Original Article

OPEN ACCESS

Outcome of Lower Limb Amputation Performed in General Surgery Department

Fahim Sakhizada[1], Muhammad Aqib[2], Aliya Shaima[3], Fatima Shahzad[4], Fahad Akhtar[5], S H Waqar[6]

[1,2]Postgraduate Resident, Department of General Surgery, PIMS Islamabad
[3]Senior Registrar, Department of General Surgery, Allied Hospital Faisalabad
[4]House Officer, Department of General Surgery, PIMS Islamabad
[5]Medical Officer & Postgraduate Resident, Department of General Surgery, PIMS Islamabad
[6]Professor & Head, Department of General Surgery, PIMS Islamabad

Author`s Contribution

[1,3]Substantial contributions to the conception or design of the work or the acquisition, methodology, analysis, [2,4,5]Active Participation in active, Drafting the work or revising it critically for important intellectual content, [6]Final approval of the version to be published.

Funding Source: None
Conflict of Interest: None

Received: Sept 5, 2023
Accepted: May 13, 2024

Address of Correspondent
Prof Dr S H Waqar
Professor of Surgery & Head,
Department of General Surgery,
Pakistan Institute of Medical Sciences, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad
waqardr@yahoo.com

ABSTRACT

Objective: To evaluate the outcomes of lower extremity amputation at a tertiary care hospital in Pakistan.

Methodology: This cross-sectional study was conducted at the Department of General Surgery, Pakistan Institute of Medical Sciences, Islamabad from March 2022 to February 2024. All adult patients who underwent any form of lower limb amputation were included in the study. The data regarding their demographics, risk factors, indications of amputation, type of amputation and outcome was collected from patients on a prescribed proforma and were analyzed using SPSS version 22.

Results: There were a total of 73 patients with 45 (61.6%) men and 28 (38.4%) women. The mean age was 57.3±13.7 years. The most common indication for amputation (69.8%) was diabetic foot gangrene. The most common level of amputation (45.2%) was below knee amputation and 21.9% had above knee amputation. The majority (83.6%) were admitted through the emergency department. Hypertension (72.6%) and smoking (46.6%) were the most common risk factors among the participants. The most common comorbidity reported was Diabetes Mellitus (65.8%) followed by Peripheral artery disease (41.1%). Pain and Mobility both improved after amputation.

Conclusion: Lower extremity amputations are done mainly in patients with diabetes and peripheral artery diseases. Diabetes Mellitus, hypertension and PAD were the commonest comorbidities identified among them. Below knee amputation is the most common procedure followed by ray amputation. Postoperative patients have improved mobility and pain relief. In many cases, significant amputations can be avoided with the help of public awareness, education, and prompt health care seeking.

Keywords: Diabetes Foot Ulcer, Lower Extremity Amputation, Peripheral Artery Disease.

Cite this article as: Sakhizada F, Aqib M, Shaima A, Shahzad F, Akhtar F, Waqar SH. Outcome of Lower Limb Amputation Performed in General Surgery Department. Ann Pak Inst Med Sci. 2024; 20(3):304-308. doi. 10.48036/apims.v20i3.1127

Introduction

A surgical procedure known as lower extremity amputation (LEA) involves the removal of either a portion or the entire lower limb as a result of trauma, infection, peripheral vascular disease, or cancer.[1] In Pakistan, this procedure is becoming more and more common. One of the most physically and psychologically devastating events is the loss of a limb, which affects mobility, independence, and quality of life in addition to causing significant disfigurement. "Major" lower limb loss was defined as amputation above the knee, below the knee, or foot amputation. Lower limb amputations are caused by a variety of factors in both developing and developed

nations. Poor records in many nations, including Pakistan, make it difficult to estimate the precise global burden of limb amputation.[2] However, the latest study conducted on similar lines in South India demonstrated a 54.1% increase in amputations.[3] In the USA, 1.6 million people were living with amputated limb in 2005 and this figure is expected to increase to 3.6 million peopled by 2050.[4] Studies have shown that 93.4% of all lower extremity amputations are due to vascular disease, with incidence increasing from 2007-2011.[5] Despite the increase in the burden of diabetic disease, the overall rate of major amputations in the United States has decreased. While rates of major lower extremity amputation decreased by 40% between 1996 and 2011 among US Medicare recipients, from 2010 through 2015, there was a reversal with an increase in the national amputation rate driven notably by younger and middle-aged adults, and men.[6] Overall, the rate of lower extremity amputation remained comparatively low until 1996, but the reason for this more recent change remains unclear.[7]

