DOI: https://doi.org/10.67579/njo.2026.37wdm8y4

SARCOMA AND LIMB AMPUTATION: THE UNIVERSITY COLLEGE HOSPITAL IBADAN EXPERIENCE

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Citation: Balogun MJ, Idowu OK. Sarcoma and Limb Amputation: The University College Hospital Ibadan Experience. *Niger J Oncol* 2026;2(2):179-188

ABSTRACT

Background: Sarcomas are rare malignant tumours originating from mesenchymal tissues. Despite advances in limb-sparing techniques, amputation remains a vital option for patients with extensive or non-salvageable limb sarcomas.
Objective: 1. To describe the demographic characteristics, tumour distribution, perioperative management, and clinical outcomes of patients who underwent limb amputation for sarcoma at the University College Hospital, Ibadan. 2. To assess the factors influencing surgical decision-making, and the impact of amputation on patients' physical and psychological health. 3. Outcome of limb amputations for sarcomas
Methods: A retrospective cohort study was conducted at the University College Hospital, Ibadan, involving 39 patients aged 16 years and above who underwent amputations for non-salvageable limb sarcomas between 2018 and 2023. Data on demographics, anaesthesia, blood loss, transfusion, surgical outcomes such as hematoma formation, length of hospital stay, thirty-day postoperative mortality, Blood loss during surgery, duration of surgery, and diagnosis were analysed using descriptive and inferential statistics.
Results: The mean age was 36.0±18.02 years, with a male predominance (66.7%). Lower limbs were more frequently affected (64.1%), and soft tissue sarcoma and osteosarcoma were the most common diagnoses. Most surgeries were conducted under spinal anaesthesia (69.3%). ICU admission was rare (2.6%), and the mortality rate was high (48.7%). No statistically significant association was found between mortality and age, sex, or limb involved ($p > 0.05$).
Conclusion: Amputation remains a necessary intervention for advanced sarcomas, particularly in resource-limited settings. The high mortality underscores the need for early detection, multidisciplinary management, and improved access to comprehensive oncologic care.
Keywords: Sarcomas, Amputation, Surgeries, Anaesthesia

INTRODUCTION

Sarcomas are a rare and diverse group of malignant tumours that arise from mesenchymal tissues, including bone, muscle, fat, cartilage, and connective tissues.[1] These tumours are classified into two main types: bone sarcomas, such as osteosarcoma and Ewing sarcoma, and soft tissue sarcomas,

which include liposarcoma, synovial sarcoma, and leiomyosarcoma.[2] Among the various types, osteosarcoma and soft tissue sarcomas are the most common subtypes that necessitate radical surgical interventions, including amputation, particularly when the tumour is extensive,[3] involves major neurovascular structures, or fails to respond to limb-sparing treatments[4] such as biological and non-biological limb-sparing treatments.

Historically, amputation was the standard treatment for sarcomas involving the limbs, as it provided the highest chance of eradicating the tumour and preventing local recurrence.[6] However, advancements in multimodal treatment approaches, including chemotherapy, radiation therapy, and limb-sparing surgeries, have significantly reduced the need for amputations in recent years.[7] Nevertheless, in cases where the tumour invades critical neurovascular structures, where limb salvage is not feasible, or where the disease is unresponsive to conservative treatments, amputation remains a necessary intervention.[4]

Amputation due to sarcoma presents several challenges, including post-operative pain, phantom limb syndrome, prosthetic adaptation, and psychological distress, such as anxiety and depression.[8] Additionally, socioeconomic factors, access to modern prosthetic devices, and the level of rehabilitation support available play vital roles in determining functional outcomes and overall well-being post-amputation.[7] Recent innovations in prosthetic technology, including myoelectric and osseointegrated prostheses, have improved mobility and functionality in amputees,[9] allowing better reintegration into daily life and professional activities.[6]

This study aims to assess the demographics of patients who had limb amputation, factors influencing surgical decision-making, and the impact of amputation on patients' physical and psychological health. Outcome of limb amputations for sarcomas. By examining the challenges faced by amputees and evaluating modern rehabilitation strategies, this research seeks to contribute to the growing body of knowledge on improving patient outcomes and quality of life following sarcoma-related amputations.

MATERIALS AND METHODS

This study is a retrospective cohort analysis with a sample size of 39; it was conducted over a five-year period, from January 2018 to December 2023. The research focuses on patients who had a non-salvageable sarcoma of the extremities that subsequently required amputation. The study was conducted at the University College Hospital (UCH), a premier tertiary healthcare centre in Nigeria.

