

Original Research Article

Pediatric amputation from traditional bone setters' gangrene in Ibadan: a malady

Mosimabale J. Balogun¹, Jemiludeen O. Morhason-Bello^{2*}, Idowu K. Olusola³

¹Department of Surgery, College of Medicine, University of Ibadan, Ibadan, Oyo State, Nigeria

²Department of Orthopaedics and Trauma, University College Hospital, Ibadan, Oyo State, Nigeria

³Department of Anaesthesia, College of Medicine, University of Ibadan, Ibadan, Oyo State, Nigeria

Received: 29 August 2024

Accepted: 05 October 2024

*Correspondence:

Dr. Jemiludeen O. Morhason-Bello,
E-mail: morhasonbelloj@yahoo.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Pediatric amputations resulting from gangrene pose a significant medical challenge, especially in resource-limited settings. In Nigeria, traditional bone setters (TBS) often serve as the first point of contact for musculoskeletal injuries, but their practices can lead to severe complications, including gangrene. Our hospital manages many of such cases. This study aims to explore the epidemiology, clinical presentation, and outcomes of pediatric patients who developed gangrene requiring amputation following TBS treatment, with the goal of informing public health strategies and improving pediatric care quality.

Methods: The study is a retrospective study which seek to extract the data from the hospital record all the patient who underwent amputation due to gangrene after initial TBS treatment. All the case notes were retrieved and data was extracted and analyzed using descriptive statistics. The study adhered to ethical standards and anonymized data to protect patient confidentiality, ensuring the study's integrity.

Results: The study involved 33 pediatric patients aged 8.3 years, with a significant gender disparity. Most patients were from the Yoruba ethnic group and practiced Islam. 87.9% of parents had no formal education. Gangrene was most common in the left hand, and falls were the leading cause of initial injury. The average surgery time was 81.2 minutes, with a 13-day hospital stay. Post-operative complications occurred in 43.5% of patients, with surgical site infections (SSI) being the most common. Only 8.7% received occupational therapy.

Conclusions: The study highlights post-operative care challenges in pediatric amputations, including high complications and limited access to services. It suggests targeted interventions, infection control, and public health campaigns to improve outcomes. Future research should include long-term follow-up studies.

Keywords: Pediatric amputation, Traditional bone setters, Gangrene, Amputation, Surgical site infection, Rehabilitation

INTRODUCTION

Pediatric amputations, particularly those resulting from gangrene, represent an unfortunate severe and complex medical challenge. Gangrene refers to the death of body tissue due to either a lack of blood flow or a serious bacterial infection, poses a significant threat to children's health, especially in resource-limited settings where access to prompt and appropriate medical care is often restricted. The complications arising from gangrene can be life-

threatening particularly sepsis culminating into multiple organ dysfunction syndrome and death these often-necessitating expedient amputation.¹

In many parts of the world, including Nigeria, TBS play a crucial role in the healthcare system, especially in rural and underserved areas. These practitioners are often the first point of contact for patients with musculoskeletal injuries.^{2,3} However, the practices employed by TBS can sometimes lead to adverse outcomes, including infections

and gangrene, due to the use of non-sterile techniques, improper handling of injuries, and lack of adequate medical knowledge. Despite these risks, TBS remain popular due to cultural beliefs, accessibility, and the perceived high cost of modern medical care.⁴

Our hospital serves as a critical tertiary care center, providing advanced medical education and services, including the management of severe complications arising from traditional bone-setting practices. This study aims to explore the epidemiology, clinical presentation, and outcomes of pediatric patients who developed gangrene of the extremities and required amputation following treatment by TBS.

This hospital is uniquely positioned to handle the severe complications resulting from traditional bone-setting practices. The study leverages the hospital's extensive clinical records to provide a comprehensive analysis of pediatric gangrene cases that necessitated amputation.

By addressing these key objectives and background considerations, the study aims to contribute significantly to the body of knowledge on pediatric amputations due to gangrene and inform better clinical and public health practices to safeguard the well-being of children in similar contexts.

METHODS

This study is a retrospective cohort analysis conducted over a five-year period, from January 2018 to December 2023. The research focuses on pediatric patients who had initial treatment by TBS, developed gangrene and subsequently earned amputation. The study was conducted at the university college hospital (UCH) in Nigeria, a tertiary healthcare center.

The inclusion criteria were patients between the ages of 4 months and 16 years, who sustains perceived or real fractures of the extremities, managed by TBS with inappropriately applied splints or plaster of Paris cast and subsequently developed gangrene necessitating amputation in our facility. Patients with congenital amputations or those who developed gangrene without prior history of splinting 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 collected data were analyzed using statistical software. Descriptive statistics were used to summarize 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.

Due to the retrospective nature of the study, patient consent was waived. However, all data were anonymized to protect patient confidentiality. The study adhered to the principles of the declaration of Helsinki.

RESULTS

The study included 33 pediatric patients who underwent amputation over a five-year period, with a mean age of 8.3 years, ranging from 4 months to 16 years. 69.7% of the case resulted following traditional bone setter intervention. There was a significant gender disparity among the patients, with 72.7% being male and 27.3% female. Majority of the patients belonged to the Yoruba ethnic group (78.8%), followed by the Hausa ethnic group (18.2%). Islam was the predominant religion practiced by 66.7% of the patients' parents. Most parents (87.9%) had no formal education, highlighting a critical socio-economic factor as shown in Table 1.

Table 1: Demographic characteristics of 5 years peadiatric amputation, (n=33).

