JOURNAL OF PHARMACEUTICAL AND BIOMEDICAL SCIENCES

Mummidi DS, Dugar D, Mishra RK, Mohapatra JS, Houghton T.

Clinicopathological Study: Management Of Diabetic Foot And Its Complications. *J Pharm Biomed Sci* 2015; 05(04):308-311.

The online version of this article, along with updated information and services, is located on the World Wide Web at: www.jpbms.info

Journal of Pharmaceutical and Biomedical Sciences ***(J Pharm Biomed Sci.)*****, Member journal. Committee on Publication ethics (COPE) and Journal donation project (JDP).**

JPBMS
Journal of Pharmaceutical and Biomedical Sciences

ISSN NO- 2230 – 7885
CODEN JPBSCT
NLM Title: J Pharm Biomed Sci.

Original article

Clinicopathological Study: Management Of Diabetic Foot And Its Complications

Deepti Sureka Mummidi[1,*], Dharmendra Dugar[1,±], Ranjit K Mishra[1,¥], Jatasankar Mohapatra[1,±], Tim Houghton T[1]

Affiliation:
[1]P.G Student, [1±]Professor, [1¥]Professor and HOD Department of General surgery, Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha, India

The name of the department(s) and institution(s) to which the work should be attributed:
Department of General surgery, Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha, India

Address reprint requests to
*** Dr. Deepti Sureka Mummidi.**
P.G Student, Department of General surgery, Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha, India or at deepti.palaypu@gmail.com, Tel.: +91-9937038889
Address: Flat no A108, Gatikrushna lagoon, near megheswar temple, Tankapani road, Bhubaneswar, odisha, India 751018.

Article citation:
Mummidi DS,Dugar D,Mishra RK, Mohapatra JS, Houghton T. Clinicopathological study: management Of diabetic foot and its Complications. *J Pharm Biomed Sci.* 2015; 05(04):308-311. Available at www.jpbms.info

ABSTRACT:
Diabetes is a lifelong problem, and the incidence of diabetic foot complications increases with age and duration of the disease. Ulceration, infection, gangrene, and amputation are significant complications of the disease. Diabetic foot infections are frequently polymicrobial in nature. Hyperglycemia, impaired immunologic responses, neuropathy, and peripheral arterial disease are the major predisposing factors leading to limb-threatening diabetic foot infections.

Objectives of the study: To understand the pathology of diabetic foot and relative distribution of this condition according to age, sex, among diabetic patients. To study the benefit and outcome of the different treatment modalities for diabetic foot
Methods: This study was conducted comprising of 100 patients of diabetic foot in the department of general surgery at Hitech medical college and hospital, Bhubaneswar, Odisha, during the period of Jan 2013 to Jun 2014.
Results: Commonest presenting lesion was ulcers (44%), followed by gangrene (24%) and cellulitis (20%). Commonest site of the lesion was dorsum of the foot (32%), followed by fore foot (28%), and toes (22%). Trivial trauma is the initiating factor in more than half of the cases. More than half of the patients 82% had infection. Most common microorganism grown from culture was *staphylococcus aureus* (30%), 28(28%) patients were treated with wound debridement, 18(18%) patients underwent major amputation. Prognosis was good in 72(72%) patients. 2(2%) patient died due to septicemia.
Conclusion: Diabetic patients at risk for foot lesions must be educated about risk factors. The multidisciplinary team approach to diabetic foot disorders has been demonstrated as the optimal method to achieve favorable rates of limb salvage in the high-risk diabetic patient. Infection in a diabetic foot is potentially limb-threatening and always requires urgent diagnostic and therapeutic attentions.

KEYWORDS: Diabetes; foot ulcers; neuropathy; ischemia.

Statement of Originality of work: The manuscript has been read and approved by all the authors, the requirements for authorship have been met, and that each author believes that the manuscript represents honest and original work.

