DOI: https://doi.org/10.53350/pjmhs22161693

ORIGINAL ARTICLE

Prevalence of Osteomyelitis of the Foot among Patients of Diabetic Foot Ulcers

MUHAMMAD NADEEM KASHMIRI[1], INAMULLAH[2], FAZAL-E-NAUMAN[3]
[1]*Associate Professor, Orthopedic surgery, Watim Medical College Rawat, Rawalpindi*
[2]*FCPS General Surgery, Senior Registrar, Watim Medical College Rawat, Rawalpindi*
[3]*Assistant Professor, Islam Medical College Sialkot*
Corresponding author: Muhammad Nadeem Kashmiri, Email: drnadeemkashmir@yahoo.com, Cell: 0334 5458567

ABSTRACT

Aim: To assess the prevalence of osteomyelitis of the foot in patients with non-healing diabetic foot ulcers, the diagnostic accuracy of tests and the results of conservative treatment.

Methods: Prospective data from 180 diabetic patients (selected by consecutive sampling) who presented to the Surgical and Orthopaedic department with non-healing diabetic foot ulcers were assessed and selected for the study. All subjects had plain x-rays, physical and general examination, and complete blood count done. The results were analyzed using SPSS v. 21.0.

Results: Of 180 patients with non-healing diabetic foot ulcers assessed and treated in the out-patient department, 105 (58.3%) had osteomyelitis based on positive clinical picture, laboratory data, and imaging tests. 105 patients whom tested positive for osteomyelitis initially received conservative treatment. Twenty-five patients (13.8%) faced the tragic fate of amputation, which was not prevented by conservative treatment, the rest were positive and did not require amputation.

Conclusions: We conclude that conservative treatment gives positive results in most cases. It is recommended that patients at risk of osteomyelitis be assessed on an outpatient basis so that the disease can be diagnosed at an early stage and thus help reduce the frequency of amputations.

Keywords: diabetic foot ulceration, osteomyelitis, frequency of amputations.

INTRODUCTION

The prevalence of diabetes worldwide is so high that it is only a matter of time before it reaches epidemic levels and eventually surpass them[1-2]. With such a high level of morbidity and mortality, it is natural to assume a significant increase in the comorbidities most common in diabetes[3]. Vascular insufficiency and sensory neuropathy in people with diabetes mellitus are responsible for the formation of foot ulcers due to their primary pathological role in ulceration and their progression to infection and osteomyelitis and other adverse sequelae[4]. Current evidence-based statistics reveal that osteomyelitis is much more common than previously thought, and in most cases puts patients on the grim path that results in the greatest number of non-traumatic lower limb amputations[5-6]. The researchers also calculated that about a quarter of all people diagnosed with diabetes has a 100% risk of developing diabetic foot ulcers at some point in their life[7-8]. In addition, half of the people who develop suffer from further infections, including osteomyelitis. This amount accounts for about one-fifth of all diabetes hospitalizations in the United States, and therefore placed a significant economic burden on the healthcare system of approximately eleven billion over the year[9-10]. Nearly sixty-five percent of all people who report to healthcare facilities for non-healing diabetic foot ulcers have osteomyelitis. It's worth noting that these infected ulcers lead to more non-traumatic injuries, not just comorbidities. Lower limb amputations are more common than other pathologies[11]. Moreover, the consequences of non-traumatic lower limb amputation have now been shown to be dire, with less than half of people living more than five years post-amputation, which is worse than their survival rate in neoplastic conditions[12]. More recently, the traditional approach to these cases has been to treat osteomyelitis by removing the infected bone, but now some reports suggest that a more conservative approach with appropriate topical agents and long-term antimicrobial therapy can cure the infection. However, in order to wait for such results, it is necessary to make an early diagnosis in an outpatient clinic based on clinical presentation, laboratory data and radiological imaging. This study supports all of the above views by assessing the prevalence of osteomyelitis in patients with initial non-healing diabetic foot ulcers in the outpatient department. Secondly, it checks whether the conservative treatment is as promising as recent reports suggest, and finally determines whether the clinical examination itself is sufficient or whether radiological and pathological reports are necessary for a more accurate diagnosis.

MATERIAL AND METHODS

This Prospective analysis was based on hospital records. 180 diabetic patients (selected in consecutive samples) with non-healing diabetic foot ulcers were assessed at the Surgical and Orthopaedic department of Jinnah Hospital Lahore for one-year duration from December 2020 to December 2021. Physical examination, normal radiography, and complete blood count with written informed consent for all patients (as per standard routine protocol) was done. Data was also obtained using a structured questionnaire in the patient's local language. The results were analyzed using SPSS v. 21.0. In addition to location, size and nature, healthcare professionals assessed patients' ulcers for vascular disease, neuropathy, and the extent of the underlying infection. Plain x-rays were also carefully examined for signs of cortical thickening, atherosclerosis, and irregularities, as well as periosteum thickening or elevation. Loss of trabecular architecture, osteolysis and new bone formation were closely monitored.

Among other pathological and haematological studies, attention was paid to the level of leukocytes, the erythrocyte sedimentation rate and the level of C-reactive protein.

