Research Article
Volume 6:5, 2022

Journal of Clinical Research

ISSN: 2795-6172 **Open Access**

Outcomes of Major Lower Limb Amputation among Patients at a Referral Hospital

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Abstract

Background: Patients undergoing major lower limb amputation sometimes have complicating underlying comorbidities that are likely to have significant influence on post-operative morbidity and mortality and long-term psychological status. This necessitates the healthcare system to plan for the amputees' needs to achieve best outcomes.

So we aimed to determine the outcomes of major lower limb amputation among patients at our Hospital.

Methods: A retrospective cross-sectional study was conducted using medical records of 75 patients who underwent major lower limb amputation between 1st January 2016 and 31st December 2020 at St. Francis Hospital Nsambya. Variables including socio-demographic characteristics (age, sex), clinical factors (mean arterial pressure, random blood sugar, glycated hemoglobin), causes of amputation (trauma, neoplasms, diabetes mellitus, peripheral arterial disease, infections, congenital anomalies) and short-term outcomes (re-amputation, length of hospital stay, in-hospital mortality) were collected from patients' files. Intermediate outcomes (utilization of physiotherapy services) and long-term outcomes (prosthetic use, functional return and psychological status) were collected through phone calls.

Results: only 2(3%) underwent re-amputation. In-hospital mortality was 10.7% with deaths registered only among those aged ≥ 50 years. Average length of hospital stay was 12.8 ± 8.4 days. Physiotherapy utilization was 85.3% and it increased with older age (p=0.002). 16(26.2%) utilized prosthetics with majority being males. Majority (62.3%) of amputees had been able to return to work; 73.8% were still married. Psychological status score ranged from 4 to 10 with mean of 7.5 ± 1.7.

Conclusion: Majority of patients had gained full functionality with good utilization of physiotherapy services which are very key in improving amputees' quality of life, thus the high psychological status scores. However, we found a low prosthetic uptake among our patients.

Keywords: Amputation • Prosthetic use • Psychological status

Introduction

Limb amputation is broadly defined as the surgical removal of all or part of a limb or extremity such as an arm, leg, foot, hand, toe, or finger. Amputation has been practiced for punitive, ritual and therapeutic reasons [1]. Below-knee (BKA) and above-knee (AKA) amputations commonly referred to as major lower limb amputations are the commonest amputation surgeries [2,3] Being among the most acquired disabilities, the global prevalence of major limb amputation ranges from 3.6 to 68.4 per 100,000 population [4]. Basing on the Uganda national population census of 2014, the prevalence of limb disability increases with age, varying from 3.5% in children through 7.5% in teenagers to 16.5% in adults of which 5% have difficulty in walking.

The incidences of indications for limb amputation have been reported to vary from one place to another [5,6]. With increasing urbanization and improved medical management, life expectancy of the population has also continually increased. As people live longer, the complications of diabetes, peripheral vascular disease, and other chronic diseases progressively increase the frequency of lower limb loss. In Uganda, trauma is the leading cause of lower limb amputation followed by diabetes, neoplasms and Peripheral Artery Disease (PAD) [7,8].

Patients undergoing major limb amputation usually carry a high burden of comorbidities such as diabetes, renal disease and hypertension. In addition, patients present to health facilities late when limb salvage is not a viable option thus increasing their risk of poor outcomes of amputation; prolonged post-operative hospital stay, in-patient complication rate, re-amputation and in-hospital mortality [9] The adverse impact of lower limb amputation is further increased because of limited resources, advanced age, smoking, chronic renal failure, hypercoagulability, and genetic factors.

This study aimed to determine the short term, intermediate and long term outcomes of patients who undergo major lower limb amputation at St. Francis Hospital Nsambya (SFHN).

Materials and Methods

A retrospective cross-sectional study of patients who underwent major lower limb amputation between 1st January 2016 and 31st December 2020 at St. Francis Hospital Nsambya.

Surgical department was conducted the hospital runs orthopedic survives that include clinics ward rounds and a daily orthopedic theatre. On average the hospital receives 19,000 inpatients and 117,204 outpatients annually. We enrolled Patients who undergo major lower limb amputation.

The Entry point was the theatre registry where in- patient numbers of patients who underwent major lower limb amputation were obtained between 1st January 2016 and December 31st 2020, demographics, pre-operative blood pressure, random blood sugar, glycated haemoglobin, date of admission and

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Date of Submission: 25 August, 2022, Manuscript No. jcre-22-72955; **Editor Assigned:** 27 August, 2022, PreQC No. P-72955; **Reviewed:** 12 September, 2022, QC No. Q-72955; **Revised:** 17 September, 2022, Manuscript No. R-72955; **Published:** 20 September, 2022, DOI: 10.37421/2795-6172.2022.6.167

discharge, reason for amputation, type of amputation, were extracted using a data abstraction form. Mean Arterial Pressure (MAP) was calculated from pre-operative blood pressure. HBA1C results were obtained from the hospital management system. Data on physiotherapy utilization, prosthetics use, functional return and psychological status were obtained via phone calls to each individual patient.