The prevalence of LEAs has significantly increased in diabetes and peripheral vascular disease. Amputation is found to be more prevalent in the older age group (56-75 years).[8] The most common indication for lower limb amputation in Pakistan is diabetic foot ulcer followed by infection.[9]

While the incidence of non-traumatic LEAs are steadily falling and the indicators are getting smaller in the developed world due to better health care systems and well-established prevention initiatives, the growing threat of LEAs still plagues in developing countries.[10]

The purpose of this study was to collect data on the etiology, clinical presentation, causes, and outcomes of non traumatic LEAs at our facility in order to create a foundation of actionable evidence that would improve the future outcomes for our patients. The results of this study will help to evaluate the current magnitude of the problem, so effective measures can be adopted regarding the control and management of such cases which will not only decrease the extra healthcare burden on hospital authorities but will also improve the quality of life, productivity and performance of our main workforce to help the national economy.

Methodology

This cross-sectional, descriptive study was conducted at Department of General Surgery, Pakistan Institute of Medical Sciences, Islamabad, Pakistan from March 2022 to February 2024. After taking informed consent, all adult patients of both gender who presented in emergency or OPD and underwent any form of lower limb amputation for non traumatic indications were included in the study. Patients in whom amputations were performed for acute traumatic indications and those unwilling to participate in the study were excluded. Patient's history with comorbids, possible causes and risk factors, findings of the clinical examination, and outcomes of the procedures were recorded in the prescribed proforma. Patients were operated for lower limb amputation by the team of General Surgery. Below knee amputation (BKA) was performed at a level of 12-17 cm of the tibial stump, measuring the length from the tibial tuberosity. In difficult cases, the length of the tibial stump was ensured to be no <8 cm. Above knee amputation (AKA) was performed at a level 25-30 cm of the femoral stump, taking the greater trochanter as the measuring landmark. The primary study outcomes were indications of the operation, type of amputation (Below knee amputation, Above knee amputation, Ray amputation, Transmetatarsal amputation and hip dis articulation), duration of hospital stay, immediate post operative complications were recorded. Patients were followed up for three months postoperative and assessed for wound healing, chronic pain and activity.

The data were analyzed with SPSS 22. Variable like age was presented as mean ± standard deviation and variables like gender and outcome were expressed as frequency and percentage.

Results

There were a total of 73 patients, out of them 45 (61.6%) were males and 28 (38.4%) were females with a mean age of 57.3±13.7 years. The majority of 61 (83.6%) patients were admitted through the emergency department and 12 (16.4%) were admitted via the outpatient department. Hypertension (72.6%) and smoking (46.6%) were the most common risk factors among the participants. The most common comorbidity reported was Diabetes Mellitus followed by Peripheral artery disease as shown in Table 1.

Various types of amputations performed among the patients are shown in Figure I. A total of 33 (45.2%) patients underwent below-knee amputation whereas only 17 (23.3%) underwent above-knee amputations.

The mean length of hospital stay was 6.79 ± 4.13 days ranged from 4 to 28 days and mortality was 03 (4.1%) patients, all had uncontrolled diabetes with multiple comorbids. Outcome data of the included patients is summarized in Table II. Around 36 (46.6%) of patients

Table I: Demographic Characteristics of Patients. (n=73)		
	N	**%**
Gender		
Male	45	61.6
Female	28	38.4
Risk Factor		
Hypertension	53	72.6
Smoking	34	46.6
Obesity	09	12.3
Hyperlipidemia	16	21.9
Comorbid		
Diabetes Mellitus	51	69.8
Peripheral Vascular Disease	26	35.6
Ischaemic Heart Disease	19	26.0
Bone Cancer	01	1.4
Oesteomylitis	01	1.4

reported chronic pain and 46 (63%) of patients showed some activity after amputation at three months follow up.

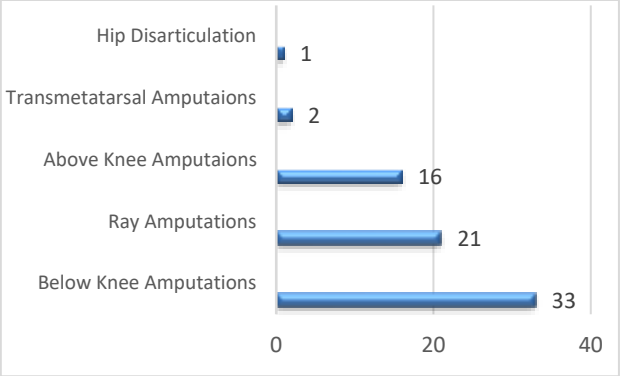

Figure I. Types of amputations performed. (n=73)