INTRODUCTION
Diabetes mellitus is and iceberg disease. It is a worldwide problem. The incidence of diabetes mellitus is increasing globally[1]. Patients with diabetes have a 12% to 255% life time risk of developing a foot ulcer[2]. In the diabetic patient, the foot is the crossroad for many pathological processes, in which almost all components of the lower extremity involved; from skin, subcutaneous tissue, muscles, bones and joints, to blood vessels and nerves. Foot disorders are a major source of morbidity and a leading cause of hospitalization for persons with diabetes..

PBMS
Journal of Pharmaceutical and Biomedical Sciences
ISSN NO- 2230 – 7885
CODEN JPBSCT
NLM Title: J Pharm Biomed Sci.

Prevalence of diabetes in adults worldwide was estimated to be 4% in 1995 and is expected to rise to 5.4% by the year 2025. The number of adults with diabetes in the world will rise from 135 million in 1995 to 300 million in the year 2025. There will be a 42% increase, from 51 to 72 million, in the developed countries and a 170% increase, from 84 to 228 million, in the developing countries. The countries with the largest number of people with diabetes ar, and will be in the year 2025, India, China, and the U.S[3].

India alone, diabetes is expected to increase from 40.6 million in 2006 to 79.4 million by 20304. India presently has the largest number of diabetic patients in the world and India is thus designated to become the —diabetes capital of the world.

AIMS AND OBJECTIVES

1. To study the clinical pattern of foot infections in diabetic patients.
2. To analyze the risk factors leading to complication in diabetic foot infection.
3. To study the outcome of treatment modalities and suggest a patient friendly hospital management strategy for diabetic foot.
4. To educate the patient about taking care of feet and preventive care.

MATERIALS AND METHODS

This study was conducted comprising of, 100 patients of diabetic foot in the department of general surgery at Hi tech medical college and hospital during the period of January 2014 to January 2015.

INCLUSION CRITERIA

All patients with diabetes mellitus suffering from foot ulcers and infections are included in the study.

Age group of the patients: all age groups are included in the study.

Patients with known past history of diabetes are also included.

Patients with gangrenous foot, complicated by diabetes are included in the study.

EXCLUSION CRITERIA

Patients with foot infections without diabetes mellitus are excluded.

Patients with gangrene foot of etiology other than infection of foot complicated by diabetes are excluded.

Patients whose treatment could not be completed due to non compliance are excluded.

Incidental diagnosis of diabetes on admission.

OBSERVATION AND RESULTS

An analysis of 100 cases of diabetic foot was done. These cases were admitted and treated in different surgical units in Hitech Medical College and Hospital, Bhubaneshwar, Odisha during the period of January 2014 to January 2015.

AGE DISTRIBUTION

Of 100 cases studied, most of the diabetic patients with foot lesions were in the age group of 61-70 (32%) followed by 51-60 (24%).

The youngest has 31 years come with complaints of abscess over the (R) fore foot and the oldest was 80 years admitted for cellulitis of (R) whole fore foot.

SEX DISTRIBUTION

Out of 100 cases studied, there was a marked male predominance in occurrence of diabetic foot lesion. 78 (78%) were male patients and 22 cases females patients. Ratio of 1 Male: Female is 3.54: 1

CLINICAL PRESENTATION

Out of 100 SG" cases, 22 (44%) cases presented with ulcers, 10 (20%) cases with cellulitis 16 (16%) of cases abscess, 24 (24%) of cases gangrene and (4%) of cases Neuropathic ulcer.

SITE OF THE LESION

The most common site of lesion in the diabetic foot was dorsum of foot which was in about 32 patients (32%).

Then whole fore foot which comprised about 14 cases (28%). The least was heel which was about 4 (4%) patients.

CULTURE AND SENSITIVITY

The most common microorganism grown on culture of pus was *staphylococcus aureus* in 30 (30%) patients followed by pseudomonas 18 (18%), *streptococcus* 14 (14%), *Ecoli* 10 (10%), *Klebsiella* 8 (8%), and *Proteus* 6 (6%). In 14 (14%) patients there was no growth seen on culture some cultures yielded more than one type of bacteria.

