IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 5 Ser. 5 (May. 2025), PP 01-06
www.iosrjournals.org

Limb Amputation In Under-18 Years: A Tertiary Hospital Experience.

Idowu K. Olusola
Faculty Of Clinical Sciences
University Of Ibadan, Ibadan
Oyo State, Nigeria

Orji O. Mathias
Faculty Of Clinical Sciences, College Of Medicine,
University Of Ibadan, Ibadan,
Oyo State, Nigeria

Oladiran B. Ajibola
(MBBS, FMCA).
Faculty Of Clinical Sciences, College Of Medicine,
University Of Ibadan, Ibadan,
Oyo State, Nigeria

Jemiludeen O. Morhasson-Bello
Department Of Orthopedic And Trauma
University Of Ibadan, Ibadan,
Oyo State, Nigeria

Abstract
Background: *The available literature predominantly focuses on amputations in adults within Nigeria, with limited published data addressing the occurrence and specifics of amputations in children. This knowledge gap underscores the need for further research and comprehensive studies on pediatric amputations in the Nigerian context.*
Methods: *A retrospective analysis was conducted on all individuals under the age of 18 who underwent limb amputations at the University College Hospital in Ibadan. This study aims to determine the pattern, indications, complications, and outcomes following amputation. The data were analyzed using the IBM Statistical Package for Social Sciences for Windows version 23.0.*
Results: *Trauma accounted for 69.7% of the amputations, with 48.5% of these cases diagnosed with gangrene. 54.5% of traumatic injury cases resulting in amputation were complicated by gangrene, often associated with treatment by traditional bone setters. Surgical site infection was observed in 36.4% of the patients, while only 3.0% developed phantom limb sensation. None of the patients received a prosthesis, primarily due to the high cost or unavailability of prosthetic devices.*
Conclusion: *The study examined pediatric amputations in Nigeria, revealing trauma as the primary cause, often complicated by gangrene, potentially stemming from treatment by traditional bone setters.*
Keywords: *Amputation, pediatric.*

Date of Submission: 14-05-2025 Date of Acceptance: 24-05-2025

I. Introduction

Once a brutal form of punishment, amputation has undergone transformative changes, incorporating advanced surgical procedures and prosthetic technologies. Initially devoid of anesthesia, Ambroise Paré's sixteenth-century innovations significantly enhanced the practice[1]. While amputation broadly includes the removal of body parts like the ear, nose, breast, and penis, limb amputations, particularly of the upper and lower extremities, are prevalent, with males exhibiting a higher likelihood due to their outgoing nature and increased susceptibility to trauma and peripheral artery diseases[2]. Lower limb amputations outnumber upper limb ones by

six to seven times. Causes for amputation vary, including physical trauma, peripheral artery disease, congenital limb defects, tumors, and chronic osteomyelitis[3] with trauma being the predominant cause in Nigeria. [4]

Although major limb amputations are infrequent in paediatric populations, understanding their diagnosis, management, and frequencies is crucial, emphasizing the rarity and unique considerations in children[5]. Paediatric amputation injuries, while rare, significantly impact psychosocial development, independence, and body image[6]. This study aims to comprehensively evaluate the incidence, patient demographics and characteristics, patterns and indications for amputation, outcomes of amputation, and complications following amputation among individuals under 18 years who underwent limb amputation in our hospital.

II. Methods

This research is based on a retrospective analysis of patient records containing limb amputations at the University College Hospital Ibadan, Ibadan Nigeria. This retrospective analysis was based on the datasets of patients who underwent limb amputation during the period from March 2019 to March 2024 all surgical procedures with a corresponding code were selected from hospital records. Retrieved data contained baseline characteristics of patients (age, gender) as well as clinical information (level and indication of amputation, complications, and revisions).

Inclusion criteria were set to patients containing the following variables: Limb amputations, any sex, and less than 18 years of age, at the time of amputation surgery. Patients that underwent an amputation other than limb amputation, have auto-amputation, as well as patients undergoing non-primary amputation surgery, were excluded from this study. Therefore, the patient collective contained 33 patients which were thereafter relevant for further analysis.