Table II: Outcome data of the patients (n=73)		
Characteristics	**N**	**%**
Indications of amputations		
Diabetic foot gangrene/ulcer	51	69.8
Limb ischaemia	20	27.4
Malignant bone tumour	01	1.4
Chronic ulcer with osteomyelitis	01	1.4
Types of amputations		
Below Knee Amputations	33	45.2
Ray amputations	21	28.8
Above Knee Amputations	16	21.9
Trans metatarsal	02	2.7
Hip dis articulation	01	1.4
Hospitalization		
Day care	19	26.0
Admission	54	73.9
Secondary procedures		
Delayed primary closure	11	15.1
Vacuum assisted closure / dressing	09	12.3
Revision	06	8.2
Postoperative complications		
Wound infection	27	37.0
Stump edema	13	17.8
Phantom limb pain	07	9.6
Outcomes		
Length of hospital stay	Mean 6.79 ± 4.13 days	
Mortality	03 (4.1%)	

Discussion

The present prospective study is aimed to found the demographic and clinical profile of non-traumatic LEAs managed at our hospital. Diabetes has emerged as the major cause of these conditions, as indicated in the results. Diabetic foot problems, without routine wound management, have significantly contributed to increasing amputation rates worldwide.[11] Most diabetic foot ulcers result in infection, making it a more common consequence. Further these patients are maltreated by the local quacks and referred to hospital when there is uncontrolled diabetes with uncontrolled foot infection. In hospitalized patients, this percentage increases to a greater extent. A small amputation has been found to increase likelihood of a larger amputation.[12]

In this study, the mean age of the patients was 57.3±13.7 years, which is less than patients of the Western population.[13] For instance, Kayssi et al from Canada reported a mean age of 67 ± 13 years.[14] This difference may be due to high prevalence of diabetes in our population.

Males has higher rate of LEAs as compared with females in this study. There were 61.6% of males and 38.4% were females. Males have been reported to be an independent risk factor for LEAs, particularly among patients with DM and peripheral vascular disease. There are some theories but exact cause is still unknown.[15] A recent study performed in Pakistan showed that the greatest number of individuals who underwent lower limb amputation were between 56 and 75 years of age. Additionally, many of the patients were male.[9]

The major indication of LEAs in this study was diabetic foot ulcers or gangrene (69.8%) due to uncontrolled or poorly controlled diabetes with sepsis due to infected ulcer. Uncontrolled DM constitutes one of the leading causes of non-traumatic LEAs worldwide. The risk of LEAs among DM patients is 10 times greater than those without DM. These patients may develop local foot infection, chronic trophic ulcers, osteomyelitis and systemic sepsis that ultimately leads to a variety of minor and major amputations.[16] In these individuals, lowering the risk of ulceration also lowers the risk of infection, hospital stay, and lower-extremity amputation.[17]

Peripheral arterial disease (PAD) is the second most common cause of lower limb amputation as shown by our results. It is defined as chronic arterial disease of the legs of atherosclerotic origin. Atherosclerotic plaque in the leg

arteries occurs over a longer period. This finding clarifies why older people exhibit more prominent clinical signs of this disease.[18] The decision to undergo LEA is influenced by patient risk factors, such as the intensity of symptoms, the burden, and the length of PAD. Many PAD patients require LEA when they exhibit tissue loss, which may range from ulceration to gangrene.[19]

Many recent studies conducted in Western nations have revealed a very low prevalence of below-knee amputations (25.8–9.5%) and an increase in amputations of the feet as a result of a high rate of endovascular surgery and revascularization in PAD patients.[20] However the limited scope of vascular surgeries in Pakistan could be a potential justification for the increasing number of below-knee amputations, as our study revealed that (45.2%) of patients underwent below-knee amputation, 28.8% underwent ray amputation and 23.3% underwent above-knee amputation.

Of the LEAs conducted in the current study, 46.2% were at the BKA level of amputation, making it the most common level. According to Johannesson et al., the most common amputation in their series was a transtibial amputation (74%).[21] Similarly, Kayssi et al. showed that BKA accounted for 61% of cases, AKA for 22%, and foot amputations for 14% of re amputation patients.[14]

Phantom limb discomfort was noted in 3.84% of the individuals in this study. With the use of several therapeutic modalities, such as amitriptyline, stump massage, and non steroidal anti-inflammatory medicines, it resolved on average over a six-month period. observations align with multiple published research papers

Hospital mortality was found to be 4.68% in the current study. Between 4% and 22% of LEA patients die within the first year after surgery.[22]

Studies have shown that cigarette smoking has effects on diabetes and PAD. The current analysis demonstrated that smoking has a significant impact on diabetic foot ulcers at every stage and during lower limb amputation.[23] Smoking enhances the synergistic effects of comorbidities associated with LEA. Thus, smoking is a top risk factor for lower limb amputees fortifying our study's finding that the majority of the patients (46.6%) among the amputees were smokers, followed by those with hyperlipidemia and obesity (21.9 % and 12.3%) respectively.