In-hospital mortality, Re-amputation, length of hospital stay, Physiotherapy utilization: Prosthetic use, functional return, Psychological status were assessed. Mental and emotional wellbeing was rated on a scale of 1 to 10 (0-1 very poor; 2-3 poor; 4-5 fair; 6-8 good; 9-10 very good).

Results

The study recruited 75 patients who had major lower limb amputation between 1st January 2016 and 31st December 2020 at St. Francis Hospital Nsambya. The average age of amputees was 61 years (64.6 years for BKA; 56.6 years for AKA). Mean arterial pressure was 99.1 ± 11.5 mm Hg. 68% of amputees had diabetes mellitus, and the commonest indication for amputation was wet gangrene. Out of the 30 patients with poorly controlled glycaemia, 29 (96.7%) had diabetes mellitus (Table 1).

Short-term outcomes of major lower limb amputations

These included re-amputation, condition at discharge and length of hospital stay:

Out of the 75 patients, only 2 (3%) underwent re-amputation. In-hospital mortality was 10.7% (two males and six females), and it was not significantly different across age groups (0.446). However, it is important to note that all of the patients who died were older than 50 years, and 5 (62.5%) had amputation due to diabetic foot gangrene. Average length of hospital stay was 12.8 ± 8.4 days, and was not significantly different by level of amputation, age, sex, blood sugar and glycated hemoglobin (Table 2).

Intermediate outcomes studied included: physiotherapy utilization and prosthesis use. Out of the 61 amputees assessed for physiotherapy use, 16(26.2%) utilized prosthetics with majority being males. Majority of participants (85.3%) utilized physiotherapy services. Physiotherapy utilization increased with older age (p=0.002)

The 45 amputees who were not utilizing prosthetics gave different reasons for not using prosthetics. These included poor access to prosthetics, failure to afford, lack of knowledge about prosthetics, among others (Table 3) (Figure 1).

The long-term outcomes of major lower limb amputations

Long term outcomes studied included: functional return (return to work, marriage) and psychological status. 62.3% of patients were able to return to work; 73.8% were still married (Table 4). Psychological status score ranged from 4 to 10 with mean of 7.5 ± 1.7 Of the 64 patients that were assessed for psychological distress of which 84%had good and very good psychological status (Figure 2).

Discussion

This study showed that lower limb amputation at St Francis hospital Nsambya is associated with outcomes which significantly affect the life style of the patients at short term, intermediate and long term.

The average age of patients was 61 years, and 68% of the amputees were aged 50 years and above, presenting with diabetes and peripheral artery disease. This could be explained by the presence of a well-established diabetic clinic at St. Francis Hospital Nsambya. Contrary to these findings, most recent studies carried out at Mulago national referral hospital had trauma as the leading cause Lower limb Amputation [7], this is because Mulago hospital receives a high number of trauma cases compared to St. Francis Hospital Nsambya therefore amputations due to trauma are more likely to be high. However findings similar to those in this study were observed in South Africa

Table 1. Characteristics patients who underwent major lower limb amputation.

Characteristic (N=75)		Frequency	Percentage
Age in years (mean ± SD)		61 ± 21.1	-
Sex	Male	37	49.3
	Female	38	50.7
Random Blood Sugar (RBS)	<7.8 mmol/L	30	40.0
	7.8-11 mmol/L	23	30.7
	>11 mmol/L	22	29.3
Glycated hemoglobin (HBA1C) (n=34)	Good glycemic control (4-6.4)	4	11.8
	Poor glycemic control (≥ 6.5)	30	88.2
Indication for amputation	Congenital anomaly	1	1.3
	Dry gangrene	1	1.3
	Wet gangrene	51	68.0
	Osteomyelitis	1	1.3
	Osteosarcoma	1	1.3
	Peripheral artery disease	12	16.0
	Trauma	8	10.7
Level of amputation	Below knee	41	54.7
	Above knee	34	45.3

Table 2. Short term outcomes patients who underwent major lower limb amputation.

