict foot abnormalities were higher age, male sex, less school achievement, longer duration of DM, higher BMI, smoking history, low social class, insulin use, hypertension, heart failure and proteinuria.

KEY WORDS: Diabetic foot, Ulcer, Prevalence, Basrah, Iraq.

Pak J Med Sci July - September 2006 Vol. 22 No. 3 229-233

INTRODUCTION

The diabetic foot abnormalities is clearly one of the most important complications of diabetes mellitus (DM) and is the leading cause of hospitalization with substantial morbidity, impairment of quality of life and engender high treatment costs.^{1,2} It not only occurs as a typical complication in the late stages of

diabetes but also in patients with newly diagnosed DM.

Motor neuropathy leads to muscle atrophy, foot deformity, altered biomechanics of walking, and redistribution of foot pressures during standing and walking lead to callus.^{3,4} Abundant callus formation on pressure points (which acts like a foreign body and further increases pressure) together with thinning of the submetatarsal head fat-pads, additionally increases the force of plantar pressure and ultimately results in foot ulceration.

The risk of ulceration is proportional to the number of risk factors. The risk is increased by 1.7 in persons with isolated peripheral neuropathy, by 12 in those with peripheral neuropathy and foot deformity and by 36 in those with peripheral neuropathy, deformity, and previous amputation, as compared with persons without risk factors.⁵

1. Dr. Abbas Ali Mansour,
2. Dr. Husam Jihad Imran,
- 1-2: Department of Medicine,
Basrah College of Medicine, Iraq.

Correspondences:

Dr. Abbas Ali Mansour,
Hattin Post Office,
P.O. Box: 142,
Basrah - 42002,
Iraq.
E-Mail: aambaam@yahoo.com

* Received for Publication: March 29, 2006

* Accepted: May 2, 2006

In developing countries, which will experience the greatest rise in the prevalence of type 2 DM in the next 20 years, people at greatest risk of ulceration can easily be identified by careful clinical examination of the feet. Education and frequent follow-up is indicated for these patients.⁶ As the world is facing an epidemic of type 2 DM and an increasing incidence of type 1 DM, the International Diabetes Federation had chosen to focus on the global burden of diabetic foot disease in 2005. Data on diabetic foot in Iraq are scanty and anecdotal.⁷

The aim of this study was to estimate the prevalence of diabetic foot abnormalities among patients with type 2 DM and the predictors of these abnormalities in Basrah.

PATIENTS AND METHODS

This was a cross sectional study of patients attending the out patient clinic of two hospitals in Basrah (the General and the Teaching) for the period from January to the end of December 2005. All patients were having type 2 DM. Diabetes and hypertension was defined as self-reported physician diagnosis of diabetes and hypertension.⁸

For all patients history was taken including age of the patients, smoking, job, and qualification (years of school achievement). Social class calculated, and each patient was classified into low, and other socioeconomic status, based on the aggregate score of education, occupation, and income.⁹ They were asked about duration of diabetes, medications, hospitalization and previous diabetic foot problems. Subjects reporting smoking at least one cigarette per day during the year before the examination were classified as smokers. All patients were examined for weight, height, blood pressure, body mass index (BMI), calculated according to Quetelet formula (weight in kilograms divided by height in metres squared). Skin and peripheral pulsation were examined. Both feet examined for structural foot abnormalities and skin changes.

Structural foot abnormalities was defined as follow: prominent metatarsal heads was

defined as "any palpable plantar prominences of the metatarsal site of the foot," and high medial arch (pes cavus) as "an abnormally high medial longitudinal arch, which extends between the first metatarsal head and the calcaneus."^{4,10,11} Extension contracture at the metatarsophalangeal (MTP) joint with flexion contracture at the proximal interphalangeal (PIP) joint is called hammer toe while hyperextension of the MTP and flexion of the PIP and distal interphalangeal (DIP) joint is termed a claw toe. Wasting was considered when there is guttering between metatarsal heads.