The inclusion criteria were patients between the ages of 16 years and above with the diagnosis of sarcomas, while patients who had local excision and their limb salvaged were excluded from the study.

Data extracted from the medical records of the patients included demographic information, clinical information, medical management and post-operative outcomes. The primary outcome measure in this study was postoperative hospital outcome (discharged alive or in-hospital mortality). Secondary outcome measures included estimated blood

loss, blood transfusion requirement, duration of surgery, duration of anaesthesia, postoperative ICU admission, ventilatory support requirement, and length of ICU stay.

The collected data were analysed using statistical software. Descriptive statistics were used to summarise the demographic, clinical, and medical management data. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as means and standard deviations.

Ethical approval was obtained (UI/EC/23/0697) from the University of Ibadan/University College Hospital ethical review committee, and the ethical principles of confidentiality, beneficence, non- maleficence and voluntariness were ensured.

RESULTS

The mean age of the study participants was 36.0±18.02 years, which ranged from 1 to 88 years.

Table 1: Demographic Characteristics of the participants (n=39)

Variables	Classification	Frequency	Percent (%)
Age (years)	< 20	7	**17.9**
	20-29	9	**23.1**
	30-39	7	**17.9**
	40-49	7	**17.9**
	50-59	4	**10.3**
	60 and above	5	**12.8**
Mean ±SD [range] years	36.0±18.02 [1-88]		
Gender	Male	26	**66.7**
	Female	13	**33.3**

The mean age of the study participants was 36.0 ± 18.02 years (range: 1–88 years). The highest proportion of patients was aged 20–29 years (23.1%), followed by those aged <20 years, 30–39 years, and 40–49 years (17.9% each). Males constituted 66.7% of the study population.

Table 2: Distribution of ASA and Anaesthesia

Variables	Classification	Frequency	Percent (%)
ASA	II	4	**10.3**
	III	35	**89.7**
Anaesthesia	GA/ETT	12	**30.8**
	SAB	27	**69.3**

Most patients were classified as ASA III (89.7%), while 10.3% were ASA II. Spinal anaesthesia (SAB) was the predominant anaesthetic technique used (69.3%), whereas 30.8% underwent general anaesthesia with endotracheal intubation (GA/ETT).

Table 3: Distribution by Side and Limb

Variables	Classification	Frequency	Percent (%)
Side	Left	20	**51.3**
	Right	19	**48.7**
Limb	upper limb	14	**35.9**
	lower limb	25	**64.1**

Tumours were slightly more common on the left side (51.3%) compared to the right (48.7%). The lower limbs were more frequently involved (64.1%) than the upper limbs (35.9%)

Table 4: Distribution of ICU admission/Ventilatory requirement

Variables	Classification	Frequency	Percent (%)
ICU care and use of ventilation	Yes	1	**2.6**
	No	38	**97.4**
Number of days in ICU	**2 days**		

Only one patient (2.6%) required postoperative ICU admission and ventilatory support for two days, while the majority (97.4%) did not require ICU care.

Table 5: Distribution of blood transfusions and number of Units transfused

Variables	Classification	Frequency	Percent (%)
Transfusion of blood	Yes	13	**10.3**
	No	26	**59.0**
Unit of blood transfused	None	25	**64.1**
	1	5	**12.8**
	2	7	**17.9**
	3	2	**5.2**

Regarding transfusion requirements, 33.3% of patients received blood transfusions, with most receiving one or two units. The majority (64.1%) did not receive any transfusion.

Table 6: Descriptive statistics of Estimated Blood Loss, Duration of Anaesthesia and Duration of Surgery

Variables	**Mean ±SD**	**Minimum**	**Maximum**
Estimated Blood Loss [ml]	244.4±89.7	112	**440**
PCV [%]	30.98±4.6	21	**42**
Duration of Anaesthesia [Min.]	112.8±29.2	50	**210**
Duration of Surgery [Mins.]	92.5±26.1	35	**180**

The mean estimated blood loss was 244.4 ± 89.7 ml (range: 112–440 ml). The mean preoperative packed cell volume (PCV) was 30.98 ± 4.6%. The average duration of anaesthesia was 112.8 ± 29.2 minutes, while the mean duration of surgery was 92.5 ± 26.1 minutes.