Characteristic (N=75)		In-hospital mortality (n=8)	P value	Length of hospital stay	P value
Age in years	≤ 17	0	0.446	8.3 ± 1.2	0.341
	18-49	0		17.1 ± 16.4	
	≥ 50	8		11.9 ± 4.3	
Sex	Male	2	0.149	13.6 ± 11	0.442
	Female	6		12.1 ± 4.7	
Random blood sugar (RBS)	<7.8 mmol/L	4	0.553	14.4 ± 12.3	0.359
	7.8-11 mmol/L	3		11 ± 3.7	
	>11 mmol/L	1		12.5 ± 3.8	
Glycated hemoglobin (n=34)	Good glycemic control (4-6.4)	1	0.447	12.3 ± 3.9	0.936
	Poor glycemic control (≥6.5)	3		12 ± 3.8	
Level of amputation	Below knee	2	0.076	11.3 ± 3.4	0.555
	Above knee	6		13.4 ± 11.9	

Table 3. Physiotherapy & prosthetics utilization

Characteristic (N=75)		Physiotherapy utilization (n=64)	P value	Prosthetic use (n=16)	P value
Age in years	≤ 17	12	0.002	1	0.086
	18 -49	15		7	
	≥ 50	47		8	
Sex	Male	33	0.344	13	0.017
	Female	31		3	
Random blood sugar (RBS)	<7.8 mmol/L	24	0.288	9	0.180
	7.8-11 mmol/L	20		3	
	>11 mmol/L	20		4	
Glycated hemoglobin (n=34)	Good glycemic control (4-6.4)	2	>0.05	0	∞
	Poor glycemic control (≥6.5)	27		5	
Level of amputation	Below knee	37	0.253	6	0.093
	Above knee	27		10	

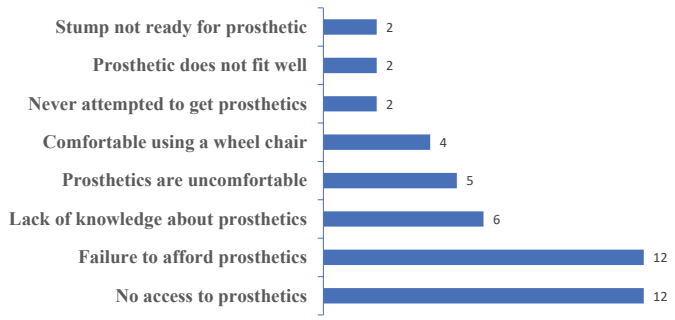

Figure 1. Reasons for not utilizing prosthetics among 45 patients who underwent major lower limb amputation.

Table 4. Long-term outcomes of patients who underwent major lower limb amputation.

Characteristic (n=61)		Returned to work (n=38)	P value	Still married (n=45)	P value
Age in years	≤ 17	0	0.004	0	0.007
	18-49	14		15	
	≥ 50	24		30	
Sex	Male	24	0.032	26	0.168
	Female	14		19	
Random blood sugar (RBS)	<7.8 mmol/L	14	0.608	16	0.339
	7.8-11 mmol/L	9		11	
	>11 mmol/L	15		18	
Glycated hemoglobin (HBA1C) (n=34)	Good glycemic control (4-6.4%)	2	0.943	2	0.533
	Poor glycemic control (≥ 6.5%)	16		20	
Level of amputation	Below knee	22	0.823	25	0.365
	Above knee	16		20	

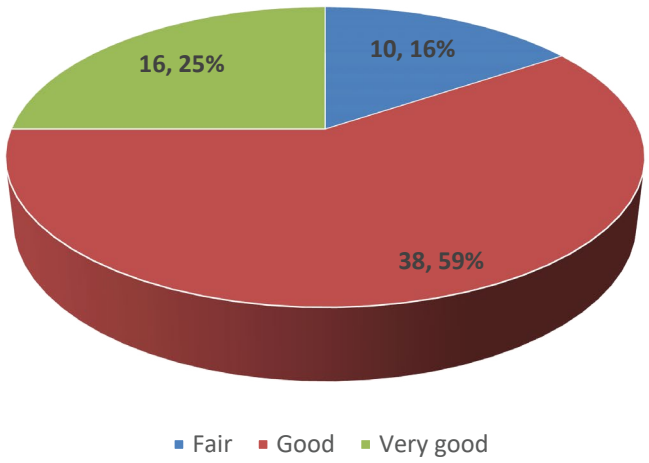

Figure 2. Psychological scores of 64 patients who underwent major lower limb amputation.

with an average patient age of 61.5 years and of these 53.7% had Diabetes mellitus patients [10] Further still findings in this study agree with what is reported in other parts of the globe that patients undergoing major lower limb amputation are older, with a high prevalence of comorbid conditions [11].

Unlike in developed countries, where peripheral arterial disease remains the most common indication for major lower limb amputation [12] in our setting, infected diabetic foot (wet gangrene) was the leading indication for major lower limb amputation at 68. This is consistent with findings at Bugando medical centre in Tanzania where infected diabetic foot was the leading cause of major limb amputation at 41.9% [3], and is not surprising given that diabetes leads to wet gangrene and peripheral arterial disease which are common comorbidities among aging populations undergoing amputation.