TREATMENT

Out of 100 patients treated 12 (12%) patients were managed conservatively by / slough excision and regular dressing with antibiotics with diabetic control. 28 (28%) patients were treated with wound debridement, (10%) patients treated with SSG, (6%) patients underwent I & D for abscess and, 5(10%) patients underwent J fasciotomy and 6 (16%) patients presented with gangrene of toes and phalanges were M treated with disarticulation. 4(4%) patients underwent below knee amputation and 14 (14%) patients were above knee amputation. In most of the cases, limb was salvaged by conservative treatment and minor computations.

PBMS
ournal of Pharmaceutical and Biomedical Sciences
ISSN NO- 2230 – 7885
CODEN JPBSCT
NLM Title: J Pharm Biomed Sci.

PROGNOSIS

In this series 72 (72%) cases prognosis was good and in 20 (20%) cases it was satisfactory. 2 (2%) patients died of septicemia and 6 (6%) cases were discharged against medical advice.

DISCUSSION

When compared with Wheel, Lock and Root series5, there is not much age difference in youngest and oldest age group. (Table 1)

Table 1. Age distribution.

Age group	Wheel, Locked and root series[5]	Present study
Youngest	32	31
Oldest	89	80

When compared with Wheel, Lock and Root series, there is not much HR difference in youngest and oldest age group.

Like Jennifer A. May field et al.,[6] study, the Present study had more number of male patients 39 (78%) suffering from diabetic foot lesions than females 11 (22%). But the proportion between the two was far greater in this study. (Table 2) The present study had ratio of Male: Female as 3.54: 1. The incidence is more among males probably as they are mostly working out door, which makes them more vulnerable for trauma and sequel.

Table 2. Sex distribution.

Sex	Jennifer A. May field et al.[6]		Present study	
	No. of cases	Percentage	No. of cases	Percentage
Male	32	53	78	78
Female	29	47	22	22

Like Jennifer A. May field et al., study, the Present study had more number of male patients 39 (78%) suffering from diabetic foot lesions than females 11 (22%).

Out of 100 cases studied in this series, 22 cases (44%) presented as diabetic. ulcers. Out of these, 22 cases, the most common site of occurrence was on dorsum of foot 32% where as in Apelquist et. al.[7], and Reiber et. al.[8], study the common site was toes which was 51% and 52% respectively. Surprisingly toes (15%) were the least common site to be involved in the present study. (Table 3)

Table 3. Site of lesions.

Site of Lesion	Apelquist et al., [314][7]	Reiber et al., [n=302][8]	Present Study [100]
Toes	51	52	44
Dorsum of foot	14	11	64
Plantar metatarsal heads, Mid foot & Heel	9	18	36
Multiple ulcers	7	0	0
Whole fore foot	0	0	56

Out of these, 22 cases, the most common site of occurrence was on dorsum of foot 32% where as in Apelquist et. al., and Reiber et. al., study the common site was toes which was 51% and 52% respectively.

In the present study the commonest organism cultured was *staphylococcus aureus* 15 (30%) which was similar to study conducted by Gibbons et al. and Wheat et. al., studies. (Table 4)

Table 4. Culture and sensitivity.

ORGANISMS	NO OF PATIENTS	PERCENTAGE
Staph aureus	30	30
Streptococcus	14	14
Pseudomonas	18	18
E coli	10	10
Klebsiella	8	8
Proteus	6	6
No growth	14	14

The most common organism grown on pus culture and sensitivity was *Staphylococcus aureus* in 30 patients (30%) followed by *Pseudomonas* 18 (18%), *Streptococcus* 14 (14%), *E coli* 10 (10%), *Klebsiella* 8 (8%) and *Proteus* 6 (6%). In 14 patients (14%) there was no growth on culture and some cultures yielded more than one type of bacteria.