RESULTS

Of 180 patients with non-healing diabetic foot ulcers assessed and treated in the outpatient department, 105 (58.3%) had osteomyelitis based on positive clinical picture, laboratory data, and imaging tests. 105 patients who tested positive for osteomyelitis initially received conservative treatment. Twenty-five patients (13.8%) faced the tragic fate of amputation, which was not prevented by conservative treatment, the rest were positive and did not require amputation.

The Demographic Features of the patients are given in Table-1

Males	105(58.33%)
Females	75(41.7%)
Age Group	
30-40	25(13.9%)
40-50	42(23.3%)
50-60	66(36.7%)
60-70	35(19.4)
70-80	12(6.7%)
Education Level of the patients	
Primary	124(68.9%)
Secondary	30(16.7%)
Graduate	26(14.4%)
Residential Status	
Rural	102(56.7%)
Urban	78(43.3%)

The co-Morbidities of the patients are given in Table-2

Hypertension	87(48.3%)
Varicose Veins	12(6.7%)
Stroke	9(5%)

The Glycemic Status of the patients in terms of HbA1c is given in Table-3

	Patients No.	HbA1c mean
Controlled	41(22.8%)	6.12
Moderately Controlled	58(32.2%)	6.89
Poorly Controlled	81(45%)	9.35

The patient's treatment and prevalence of osteomyelitis in the studied population given in Table-4

Osteomyelitis	105(58.3%)
Amputation performed	25(31.8%)

DISCUSSION

Currently about 5 to 18 percent of Pakistanis have diabetes, and 64 percent of them are unaware of their disease. 97 percent of them do not know the principles of good diabetes control, and as the incidence of the disease will increase in the coming years, the situation could deteriorate statistically. Adverse Diabetic Foot Outcomes are considered the leading cause of hospitalization worldwide, and nearly a quarter of all diabetes admissions in developed countries are due to these adverse diabetic foot outcomes[13]. Put simply, approximately 24,000,000 people with diabetes are likely to injure their feet each year, and a third of them will at some point develop osteomyelitis. Similarly, if diagnosis is not made on time, the results could be dismal, as shown by a prospective study of four hundred and sixty-eight consecutive hospital admissions with diabetic foot ulcers with a 62 percent amputation rate in three years, and almost all amputations were caused by osteomyelitis due to foot ulceration[14]. Another random comparative analysis suggested that osteomyelitis has a 17% mortality rate if detected early and treated conservatively. However, in the case of late diagnosis, a mortality of 31% was observed[15-16].

Boyko and colleagues reported similar results in the veteran population of the United States. In addition to the morbidity and mortality associated with these diabetic foot problems, Apelqvist and colleagues also identified the financial costs[17-18]. The average total direct cost is much lower when the problem is identified early and treated (conservative or surgical). Given the serious ramifications of foot infections, it is clear that early diagnosis and prevention are critical in caring for these patients, especially if the infection is ignored or not recognized early[19]. Many others also provide evidence that a methodological and multidisciplinary approach to podiatry can significantly reduce the rate of adverse outcomes, especially if more care is undertaken early and more detailed assessment is given for those at higher risk[20-21]. Our results are in line with the above-mentioned international literature and show that conservative treatment produces encouraging results. Future studies involving a larger sample size may provide further confidence in the results already obtained[22]. It also emphasizes the importance of all the basic tests needed to evaluate diabetic foot ulcers, as the clinical examination itself, although very accurate, does not provide the best diagnostic accuracy[23].

CONCLUSION

The results show that patients with non-healing diabetic foot ulcers most often test positive for osteomyelitis, with a quarter having a grim fate. To our joy, conservative treatment often brought positive results. We recommend that patients at risk for osteomyelitis be examined on an outpatient basis for early detection of the disease to reduce the frequency of amputations. Pathological testing should also be considered more accurate than just a physical examination.

REFERENCES

1. Llewellyn A, Kraft J, Holton C, Harden M, Simmonds M. Imaging for detection of osteomyelitis in people with diabetic foot ulcers: A systematic review and meta-analysis. European journal of radiology. 2020 Oct 1;131:109215.
2. Van Asten SA, Nichols A, La Fontaine J, Bhavan K, Peters EJ, Lavery LA. The value of inflammatory markers to diagnose and monitor diabetic foot osteomyelitis. International wound journal. 2017 Feb;14(1):40-5.
3. Giurato L, Meloni M, Izzo V, Uccioli L. Osteomyelitis in diabetic foot: a comprehensive overview. World journal of diabetes. 2017 Apr 15;8(4):135.
4. Martínez JL, Álvarez YG, Tardáguila-García A, Morales EG. Optimal management of diabetic foot osteomyelitis: challenges and solutions. Diabetes, metabolic syndrome and obesity: targets and therapy. 2019;12:947.
5. Hutting KH, van Netten JJ, ten Cate WA, Smeets L, Welten GM, Scharn DM, de Vries JP, van Baal JG. Surgical Treatment of Diabetic Foot Ulcers Complicated by