To create the dataset, all surgical procedures with a corresponding code were selected from the patient's record unit and reviewed by the study investigators.

Age, sex, religion, tribe, handedness, parents' level of education, cause of amputation, diagnosis, type of amputation, and complications were used as observation characteristics. A differentiated analysis of the above-mentioned characteristics was then considered.

The causes of amputation were divided into trauma, vasculitis, neoplasm, and congenital.

The amputation types were divided into Below Elbow Amputation (BEA), Above Knee Amputation (AKA), RAY amputation, Above Elbow Amputation (AEA), and Below Knee Amputation (BKA). Anaesthesia types used are General Anaesthesia (GA), Endotracheal Tube (ETT), Facemask, Subarachnoid Block (SAB)/Sedation, and Axillary Block

Data collected was analyzed using the IBM Statistical Package for Social Sciences for Windows version 23.0 (SPSS Inc. Chicago Illinois). Descriptive data were presented as means and standard deviations (SD) for continuous variables, while categorical and dichotomous variables were presented as numbers and frequencies.

III. Results

The study included a total of 33 amputations, comprising 23 (69.7%) males and 10 (30.3%) females, with a male-female ratio of 2.3:1. The average age was 8.04 ±5.03 years, with the peak age group being early adolescence (12-18 years), as illustrated in table 1 & Fig 1. Further demographic characteristics are detailed below.

(n=33)		**Frequency**	**Percent (%)**
Gender	Male	23	69.7
	Female	10	30.3
Age group	Infancy(28days-12months)	3	9.1
	Toddler(13month-2yrs)	3	9.1
	Early childhood(2-5yrs)	7	21.2
	Middle childhood6-11yrs)	9	27.3
	Early adolescence(12-18yrs)	11	33,3
Religion	Islam	22	66.7
	Christianity	11	33.3
Tribe	Hausa	6	18.2
	Igbo	1	3.0
	Yoruba	26	78.8

Table 1: Demographic characteristics

Of the amputations, 22 (66.66%) were in the lower limb, while 11 (33.33%) were in the upper limb. Specifically, 9 (27.3%) were Above Knee Amputation (AKA), 8 (24.2%) were Below Knee Amputation (BKA), 6 (18.2%) were Below Elbow Amputation (BEA), 5 (15.2%) were Above Elbow Amputation (AEA), and 5 (15.2%) were RAY Amputation.

n=33		Frequency	Percent (%)
Upper Limb 11(33.33%)	Above Elbow Amputation (AEA)	5	15.2
	Below Elbow Amputation (BEA)	6	18.2
Lower limb 22(66.66%)	Above Knee Amputation (AKA)	9	27.3
	Below Knee Amputation (BKA)	8	24.2
	RAY Amputation	5	15.2

Table 2: Types of Amputation

The primary diagnoses leading to amputation were gangrene (48.5%), severe deformity (3.0%), mangle (18.2%), sarcoma (15.2%), tumour (6.1%), hemiamelia (3.0%), and osteoblastoma (6.1%).

n=33	Frequency	Percent (%)
GANGRENE	16	48.5
SEVERE DEFORMITY	1	3.0
MANGLED LIMB	6	18.2
SARCOMA	5	15.2
TUMOR	2	6.1
HEMIAMELIA	1	3.0
RECURRENT OSTEOBLASTOMA	2	6.1

Table 3: Diagnosis for Amputation

Trauma accounted for 23 (69.7%) of the amputations, followed by neoplasm (24.2%), vasculitis (3.0%), and congenital conditions (3.0%).

n=33		Frequency	Percent (%)
	TRAUMA	23	69.7
	VASCULITIS	1	3.0
	NEOPLASM	8	24.2
	CONGENITAL	1	3.0