A study conducted in the UK showed that the general quality of life after lower limb amputation is poor. The majority of amputees reported more issues with pain and mobility and wound infection in terms of patient outcome.[24] Among our patients, 61.6%, 63%, and 71.2% patients had no complaints of activity, pain, or wound infection respectively. In conclusion, providing lower limb amputation patients with effective wound care is critical to their overall well-being since it reduces complications, manages pain, encourages healing, preserves function, supports psychological health, and improves mobility. Providers can greatly enhance patients' overall pleasure and well-being by attending to the physical and emotional components of wound care.

Interventions to avoid PAD, as well as the prevention, early identification, and treatment of foot lesions that arise in patients with this illness, should be the focus of efforts to prevent LEAs. Although there are no proven interventions for the prevention of PAD, efforts aimed at controlling hypertension, hyperglycemia, and hyperlipidemia as well as smoking cessation should lower the incidence of PAD and eventually lower the incidence of amputation in the diabetic population. Since many diabetic patients also have PAD, therapies should concentrate on preventing ulcers, infections, and gangrene by employing rigorous foot care regimens.[25]

Study Limitation: The study was conducted at a single institution limiting generalizability. The sample size was small thereby decreasing the statistical power of the study.

Conclusion

Lower extremity amputations are on the rise in underdeveloped countries such as Pakistan. More studies are needed to better understand the multiple factors associated with this procedure. The findings of this study provide insights into the sociodemographic characteristics, past medical conditions, and patient outcomes. The issues related to foot ulcers caused by diabetes followed by peripheral artery disease, and other minor related risk factors could essentially be eliminated by screening and treating risk factors at an earlier stage and hence decreasing the amputation rate. It is vital to analyse these factors in depth to improve patient care and address all concerns contributing to this rise.

References

1. Molina CS, Faulk JB. Lower Extremity Amputation. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK546594/
2. Rathore FA, Ayaz SB, Mansoor SN, Qureshi AR, Fahim M. Demographics of Lower Limb Amputations in the Pakistan Military: A Single Center, Three-Year Prospective Survey. Cureus. 2016; 8(4):e566. https://doi.org/10.7759/cureus.566

