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Prevalence and Factors Attributed to Lower Limb Amputation at Hoima Regional Referral Hospital in Hoima District, Uganda

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Abstract

Background: Lower limb amputation is the complete loss of any part of the lower extremity for any reason. It is one of the oldest and most common surgical procedures, with the earliest known case dating to 31,000 years ago. Despite its prevalence, lower limb amputation remains a significant public health concern globally, with substantial implications for individuals' quality of life.

Methods: To investigate the prevalence, risk factors, outcomes, and management of lower limb amputation, we conducted a retrospective cross-sectional study at Hoima Regional Referral Hospital. We collected data from operating room registries, patient medical files, and the physiotherapy department registry. Our study included 60 participants, with a prevalence of 6.7% for lower limb amputation.

Results: We found significant associations between lower limb amputation and age, sex, diabetes mellitus, BMI, and gangrene. We also observed that 25% of cases required re-amputation, and the in-hospital mortality rate was 25%. Half of the cases reported using physiotherapy, while 25% of participants experienced psychological distress. These findings highlight the complex interplay of factors contributing to lower limb amputation and the importance of preventive measures and comprehensive management strategies. We recommend early detection, proactive management of associated risk factors, and holistic rehabilitation to improve patient outcomes and quality of life.

Conclusion: Our study provides valuable insights into the epidemiology and management of lower limb amputation, informing targeted interventions and healthcare policies aimed at reducing its prevalence and mitigating its impact on affected individuals.

Keywords: lower limb amputation, prevalence, attributed factors.

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Introduction

Lower limb amputation is a complete loss in the transverse anatomical plane of any part of the lower extremity for any reason (Lower extremity Amputation (LEA) study Group, 1995). Lower limb Amputation is among the most acquired disabilities, with a global prevalence ranging from 3.6 to 68.4 per 100,000 population (Moxey et al., 2011). there are 30,000- 40,000 amputations performed annually in the United States, with an estimated 1.6 million amputees worldwide in 2005, and this figure is expected to rise to 3.6 million by 2050 (Ziegler-Graham K et al., 2008). Also, LLA accounted for 3.08% of operations done at University Hospital-Butare, Rwanda (Ssebuufu et al., 2013).

According to the Uganda national population census of the year 2014, the prevalence of Limb disability increases with age, varying from 0.5% in children through 7.5% in teenagers to 16.5% in Adults, of which 5% have difficulty walking. LLA occurs as a result of a wide range of diseases and trauma; it is attributed to significant morbidity, disability, and mortality. An amputation is not merely limb loss as it can mean disability, joblessness, high insurance payments, depression, and poor quality of life (Spichler et al., 2001).

Lower-limb amputation is attributed to several complications, which include infection, phantom limb sensation and pain, residual limb pain, painful neuroma, depression, and heterotopic ossification. Joint contracture is a common, often preventable, sequela of amputation, with knee and hip flexion contractures being most common for persons with trans-tibia and trans-femoral amputation, respectively. Patients undergoing major limb amputation often carry a high burden of comorbidities such as diabetes, renal disease, and hypertension. In addition, patients present to health facilities usually 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 (Basimbe et al., 2022).

Globally, it is estimated that 65 million people live with limb amputations, and 1.5 million people undergo amputations every year, with 60% being Lower limb amputations (LLA) (Lao et al., 2020). Also, two-thirds of people with amputation live in low-resourced settings (Lao et al., 2020) and it is estimated that 5 million of the amputee population live in Africa, of which around 75% are lower limb amputees (Lao et al., 2020). LLA does not only disfigure but also renders people less mobile and may lead to loss of Independence (Gitter. A. et al., 2005). Godwalna and Stewart 2013 reported that people with LLA often withdraw from social activities owing to their physical limitations, perceived body image, and lack of disability-supported facilities.

The present article investigated the prevalence and factors attributed to lower limb Amputation at Hoima Regional Referral Hospital in Hoima district, Uganda, between 25 January 2017 and 25 March 2023. Hoima has a homogenous population with fewer variations in social deprivation and ethnicity and differences in the provision of and access to specialist care.

Methods

Using a sample size of 60 patients, data was collected from the operating room registry, patient medical files, and registry from the physiotherapy department for all patients who had had a lower limb amputation between 25th January 2017 and 25th March 2022; no patient follow-up was done. A data collection questionnaire was used to collect patients' socioeconomic and clinical data. Data regarding the patients' rehabilitation, such as crutches or prostheses, was obtained from the physiotherapy department registry.