Table 4: Causes / Indication

Based on the American Society of Anesthesiologists (ASA) classification, the distribution of amputations was as follows: type I (9.1%), type II (24.2%), type II(E) (24.2%), type III (15.2%), type III(E) (24.2%), and type IV(E) (3.0%).

n=33		Frequency	Percent (%)
0	I	3	9.1
	II	8	24.2
	II(E)	8	24.2
	III	5	15.2
	III(E)	8	24.2
	IV(E)	1	3.0

Table 5: American Society of Anesthesiologists (ASA) Classification

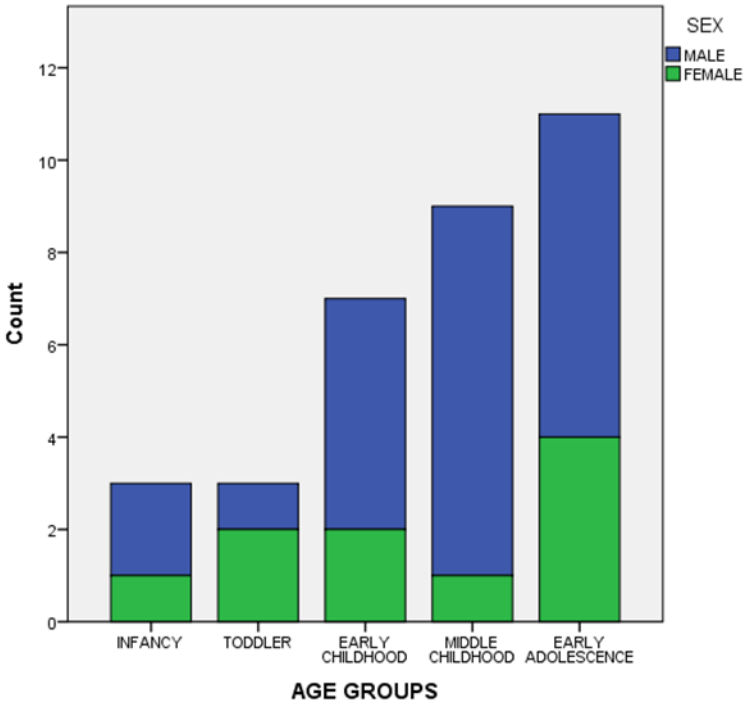
The predominant anaesthesia type utilized was General anesthesia (GA) + Endotracheal tube (ETT) (72.7%), followed by Subarachnoid block (SAB) (18.2%). Facemask, SAB & Sedation, and Axillary Block (3.0% each). The average surgery time was 87.27± 23.96seconds, with an average estimated blood loss (EBL) of 105.45±57.51 and an average pre-operative packed cell volume (PCV) of 29.20±5.43

Blood transfusion was required in 18 (54.5%) cases, and only one (3%) patient had an associated injury. Comorbidities were rare, with 32 (97.0%) patients having none, while Peripheral Vascular Disease was present in only one (3%) patient. Additionally, 18 (54.5%) amputations have been to Traditional bone setters. None of the patients collected prosthetics. Complications occurred in 13 (39.4%) out of 33 amputated patients, with surgical site infection (SSI) being the most common (36.4%), followed by phantom limb sensation (3%)

Table 6: Average Analysis of some parameters

n=33	Mean	Standard deviation
AGE (years)	8.04	5.03
SURGERY TIME (min)	87.27	23.96
ANAES TIME (min.)	117.36	23.59
EBL	105.45	57.51
PRE-OP PCV	29.20	5.43
DURATION OF SYMPTOMS (days)	223.43	443.43

Fig 1: Age-gender distribution



IV. Discussion

Major limb amputation is a commonly performed surgical procedure across various medical specialties, including orthopedics, general surgery, vascular surgery, and trauma care, often undertaken with the primary goal of saving the patient's life. The indications for amputation, its frequency, and the levels at which it is performed, as well as the subsequent complications, exhibit significant variability. These variations are influenced by factors such as the age of the patients, the specific medical setting, and the country where the procedures are conducted[7]. Therefore, we conducted this retrospective analysis of under-18 children's patients who underwent limb amputation at our institution for 5 years to report patterns of amputation indications, complications, and outcomes of amputation.

