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PAINS OF AMPUTATION AMONGST DIABETIC FOOT ULCER PATIENTS IN NORTH CENTRAL NIGERIA: AMPUTATION VERSUS NO AMPUTATION

¹Oseni-Momodu E, ²Chima AAG, ³Lengman S

¹Department of Surgery, Bingham University/Bingham University Teaching Hospital, Jos. E-Mail: eosenimomodu@yahoo.com
+234(0) 8072251626

²Department of Family Medicine, Bingham University/Bingham University Teaching Hospital, Jos. Email
cagma2002@yahoo.com, cagma2002@gmail.com, +234 8064738147

³Department of Family Medicine, Bingham University/Bingham University Teaching Hospital, Jos. Email: sirlengs@yahoo.com,
+234 8035075874

Correspondence Author: E-Mail: eosenimomodu@yahoo.com +234(0) 8072251626

Authors Contributions:

E. Oseni – Momodu – Conceptualisation, manuscript writing and protocol implementation.

Chima AA George – Ethical and protocol compliance and manuscript writing.

Lengman Sunday J – Protocol implementation

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ABSTRACT

Background: Diabetic foot ulcers (DFU) arising from diabetic “foot at risk” are frequent clinical complications of long standing Type 2 Diabetes Mellitus (T2DM) of the elderly patients in this environment. The diabetic patient has a foot at risk of developing infections when not properly cared for. Ulcer prevalence of over 40% T2DM accounts for over 50% of major amputations with high morbidities and mortalities.

The pathophysiology of DFU is multi factorial consisting of peripheral polyneuropathy, arterial disease, and breaches of skin and consequent infections.

Objective: Was to determine patterns, management modalities and treatment outcomes of foot ulcers in chronic diabetics and whether there are no other solutions for the irresistibly damning consequences of Diabetic Foot Ulcers (DFU) namely amputations of extremities with high 5-year mortality index, and to find out what these alternatives are.

Methods: A 5-year retrospective study between June 2012 and June 2017 was undertaken of both type's adult diabetic patients, T1DM and T2DM, with foot ulcers, which were managed surgically at Bingham University Teaching Hospital (BHUTH), Jos, North-Central Nigeria.

Results: Fifty-three 53 (100%) patients with Diabetes Foot Ulcers (DFU) were studied. Fifty-two 52 (98 %) came with advanced ulcers whose limbs could not be salvaged. They were amputated because they came too late with expansive infections. Forty-seven (47) T2DM patients (88.7 %) were discharged home, after amputation of different sorts. We recorded a post amputation mortality of five (5) patients (9.6%). Only one patient, who also came late, a T1DM male patient, was not operated. He was already on insulin and oral anti-diabetic medication at home. Managed with regular wound dressings, his ulcers healed well.

Conclusions: Foot ulcers occur frequently in diabetics who had neglected proper foot care. Chances of the contralateral limbs becoming also ulcerated and getting amputated with attendant mortality were high.

INTRODUCTION

A five-year (5) retrospective study to determine pattern, management modalities and treatment outcome of foot ulcers in chronic diabetic patients was done between June 2012 and June 2017 on 53 (100%) long-term diabetic patients at BHUTH, Jos.

The large numbers of diabetic amputations done at BHUTH motivated this study. We wanted to know whether there was need for such a high rate of amputations of extremities in the DFU patients with consequent 5-year mortality risk. Where there no other alternatives? It was no longer news that long-term existence of Diabetes Mellitus (DM) causes

DFU seen in about 20% of diabetic patients, resulting to amputation prevalence forty times higher than non-diabetics worldwide.^{1,2,3,4} How justifiable were all the large numbers of amputations performed globally and at BHUTH? The question therefore arose whether to amputate or not to, which largely motivated this study.

