

Foot complications in people with diabetes: Experience with 105 Nigerian Africans

Ismaila Adigun, John Olarinoye

Article points

1. This is a hospital-based study of people with diabetes attending an outpatient clinic in Nigeria.
2. The study aim was to assess the prevalence and types of diabetic foot, and management given among these individuals.
3. In this study group, 31 (29.5%) people had a diabetic foot ulcer and 6 (5.7%) had amputation.
4. There is need for more organised care to reduce the prevalence of the diabetic foot among people with diabetes in the West African sub-region.

Key words

- Foot complications
- Sub-Saharan Africa
- Education
- Multidisciplinary teams

Ismaila Adigun is a Senior Lecturer and Consultant Plastic & Reconstructive Surgeon and John Olarinoye is a Lecturer and Consultant Endocrinologist, both at the University of Ilorin Teaching Hospital, Ilorin, Nigeria.

Diabetes is a leading cause of morbidity and mortality in sub-Saharan Africa (McLarty et al, 1990). As a single complication of diabetes, the diabetic foot is responsible for more hospitalisations than all other complications put together (Boulton, 1990) and it is the most common cause of non-traumatic, non-neoplastic amputation in the lower extremity (Solagberu and Kuranga, 2002). People with diabetes attending an outpatient clinic at the University of Ilorin Teaching Hospital, Nigeria, were prospectively recruited into this study. Clinical assessment of each of the 105 individuals was done by interns and post-graduate doctors (registrars) for evidence of peripheral neuropathy, peripheral vascular disease and foot complications, among others. The age range was 15–88 years (mean age 56.78 years). Various foot complications were observed, with foot ulceration being the most common (29.5%). Diabetic foot complications are of particularly high incidence in the West-African sub-region and the importance of foot care should be emphasised when diabetes is first diagnosed and reinforced at regular intervals. There is a need to establish a multidisciplinary foot clinic to address the special care of people with diabetic foot complications in this sub-region.

Diabetes is a leading cause of morbidity and mortality in sub-Saharan Africa (McLarty et al, 1990). Foot complications are the most common reason for hospitalisations in people with diabetes in Western countries (Boulton, 1990), with an estimated US\$500 million spent on the care of diabetic foot problems in the USA in 1988 (Bild et al,

1989). In community surveys in the UK, 5–7% of people with diabetes currently had or had a history of a foot ulcer (Walters et al, 1992; Kumar et al, 1994).

There is paucity of information on the prevalence of diabetes in the West-African sub-region. However, there have been isolated reports of its absence or rarity among rural communities, and of increasing

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1. People with diabetes and peripheral neuropathy may present with a myriad of foot complications, such as dry skin, callosity, fungal infections, cracked skin, onycholysis, yellow nails, eczema and ulcers.
2. Participants for this study were recruited from the diabetes outpatient clinic of the University of Ilorin Teaching Hospital (UITH), Nigeria.
3. Data were collected on demography, type and duration of diabetes, the results of the last three fasting blood glucose (FBG) assessments, the treatment the individual was on and their history of diabetes education.
4. One-hundred and five people with diabetes who attended the UITH diabetes outpatient clinic consecutively were recruited into the study during the study period.

prevalence with urbanisation (Johnson, 1971; Teuscher et al, 1987). In 2003, Nauru was reported to have the highest prevalence of diabetes in people aged 20–79 years (30.2%), closely followed by the UAE with a prevalence of 20.1% (Teuscher et al, 1987). One survey in urban Lagos revealed a prevalence of 19% among people in a residential home (Johnson, 1971). Despite the lack of precise information on its epidemiology, the various complications of diabetes have been well documented in Nigeria (Greenwood et al, 1968; Osuntokun et al, 1971). People with diabetes and peripheral neuropathy may present with a myriad of foot complications, such as dry skin, callosity, fungal infections, cracked skin, onycholysis, yellow nails, eczema and ulcers, that may become apparent only during careful physical examination of the feet. These foot complications have been described in European people with diabetes (Borssén et al, 1990). It is important to realise that, although not ranking as one of the ten most common diseases in Africa, the diabetic foot is becoming a significant cause of untold hardships, morbidity and avoidable deaths.

