

Hong Kong Journal of Orthopaedic Research

(An Open Access Journal for Orthopedics and Trauma Research)

Research Article

Hong Kong J Orthop Res
2021; 4(2): 29-31
ISSN (e): 2663-8231
ISSN (p): 2663-8223
Received: 01-05-2021
Accepted: 16-07-2021
© 2021, All rights reserved
www.hkorthopaedicjournal.com
DOI: 10.37515/ortho.8231.4202

Major Lower Extremity Amputations due to Diabetes Mellitus Complications

Pramod Devkota^{1*}, Shiraz Ahmad²

¹ Department of Orthopaedics and Trauma Surgery, Patan Academy of Health Sciences, Patan Hospital, Lalitpur, Nepal

² Department of Orthopaedics and Trauma Surgery, Suri Seri Begawan Hospital, Kuala Belait, Brunei

Abstract

Background: Lower limb ulcers and wounds, Charcot foot with the presence of peripheral neuropathy or peripheral vascular disease are common complications of the diabetes mellitus (DM). Major extremity amputations (below and above knee) are one of the common surgical procedures performed due to DM complications. **Objective:** To review the amputations performed due to diabetes mellitus (DM) complications with other associated illness, commonly isolated bacteria, and the demography of the patients in a public general hospital. **Materials and Methods:** We retrospectively reviewed the cases of above and below the knee amputations due to DM complications from January 2012 to December 2016. The age, gender, duration of DM anyone having, bacteria isolated, vascular condition of the lower limbs, other diseases anyone having, post-surgery wound conditions and status of the ambulation after surgery were analyzed. **Results:** A total of 53 amputations of the limbs of 51 patients were performed. Below knee amputations were performed on 43 (81.83%) limbs and male gender were 35(68.62%). The mean age of the patient was 57.6±12.01 years (range 31-91 years). The three most common bacteria isolated were *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Enterobacter cloacae*. About 85% of these bacteria were sensitive to commonly used first line of antibiotics like co-amoxiclav and ciprofloxacin. Fifty cases (98.03%) had diabetes for more than five years. End stage renal disease (ESRD) and ischaemic heart disease (IHD) were the other common co-morbidities observed. **Conclusion:** Major lower limb amputations (below and above the knee) due to uncontrolled blood sugar are common surgical procedures performed on DM. Majority of the bacteria were sensitive to commonly used first line of antibiotics but still 15% were not sensitive and bacteria isolation, sensitivity with the drugs were also important for the treatment of the infection.

Keywords: Diabetes Mellitus, lower limb, major amputations, below knee amputation, above knee amputation.

INTRODUCTION

Chronic non-healing wounds, infections and ulcers are common complications of diabetes mellitus (DM), which are the main causes of amputations in DM [1]. Amputation of lower extremities in DM patients is more common than in non-diabetics [2]. Amputation is a costly and extreme procedure for both the patient and the healthcare system [3]. It is estimated that one-third of diabetes are at risk of amputation [4]. Furthermore, any diabetes patient who had an amputation, is having a 30-50% more chances to undergo a second major limb amputation as well [5].

The incidence of amputation of lower extremities in diabetes has increased due to the worldwide increase in prevalence of DM and the increasing life expectancy of DM patients [6]. The incidence of DM is also increasing in the Asian populations, indicating a longer duration of this disease and greater risks of lower limb amputations [7, 8]. Major limb amputation is defined as the amputation above the ankle joint or through the knee joint level and up to the level of hip joint, and minor amputation is the amputation below the level of the ankle joint, foot and toe [9]. Sixty to eighty percent of the non-traumatic amputations are performed in diabetes and there is a 15-fold risk of major amputations, and 45-85% of lower extremity amputations are preventable if an aggressive, prompt and correct line of treatment is followed [10, 11]. The objective of this study was to retrospectively review the amputations performed due to diabetes mellitus (DM) complications with other associated illness, commonly isolated bacteria, and the demography of the patients in a public general hospital.

