DIABETIC FOOT

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ABSTRACT

Objective: To evaluate the precipitating causes, severity, and complications of diabetic foot.

Material and Methods: This study carried out a study in Medical C Unit of Khyber Teaching Hospital, Peshawar. It was a longitudinal study done from June 2000 to December 2001. A total of 68 patients were studied having diabetic foot. Swabs for culture and sensitivity were taken. Other complications of Diabetes were recorded. Based on the observed commonest organism involved, appropriate antibiotic therapy was started promptly, besides doing surgical management of the wound.

Results: Out of 68 patients, 19 were Type-1 diabetic and 49 were Type-2 diabetic. Forty patients (58.8%) were male and 28((41.2%) were female. Thirty four patients (50%) had more than 11 years of duration of diabetes. Ill fitting shoes (19 patients) was the commonest precipitating cause. Three patients (15.8%) of Type-1 DM and 5(10.2%) of type-2 DM had grade 3 ulcer and 59(26.3%) and 6(12.2%) of Type-1 DM and Type-2 DM respectively had grade 4 foot ulcer. Staph. aureus was the commonest organism involved.

Conclusion: Diabetic foot is still common and requires proper management and counseling of the patients.

Key words: Diabetic Foot, Ulcer, Type-1 DM, Type-2 DM, Complications.

INTRODUCTION

Diabetes is one of the oldest metabolic diseases known to mankind. In 500 AD, two Indian Physicians, Susruta and Charuta noticed the sweet taste of urine of diabetics. Avicenna (960-1037) defined the clinical features of diabetes and described gangrene and impotence as its effects. In 1909, Belgian J de Meyer discovered insulin to be secreted from pancreatic islets[1]. Diabetes is a chronic disorder in which impaired metabolism of glucose and other energy yielding fuels

leads to late complications. Over 12% of Pakistani population above 25 years of age have diabetes and 10% suffer from impaired glucose tolerance (IGT)[2].

Diabetes is divided into two types: Type 1 (IDDM) and Type 2 (NIDDM). Both of these, have hyperglycemia in common, either due to absolute or relative lack of insulin. They lead to complications of diabetes in the form of blindness, ESRD (End Stage Renal Disease), vascular complications and non-traumatic limb amputations.

If looked after properly, diabetics can enjoy reasonably normal life style. A special problem in diabetes is the development of foot ulcers[3]. Diabetic neuropathy, vasculopathy and susceptibility to infections facilitate the development of foot ulcers leading to gangrene and possible amputation[4] .

The diabetic foot ulcers are graded according to Wagener's classification[5] as follows:

Grade 0: No ulcer, risk factor(s) like callus present.

Grade 1: Ulcer present with full thickness skin loss.

Grade 2: Ulcer penetrates the subcutaneous tissues.

Grade 3: Cellulitis with deeper extension of infection upto bones.

Grade 4: Grade 3 with localized gangrene.

Grade 5: Extensive gangrene of limb.

These diabetic foot ulcers are usually preceded by trauma, due to poor vision, impaired sensations and motor neuropathy. Most of these wounds are infected by a variety of organisms and their culture and sensitivity is an important step to save the possible future limb amputation[6]. Early effective antibiotic treatment is essential[7]. If peripheral circulation is effective, these foot ulcers heal well with surgical debridement [8], weight relief from the ulcer and prompt effective antibiotic therapy[9].

In our set-up, lack of patient's education about diabetes, unhygienic conditions and poor social status contribute towards progression of the diabetic ulcers. Effective patient's education with regular podiatry alone can decrease the incidence of foot ulcers in diabetics by 50%[10]. C/S of the swab from ulcer help in defining the organism(s) and effective antibiotic therapy, thus averting the possibility of foot amputation[11].

MATERIAL AND METHODS

The study was carried out in Medical "C" Unit, Khyber Teaching Hospital, Peshawar from June 2000 to December 2001. 68 diabetic patients with foot ulcers of grade 1-4 were included in the study. Those with grade 0 and 5 ulcer were excluded from the study. Their type of diabetes, age sex, duration and complications of the disease noted.

Sterile swabs were taken from the exudate or deep base of the ulcer after thoroughly washing the ulcer with sterile normal saline. These swabs were sent to the Bacteriology section of Main laboratory of our hospital.

The patients were put empirically on wound care and broad spectrum antibiotics with metronidazole, which were modified according to the C/S report made available later on, keeping in view the availability of drug, cost-effectiveness and duration of treatment.

The knowledge of patients about their primary disease, viz.; Diabetes, was noted and any complications recorded. Lower limbs were specifically looked for neuropathy and vasculopathy.

RESULTS

Out of 68 patients, 19 were type 1 (IDDM), while 49 were type 2(NIDDM) Diabetics. Out of 19 type-1 patients, 11 were males while 8 were females. In type-2 group, 29 males and 20 females were included (Fig. 1).