Table 7: Association of Age, Sex and Limb with Outcome

Variables	Categories	outcome		χ^2	p-value
		Discharged N (%)	Dead N (%)		
Age years	< 20	4 (10.3)	3 (7.7)	.715	**.982**
	20-29	4 (10.3)	5 (12.8)		
	30-39	4 (10.3)	3 (7.7)		
	40-49	3 (7.7)	4 (10.3)		
	50-59	2 (5.1)	2 (5.1)		
	60 and above	3 (7.7)	2 (5.1)		
Sex	male	14 (35.9)	12 (30.9)	.205	**.651**
	female	6 (15.4)	7 (17.9)		
Limb	upper limb	9 (23.1)	5 (12.8)	1.478	**.224**
	lower limb	11 (28.2)	14 (35.9)		

Overall mortality was high, with 48.7% of patients dying during admission, while 51.3% were discharged. There was no statistically significant association between mortality and age (χ^2 = 0.715, p = 0.982), sex (χ^2 = 0.205, p = 0.651), or limb involved (χ^2 = 1.478, p = 0.224).

Table 8: Classification and Percentage of The Diagnosis

Diagnosis	**Frequency**	**Percent**	**Valid percentage**	**Cumulative percentage**
Soft tissue sarcoma	11	28.2	28.2	28.2
osteosarcoma	14	35.4	35.4	63.6
Giant cell tumor	2	5.2	5.2	68.8
Kaposi Sarcoma	1	2.6	2.6	71.4
Majorlin Ulcer	10	26.0	26.0	97.4
Synovial Sarcoma	1	2.6	2.6	100
Total	39	100	100	

Histologically, osteosarcoma was the most common diagnosis (35.4%), followed by soft tissue sarcoma (28.2%) and Marjolin ulcer (26.0%)

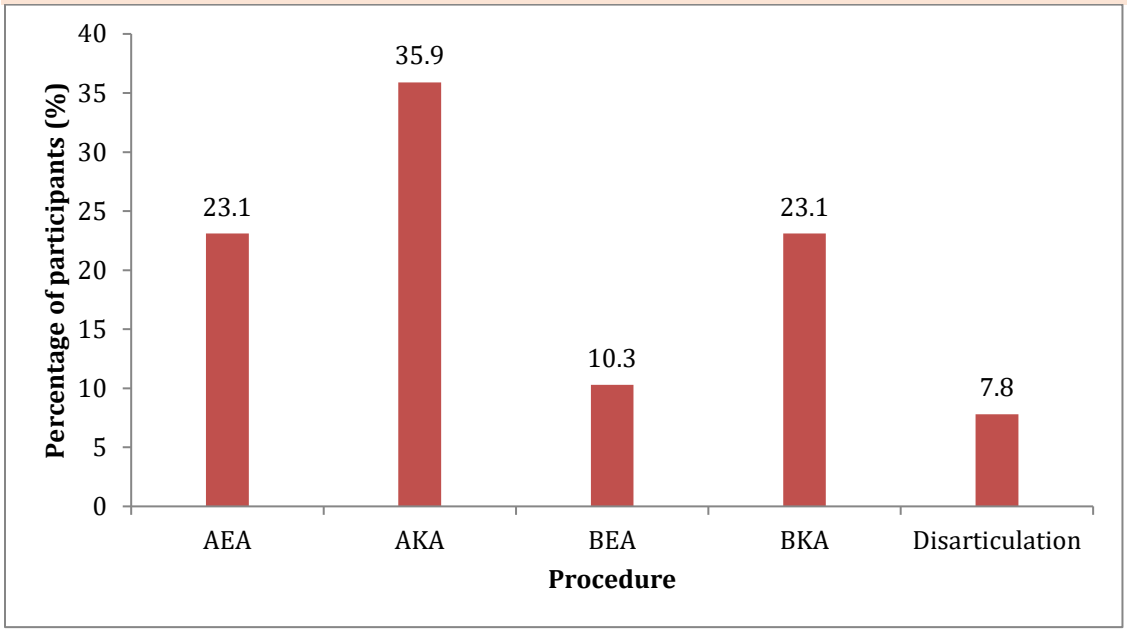


Figure 1: Distribution of Procedures Involved

Figure 1 shows the distribution of amputation procedures performed, with below-knee and above-knee amputations being the most frequent procedures, particularly among patients who subsequently died.