Skin was examined for callus which was defined as any hyperkeratotic formation due to shear stresses, usually in proximity to a bony prominence. Dryness was assessed objectively, fissures were included in any skin break that does not fit for the definition of foot ulcer below. Nails changes includes any longitudinal ridging, fissuring, separations, loss or thickening.^{4,10,11} Diabetic foot ulcer was defined as any full-thickness skin lesion distal to the ankle excluding minor abrasions, fissures or blisters. Interdigital fungal infection (Tinea pedis) were considered as any white, macerated skin between any web spaces.¹²

Metabolic control was according to American Diabetes Association (ADA) with fasting plasma glucose of 90–130 (5.0–7.2) mg/dL (mmol/L) and postprandial plasma glucose of less than 180 (< 10.0) mg/dL (mmol/L).¹³ Average of at least 3 readings were taken. Diagnosis of peripheral neuropathy was according to quantitative assessment of symptoms and physical finding according to others practice.¹⁴

Electrocardiography (ECG) was done for all and urine examined for overt proteinuria. Proteinuria was diagnosed on the basis of persistent frank proteinuria without erythrocytes or white blood cells in urine. Electrocardiographic changes were considered according to practice.¹⁵ Heart failure diagnosis was based on history and physician diagnosis with echocardiography.

Continuous variables were summarized as the mean \pm SD. Categorical variables were

Table-I: Patient's characteristics

Variables	No. (%)
Number	182(100)
Sex	
Male	80(43.9)
Females	102(56)
Age(years) mean \pm SD	56 \pm 8.4
Qualification (years of school achievement) mean \pm SD	2.5 \pm 4
Duration of diabetes mellitus mean \pm SD	7.6 \pm 6.1
BMI mean \pm SD	25.6 \pm 2.5
Smoker	34(18.6)
Employment	
Employed	57(33.1)
Non -employed	125(68.6)
Residency	
Urban	41(22.5)
Rural	141(77.4)
Social class	
Low	158(86.8)
Other social class	24(13.1)
Treatment /diet alone	30(16.4)
Treatment/ oral hypoglycemic agents	134(73.6)
Treatment/ insulin with or with out oral drugs	18(9.8)
Glycemic control	
Non-optimal	172(94.5)
Optimal	10(5.4)
Hypertension	95(52.1)
Heart failure	38(20.8)
ECG changes	116(63.7)
Proteinuria	48(26.3)
Past history of diabetic foot	7(3.8)

summarized as percentages. For statistical analysis a chi-square test was used. A comparison of 2 means was carried out with an unpaired Student t test. The level of significance was set to be <0.05 throughout the analysis.

RESULTS

The total number of patients was 182 (80 males and 102 females), with mean age of 56 \pm 8.4 year, and qualification of 2.5 \pm 4 year (Table-I). Duration of DM was 7.6 \pm 6.1 year and BMI of 25.6 \pm 2.5. Sixty eight point six percent were non-employed and 77.4% were from rural area. Most of them were from low social class (86.8%). Their treatment were diet with oral hypoglycemic drugs in 73.6% and most of them were having non-optimal glycemic control (94.5%) according to ADA. Hypertension was present in 52.1% with heart failure in 20.8%, ECG changes in 63.7% and proteinuria in 26.3%.

Structural foot abnormalities reported in diabetic patients were prominent metatarsal

Table-II: Foot abnormalities

Abnormalities	No. (%)
Structural foot abnormalities	
Prominent metatarsal heads	66(36.2)
Wasting	21(11.5)
Hammer toes	20(10.9)
Pes cavus	10(5.4)
Amputees	4(2.1)
Skin changes	
Dryness of the skin	31(17)
Fissures in the skin	27(14.7)
Callosities	26(14.2)
Tinea pedis	25(13.7)
foot ulcer	25(13.7)
Nails changes	13(7.1)
Others	
Peripheral neuropathy	40(21.9)
Dermopathy	11(6)

heads in 36.2%, wasting in 11.5% hammer toes in 10.9%, pes cavus in 5.4%, claw toes in 3.8%, and amputees in 2.1% (Table-II). While skin changes includes dryness of the skin in 17%, fissures in the skin in 14.7%, callosities in 14.2%, Tinea pedis in 13.7%, foot ulcer in 13.7% and nails changes in 7.1%. Peripheral neuropathy and dermopathy were seen in 21.9% and 6% respectively.