Only 3% of patients underwent re-amputation and these were due to Diabetic foot infections. The low rates of re amputation is attributed to good pre-operative assessment with appropriate level selection, effective peri operative and post-operative patient care that involved targeted antibiotic therapy, hence preventing wound sepsis that would progress to require revision of amputation. At Bugando Medical centre in Tanzania, 29.6% of the Amputations were revised [3], which is higher than what is observed in this study and still re-amputation rate among patients in this study was quite low compared to reports from other parts of the world [13-15] Reason being that this study focused on major lower limb amputations contrary to the referenced studies which reported on both major and minor lower limb amputations, of which conversion rates from minor to major lower limb amputation are higher.

In-hospital mortality was 10.7%. All deaths occurred among aging patients above 50 years, and of these 62.5% were diabetic. This higher mortality among elderly patients could be explained by the fact that they are more prone to severe cardiac disease, deep vein thrombosis (DVT), wound infection, pneumonia, stump and "phantom limb" pain, reflecting the frailty of this population [14]. In this study, in-hospital mortality was not significantly different across sex, level of amputation, and also there was no significant association between hospital mortality and levels of glycated haemoglobin and pre-operative blood sugar reading. A possible explanation for this could be the small study population that may not have been sufficient enough to detect differences across groups. The complications due to diabetes further pose a large risk of mortality among this population. Findings in this study are similar to what is observed in Tanzania at 16.7% [3] and other regions of the world with 30 day mortality post Lower limb Amputation Ranging between 9% and 17% [4,15,16]

The average length of hospital stay was 12.8 ± 8.4 days and it was not significantly associated with age, sex, blood sugar or level of amputation. Studies done in East and West Africa by [3,17] found that average length of hospital stay was 22.4 days and 17.53 days respectively; while studies done elsewhere found the average length of hospital stay to range between 7-30 days [18,19]. The shorter mean length of hospital stay in our study could be attributed to timely decision making for amputation and appropriate selection of level of amputation. However the similarity in the length of hospital can be explained by the uniformity in the indications and the average age of Amputees.

Physiotherapy following amputation plays a key role in prosthetic use, developing independence, regaining functional mobility and improving quality of life [20,21].

Despite the high uptake of physiotherapy services following amputation in our study, only 26.2% of the participants utilized prosthetics (with 81.3% being males). SFHN does not have a prosthetics workshop and this puts a break in the continuity of care for amputees following physiotherapy. Furthermore, prosthetics themselves are costly. This, coupled with the absence of a prosthetic workshop at the facility may explain the low rates of prosthetic use found in our study. In addition, males may be more likely to afford prosthetics, and given the dynamics of society, they are required to continue funding for their families despite their impairment and challenges that come with prosthetic uses hence influencing prosthetic use in the male gender. Similar findings were reported by a study in UK where prosthetic fitting was more in men than in women at 68.6% *vs*. 42. 9% [22,23]

However, a study done in Rwanda reported a prosthetic use of 6.5% which is much lower than that in our study [24].

The findings in our study and in the above referenced study indicate that there is a much lower rate of prosthetic uptake in developing countries compared to developed countries as documented by study findings that place prosthetic use among lower limb amputees between 49% and 95% [25,26] This may be because these countries have more developed and established rehabilitation systems in place compared to developing countries like Uganda.

Putting in place a full rehabilitation structure, including a prosthetics unit at SFHN, may help improve prosthetic uptake among major lower limb amputees at SFHN and therefore enhance functional return among our patients.

Functional return of most of the amputees was good. 62.3% of amputees

had been able to return to work; 73.8% were still married. These findings are similar to others that reported 58% to 66% of amputees are able to return to work and continue with their daily activities [27,28]

Psychological status score ranged from 4 to 10 with mean of 7.5 ± 1.7. 84% of amputees had good and very good psychological status scores holistically. Involvement of Psychologists in pre and post amputation care at St. Francis hospital Nsambya helps amputees to come to terms with the new form of disability early, and also the holistic psychological scores are indicators of good family social support to our Amputees. These findings differ from what was reported at Mulago hospital where 46.7% had depression and 45% had abnormal anxiety [29].

Depression was found to be less prevalent among the elderly compared to the young generation [30]. And patients in our study were older and had other comorbidities and this may have masked the negative effects of depression.

Conclusion

Physiotherapy was well utilized, however prostheses use was low due to limited knowledge on the role of prosthetics, lack of access to prosthetics and high costs of prostheses

Majority of participants had gained full functionality which indicates that physiotherapy services are effective and amputees have attained psychosocial support that has helped them get to terms with their impairment, thus the high holistic psychological status scores.

Conflict of Interest

The author shows no conflict of interest towards this manuscript.

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How to cite this article: Basimbe, Francis, Dionizi Muganga, and Fredrick Mutyaba. "Outcomes of Major Lower Limb Amputation among Patients at a Referral Hospital" J Clin Res 6 (2022): 167.