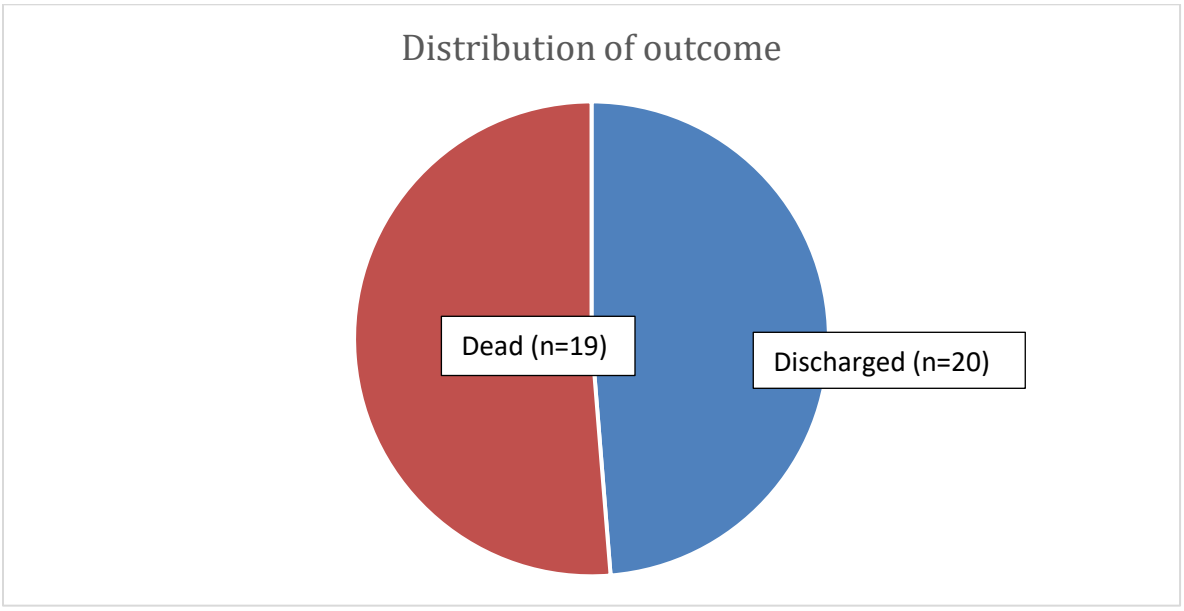


Figure 2: Distribution of the outcome.

Figure 2 shows that 19 were dead and 20 were discharged home

DISCUSSION

This study analysed the demographic and clinical characteristics of the type of sarcoma, location, side of limb affected, of 39 patients who underwent amputation for sarcomas and other related tumours, with particular emphasis on anaesthetic management, estimated blood loss, transfusion requirements, and post-operative outcomes. The findings provide relevant insights into the perioperative experiences of patients with musculoskeletal tumours in a resource-limited setting.

The mean age of patients was 36.0 ± 18.02 years, ranging from 1 to 88 years (Table 1). The age distribution with the highest representation was 20–29 years (23.1%), followed by <20 years, 30–39 years, and 40–49 years, each constituting 17.9% of the study population. This relatively young age distribution is consistent with the findings of Burningham Z and colleagues in the United States,[17] who reported that osteosarcoma and several soft tissue sarcomas predominantly affect children, adolescents, and young adults. Similar observations have also been reported in studies from Europe and North America, where the peak incidence of osteosarcoma occurs during the second and third decades of life.[8] The sex distribution revealed a predominance of males (66.7%) (Table 1),

consistent with reports that musculoskeletal tumours, particularly sarcomas, exhibit a slight male preponderance.[9] The majority of tumours were located in the lower limbs (64.1%) (Table 3) compared to the upper limbs (35.9%), with almost equal distribution between the left (51.3%) and right (48.7%) sides. The predominance of lower limb involvement observed in this study is similar to reports by Anyanwu SNC and colleagues in Nigeria, who documented that most extremity sarcomas occur in the lower limbs.[15] Similar findings have been reported by Grimer R and colleagues in the United Kingdom, where the lower extremity was the most frequent site of presentation for both bone and soft tissue sarcomas.[9,16]