Diabetic foot abnormalities were reported in 46.7% of patients (Table-III). Most of the patients were having more than one abnormality. Variables predicts foot abnormalities, that are statistically significant were higher age, male sex, less school achievement, longer duration of DM, higher BMI, smoking history, low social class, insulin use, hypertension, heart failure and proteinuria.

DISCUSSION

Foot abnormalities were reported in 46.7% in this study with mean age of 62 \pm 6.2 year. A population based study in Minnesota showed that most diabetic patients have foot problems after age 40 and that the incidence of these problems increases with age.¹⁶

The commonest structural foot abnormalities in our study were prominent metatarsal heads (36.2%), followed by wasting (11.5%), than hammer toes (10.9%) and claw toes (3.8%).

Table-III: Predictors of foot abnormalities

<i>Variables</i>	<i>Foot abnormalities</i> No. (%)	<i>No foot abnormalities</i> No. (%)	<i>P value</i>
No.	85(46.7)	97(53.2)	0.7
Age mean±SD	62±6.2	50.7±6.1	<0.0001
Sex			0.00002
males	52(61.1)	28 (28.8)	
Females	33	69	
Qualification (years of school achievement) mean±SD	1±2.1	4.5±4.5	<0.0001
Duration of diabetes mean±SD	11±6.9	4.6±2.9	<0.0001
BMI mean±SD	26.5±2.5	24.8±2.2	<0.0001
Smoking	26(30.5)	8(8.2)	0.0002
Employment			0.3
Employed	23	34	
Non -employed	62	63	
Residency			0.5
Rural	68	73	
Urban	17	24	
Low Social class	81	77	0.003
Insulin use	13(15.2)	5(5.1)	0.04
Non- optimal glycemic control	82	90	0.4
Hypertension	63(74.1)	32(32.9)	<0.00001
Heart failure	32	6	<0.00001
ECG changes	60(70.5)	56(57.7)	0.09
Proteinuria	31(36.4)	17(17.5)	0.006

These changes will altered foot biomechanics which will increased risk of ulceration and amputation.¹⁷

In this study diabetic foot ulcer was present in 13.7% of patients. This alarming high figure, comparable with figure of (11.9%) in Algeria.¹⁸ To complicate the story of diabetic foot care in our area, we have no podiatry services available and since amputations are preceded by foot ulcers in 75–85% of cases.⁶ These figures seems amazing, for the future amputation in our diabetics.

Commonest skin changes in this study were dryness of the skin followed by fissures in the skin and callosities. The explanation for these skin changes is autonomic neuropathy which is reflected by decreased sweating, loss of skin temperature regulation, and autonomic sympathectomy. Anhydrosis results in xerotic skin and predisposes skin to fissures, cracks, and callus formation.¹⁹

Predictors of foot abnormalities in this study were higher age, male sex, less school

achievement, longer duration of diabetes mellitus, higher BMI, smoking history, low social class, insulin use, hypertension, heart failure and Proteinuria. Similarly ADA consensus group found that among persons with diabetes, the risk of foot ulceration was increased among men, patients who had had diabetes for more than 10 years and patients with poor glucose control or with cardiovascular, retinal, or renal complications.¹⁷ The benefit of education in reducing diabetic foot ulcers and lower- extremity amputation is well documented.²⁰ In a large Italian case-control study possible risk factors for ulcer formation were, male sex and lack of diabetes education.²¹ While in Jordan amputation of the lower limbs correlates with duration of diabetes, poor glycemic control, smoking, neurological impairment, peripheral vascular disease and microalbuminuria.²² Lavery et al, in a multivariate model, have also demonstrated that poor glucose control, duration of diabetes over 10 years, and male sex are also significant risk factors for foot ulceration.⁵

CONCLUSION

Diabetic foot abnormalities were reported in 46.7% of patients. Variables that predicts foot abnormalities, that are statistically significant were higher age, male sex, less school achievement, longer duration of diabetes mellitus, higher BMI, smoking history, low social class, insulin use, hypertensnion, heart failure and proteinuria. We are calling for organization of the foot-care service in Basrah and education which should be tailored to the patient's understanding and social background to mangle an epidemic of foot abnormalities expected to be seen in the near future.

Limitations of the study: The sample size appears to be small to generalize the results for whole Basrah city. However, in view of the prevailing conditions in Iraq, this study highlight the high prevalence of diabetic foot abnormalities requiring appropriate measures and establishment of foot care services.