This study is a hospital-based prospective study of people with diabetes attending an outpatient clinic in a tertiary institution in Nigeria. The study aim was to assess the prevalence and type of diabetic foot complications and their management among those with complications.

Materials and methods

Participants for this study were recruited from the diabetes outpatient clinic of the University of Ilorin Teaching Hospital (UITH), Nigeria, from October to December 2003. Consecutive individuals of more than 14 years of age who attended the UITH diabetes clinic were non-selectively evaluated and questioned by doctors regarding foot symptoms or foot-related problems. With informed consent, individuals were recruited into the study (n=105). A comprehensive history was

then taken from each person, followed by a thorough physical examination. A questionnaire was designed to record the history and physical examination carried out on each individual.

Clinical assessment

The history included data on demography, type and duration of diabetes, the results of the last three fasting blood glucose (FBG) assessments, the treatment the individual was on and their history of diabetes education. Social history of alcohol ingestion and cigarette smoking were also recorded, along with history of footcare knowledge, foot wear and foot hygiene, and history of associated medical conditions including hypertension, hyperlipidaemia, nephropathy and retinopathy. The blood pressure of the person standing and supine, and the weight and height were also measured.

Assessment for peripheral neuropathy

Evaluation for signs of peripheral neuropathy included tests for pain, temperature, vibration sense and ankle reflex. Symptoms of peripheral neuropathy were recorded using a questionnaire similar to that used by Young et al (1993) and showed that people did not always understand questions such as those referring to description of symptoms, site of discomfort, time of worst symptoms and night-time insomnia.

Assessment for peripheral vascular disease

Peripheral vascular disease was determined mainly by the presence or absence of dorsalis pedis. Unfortunately, ankle-brachial pressure index could not be used because most people did not have their ankle blood pressure measured. In addition, Doppler ultrasonography would have been used but is not readily available in most Nigerian centres.

Foot complications

Modified foot complications similar to those used for assessment at the Muhimbili Medical Centre, Dar es Salaam, Tanzania

(Gulam-Abbas and Archibald 2000), including dry skin, callus, fungal infections, onycholysis, hypopigmentation, ulcer, hallux vagus and paronychia, were used to assess various foot complications in the study population. Clinical and epidemiological data were recorded in standardised clinical assessment forms, entered into a computer and analysed.

Results

Patient characteristics

One-hundred and five people with diabetes who consecutively attended the UITH diabetes outpatient clinic were recruited into the study. The age range was 15–88 years with a mean age of 56.78 years (SD: 13.04) and 45 were male (42.9%). Six individuals had type 1 diabetes (5.7%) and 99 (94.3%) had type 2 diabetes. The mean weight was 62.62 kg (SD: 14.42). Fifty-three (50.5%) of participants were traders, 28 (26.7%) were civil servants and the remaining 24 (22.9%) were unemployed or students. The mean duration of diabetes was 10.5 years (SD: 11.5). Fifty six (53.3%) individuals had systemic hypertension, five (4.7%) had hyperlipidaemia, five (4.7%) had evidence of nephropathy (suggested by a persistent high level of urea and creatinine in those with hypertension but no other known renal disease), and 18 (17.1%) had some form of retinopathy. One hundred (95.2%) of the study group were married. The mean FBG was 8.68 mmol/l (SD: 3.28).

Behaviour and literacy

Of the 105 participants, 14 (13.3%) and 12 (11.4%), respectively, regularly drank alcohol and smoked tobacco. Forty-five (42.9%) individuals did not have any educational background, 20 (19.0%) had primary education, 27 (25.7%) had secondary education and only 13 (12.4%) had tertiary education.

Eighty-six (81.9%) had diabetes education from the diabetes clinic and the diabetes club. Sixty-one (58.1%) people had adequate knowledge of foot care, 26

(24.8%) had inadequate knowledge and only 18 (17.1%) did not have any knowledge of foot care. Sixty-four (61.0%) individuals had appropriate knowledge of footwear, 27 (25.7%) had inappropriate knowledge of footwear and 14 (13.3%) had no knowledge of proper footwear. In addition, 77 (73.3%) people had good knowledge of foot hygiene while 28 (26.7%) had poor knowledge of foot hygiene.