The questionnaire consisted of sections of study variables on age, sex, address (rural vs urban), level of education, marital status, occupation, affected lower limb, indications for amputation, levels of

amputation, associated comorbidities, patient rehabilitation and outcome of treatment on leaving the hospital. Also, a review of patients' necessary past medical histories was done.
Data was checked for completeness, clarity and accuracy. Those that were severely incomplete and with a lot of unclear jargons and abbreviations were removed and disposed of but complete files and records were collected and analyzed using the SPSS computer package. Data was presented in form of tables and graphs using Microsoft office Excel 2019.
Sample size determination:
Sample size N = $(Z^2*P*(1-P))/E^2$ (kish and Lisle, 1967)
According to Okello et al., (2019) the prevalence of Lower limb amputation is 15.3% in Uganda and will be used in this study
Where;-
n= desired sample size
z= standard normal deviation usually set at 1.96 which correspond to 95% confidence level.
p= prevalence rate of 15.3% (0.153)
E = desired precision of error (100 - 93 = 7%) = 0.07
Therefore;
n= $1.96^2(0.153)$ (1-0.5)/ $(0.07)^2$; n = 59.9
0.588
0.293
0.0049
Sample size was 60.

Results

Baseline socio-demographic characteristics of the study participants

The study recruited 60 participants. Majority (65.0%) were aged ≥50years, male (68.3%), residing in rural areas (61.7%), attained secondary education (41.7%) and were catholic (35.0%) (Table 1).

Table 1: Socio-demographic characteristics of study participants

Variable	Frequency(N)	Percentage (%)
Age(Years)		
≤30	07	11.7
31-49	14	23.3
≥50	39	65.0
Sex		
Male	41	68.3
Female	19	31.7
Area of residence		
Rural	37	61.7
Urban	23	38.3
Level of education		
None	10	16.7
Primary	18	30.0
Secondary	25	41.7
Tertiary	07	11.7
Religion		
Catholic	21	35.0
Anglican	18	30.0

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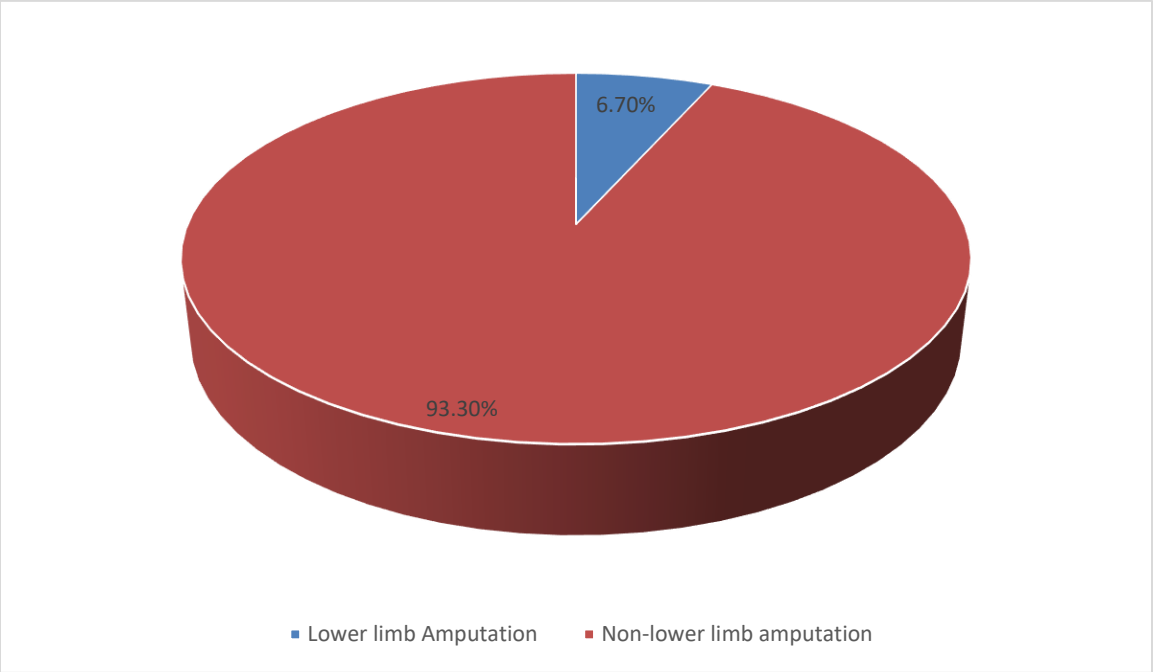
Muslim	09	15.0
Others	12	20.0

Prevalence of lower limb amputation

The prevalence of lower limb amputation during the study period was 6.7% as shown in the figure below.