MATERIALS AND METHODS

This is an observational retrospective study conducted at the Department of Orthopedics and Trauma Surgery, Suri Seri Begawan Hospital, Kuala Belait, Brunei. All patients who underwent above or below knee

*Corresponding author:

Dr. Pramod Devkota

Department of Orthopaedics and Trauma Surgery, Patan Academy of Health Sciences, Patan Hospital, Lalitpur, Nepal
Email: devkotap@gmail.com

amputations due to diabetes mellitus complications of five years' time (from January 2012 to December 2016) were reviewed. The data of the patient were reviewed from the electronic data base of Brunei Darussalam Healthcare Information and Management Systems (Bru-HIMS). Included on this study were amputation performed due to diabetes complications. All patients age 18 and above with DM and who had undergone amputations of above knee or below-knee were included. The other causes of amputations like trauma, vascular injuries and tumors were excluded. Also excluded were ray amputations and foot disarticulations.

The age, gender, duration of DM anyone having, bacteria isolated, vascular condition of the lower limbs of Doppler study and other illness patient having were analyzed. Post-surgery hospital stays, post-operative wound status and ambulation status of the patients were also reviewed.

Statistical analysis was done using Statistical Package for Social Sciences for windows, version 22. (IBM Corp., Armonk, NY, USA). Quantitative data such as age, hospital stay, were expressed as mean \pm SD, while qualitative data such as gender, side involved, presence of other illness, above knee amputations, below knee amputations, post-operative status were expressed as a percentage

RESULTS

A total of 53 limb amputations in 51 patients were performed lower extremity amputation. The mean age was 57.6 ± 12.01 years (range 31-91 years). The mean hospital stay time was 15.24 ± 3.94 days (range, 9-25). Incision and drainage (I&D), debridement and disarticulations or rays' amputations of the feet were performed on 48 (90.56%) limbs prior to performing the amputations. Above knee amputation was performed on 10 (18.86%) limbs, below knee on 43 (81.14%) limbs. Majority of the patients were male 35 (68.62%). Amputations on the right sides were performed on 32 (60.37%) extremities, the left side was amputated done on 21 (39.63%) extremities.

The three most common bacteria isolated were *Klebsiella pneumoniae* in 21 limbs (39.62%), *Staphylococcus aureus* in 16 limbs (30.18%) and *Enterobacter cloacae* in 10 (18.86%) limbs. The majority (84.9%) of these bacteria were sensitive to antibiotics; co-amoxiclav and ciprofloxacin, which were the first line of antibiotics used. Fifty (98.03%) patients were suffering from DM for more than five years and on treatment. All patients were also taking medicine for hypertension as well. 32 (62.75%) patients were on oral hypoglycemic agents with insulin therapy. Still these patients had the record of uncontrolled blood sugar due to various reasons. The time of uncontrolled blood sugar of the patient ranges from 6 months to 19 months and the mean time being 9.87 months. Regular Doppler study was performed on every limb and vascular compromises of different degrees were recorded on 50 (94.33%) limbs. End stage renal disease (ESRD) and ischaemic heart disease (IHD) were the other common co-morbidities diagnosed. ESRD was diagnosed on 39 (76.45%) cases, IHD was seen on 19 (37.25%) cases and combined ESRD and IHD were found on 13 (25.49%) patients.

Post-operatively wound of 25 (47%) limbs healed uneventfully and different degrees of wound complications were encountered on 28 (52.83%) limbs. Till the time of this study, 27 (52.94%) of patient were able to do ambulation with crutches or prosthetics, 15 (29.41%) patients were mobilized on wheel chair and mortality was recorded on nine (17.64%) of cases.



Figure 1: Below knee amputation stump of diabetes limb.



Figure 2: Stump after above knee amputation

DISCUSSION

Diabetes mellitus (DM) is a major health problem globally and its complications are also increasing every year worldwide [6]. The total medical burden for treating diabetic related limb infections and diseases in the United States ranges from \$9 billion to \$13 billion and is an additional cost associated with diabetes [12].