DM causes “foot at risk”, a disease complex of bone deformities at the tarsophallageal joints with pains, intermittent claudication, foot restlessness and warmth in an apparently intact skin in DM of long standing. These feet soon manifest with ulcers, which are annoyingly stubborn to treatment also because of the paucity of specialized personnel with good

knowledge of foot care. Randomized Controlled Trials (RTC) have not shown that foot care and glycaemic control benefit feet after development of DFU; however a regular foot care is apparently the only known remedy at the moment for preventing development of ulcer of foot at risk.³

Despite serious works, the definitions and

classifications of DFU are not widely accepted. Surgeons prefer the Wagner- Meggitt classification, which has received a wide acceptance by the International Working Group on the Diabetic Foot (IWGDF) for professed better results.^{6,7,8} The Wagner-Meggitt DFU classification, based on wound depth, consists of 6 grades of the wounds. as seen in Table 1

Table 1. The Wagner – Meggitt of DFU^{6,7,8}

GRADE 0	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5
intact skin	superficial ulcer	deep ulcer to tendon, bone or joint	deep ulcer with abscess or osteomyelitis	Fore foot gangrene	Whole foot gangrene

Pictures 1: Diabetic Fore Foot Ulcer - Wet Gangrene - of One of the Study Patients



DFU consists of peripheral neuropathy and ischaemia, necrosis with skin breakages thereby creating portals for infection of the foot, resulting in comorbidities and limb amputation and death.⁶⁻¹³

DFU a common finding of the T2DM in peasant farmers happen because they walk mostly unshod thereby acquiring bacterial/fungal super-infection of their pachyderm feet.^{14,15}

Comorbidities of DM consist of DFU the main subject of this manuscript, renal diseases, ophthalmopathy, hypertension and hypercholesterinaemia, heart diseases and sudden heart death. DM suffers an upward spread of the ulcers so that amputations are needed to save patients' lives. The necrotic toe, the forefoot or even the entire lower leg is amputated followed by frequent sharp filleting of the necrotic portions of the remaining ulcerous foot. This method is now seen as the gold standard for the management of DFU.¹⁶

DFU causes severe hardship socially and financially for diabetics and has become the highest cause of

non-traumatic limb amputation.^{10-13, 20} DFT causes prolonged length of hospital stay (LoS) as well as poor quality of life (QoL) before admission into hospitals and during inpatient management.

PATIENTS AND METHODOLOGY

ETHICAL CONSIDERATIONS

Ethical clearance was obtained from the Health Research Ethics Committee of BHUTH prior to commencement of this study. Documented informed consent was obtained prior to each surgery.

A 5-year retrospective study of 53 DFU patients with long-term adult T2DM out of 1860 (3%) diabetic patients seen at the Endocrinology Unit of BHUTH was done. Thirty-three thousand, eight hundred and forty eight (33,848) patients were admitted through the A & E during the 5-years period of study of which the Surgical Department received and managed 53 of these (0.2%) with advanced DFU cases with age-mode of 55. Fifty-two (98 %) DFU cases were amputated.

All 53 patients (100%) had long-term adult diabetes

mellitus of more than 12 years (DM) with M: F ratio of approximately 1:1(27:26). One male patient (2%) age 75 years was T1DM on a combination medication of metformin and insulin. He was not amputated while the rest 52 (3% of 1860T2DM) seen at the Endocrinology Unit had various types of amputations.

Demographics, anthropometrics, and clinical features were extracted from their charts. The collated data were analysed with Statistical Package for Social Sciences (SPSS) 22nd Edition.

WORK UP.

Most cases were noted to have heavy wet gangrenes with exposed osteomyelitic bones as a result of late presentations. Cultures of filleted tissues were sent for antibiogram. A mixture of gram-positive and gram-negative bacteria were found with few resistance to antibiotics probably due to self-medication. Gram-positive cocci were mostly isolated and treated with antibiotics according to best practices. Other investigations included regular checks of fasting plasma glucose, full blood count, serum electrolytes, creatinine and urea; ESR, CEA and HIV screen; plain radiographic examinations of the arms, hands and lower limbs of areas with ulcers were done to rule out osteomyelitic bone lesions and signs of gas gangrene. Doppler sonography (DUPLEX)⁸ were done instead of ankle brachial systolic pressures index (ABPI) which have proven less dependable.^{1,2}

Most referred patients presented very late. Some came only because of pains, fever with rigors or sheer peer pressure from the community. So sad some did not even know that they were diabetic. The ulcers were obvious, yes! Nevertheless, were not sufficient to motivate them to come early to the hospital for ulcer management. However, neuropathic and severe vascular disturbances in form of intermittent claudication, restless and painful feet added to the persuasion of neighbors compelled them report to BHUTH.

Immediate surgical managements commenced according to standard surgical protocols on admission. Good history taking were followed by frequent deep surgical debridement of the necrotic tissues. The osteomyelitic bones were removed and bulky wet wound dressings of Normal Saline and/or honey were applied with good healing.^{3,16} Imaging diagnostics showed poor peripheral vascular

deficiencies (PVD) confirming their intermittent claudication.