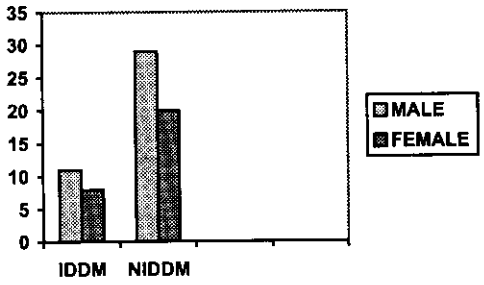


Fig. 1. Sex Distribution

AGE RANGE:

The age range of patients with Type 1 diabetes was from 13 years to 63 years, with an average age of 46.3 years. Similarly the age range of those with type 2 diabetes was 31 to 76 years with an average of 51.1 years.

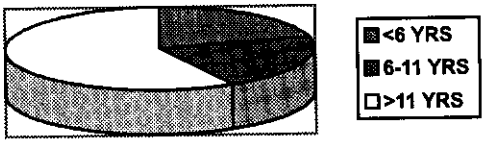
Duration of Diabetes:

The patients reporting to our study had variable length of their diabetes, ranging from new diagnosis upto 20 years of the disease. Most of our patients of both the types of diabetes, had the disease for more than 11 years. (Table 1 & Fig. 2).

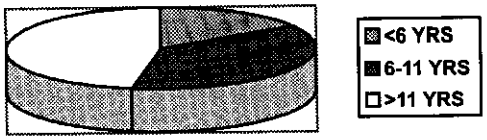
DURATION OF DIABETES

	Type 1 diabetics	Type 2 diabetics
Upto 6 years	4	8
6-11 years	4	18
> 11 years	11	23

TABLE–1



TYPE 1 D.M.



TYPE 2 D.M.

Fig. 2. (Duration of Diabetes)

Precipitating causes:

Foot ulceration in diabetes is precipita-ted by the co-incidence of other factors as well. We surveyed these patients for the frequency of these factors. The commonest known factors were ill fitting shoes, foot deformity and past trauma. No cause could be ascertained in about one-third of the pa-tients (Table 2).

PRECIPITATING CAUSES

	Type 1 Diabetics	Type 2 Diabetics
Hx. Of trauma	4 (21.1 %)	6 (12.3%)
Foot deformity	5 (26.3 %)	12 (24.5%)
Ill fitting shoes	3 (15.8 %)	16 (32.6%)
No cause known	7 (36.8 %)	15 (30.6%)

TABLE–2

The involved foot was examined clinically for signs of neuropathy and ischemia. Most of these patients revealed some signs of diabetic neuropathy, ranging from 67 to 73 %. Ischemia was found to contribute in 26 to 33 % of them (Table 3).

STATE OF FOOT

State of foot	Type 1 diabetics	Type 2 diabetics
Neuropathy in the foot	14 (73.7%)	33 (67.3%)
Ischemia in the foot	5 (26.3%)	16 (32.7%)

TABLE –3

As the right foot is usually the dominant one, it was found to be affected most commonly, ranging from 2/3rd to 3/4th of the cases (Table 4).

SIDE AFFECTED

Type of diabetes	Type 1	Type 2
Right foot	14 (73.7%)	33 (67.3%)
Left foot	5 (36.3%)	16 (32.7%)

TABLE–4

Diabetes being a multi-system disorder, can affect any tissue and organ of the body. Pathologically diabetes is micro-angiopathy. Thus its duration and glycemic control determine the out-come of its complications, which involve the kidneys, retina, coronaries and the nerves, causing diabetic nephropathy, retinopathy, ischemic heart disease and neuropathy respectively (Table 5).

COMPLICATIONS OF DIABETES

	Type 1 D.M. (19 patients)	Type 2 D.M. (49 patients)
Nephropathy	11	20
Retinopathy	5	25
Autonomic neuropathy	2	6
Hypertension	3	16
Ischemic heart disease	5	10

TABLE–5

The out-come of diabetic foot disease depends upon the grade of ulceration which were classified accordingly to Wagener's classification[5] . The most common ulcers were of grade 2, both in type 1 as well as type 2 diabetics (Table 6 & Figs. 3, 4).

Culture and Sensitivity:

Sterile swabs were taken from the exudate or the depth of ulcer for culture/ sensitivity of the involved micro-organisms. Staph. aureus was found to be the common-

GRADE OF ULCER

Grade of ulcer	Type 1 DM	Type 2 DM
Grade 1	5 (26.3 %)	13 (26.5%)
Grade 2	6 (31.6%)	25 (51.1%)
Grade 3	3 (15.8%)	5 (10.2%)
Grade 4	5 (26.3%)	6 (12.2%)

TABLE–6

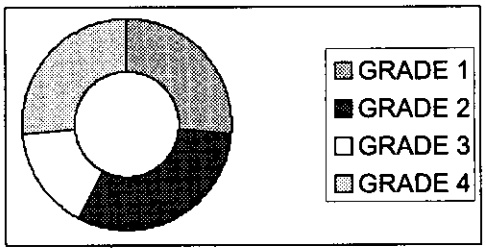


Fig. 3. Grade of Foot Ulcers in Type 1 D.M.