REFERENCES

1. New JP, McDowell D, Burns E, Young RJ. Problem of amputations in patients with newly diagnosed diabetes mellitus. *Diabet Med* 1998; 15:760-4.
2. Boulton AJ. The diabetic foot: a global view. *Diabetes Metab Res Rev* 2000; 16(suppl 1):S2-5.
3. Pataky Z, Golay A, Faravel L, Da Silva J, Makoundou V, Peter-Riesch B, Assal JP. The impact of callosities on the magnitude and duration of plantar pressure in patients with diabetes mellitus. *Diabetes Metab* 2002; 28: 356-61.
4. Reiber GE, Vileikyte L, Boyko EJ, del Aguila M, Smith DG, Lavery LA et al. Causal pathways for incident lower-extremity ulcers in patients with diabetes from two settings. *Diabetes Care* 1999; 22:157-62.
5. Lavery LA, Armstrong DG, Vela SA, Quebedeaux TL, Fleischli JG. Practical criteria for screening patients at high risk for diabetic foot ulceration. *Arch Intern Med* 1998; 158:157-62.
6. Boulton AJM, Vileikyte L, Ragnarson-Tennvall G, Apelqvist J. The global burden of diabetic foot disease. *Lancet* 2005; 366: 1719-24.
7. Khoshnaw AI. The diabetic foot in Iraq. *Lancet* 2005; 366:17-8.
8. Standards of medical care for patients with diabetes mellitus. American diabetes association. *Diabetes Care* 2002; 25: 213-29.
9. Park JE, Oark K. Text book of preventive and social medicine .4th ed. Jabalpur: Banarsidas Bahnot 1985; P 25-6.
10. Boike AM, Hall JO. A practical guide for examining and treating the diabetic foot. *Cleve Clin J Med* 2002; 69:342-8.
11. Birke JA, Novick AC, Hawkins ES, Patout CA Jr. A Review of Causes of Foot Ulceration in Patients with Diabetes Mellitus. *JPO* 1992; 4: 13-22.
12. Masri-Fridling GD. Dermatophytosis of the feet. *Dermatol Clin* 1996; 14: 33-40 .
13. American Diabetes Association. Summary of revisions for the 2005 clinical practice recommendations. *Diabetes Care* 2005; 28: S3.
14. Young MJ, Boulton AJM, Macleod AF, Williams DRR, Sonksen PH. A multicenter study of the prevalence of diabetic peripheral neuropathy in the United Kingdom hospital clinic population. *Diabetologia* 1993; 36:150-4.
15. Galens, Wagner D. Marriott's Practical Electrocardiography. 10th ed. Philadelphia, Lippincott Williams & Wilkins, 2000.
16. Humphrey LL, Ballard DJ, Butters PJ, et al. The epidemiology of lower extremity amputation in diabetics: a population-based study in Rochester, Minnesota (Abstract). *Diabetes* 1989; 2(suppl 2): 33A.
17. American Diabetes Association. Preventive foot care in people with diabetes. *Diabetes Care* 1999; 22: Suppl 1:S54-S55.
18. Richard JL. Le pied diabétique: fréquence, coût dépistage et prévention. *J Plaies Cicatrisations* 1997; 7: 127-31.
19. Murray HJ, Boulton AJM. The pathophysiology of diabetic foot ulceration. *Clin Podiatr Med Surg* 1995; 12: 1-17.
20. American Diabetes Association: Consensus Development Conference on Diabetic Foot Wound Care: 7-8 April 1999, Boston, Massachusetts. *Diabetes Care* 1999; 22: 1354-60.
21. El-Shazly M, Abdel-Fattah M, Scorpiglione N, Benedetti MM, Capani F, Carinci F, et al. Risk Factors for Lower Limb Complications in Diabetic Patients. *J Diabetes Compl* 1998; 12: 10-17.
22. Jbour AS, Jarrah NS, Radaideh AM, Shegem NS, Bader IM, Batieha AM, et al. Prevalence and predictors of diabetic foot syndrome in type 2 diabetes mellitus in Jordan. *Saudi Med J* 2003; 24: 761-4.