Diabetes foot infections, non-healing ulcers, ischaemia are common and potentially serious problem in persons with diabetes. Lesions and infections on the limbs are amongst the commonest indication for hospitalization amongst diabetic patients [13]. In this study 48 patients (90.56%) were hospitalized prior to perform amputation for incision and drainage (I&D), debridement and disarticulations or rays' amputations of the limbs which is similar to other studies [10].

The mean age of the patients in this study was 57.6 years, the majority were male and below-knee amputation performed more than above-knee amputation. Johannesson *et al.* reported the mean age of higher than 45 years and male predominance with predominantly below-knee amputation performed [14]. Yusof *et al.* reported the mean age of patients to be 60.9 years, and the male patients were more than the female which are comparable to our study [15].

The most common bacteria isolated were *Klebsiella pneumoniae*, *Staphylococcus aureus*, and *Enterobacter cloacae*. Sánchez-Sánchez *et al.* reported *Staphylococcus aureus*, *Enterococcus* sp. *Staphylococcus epidermidis* as the three most common bacteria cultured on their study [16]. Rahim *et al* found *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli* as the three most common bacteria isolated from the diabetic limbs wounds [17]. In our study *Staphylococcus aureus* was the second most common bacteria isolated, which was a slightly different results but comparable from these two cited studies. We found that a major part (85%) of these bacteria is sensitive to the first line of antibacterial which was comparable to other reports as well [16, 17].

In this study, the vast majority (98.03%) of patients were having DM for longer than five years and on medications with 62.75% patients were on insulin. Nazri *et al.* reported 41.2% of his sample had suffered from DM for more than 10 years, and 84.0% were on insulin injections [8]. Regular doppler study was performed on every limb and vascular compromises of different degrees were recorded on 50 (94.33%) limbs. Fosse *et al.* reported 95% peripheral vascular disease [18]. End stage renal disease (ESRD) and ischaemic heart disease (IHD) were the other two most common co-morbidities diagnosed. ESRD was diagnosed on 39 (76.45%) cases, IHD was seen on 19 (37.25%) cases and combined ESRD and IHD was found on 13 (25.49%) patients. Rodrigues *et al.* reported IHD incidence more than ESRD, 54% and 7%, respectively [19]. Fosse *et al.* reported renal complications in 30% of cases [18]. Yusuf NZ *et al.* concluded that age, gender, ethnicity, smoking status, obesity, nephropathy, hyperlipidaemia, hypertension and history of IHD were not associated with major lower limb amputation in diabetic patients [15].