Figure 1: Prevalence of lower limb amputation



Bivariate analysis of factors associated with lower limb amputation (LLA)

With bivariate logistic regression analysis, age, sex, area of residence, level of education, diabetes mellitus, BMI and gangrene were statistically significant (Table 2).

Table 2: Bivariate analysis of factors associated with lower limb amputation

Variable	N	LLA n(%)	COR(95% CI)	P-value
Age(Years)				
≤30	07	-	1	
31-49	14	1(7.1)	1.74(0.92-3.46)	0.017
≥50	39	3(7.7)	5.09(1.83-10.24)	0.006
Sex				
Male	41	4(9.8)	2.39(1.08-5.62)	0.136
Female	19	-	1	
Area of residence				
Rural	37	3(8.1)	1.68(0.73-3.89)	0.085
Urban	23	1(4.3)	1	
Level of education				
None	10	2(20.0)	3.97(2.40-6.10)	0.048
Primary	18	1(5.6)	2.54(1.47-5.01)	0.091
Secondary	25	1(4.0)	1.41(0.51-2.14)	0.219
Tertiary	07	-	1	
Religion				
Catholic	21	3(14.3)	1.94(1.25-3.56)	0.275

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Anglican	18	1(5.6)	1.22(0.92-2.38)	0.392
Muslim	09	-	0.75(0.42-1.95)	0.641
Others	12	-	1	
Diabetes Mellitus				
Yes	13	2(15.4)	6.75(2.07-8.64)	0.037
No	47	2(4.3)	1	
BMI				
≤25kg/m^2	44	2(4.5)	4.27(1.69-7.83)	0.150
≥25kg/m^2	16	2(12.5)	1	
Gangrene				
Yes	07	1(14.3)	7.15(3.04-9.62)	0.050
No	53	3(5.7)	1	

Multivariate analysis of factors associated with lower limb amputation

From table 3 below, age, sex, diabetes mellitus, BMI and gangrene were significantly associated with amputation.

Table 3: Multivariate analysis of factors associated with lower limb amputation

Variable	N	LLA n(%)	AOR(95% CI)	P-value
Age(Years)				
≤30	07	-	1	
31-49	14	1(7.1)	1.20(0.61-2.98)	0.022
≥50	39	3(7.7)	4.17(1.29-8.96)	0.001
Sex				
Male	41	4(9.8)	1.56(0.63-4.52)	0.041
Female	19	-	1	
Area of residence				
Rural	37	3(8.1)	1.10(0.50-3.28)	0.068
Urban	23	1(4.3)	1	
Level of education				
None	10	2(20.0)	2.65(1.63-5.29)	0.094
Primary	18	1(5.6)	1.82(1.02-4.35)	0.072
Secondary	25	1(4.0)	0.73(0.30-1.67)	0.106
Tertiary	07	-	1	
Diabetes Mellitus				
Yes	13	2(15.4)	5.57(1.55-7.35)	0.005
No	47	2(4.3)	1	
BMI				
≤25kg/m^2	44	2(4.5)	3.49(1.27-5.69)	0.019
≥25kg/m^2	16	2(12.5)	1	
Gangrene				
Yes	07	1(14.3)	5.88(2.70-8.31)	0.002
No	53	3(5.7)	1	

Outcome of patients with lower limb amputation

Out of the 4 amputees, 1(25.0%) underwent re-amputation, in-hospital mortality was 25.0% and physiotherapy utilization 50% (Figure 2). Psychological score was 3 to 10 with a mean of 6.0 as shown below. Out of the three assessed for psychological distress, 75.0% had good and 25.0% had fair psychological status (Figure 3).