The vast majority of patients (89.7%) were classified as ASA III, indicating moderate to severe systemic disease, which may be attributable to tumour burden, chronicity of illness, or co-morbid conditions. Most surgeries (69.3%) were performed under spinal anaesthesia (SAB), while 30.8% underwent general anaesthesia with endotracheal intubation (GA/ETT) (Table 2). This high preference for regional anaesthesia may reflect the institutional strategy to reduce perioperative risks, particularly in resource-limited settings where postoperative ventilation support is constrained.[5] The mean estimated blood loss (EBL) was 244.4 ± 89.7 ml, with some patients losing up to 440 ml intraoperatively. Despite this, only 33.3% of patients received blood transfusions, mostly limited to 1–2 units (Table 5). This suggests judicious use of blood transfusion, possibly guided by clinical judgment and resource availability. The preoperative PCV averaged 30.98%, which is slightly below normal and might explain the relatively high threshold for transfusion (Table 6).

Importantly, only one patient required ICU admission and mechanical ventilation postoperatively, indicating generally stable postoperative outcomes and possibly effective

intraoperative monitoring (Table 4). The mean durations of anaesthesia and surgery were 112.8 ± 29.2 minutes and 92.5 ± 26.1 minutes, respectively (Table 6), which were within acceptable limits for procedures involving tumour resection.[10]

The histological classification showed a wide range of sarcoma types. Marjolin ulcers (20.5%) and soft tissue sarcomas (20.5%) were the most common diagnoses, followed by osteosarcoma and generic sarcoma categories. Marjolin ulcer, a malignant transformation of chronic wounds, is particularly common in regions with high rates of untreated burns and chronic ulcers, and its prevalence in this cohort reflects that assertion.[11] (Table 8). Among the study population, survival and mortality outcomes were not significantly associated with age, sex, or limb involvement ($p > 0.05$) (Table 7). Although the lower limb tumours had a higher absolute number of deaths (35.9%) compared to upper limb tumours (12.8%), this was not statistically significant (Table 7). This may suggest that other factors, such as tumour grade, size, metastasis, or access to adjuvant therapy, might play a larger role in determining outcomes.[12]

The overall mortality rate observed (48.7%) is alarming but not unexpected, considering late presentation, limited access to specialised care, and the absence of multidisciplinary cancer treatment infrastructure in many low-resource settings.[13] The equal distribution of deaths across age and gender groups also emphasises the need for systemic improvements in early detection and referral pathways (Table 7).

As shown in Figure 1, the procedures undertaken included various forms of limb amputations, notably Below-Knee Amputation (BKA), Above-Knee Amputation (AKA), Above-Elbow Amputation (AEA), and Below-Elbow Amputation (BEA).[14] These procedures were performed primarily for tumour control in patients with advanced or invasive sarcomas, especially when limb-salvage was not feasible. Amputations remain a common treatment modality in low-resource settings where delays in presentation and limited access to radiotherapy or chemotherapy are prevalent. The predominance of lower limb amputations in the cohort reflects the higher incidence of sarcomas in the lower extremities and is consistent with findings from prior studies.[15] Figure 2 illustrates patient outcomes post-surgery, with nearly half of the patients discharged and the remainder unfortunately succumbing to disease complications, highlighting the urgency of early diagnosis and multidisciplinary care strategies.

CONCLUSION

This study highlights that sarcomas requiring amputation predominantly affect young patients, with a male preponderance and frequent involvement of the lower limbs. Most patients presented with advanced disease necessitating radical surgery, and although perioperative parameters were generally acceptable, postoperative mortality remained high. Marjolin ulcers and soft tissue sarcomas were the most common histological types, reflecting late presentation and chronic disease burden. Overall, amputation remains a vital treatment option in advanced sarcoma, but improved early detection and multidisciplinary care are essential to enhance outcomes.

Limitations

This study has several limitations. First, the relatively small sample size limits the generalizability of the findings. Second, the retrospective design may have introduced selection bias and limited the availability of some clinical variables such as tumour grade, stage, and adjuvant therapy details. Third, being a single-centre study conducted in a resource-limited setting, the findings may not fully represent outcomes in centres with advanced oncologic and rehabilitation facilities. Despite these limitations, this study provides important insights into the perioperative characteristics and outcomes of patients undergoing amputation for sarcoma in a tertiary Nigerian hospital.

Declarations

Conflict of Interest

The authors have no conflicts of interest.

Source of Funding

The research work was funded by the authors.

Acknowledgement

We thank Almighty God for His grace, which has been sufficient for me.

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