A total of 33 patients were included for descriptive analysis. All of them were children with a mean age of 8 years. The active age group of 12-18 years (early adolescence) accounted for the majority of the amputations. We observed a male predominance accounting for 23 (69.7%) of amputated patients. This observation stands in line with the recent literature.[5]

The authors of the study focused on various types of limb amputations, with lower limb amputations comprising the majority of cases. This finding is consistent with a study conducted by Nwosu et al[4]. Specifically, above-knee amputations accounted for a majority of the cases, although the incidence of below-the-knee amputations was relatively close. This aligns with the results reported by Horsch et al[5] and Sarfo-Kantanka[8] This contrasts with the findings of Reddy et al[9], and Salawu et al[10] where below-the-knee amputations were more prevalent than above knee amputations. However, it is worth noting that there has been a global decline in the number of above knee amputations, attributed to efforts aimed at preserving the knee joint, which enhances the rehabilitation potential of amputees.[11]

The indications for limb amputation, particularly among pediatric populations, exhibit significant variability across different settings and countries, as highlighted by studies conducted by Horsch et al.[5] and Okenwa, 2020[12]. In our findings, trauma emerged as the most common indication for amputation, followed by neoplasm. This trend mirrors the findings of studies conducted in various regions of Africa, as reported by Kouevi-Koko et al.[13] and Naidu et al.[14] However, it's noteworthy that diabetes was more prevalent as an indication for amputation in studies conducted by Reddy et al[9] and Chalya et al[15]. This disparity may be attributed to the adult population included in these studies, as opposed to our focus on pediatric patients.

The diagnosis of gangrene was prevalent among most of the patients, which aligns with the findings of studies conducted by Soares et al.[16] Salawu et al[10], and Dada & Awoyomi[17]

In our study, a significant proportion of amputations were attributed to complications arising from traditional bone setters' treatment (TBS). Traditional Bone Setting (TBS) holds a prominent role in alternative healthcare systems, particularly in regions like Nigeria and other low- and middle-income countries, despite the presence of modern healthcare facilities. This reliance on traditional bone setters can be attributed to several

factors, including lower costs, ease of accessibility, prompt service delivery, cultural beliefs, and influence from family and peers. However, the utilization of traditional bone setters' services often leads to complications such as mal-union, non-union, gangrene, chronic osteomyelitis, and joint stiffness the problems with extremity gangrene being the worst.[18] These complications likely contributed to the indications for trauma and gangrene diagnoses observed in our study.

The American Society of Anesthesiologists (ASA) physical status classification serves as the standard for assessing the risk of morbidity and mortality in perioperative patients. This classification system ranges from ASA I, indicating the least concern, to ASA VI, which pertains to brain-dead patients, with emergency surgeries denoted as E. Regular updates have been made to this classification system to incorporate additional comorbidities and address its limitations, as noted by Singh et al[19], Mayhew et al,[20] and Horvath et al.[21] In our study, the predominant classifications observed were II, II(E), and III(E), with no hierarchical order noted.

The type of anesthesia utilized did not show a significant impact on mortality or morbidity following amputation, consistent with findings reported by Kim et al.2019 and Pisansky et al.[22] While most patients received general anesthesia (GA) along with an endotracheal tube, a study conducted by Mufarrih et al.[23] suggested that general anesthesia might be associated with a higher incidence of respiratory failure and sepsis when compared to regional anesthesia. Additionally, blood transfusion was prevalent among the patients, with the majority not presenting with associated injuries.

In our study of patients undergoing limb amputation, a significant proportion, accounting for 39.4% of the studied population, experienced complications. The most prevalent complication observed was surgical site infection (SSI), affecting 36.4% of our patient population, while phantom limb complications were reported in only 3% of cases. These findings are consistent with previous studies, such as those conducted by Miwa et al.[24] and Pherson et al,[25] which also identified SSI as a common complication associated with major limb amputation in adolescents.