Signs of peripheral neuropathy

Signs of peripheral neuropathy were not graded for proper scoring. However, pain (assessed by a pin prick to both feet while the individual kept their eyes shut) was either impaired or absent in one or both feet in 52 (49.5%) individuals; 14 (13.3%) people had impaired or absent temperature sensation while 26 (24.8%) had impaired or absent vibration sense. Ankle reflex was absent in 19 (18.1%) of individuals.

It is important to note that there were limitations in the measurement of peripheral neuropathy. It would have been more appropriate to score symptoms and signs using the method applied by Young et al (1993). However, people did not fully understand the questionnaire. We believe this was owing to a low level of literacy and propose that in the future, individuals are educated on the and signs and symptoms of peripheral neuropathy before the study commences.

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1. Fifty six (53.3%) individuals had systemic hypertension, five (4.7%) had hyperlipidaemia, five (4.7%) had evidence of nephropathy, and 18 (17.1%) had some form of retinopathy.
2. Eighty six (81.9%) had diabetes education from the diabetes clinic and diabetes club. Sixty-one (58.1%) people had adequate knowledge of foot care, 26 (24.8%) had inadequate knowledge and only 18 (17.1%) did not have any knowledge of foot care.

Table 1. Foot complications in people with diabetes.

Complication	Frequency (n = 105)	%
Dry skin	30	28.6
Ulcer	31	29.5
Cracked skin	12	11.4
Colour change	17	16.2
Fungal infection	9	8.6
Callus	6	5.7
Yellow nails	2	1.9
Onycholysis	2	1.9
Corns	2	1.9
Hallux valgus	3	2.9
Eczema	3	2.9

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1. Ninety-five (90.5%) people had dorsalis pedis pulsation while only ten (9.5%) had absent dorsalis pedis pulsation.
2. Despite the authors' institution having various specialists to help people with diabetes manage their complications, this study still revealed a myriad of foot complications among people with diabetes attending the specialist outpatient clinic.
3. If it was not for the diabetes education that is given to these individuals whenever they attend the clinic, as well as information gathered at the diabetes club meetings, the prevalence of diabetic foot complications in our society would be much higher.

Assessment of peripheral vascular disease

Ninety-five (90.5%) people had dorsalis pedis pulsation while only ten (9.5%) had absent dorsalis pedis pulsation. This is unlike other populations with diabetes of a similar age range.

Foot complication

Foot complications observed in this study were recorded as shown in *Table 1*. Foot ulceration was the most common, with 31 (29.5%) individuals having various degrees of foot ulcers managed by surgical units. This was closely followed by dry skin (n=30; 28.6%), colour change in the form of hypo- or hyperpigmentation (n=17; 16.2%), and cracked skin (n=12; 11.4%).

Treatment given

Six (5.7%) individuals who were managed for diabetic foot ulcers had various amputations. Twenty-three (21.9%) had received wound debridement treatment as well as the regular wound dressing. Four (3.8%) individuals had skin grafting done to cover their ulcers while others attended the outpatient daily wound dressing to help the ulcer to heal.

Discussion

Ten million people in the US were known to have diabetes in 1993, of which 15% had diabetic foot problems (Kinghton and Fiegel, 1993). The prevalence of severe diabetic foot complications has been estimated at 10% in Stockholm, Sweden (Rosenquist, 1982), and 16% in a veterans administration metabolic clinic in the US (Holewski et al, 1989). Diabetic foot complications are experienced worldwide and affect both sexes. Humphrey et al (1996) found diabetic foot problems to be more common in men than women, especially in uncontrolled diabetes, with plasma glucose levels exceeding 7.8 mmol/l and a duration of diabetes exceeding 10 years. In the present study the mean FBG was 8.68 mmol/l (SD: 3.28), while the mean duration of diabetes was 10.5 years (SD: 11.5).