Some of these patients got the "salami-type-amputation", that is, the incremental amputations beginning with removal of distal digits, then the mid foot amputation and eventually below-the-knee-amputation (BKA) due to expanding spread of cellulites.^{2,3}

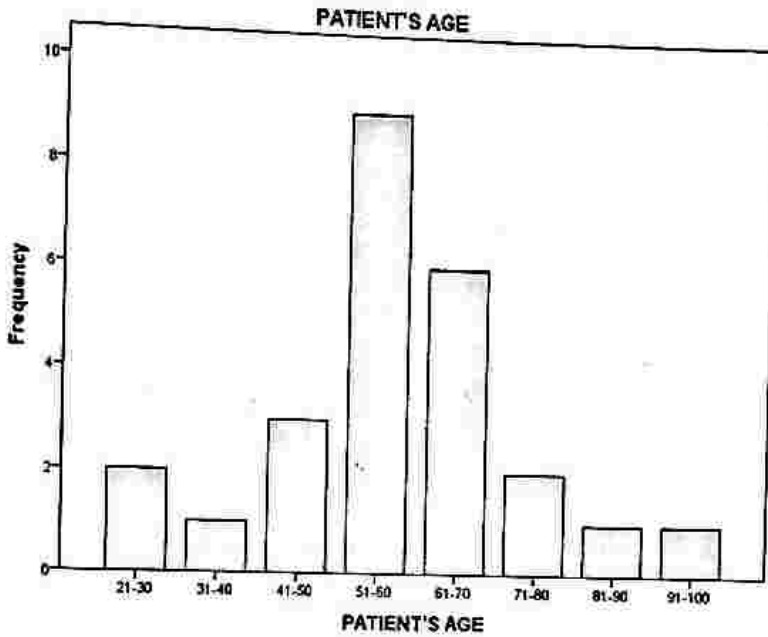
SURGICAL MANAGEMENT

Below-The-Knee-Amputation (BKA): are two types. The standard type being about 10 – 15 cm below knee joint and the short type, being just below the knee joint. Patients who had septicaemia, osteomyelitis and neuropathia of the foot or ankle and yet relatively good peripheral vascular integrity by the Doppler colour flow had a BKA despite their heavily infected DFU of distal 1/3rd of the leg. If the post-operative wound did not heal and the rate of debridement could not catch up with resulting ulcer size, which may now be larger than 2 cm by 2 cm, it became easier to solicit for informed consent for amputation at higher levels. They understood that their lives were also in danger apart from the imminent amputation of the legs. The standard amputation leaves 10 – 15 cm of stump below the knee that fits into a specially produced prosthesis so the patients could walk effortlessly. In trousers, passers-by hardly know that they have prosthesis on. Phantom pains were seldom. Not all patients had very severe pains despite the severity of the ulcers. Ulcer pains as well as post-operative phantom pains were managed with NSAIDs and amitriptyline group of drugs.¹⁶ Amputation improved quality of life for many of these patients. According to American Orthopaedic Foot & Ankle Society® this type of amputation is claimed to improve the QOL of the patients.

Twenty-eight patients, 28, (52.8%) had BKA of the lower limbs in this study.

Above the knee amputations (aka): A dead unsalvageable limb with Grade 4 of Table 1 Wagner-Meggitt classification infection was amputated out rightly as soon as signed informed consent was obtained from the patients.^{6,8} Convincing patients to accept an amputation was the most difficult assignment of the entire procedure. For reasons due to higher spread of sepsis of the limb, above-the-knee-amputations (AKA) became necessary often with increased morbidity and mortality.

Bar Chart 1: Frequency Distribution of Patient's Age in Groups of Tens (10)



Exclusion from amputations: One (2 %) T1DM patient 75 years old male, on insulin was excluded from amputation. His ulcers were managed conservatively until skin grafting was possible. His HbA1c and Fasting Plasma Glucose (FPG) results were averagely 6 and 120mg/dL respectively.^{1,3} He had longer LoS values because he garnered several rounds of sharp debridement and wound dressings for the DFU until conditions were favourable for skin grafting. Antibiotic treatment followed precise antibiogram results. Wound dressings with wet bulky dressings of Normal Saline and honey 2 to 3 times a week softened up his callosities. His pains were managed with NSAIDs and amitriptyline group of drugs.¹⁶ Minor foot amputation, e.g. Toe

disarticulation, trans-metatarsal, Lisfranc, Chopart, hind foot, such as Boyd or even the Symes amputation were welcomed by these patients because they were less disfiguring.