Osteomyelitis with Gentamicin-Loaded Calcium Sulphate-Hydroxyapatite Biocomposite. Journal of Clinical Medicine. 2021 Jan;10(2):371.
6. Senneville E, Robineau O. Treatment options for diabetic foot osteomyelitis. Expert opinion on pharmacotherapy. 2017 May 24;18(8):759-65.
7. van Asten SA, Mithani M, Peters EJ, La Fontaine J, Kim PJ, Lavery LA. Complications during the treatment of diabetic foot osteomyelitis. Diabetes research and clinical practice. 2018 Jan 1;135:58-64.
8. Arias M, Hassan-Reshat S, Newsholme W. Retrospective analysis of diabetic foot osteomyelitis management and outcome at a tertiary care hospital in the UK. Plos one. 2019 May 16;14(5):e0216701.
9. Niazi NS, Drampalos E, Morrissey N, Jahangir N, Wee A, Pillai A. Adjuvant antibiotic loaded bio composite in the management of diabetic foot osteomyelitis—A multicentre study. The Foot. 2019 Jun 1;39:22-7.
10. Dutra LM, Melo MC, Moura MC, Leme LA, De Carvalho MR, Mascarenhas AN, Novaes MR. Prognosis of the outcome of severe diabetic foot ulcers with multidisciplinary care. Journal of multidisciplinary healthcare. 2019;12:349.
11. Aragón-Sánchez J, Víquez-Molina G, López-Valverde ME, Rojas-Bonilla JM, Murillo-Vargas C. Surgical Diabetic Foot Infections: Is Osteomyelitis Associated With a Worse Prognosis?. The International Journal of Lower Extremity Wounds. 2021 Feb 2:1534734620986695.
12. Schmidt BM, Ye W, Zhou S. Multidrug resistant organism predicts ulcer recurrence following surgical management of diabetic foot osteomyelitis. International Wound Journal. 2020 Dec;17(6):1634-41.
13. Jiang X, Li N, Yuan Y, Yang C, Chen Y, Ma Y, Wang J, Du D, Boey J, Armstrong DG, Deng W. Limb salvage and prevention of ulcer recurrence in a chronic refractory diabetic foot osteomyelitis. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 2020;13:2289.
14. Tardáguila-García A, Sanz-Corbalán I, García-Alamino JM, Ahluwalia R, Uccioli L, Lázaro-Martínez JL. Medical Versus Surgical Treatment for the Management of Diabetic Foot Osteomyelitis: A Systematic Review. Journal of Clinical Medicine. 2021 Jan;10(6):1237.
15. Tardáguila-García A, García-Álvarez Y, Sanz-Corbalán I, Álvaro-Afonso FJ, Molines-Barroso RJ, Lázaro-Martínez JL. Role of inflammatory markers in the healing time of diabetic foot osteomyelitis treated by surgery or antibiotics. Journal of wound care. 2020 Jan 2;29(1):5-10.
16. Aicale R, Cipollaro L, Esposito S, Maffulli N. An evidence based narrative review on treatment of diabetic foot osteomyelitis. The Surgeon. 2020 Oct 1;18(5):311-20.
17. Senneville EM, Lipsky BA, van Asten SA, Peters EJ. Diagnosing diabetic foot osteomyelitis. Diabetes/metabolism research and reviews. 2020 Mar;36:e3250.
18. Mandell JC, Khurana B, Smith JT, Czuczman GJ, Ghazikhanian V, Smith SE. Osteomyelitis of the lower extremity: pathophysiology, imaging, and classification, with an emphasis on diabetic foot infection. Emergency radiology. 2018 Apr;25(2):175-88.
19. Geraghty T, Laporta G. Current health and economic burden of chronic diabetic osteomyelitis. Expert review of pharmacoeconomics & outcomes research. 2019 May 4;19(3):279-86.
20. Mendame Ehya RE, Zhang H, Qi B, Yu A. Application and Clinical Effectiveness of Antibiotic-Loaded Bone Cement to Promote Soft Tissue Granulation in the Treatment of Neuropathic Diabetic Foot Ulcers Complicated by Osteomyelitis: A Randomized Controlled Trial. Journal of Diabetes Research. 2021 Jul 14;2021.
21. Tardáguila-García A, García Álvarez Y, García-Morales E, Álvaro-Afonso FJ, Sanz-Corbalán I, Lázaro-Martínez JL. Utility of blood parameters to detect complications during long-term follow-up in patients with diabetic foot osteomyelitis. Journal of Clinical Medicine. 2020 Nov;9(11):3768.
22. Wilson BM, Bessesen MT, Doros G, Brown ST, Saade E, Hermos J, Perez F, Skalweit M, Spellberg B, Bonomo RA. Adjunctive rifampin therapy for diabetic foot osteomyelitis in the veterans health administration. JAMA network open. 2019 Nov 1;2(11):e1916003-.
23. Tardáguila-García A, Sanz-Corbalán I, Molines-Barroso RJ, Álvaro-Afonso FJ, García-Álvarez Y, Lázaro-Martínez JL. Complications associated with the approach to metatarsal head resection in diabetic foot osteomyelitis. International wound journal. 2019 Apr;16(2):467-72.