Despite the authors' institution having various specialists to help people with diabetes manage their complications, this study still revealed a myriad of foot complications among people with diabetes attending the specialist outpatient clinic, as demonstrated in *Table 1*; the most common being the diabetic foot ulcer. Most other foot complications were being managed by the dermatology unit of the hospital. People with fungal infection, onycholysis, yellow nails, colour changes, cracked skin and dry skin responded to dermatological treatment.

However, these foot complications are still high in frequency compared with figures from the UK and the US (Rosenquist, 1982; Holewski JJ et al, 1989). Eighty-six (81.9%) of this study group had diabetes education from our diabetes clinic and this was reflected in the number of individuals who had adequate knowledge of foot care; 61 (58.1%), appropriate knowledge of foot wear 64 (61%) and good knowledge of foot hygiene 77 (73.3%). With these results, one would have assumed a very low incidence of foot complications compared with that recorded in developed countries. However, when the literacy level of this study group was assessed, it was still very far from that of developed countries. Our study showed that 45 (42.9%) of individuals did not have any background education, while only 27 (25.7%) and 13 (12.4%) patients had secondary and tertiary education, respectively.

Social status could be another important factor in this sub-region. Fifty-three (50.5%) individuals were traders (mainly petty traders), 28 (26.7%) were civil servants and 24 (22.9%) were unemployed or students. If it was not for the diabetes education that is given to these individuals whenever they attend the clinic, as well as information gathered at the diabetes club meetings, the prevalence of diabetic foot complications in our society would be much higher. This shows that we still have a lot of work to do to improve the care and education for people with diabetes.

The current Government is running a programme called *Adult education for people who did not receive western education from childhood*. It is hoped that with time, the majority of Nigerians will have acquired basic education that will have a positive impact on their preventative behaviours.

Out of this study population, 31 people had a diabetic foot ulcer (29.5%) and 6 had an amputation resulting from gangrene of the ulcer (5.7%); this amputation rate is high. Diabetic foot ulcers, as a single complication of diabetes, are said to be responsible for more hospitalisation than all other complications put together (Solagberu and Kuranga, 2002). Factors that have been implicated in the development of the diabetic foot include peripheral somatic and autonomic neuropathy, peripheral vascular disease, infection, nephropathy, poor vision and greater body mass (Boyko et al, 1999). Neuropathy is a major risk factor that can lead to a lack of proprioception and imbalance between the long flexors and extensors of the foot, which are thought to lead to the typical foot with clawed toes and prominent metastasis heads (Boulton, 1988). In our study, 26.4% of individuals had signs of peripheral neuropathy with 52 (49.5%) people having sensory impairment or absence in their lower limbs. Ten (9.5%) individuals had absence of palpable dorsalis pedis. Fifty-six (53.3%) people were hypertensive, five (4.7%) had evidence of nephropathy and 18 (17.1%) had retinopathy. The mean weight was 62.62 kg (SD: 14.42). Therefore, most of the risk factors that have been identified in developed countries (Boulton, 1988; Boyko, 1999) also exist among the people who took part in the present study (except the presence of peripheral arterial disease).

The importance of foot care should be emphasised when diabetes is first diagnosed and reinforced at regular intervals. However, in those who develop ulcers, further re-education is needed to try and prevent another ulcer. In particular, neuropathic ulceration should be preventable with good

foot care and appropriate footwear. The use of walking plasters has been advocated by some people. For instance, plaster casts and the 'Scotch cast' boot (Burden et al, 1983) have both been used to aid ulcer healing as they enable the individual to remain mobile, but remove pressure from the ulcer site. Such casts and boot are not readily available in our sub-region but alternative footwear that does not put persistent pressure on the ulcer can be improvised by indigenous manufacturers to serve the same purpose. Clubs and associations for people with diabetes and their relatives (supported by health workers concerned with their treatments) will allow them to discuss their problems, educate each other and pool their resources. The establishment of a multidisciplinary foot clinic to address the care of people with diabetic foot problems in our sub-region is long overdue. Now that we have most of the specialists available (that is; the endocrinologist, podiatrist, plastic surgeon, orthopaedic surgeon, nurses, dietitians and physiotherapist) there is a need to come together for more organised care to reduce the prevalence of foot complications among people with diabetes in the West African sub-region. ■

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