RESULTS/ STATISTICS OF THE MAJOR AMPUTATIONS

We had a mortality of five patients (9.6%) with a Female: Male ratio of 2:3. One patient (2%) had bilateral AKA but died. We had 28 BKA patients (52.8%) and eight patients (15.4%) had above-elbow-amputations (AEA). Two finger amputations were done; one was Ray amputation. Forty-seven (47) T2DM patients (88.7 %) were discharged home.

Table 2: Frequency Distribution of Type of Operation

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid DIGITEXARTICULATION	1	1.9	1.9	1.9
AK	1	1.9	1.9	3.8
AKA	17	32.1	32.1	35.8
AMPUTATION	1	1.9	1.9	37.7
Bil. AKA	1	1.9	1.9	39.6
BKA	28	52.8	52.8	92.5
BKA & AKA SAME LEG	1	1.9	1.9	94.3
DIGIT EXARTICULATION	3	5.7	5.7	100.0
Total	53	100.0	100.0	

The above table shows the operation types.

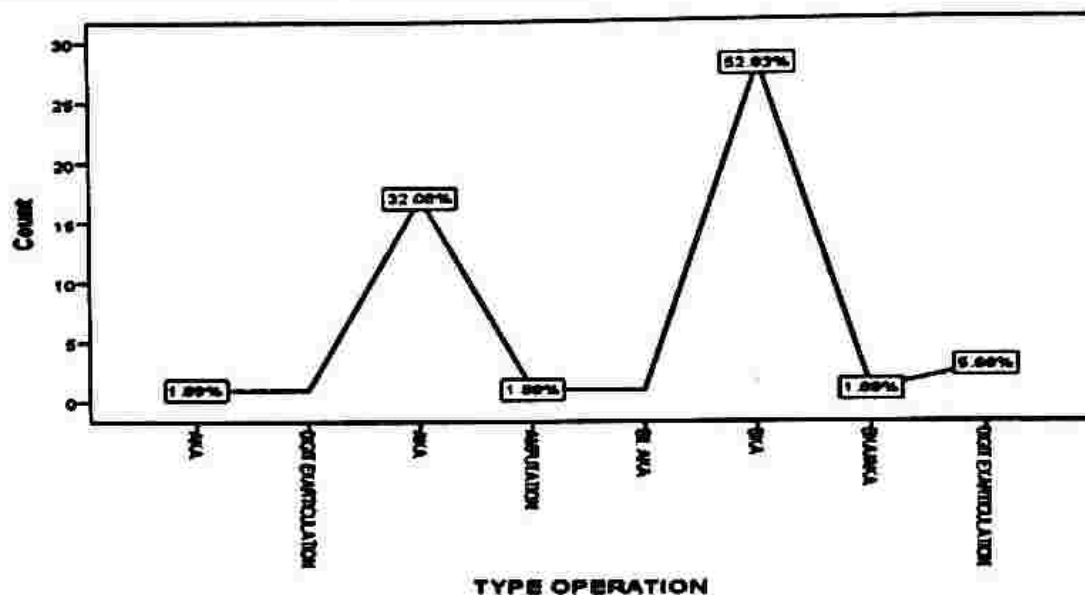
AKA, Above the knee amputation

BKA, Below the Knee amputation

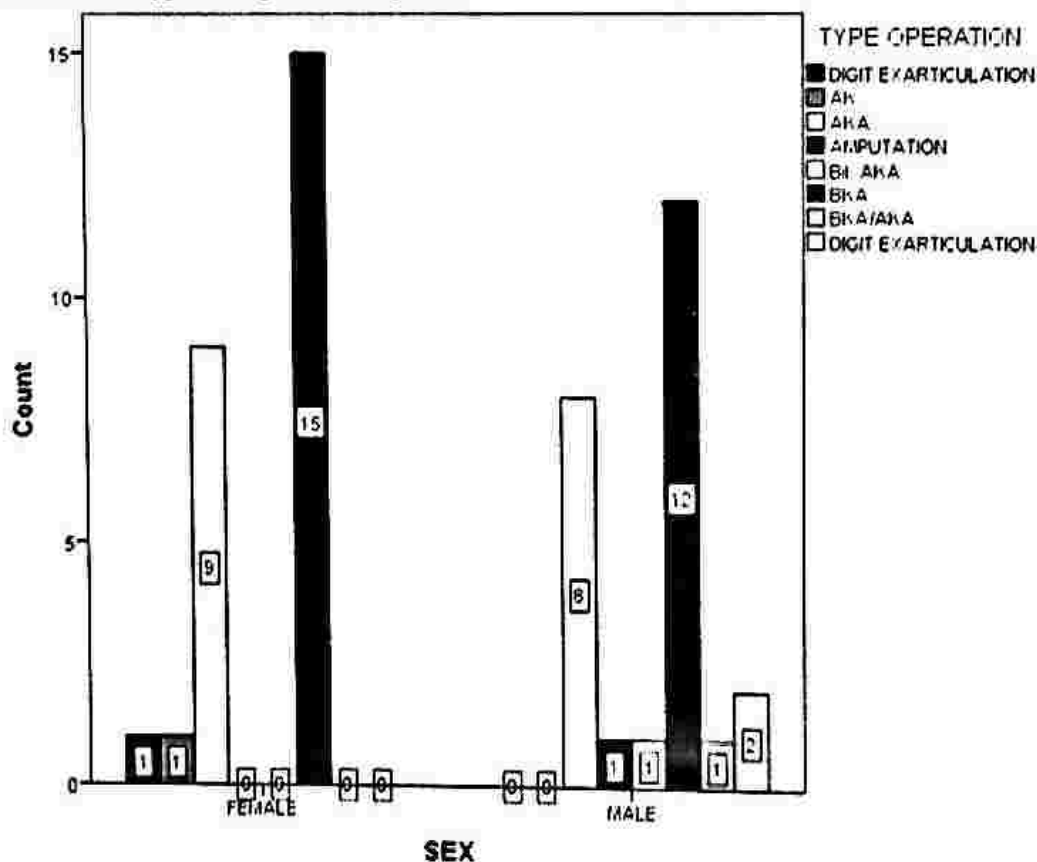
BKA and AKA, patient amputated first below the knee, later above the knee same leg

Bil. = Bilateral limb Amputations same patient

LINE CHART 1: %-AGE OF TYPES OF AMPUTATIONS



Cluster Bar Chart 2: Types of Operations by Sex



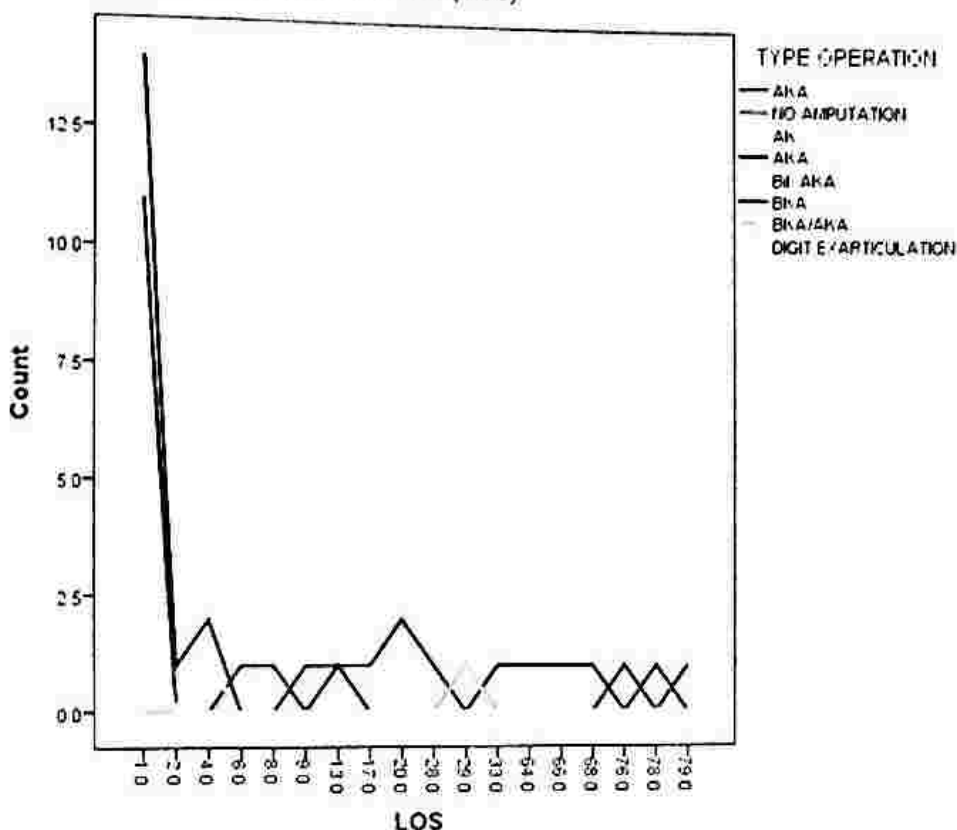
Patient's satisfaction: Physiotherapy began a day post operatively until patients learnt to walk again with axillary walking support. Patients continued insulin management of the DM. Their QoL showed that most patients were happy especially because they were well and alive and could continue with their medications correctly conveniently by themselves at home.