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Figure 2: Outcome of patients with lower limb amputation

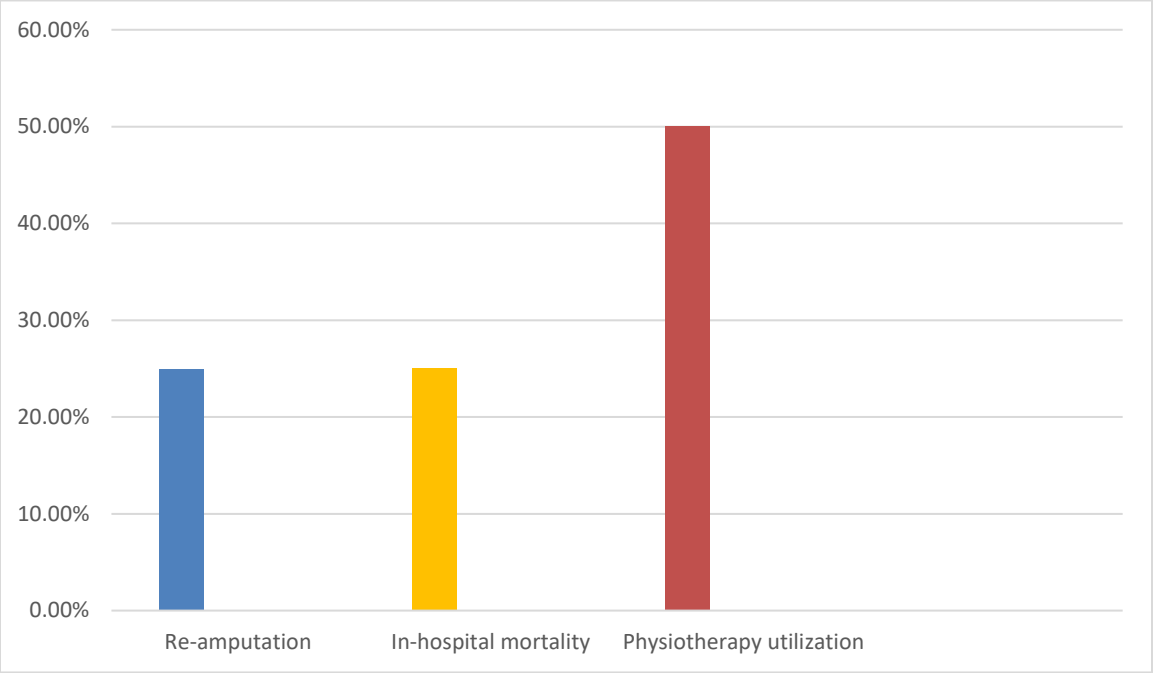
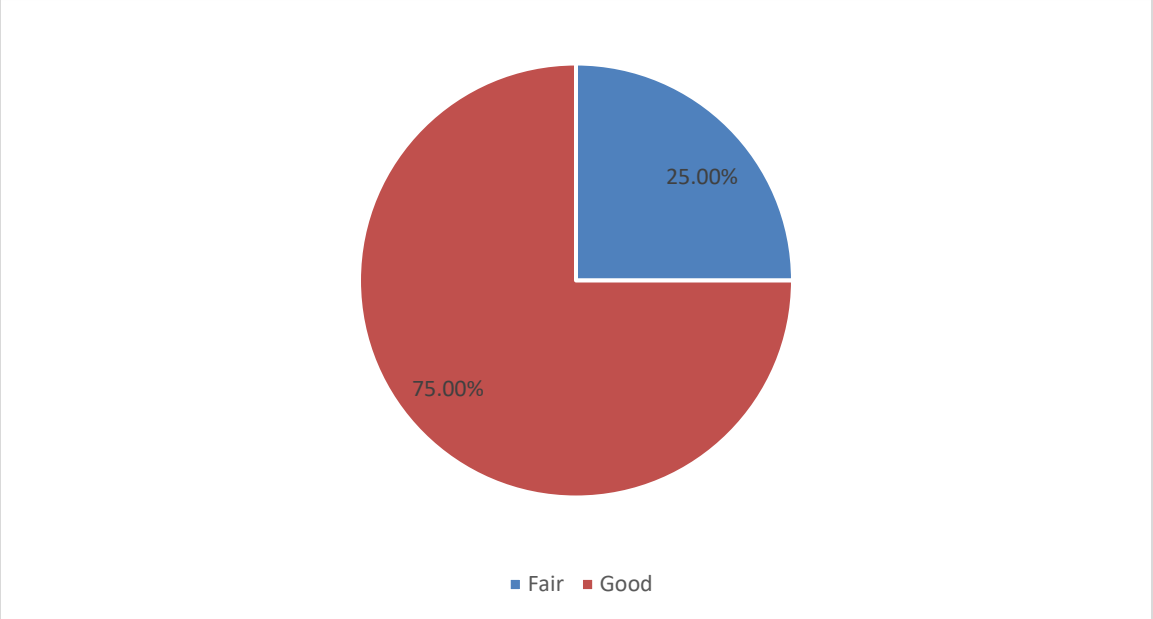