Despite the valuable insights gained from our study, it is important to acknowledge its limitations, particularly the small sample size. Future research endeavors should strive to overcome this limitation by utilizing larger and more diverse datasets to further explore the patterns and outcomes of limb amputation in pediatric populations. Such efforts will contribute to a better understanding of this rare occurrence and inform strategies for improved patient care and outcomes in this vulnerable population.

V. Conclusion

Amputation in children is a relatively rare occurrence, with a higher prevalence observed among males and often attributed to traumatic injuries. Among pediatric amputations, lower limb amputation is the most common, with above-knee amputation being particularly frequent. However, many cases of traumatic injury resulting in amputation are complicated by gangrene, often stemming from treatment by traditional bone setters, a practice passed down through generations and widely utilized.

To mitigate the risk of debilitating outcomes like amputation, it is recommended that traditional bone setter practitioners undergo training from orthopedic specialists. Additionally, there is a critical need for public education regarding the dangers associated with traditional bone settings, particularly concerning the heightened risks in the pediatric population.

Postoperative complications are prevalent in nearly half of pediatric amputee cases, with a significant proportion attributed to surgical site infections (SSI). These complications frequently require revision surgery to address resulting abnormalities. Despite the challenges associated with revision procedures, it is crucial to recognize that amputation remains the primary course of action when alternative interventions are not feasible.

We recommend the training of traditional bone setter practitioners, public education on the risks involved, and improvements in maternal and child healthcare to address congenital conditions and traumatic injuries. Overall, a comprehensive approach involving prevention, early intervention, and public awareness is crucial to reducing pediatric amputations and improving child well-being in Nigeria.

References

[1] Mishra A. Lower Limb Amputations. 2014.
[2] Woldie I, Ansari S, Dyson G, Et Al. Clinical Characteristics And Outcome Of Patients With Sickle Cell Disease Admitted To The Medical Intensive Care Unit, Https://Www.Semanticscholar.Org/Paper/Clinical-Characteristics-And-Outcome-Of-Patients-To-Woldie-Ansari/8248d25788ac5a0cff8bd066bfe37856445e439a (2017, Accessed 12 January 2024).
[3] Maduri P, Akhondi H. Upper Limb Amputation. In: Statpearls. Treasure Island (Fl): Statpearls Publishing, Http://Www.Ncbi.Nlm.Nih.Gov/Books/Nbk540962/ (2024, Accessed 2 April 2024).
[4] Nwosu C, Babalola Mo, Ibrahim Mh, Et Al. Major Limb Amputations In A Tertiary Hospital In North Western Nigeria. Afr Health Sci 2017; 17: 508–512.
[5] Horsch A, Gleichauf S, Lehner B, Et Al. Lower-Limb Amputation In Children And Adolescents-A Rare Encounter With Unique And Special Challenges. Children (Basel) 2022; 9: 1004.
[6] Squitieri L, Reichert H, Kim Hm, Et Al. Patterns Of Surgical Care And Health Disparities Of Treating Pediatric Finger Amputation Injuries In The United States. J Am Coll Surg 2011; 213: 475–485.