Dietician, hospital clergy and the medical teams

gave way of life modification instructions.

They were trained on the essence of foot inspection as often as weekly, the need to report to their physicians if they had any injuries no matter how small or shallow the wounds were considering that the contralateral limbs could develop the same morbidity and surgical intervention with a greater percentage of mortality next time around.¹⁷

LINE CHART 2: PATIENT'S LENGTH OF STAY (LOS)



DISCUSSION.

The main findings in this study were an acceptable mortality rate of five patients (9.8%) with F: M ratio of 2:3. This compares favorably with the work of Kruse I, Endelman S and co-workers. The amputation rate of 52 (98%) of the study subjects was high. Studies have however shown that T2DM accounted for up to 80% of all non-traumatic amputations of which 85% were preceded by DFU.^{14, 18-20} This study showed that T2DM patients suffered more DFU and amputations than the T1DM by a rather huge margin of 52: 1.

Age distribution showed a mean of 59.40, a median of 59.00, standard deviation of 16.673, a range of 75, minimum age of 25 and a maximum age of 100. The amputation of 52 DFU patients (98 %) in the study was in agreement with other investigators.¹⁷⁻²⁰ Of the fifty-two (98%) amputated T2DM patients, forty-seven were discharged home successfully (90.4%) with a good QOL.

Limitations in this study were the absence of artificial skin for transplantation, absence of negative pressure wound therapy (NPWT) equipment and equipment for application of hyperbaric oxygen and ozone therapy respectively, which are highly recommended for complex diabetic wounds treatment.^{19,20} We believe that these would have reduced the rate of amputations.

Other very important findings were that procedure as simple as "foot care", regular inspection of the feet in the diabetics was not done being not known, a very important simple act to avoid DFU. This study also showed that T2DM patients had more amputations than T1DM in agreement with the findings of Umar MD et al.³

Patients from the high social strata were not among our study subjects. They probably joined the bandwagon of the rich who because of the spree of the now famous national "medical tourism" could have travelled overseas for foot care and management of DFU. We saw more peasant farmers and petty traders and some old retired civil servants and teachers. DM and the attendant DFU and amputations however, did not seem to wear the ugly face of the poor only. The medications of the majority of the 52 (98%) T2DM patients were metformin and self-prescribed antibiotics and concoctions from native doctors.

Our study had a single 75-year-old male patient (2%) on insulin whose ulcer healed quickly by frequent debridement and wet dressing with normal saline and honey. He was discharged home in good state of QOL. Of particular import and bearing to our study was that though amputation is a very painful life event, the need for amputations due to DFU would be with us for some time to come because efforts at prevention of DFU by simple "foot care" are not

known. Professional podiatrists are in short supply. Our Health Institutions should introduce curricula that teach the science of foot ulcer care. Late presentation of cases is another reason for poor medical management outcome. Urgent research appears to be needful to show reasons for this habit in our subset.

This study showed that the in-patient direct cost of management of DFU was an average of N225, 827.5 that is huge seeing these patients had no insurance policies. The cost of drugs made the highest impact on them, which agrees with the works of Umar MD et al in Zaria.¹ National Health Insurance Scheme (NHIS), has not done much to ameliorate the scourge.

CONCLUSION

Implication on both clinical practice and policy makers is the knowledge that management of DFU should precede manifestation of the ulcers. Health providers should organize small group tutorials about diabetic foot care to their patients before discharge from hospitals. Both foot care and FBG occupy very important position in the scheme of management of DFU and prevention of diabetes leg amputation.

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DUALITY OF INTEREST

Nil

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