Figure 3: Psychological status of amputees



Discussion

The purpose of this study was to establish prevalence and factors attributed to lower limb amputation at Hoima regional referral hospital in Hoima district, Uganda; no such data have been published recently.

Prevalence of Lower limb amputation

The present study found the prevalence of lower limb amputation to be 6.7%. Since many nations do not keep track of the number of persons who have had limbs amputated, it is difficult to determine the precise number of amputations that have occurred globally (Esquenazi & Kwasniewski, 2021). More than 150,000 patients are hospitalized in hospitals each year for amputations brought on by diabetes or peripheral vascular disease (Newhall et al., 2016).

The study's findings are similar to a prevalence of 7% reported by a study in Brazil (Alves & Laporta, 2020). The study finding is higher than the 1.9% reported by a study in Ghana (Tuglo, 2023). This is because the Ghana study was done among patients with diabetes only. Additionally, the study finding is higher compared to the 0.9% reported in Malawi (Kasende et al., 2021).

Factors associated with lower limb amputation

In my analysis, factors significantly associated with lower limb amputation were age, sex, diabetes mellitus, BMI, and gangrene. The current study revealed that the male gender was significantly associated with lower limb amputation, which is congruent with a study in the USA (Cai et al., 2021). This finding is supported by a study in Sweden which revealed a similar finding (Hallstrom et al., 2021). According to a study in Ghana, men are six times more likely than women to undergo lower limb amputation (Tuglo, 2023). Their family responsibilities, emotional strain, and way of life may serve as the most likely justification. In contrast to women, men are more likely to work in farming and construction and have busy schedules, according to a survey (Tuglo et al., 2022). These activities may eventually impair how they take care of their feet, leading to amputation when combined with emotional stress and lifestyle factors, including smoking (Kogani et al., 2015) and depression (Polikandrioti et al., 2020).

This study also observed higher odds of lower limb amputation among participants older than 50 years compared to younger ones, consistent with a finding of a study in the United States (Cai et al., 2021). Another study reported A similar finding that observed higher odds of amputation with advanced age (Long et al., 2020). Consistent with the findings of a study in the USA, this study revealed that Diabetes mellitus and obesity were significantly associated with lower limb amputation (Cai et al., 2021). However, the finding is inconsistent with a study in Sweden which revealed that neither obesity nor severe obesity was associated with an increased lower extremity amputation risk when compared with normal weight (Hallstrom et al., 2021).

This finding may be impacted by lower normal BMI individuals' elevated risk and more severe comorbidities. The finding of this study is further supported by a study that revealed an increased risk of amputation among patients with diabetes mellitus (Long et al., 2020). The study finding also coincides with a study in Ghana which found that obese patients had an adjusted OR for amputation that was six times higher than it was for normal-weight patients (Tuglo, 2023). The possible reason is that an increase in BMI above the normal range is associated with an increased risk of being diagnosed with DM, which increases the likelihood of complications like diabetic foot and invariably leads to amputation.

Outcome of patients with lower limb amputation

The patients who undergo limb amputations face clinical and social challenges, albeit to varying degrees, depending on whether the leg is amputated below the toes or involves partial or total amputation. There is a significant increase in cardiovascular and all-cause mortality following amputation, according to earlier registry studies of patients who had major amputations (Abola et

al., 2012). Out of the 4 amputees, 1(25.0%) underwent re-amputation, in-hospital mortality was 25.0%, and physiotherapy utilization was 50%. The psychological score was 3 to 10 with a mean of 6.0. Out of the three assessed for psychological distress, 75.0% had good and 25.0% had fair psychological status. The finding is comparable to a study in Uganda, which revealed that psychological status scores ranged from 4 to 10 with a mean of 7.5 ± 1.7. 84% of amputees holistically had good psychological status scores (Basimbe et al., 2022).

Further work is still needed to clarify the factors associated with the return of function post-amputation and the indicators of good outcomes among patients before and after amputation.

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