CONCLUSION

The wound lesions and infections on the limbs with peripheral vascular compromise are common complications of uncontrolled blood sugar which led to major limb amputation. Above and below-knee amputations due to uncontrolled DM are amongst the common surgical procedures performed. Almost 85% of bacteria were sensitive to the commonly used first-line of antibiotics but still 15% bacteria are not sensitive to these drugs. Cultures of bacteria, sensitivity identifications of the drugs are also very important for good control of infection.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Al-Wahbi AM. Impact of a diabetic foot care education program on lower limb amputation rate. *Vascul Health Risk Manag.* 2010; 21:923-34. doi: 10.2147/VHRM.S13569.
- Campbell WB, Ponette D, Sugiono M. Long-term results following operation for diabetic foot problems: arterial disease confers a poor prognosis. *Eur J Vase Endovasc Surg.* 2000;19:174-7. DOI:10.1053/ejvs.1999.1006
- CDC. Hospital Discharge Rates for Nontraumatic Extremity Amputation by Diabetes Status, 1997. *MMWR Morb Mortal Wkly Rep.* 2001; 50:954-8.
- CDC. Rate of lower extremity episodes among persons with diabetes—New Mexico, 2000. *MMWR Morb Mortal Wkly Rep.* 2003; 52:66-8.
- King LB. Impact of a Preventive Program on Amputation Rates in the Diabetic Population. *J Wound Ostomy Continence Nurs* 2008; 35:479-82. doi: 10.1097/01.WON.0000335958.83360.ec
- Zhang P, Lu J, Jing Y, Tang S, Zhu D, Bi Y. Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis. *Ann Med.* 2017; 49:106-16. doi: 10.1080/07853890.2016.1231932.
- Ang Y, Yap CW, Saxena N, Lin LK, Heng BH. Diabetes-related lower extremity amputations in Singapore. *Proceedings of Singapore Healthcare* 2017; 26:76–80. DOI: 10.1177/2010105816663521 journals.sagepub.com/home/psh
- Nazri MY, Aminudin CA, Ahmad FS, Mohd Jazlan MA, Jamalludin Ab R, Ramli M. Quality of life of diabetes amputees following major and minor lower limb amputations. *Med J Malaysia.* 2019; 74:25-9.
- Arya S, Binney Z, Khakharia A, Brewster LP, Goodney P, Patzer R *et al.* Race and socioeconomic status independently affect risk of major amputation in peripheral artery disease. *J Am Heart Assoc* 2018; 7(2)pii:e007425. doi: 10.1161/JAHA.117.007425.
- Singh G, Chawla S. Amputation in Diabetic Patients. *Med J Armed Forces India.* 2006; 62:36-9. doi: 10.1016/S0377-1237(06)80151-6.
- Armstrong DG, Lavery LA, Harkless LB. Who is at risk for diabetic foot ulceration? *Clin Podiatr Med Surg* 1998; 15:11-19.
- Rice JB, Desai U, Cummings AK, Birnbaum HG, Skornicki M, Parsons NB. Burden of diabetic foot ulcers for medicare and private insurers. *Diabetes Care* 2014; 37:651–658. doi: 10.2337/dc13-2176
- Peng CW, Tan SG. Perioperative and rehabilitative outcomes after amputation for ischaemic leg gangrene. *Ann Acad Med Singapore.* 2000; 29:168-72.
- Johannesson A, Larsson GU, Ramstrand N, Turkiewicz A, Wiréhn AB, Atroschi I. Incidence of lower-limb amputation in the diabetes and nondiabetic general population: a 10-year population-based cohort study of initial unilateral and contralateral amputations and reamputations. *Diabetes Care* 2009; 32:275-80. doi: 10.2337/dc08-1639
- Yusuf NZ, Ab Rahman J, Zulkifly AH, Che-Ahmad A, Khalid KA, Sulong AF, Vijayasingham N. Predictors of major lower limb amputation among type II diabetic patients admitted for diabetes foot problems. *Singapore Med J* 2015; 56:626-31. doi: 10.11622/smedj.2015172.
- Sánchez-Sánchez M, Cruz-Pulido WL, Bladinieres-Cámara E, Alcalá-Durán R, Rivera-Sánchez G, Bocanegra-García V. Bacterial Prevalence and Antibiotic Resistance in Clinical Isolates of Diabetic Foot Ulcers in the Northeast of Tamaulipas, Mexico. *Int J Low Extrem Wounds* 2017; 16:129-34. doi: 10.1177/1534734617705254.
- Rahim F, Ullah F, Ishfaq M, Afridi AK, Rahman SU, Rahman H. Frequency Of Common Bacteria And Their Antibiotic Sensitivity Pattern In Diabetics Presenting With Foot Ulcer. *J Ayub Med Coll Abbottabad* 2016; 28:528-33.
- Fosse S, Hartemann-Heurtier A, Jacqueminet S, Ha Van G, Grimaldi A, Fagot-Campagna A. Complications incidence and characteristics of lower limb amputations in people with diabetes. *Diabet Med* 2009; 26:391–6. DOI: 10.1111/j.1464-5491.2009.02698.x.
- Rodrigues BT, Vangaveti VN, Malabu UH. Prevalence and Risk Factors for Diabetes Lower Limb Amputation: A Clinic-Based Case Control Study. *J Diabetes Res* 2016; 2016:5941957. doi: 10.1155/2016/5941957.

Note: This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial (CC BY-NC 4.0) License, which allows reusers to distribute, remix, adapt, and build upon the material in any medium or format for noncommercial use only, and only so long as attribution is given to the creator.