In the present series, 12 cases were treated by slough excision and regular U dressing. 14 cases

PBMS
ournal of Pharmaceutical and Biomedical Sciences
ISSN NO- 2230 – 7885
CODEN JPBSCT
NLM Title: J Pharm Biomed Sci.

were treated by wound debridement 10 with SSG, 16 by disarticulation of single or multiple toes at the level of metatarsophalengeal joints. I & D and fasciotomy done in 6 and 10 cases respectively. Below knee amputation was M \H done in 4 cases and above knee amputation was done in 14 'cases. Proper control of diabetes is very important in diabetic foot management fasting and post prandial blood sugar estimations were well under control. Infection was treated with broad spectrum antibiotics. Patients were educated about care of the foot. The amputation rate is much lower 18% compared to collen's series 38.6% in 1962. This could be due to, better education of the patient, better glycemic control, proper case of foot, proper use of antibiotics, extensive debridement and regular dressing after amputation wound healed well. The patients were referred to rehabilitation center for further management.

CONCLUSION

This study consists of 100 cases of diabetic foot patients with emphasis on surgical management and its complications over a period of 18 months. After analysis of the data the following are the conclusions.

The youngest patient in present study series of 100 patients studied was 31 years, and the oldest 80 years. The highest number of patients was seen in the age group of 61-70 years.

The male to female ratio was approximately 3.54: 1. Surgical complications are more common in men due to their increased susceptibility to trauma, smoking, and alcoholism.

Commonest presenting lesion was ulcers, followed by gangrene and cellulitis.

Commonest site of lesion was dorsum of foot followed by fore foot and toes.

Trivial trauma (prior to diabetic foot lesion) is the initiating factor in more than half of the cases.

Most common microorganisms grown from culture taken from the lesion was staphylococcus aureus followed by pseudomonas.

Conservative treatment consists of control of diabetes with human actrapid / human mixtard /lente / Glargine insulin along with appropriate oral or iv antibiotics was effective in most of the cases.

Wound debridement , slough excision, followed by dressing with povidine-iodine, metronidazole, collagenase, L- lysine, mupirocin, etc., dressings resulted in healing of ulcers.

Split skin grafting, disarticulation, bellow knee amputation, and above knee amputation, were the other modes of treatment. Mortality rate in the present study was 2%.

REFERENCES

1.Reiber GE. Epidemiology of foot ulcers and amputation in the diabetic foot. Bowker JH, Pfeifer MA, eds. The diabetic foot, 6th ed. st. Louis, Mo:Mosby Inc;2001:13-32.

2.Ramsey SD, Newton K, Blough D, McCulloch DK, Sandhy N, Reiber GE, et al. Incidence, outcomes and cost of foot ulcers in patients with diabetes.diabetes care 2009; 22:382-7.

3.Hilary King, Ronald E. Aubert, William H. Herman. Global Burden of Diabetes, 1995-2025: Prevalence, numerical estimates, and projections. Diabetes Care 1998; 21:1414-1431.

4.Lt Gen SR Mehta, VSM, Col AS Kashyap, Lt Col S Das. Diabetes Mellitus in India: The Modern Scourge. MJAFI2009; 65 : 50-54.

5.Wheel Lock, FC. Jr et al: Annals of surgery, 99: 776: 1969.

6.Mayfield, Jennifer, A., et al 1996: "A foot risk classification system to predict diabetic amputation in Pima Indians". Diabetes care 1996 July, 704- 709pp.

7.Apelqvist J, Larsson J, Agard C. Long term prognosis for diabetic patients with foot ulcers. JInt Med 1993; 233:485-491.

8.Reiber GE, Lipsky BA, Gibbons GW. The burden of diabetic foot ulcers. Am J Surg 1998; 176:5S-10S.

Source of support: None

Disclaimer: Any views expressed in this paper are those of the authors and do not reflect the official policy or position of the Department of Defense.

Copyright © 2015 Mummidi DS,Dugar D,Mishra RK, Mohapatra JS, Houghton T. This is an open access article under the CCBY-NC-SA license (http://creativecommons.org/licenses/by-nc-sa/3.0/). Which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.