3. Viswanathan V, Nachimuthu S. Major Lower-Limb Amputation During the COVID Pandemic in South India. Int J Low Extrem Wounds. 2023; 22(3):475-9. https://doi.org/10.1177/15347346211020985
4. Varma P, Stineman MG, Dillingham TR. Epidemiology of limb loss. Phys Med Rehabil Clin N Am 2014; 25(1): 1-8. https://doi.org/10.1016/j.pmr.2013.09.001
5. Newhall K, Spangler E, Dzebisashvili N, Goodman DC, Goodney P. Amputation rates for patients with diabetes and peripheral arterial disease: the effects of race and region. Ann Vasc Surg. 2016; 30: 292-8.e1. https://doi.org/10.1016/j.avsg.2015.07.040
6. Ziegler-Graham K, MacKenzie EJ, Ephraim PL, Travison TG, Brookmeyer R. Estimating the prevalence of limb loss in the United States: 2005 to 2050. Arch Phys Med Rehabil 2008; 89(3):422-9. https://doi.org/10.1016/j.apmr.2007.11.005
7. Okesina AA, Nsubuga I, Omoola OO, Okesina HA. Understanding Lower Limb Amputation: A Review of the Strategies for Healthcare Improvement, Prevention, and Management. Rwanda Medical Journal 2024, 81(1): 118-133. https://dx.doi.org/10.4314/rmj.v81i1.13 https://doi.org/10.4314/rmj.v81i1.13
8. Saaiq M. Epidemiology and Outcome of Nontraumatic Lower Limb Amputations. Med J Islam Repub Iran. 2023; 37:18. https://doi.org/10.47176/mjiri.37.18
9. Khatoon MA, Karim SMK, Khan L, Karimi S, Abro UF. Exploring the Indications, Levels, and Outcomes of Lower Extremity Amputation at a Tertiary Care Hospital in Pakistan. Cureus. 2023; 15(11): e48856. https://doi.org/10.7759/cureus.48856
10. Aljarrah Q, Allouh MZ, Bakkar S, Aleshawi A, Obeidat H, Hijazi E. et al. Major lower extremity amputation: a contemporary analysis from an academic tertiary referral centre in a developing community. BMC Surgery. 2019;19:170. https://doi.org/10.1186/s12893-019-0637-y
11. Nouira S, Ach T, Bellazreg F, Ben Abdelkrim A. Predictive Factors for Lower Limb Amputation in Type 2 Diabetics. Cureus. 2023; 15(6): e39987. https://doi.org/10.7759/cureus.39987
12. Barbosa Marques AD, Sales Da Silva LM, Magalhães Moreira TM, Martins Torres RA. Asociação entre internação hospitalar por diabetes mellitus e amputação de pé diabético. Enferm Glob. 2018; 17(3): 238. https://doi.org/10.6018/eglobal.17.3.286181
13. Essien SK, Kopriva D, Linassi AG, Zucker-Levin A. Trends of limb amputation considering type, level, sex and age in Saskatchewan, Canada 2006-2019: an in-depth assessment. Arch Public Health. 2022 Jan 4;80(1):10. https://doi.org/10.1186/s13690-021-00759-1
14. Kayssi A, Mestral CD, Forbes TL, Nagle GR. A Canadian population-based description of the indications for lower-extremity amputations and outcomes. Can J Surg. 2016;59(2):99-106. https://doi.org/10.1503/cjs.013115
15. Peek ME. Gender differences in diabetes-related lower extremity amputations. Clin Orthop Relat Res. 2011;469(7):1951. https://doi.org/10.1007/s11999-010-1735-4
16. Imam B, Miller WC, Finlayson HC, Eng JJ, Jarus T. Incidence of lower limb amputation in Canada. Can J Public Health. 2017;108(4):e374-e380. https://doi.org/10.17269/CJPH.108.6093
17. Bus SA, Lavery LA, Monteiro-Soares M, Rasmussen A, Raspovic A, Sacco ICN, et al. Guidelines on the prevention of foot ulcers in persons with diabetes (IWGDF 2019 update). Diabetes Metab Res Rev 2020; 36(S1): e3269. https://doi.org/10.1002/dmrr.3269
18. Cimminiello C. PAD. Epidemiology and pathophysiology. Thromb Res. 2002; 106(6): V295-301. https://doi.org/10.1016/S0049-3848(01)00400-5
19. Swaminathan A, Vemulapalli S, Patel MR, Jones WS. Lower extremity amputation in peripheral artery disease: improving patient outcomes. Vasc Health Risk Manag. 2014; 10: 417-24. https://doi.org/10.2147/VHRM.S50588
20. Kouevi-Koko TE, Amouzou KS, Sogan A, Apeti S, Dakey YEL, Abalo A. Lower extremity amputations (LEAs) in a tertiary hospital in Togo: a retrospective analysis of clinical, biological, radiological, and therapeutic aspects. J Orthop Surg. 2023; 18(1): 155. https://doi.org/10.1186/s13018-023-03628-5
21. Johannesson A, Larsson GU, Ramstrand N, Turkiewicz A, Wirehn AB, Astroshi I. Incidence of lower-limb amputation in the diabetic and non-diabetic general population: A 10-year population-based cohort study of initial unilateral and contralateral amputations and reamputations. Diabetes Care.2009;32:275-280. https://doi.org/10.2337/dc08-1639
22. Netten JJV, Fortington LV, Hinchliffe RJ, Hijmans JM. Early Post-operative mortality after major lower limb amputation: A systematic review of population and regional based studies. Eur J Vasc Endovasc Surg. 2016;51(2):248e258. https://doi.org/10.1016/j.ejvs.2015.10.001
23. Xia N, Morteza A, Yang F, Cao H, Wang A. Review of cigarette smoking in diabetic foot. J Diabetes Investig. 2019;10(2):202-15. https://doi.org/10.1111/jdi.12952
24. Kwasniewski M, Mitchel D. Post Amputation Skin and Wound Care. Phys Med Rehabil Clin N Am. 2022; 33(4): 857-70. https://doi.org/10.1016/j.pmr.2022.06.010
25. Akkus G, Sert M. Diabetic foot ulcers: A devastating complication of diabetes mellitus continues non-stop in spite of new medical treatment modalities. World J Diabetes. 2022 Dec 15;13(12):1106-1121. https://doi.org/10.4239/wjd.v13.i12.1106