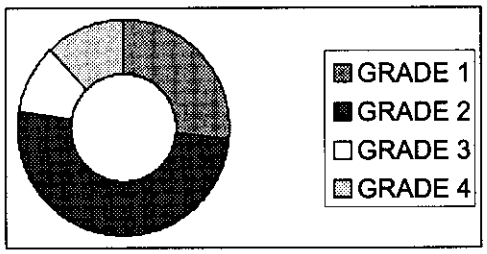


Fig. 4. Grade of Foot Ulcers in Type 2 D.M.

est organism involved, followed by E.coli, Pseudomonas aereginosa and others (Table 7).

DISCUSSION

Diabetes mellitus is a chronic serious metabolic disease having hyperglycemia as its hallmark[12] and affects almost every organ of the body[13]. Diabetic foot is one of its major complication. In USA, about 6% of total population is having diabetes while 48% of them are hospitalized for foot ulcers[14]. It accounts for 85% of non-traumatic lower limb amputations done in USA[15]. The cost of treatment of diabetic complications in USA has risen to over 9.1

C/S RESULTS

Microorganism	Quinolones	Vancomycin	Aminoglycoside	Cephalosporin	Beta-lac inhib: penicillines	Clarithromycin	Total
Staph. Aureus	20	5	2	1	1	1	30
E. coli	5	–	–	3	2	–	10
Pseudo. Aeregin	–	–	5	–	3	–	8
Entero-bacter	4	–	–	–	1	1	6
Beta- h- strepto.	5	–	–	–	–	–	5
Mixed	7	–	2	–	–	–	9

TABLE–7

billion US dollars per year[16]. In UK, the cost of treatment of diabetic foot has been estimated over 325 million US dollars per year[17].

In Pakistan, 5-7% of adult population is having diabetes, while 45% of these diabetics have foot ulcers[13]. It has been estimated that an average of 15% diabetics develop foot ulcers yearly and about 1/5 of them end up with amputations[15].

A trivial looking diabetic foot ulcer may have ominous outcomes and should be treated aggressively with antibiotics and surgical debridement of necrotic tissue with antiseptic dressing[18].

In our study, 72% of patients had type-2 diabetes while 28% were type-1 diabetics. This reveals that type 2 diabetes is more common than type-1 diabetes, as has been observed world over. Male to female ratio is 1: 0.7, showing diabetic foot to be more common in the male gender[19].

The age of our patients ranged from 25 to 80 years with a mean age of 52±19 years. This observation was also made by Lavery et al; who reported the commonest age of 46 years and above[20].

The length of diabetes carries a direct relation with the frequency of diabetic foot. More than 40% of patients suffer from foot ulcers if the duration of their disease is more than 11 years.

Ill-fitting shoes out-number other precipitating causes of foot ulceration. This is due to diabetic retinopathy and neuropathy leading to poor vision and impaired sensations in the foot. These cause gait disorders with frequent tumbling, ending up with foot ulcerations[21]. Ischemic foot was diagnosed clinically by impalpable dorsalis pedis pulses, usually in the presence of a bounding popliteal pulse[22].

We observed that diabetic foot affected the dominant right foot (64.7%) more commonly than the left foot (35.3%), in a ratio of 1.8:1. This was also reported by Evans & Williams[23].

Other complications of diabetes were noted as follows:

Nephropathy in 45.6%, Retinopathy in 44.1% and Cardiovascular diseases (Hypertension & IHD) in 50% of our patients (Table 5).

As we included grade 1-4 foot ulcers in our study, 50% of our cases had grade 1-2 ulcers, 20% had grade 3 ulcers while 30% had grade 4 ulcers. All the patients were empirically put on broad spectrum antibiotics (Augmentin) and metronidazole, till the C/S

report was available when they were changed to appropriate antibiotics.

Due to sensory neuropathy, the diabetics often ignore their early foot ulcers. Keeping in view their poor immune responses, these mild infections rapidly progress in the presence of poor blood circulation, ending up with serious diabetic foot[24]. These infections usually begin with local bacterial invasion than haematogenous spread[25]. Minor trauma to nail, web site or sole rapidly progresses and in the absence of systemic symptoms is easily ignored[26].

In our study, C/S of superficial ulcers dominantly yielded Staph. Aureus, while growth of combination of micro-organisms, including E.coli, Pseudomonas, etc. were found in deeper wounds of long standing[6]. The common antibiotic used were ciproxin, having overall sensitivity of 70%. It costs about Rs. 1500 per course of 10-14 days. They were easily affordable by the common man. Aminoglycosides were avoided in those having nephropathy. Those with ulcers of less than 2 cm size, no bone or joint involvement and having no ischemia were given oral medications. Others were given parenteral therapy.

CONCLUSIONS

Foot problem in diabetes, continues to persist and will be challenging the clinicians. They can be properly treated by proper patient's education with regular check up by diabetologist and chiropodist (if available). Any foot lesion in diabetics should receive prompt antibiotic therapy and surgical debridement of any non-viable tissue, to safe guard the limb and minimize the risks of amputations.

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