[7] Behrendt C-A, Sigvant B, Szeberin Z, Et Al. International Variations In Amputation Practice: A Vascunet Report. European Journal Of Vascular And Endovascular Surgery 2018; 56: 391–399.
[8] Sarfo-Kantanka O, Sarfo Fs, Kyei I, Et Al. Incidence And Determinants Of Diabetes-Related Lower Limb Amputations In Ghana, 2010-2015- A Retrospective Cohort Study. Bmc Endocr Disord 2019; 19: 27.
[9] Reddy Gp, Hari Ps, Sahu S, Et Al. Limb Amputations In A Tertiary Care Hospital, North India: A Cross-Sectional Epidemiological Study – Can We Prevent This? Journal Of Marine Medical Society; 10.4103/Jmms.Jmms_149_23.
[10] Salawu O, Babalola O, Mejabi J, Et Al. Major Extremity Amputations: Indications And Post Surgery Challenges In A Nigeria Tertiary Institution. Sahel Med J 2019; 22: 8.
[11] Yusof Mi, Sulaiman Ar, Muslim D A. J. Diabetic Foot Complications: A Two-Year Review Of Limb Amputation In A Kelantanese Population. Singapore Med J 2007; 48: 729–732.
[12] Okenwa Wo. Indications And Challenges Of Limb Amputation In Children; Experience In A Tertiary Hospital In Enugu Nigeria. Nigerian Journal Of Orthopaedics And Trauma 2020; 19: 27.
[13] Kouevi-Koko Te, Amouzou Ks, Sogan A, Et Al. Lower Extremity Amputations (Leas) In A Tertiary Hospital In Togo: A Retrospective Analysis Of Clinical, Biological, Radiological, And Therapeutic Aspects. J Orthop Surg Res 2023; 18: 155.
[14] Naidu P, Dominguez Lb, Trelles M, Et Al. Traumatic Injuries Are The Main Indication For Limb Amputations During And After Humanitarian Crises. World J Surg 2021; 45: 1021–1025.
[15] Chalya Pl, Mabula Jb, Dass Rm, Et Al. Major Limb Amputations: A Tertiary Hospital Experience In Northwestern Tanzania. J Orthop Surg Res 2012; 7: 18.
[16] Portela Fso, Louzada Acs, Silva Mfa Da, Et Al. Analysis Of Lower Limb Amputations In Brazil's Public Health System Over 13 Years. European Journal Of Vascular And Endovascular Surgery; 0. Epub Ahead Of Print 21 February 2024. Doi: 10.1016/J.Ejvs.2024.02.028.
[17] Dada Aa, Awoyomi Bo. Is The Trend Of Amputation In Nigeria Changing? A Review Of 51 Consecutives Cases Seen At Federal Medical Centre Ebute Metta, Lagos, Nigeria. Nigerian Medical Journal 2010; 51: 167.
[18] Lawal M, Musa A. Traditional Bone Setting In Nigeria: Issues And Challenges. Journal Of Medical Research And Health Sciences 2022; 2: 54.
[19] Singh A, Patel G, Ganesh V, Et Al. American Society Of Anesthesiologists (Asa) Classification Of The Post-Covid Patients: Separate Sub-Class Needed? Indian J Anaesth 2022; 66: 747–749.
[20] Mayhew D, Mendonca V, Murthy Bvs. A Review Of Asa Physical Status - Historical Perspectives And Modern Developments. Anaesthesia 2019; 74: 373–379.
[21] Horvath B, Kloesel B, Todd Mm, Et Al. The Evolution, Current Value, And Future Of The American Society Of Anesthesiologists Physical Status Classification System. Anesthesiology 2021; 135: 904–919.
[22] Kim Sj, Kim N, Kim Eh, Et Al. Use Of Regional Anesthesia For Lower Extremity Amputation May Reduce The Need For Perioperative Vasopressors: A Propensity Score-Matched Observational Study. Ther Clin Risk Manag 2019; 15: 1163–1171.
[23] Mufarrih Sh, Qureshi Nq, Yunus Ra, Et Al. A Systematic Review And Meta-Analysis Of General Versus Regional Anesthesia For Lower Extremity Amputation. J Vasc Surg 2023; 77: 1542-1552.E9.
[24] Miwa S, Yamamoto N, Hayashi K, Et Al. Surgical Site Infection After Bone Tumor Surgery: Risk Factors And New Preventive Techniques. Cancers (Basel) 2022; 14: 4527.
[25] Pherson Mj, Strassle Pd, Aucoin Vj, Et Al. Surgical Site Infection After Open Lower Extremity Revascularization Associated With Doubled Rate Of Major Limb Amputation. J Vasc Surg 2022; 76: 1014–1020.