Variables	Items	N	Percentage (%)
Age group (years)	≤1	3	9.1
	2-5	10	30.3
	6-10	6	18.2
	10-14	9	27.3
	15-18	5	15.2
	70-79	4	3.4
Mean±SD [Range]		8.3±5.2 (0.33-16.0)	
Sex	Male	24	72.7
	Female	9	27.3
Tribe	Yoruba	26	78.8
	Hausa	6	18.2
	Igbo	1	3.0
Religion	Christian	11	33.3
	Islam	22	66.7
Level of education of the parents	No formal education	29	87.9
	Primary	1	3.0
	Secondary school	1	3.0
	Tertiary	2	6.1

Despite most patients being right-handed (95.7%), the left hand was the most common site of gangrene (43.5%), followed by the right leg (30.4%).

The commonest cause of injury among them was fall (60.8%) followed by pedestrian motor vehicle road traffic accidents (30.4%). Various types of amputations were performed which include above elbow (21.7%), below elbow (17.4%), above knee (21.7%), below knee (21.7%) and Ray amputation (17.4) as shown in Figure 1.

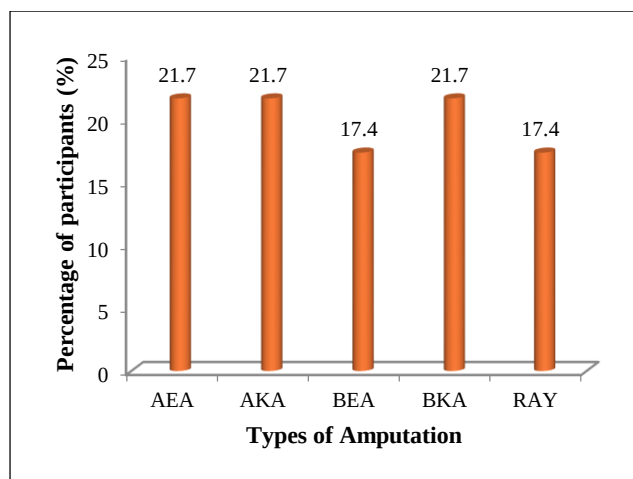


Figure 1: Distribution of types of amputation among participant with gangrenous site.

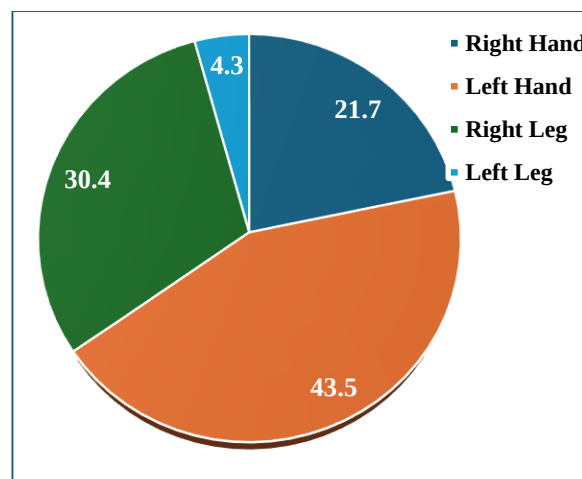


Figure 2: Site of gangrene (n=23).

Table 2: Pre operative and post operative PCV and EBL among participant with gangrenous site.

Variables	N	Minimum	Maximum	Mean	SD
Pre-op PCV (%)	23	18	40	29.5	5.9
Post op PCV (%)	17	25	39	33.3	3.5
EBL (ml)	17	10.0	600.0	156.8	152.3

Table 3: Use of tourniquet and anaesthesia type among participant with gangrenous site.

Variables	N	Percentage (%)
Use of tourniquet		
Yes	13	56.5
No	10	43.5
Total	23	100.0
Anaesthesia type		
Facemask	1	4.3
GA + ETT	5	21.7
GA +ETT	13	56.5
SAB	4	17.4
Total	23	100.0

The mean pre-operative packed cell volume (PCV) was 29.5%, which increased to 33.3% post-op indicating effective management of surgical blood loss (Table 2). The average estimated blood loss during surgery was 156.8 ml, with mean surgery time of 81.2 minutes. The average hospital stay was 13 days, suggesting complex cases or potential challenges in post-operative care. General anesthesia with endotracheal intubation was the most common type of anesthesia used (56.5%) (Table 3). Tourniquets were employed in 56.5% of cases, and 47.8% of patients required blood transfusions, with packed cells being the most used blood product (Table 4).

Only 4.3% of patients had comorbidities such as sickle cell disease. Post-op complications experienced by 43.5% with SSI being most common complication (39.1%) followed by phantom limb (4.3%). Additionally, only 8.7% of

patients received occupational therapy, which is crucial for rehabilitation and improving long-term outcomes.

Table 4: Transfusion of blood and blood product among participant with gangrenous site.

Variables	N	Percentage (%)
Transfusion of blood		
Yes	11	47.8
No	12	52.2
Blood product		
Packed cell	7	30.4
FFP	1	4.3
Whole blood	2	8.7
None	13	56.5

DISCUSSION

The study population, with a mean age of 8.3 years, included patients ranging from four months to 16 years. A notable gender imbalance was observed, with nearly three-quarters of the patients being male. This disparity might reflect differences in exposure to risk factors or healthcare access between genders. Males, especially in certain cultures, are more likely to engage in activities that increase the risk of trauma, which may lead to complications necessitating amputations. For instance, boys often participate in physical activities that carry a higher risk of injury.⁵

The cultural landscape was predominantly Yoruba this may be attributed to the fact that our facility is in Ibadan,

Oyo state-Nigeria with the natives who are mostly Muslims. Traditional bone setting practices are deeply rooted in the cultural beliefs of many African communities, where traditional healers are often the first point of contact for fractures and musculoskeletal injuries. This preference is driven by cultural beliefs, perceived effectiveness, and accessibility compared to modern medical facilities.⁶

The study found that almost 88% of parents had no formal education. Parental education significantly influences healthcare decisions and the quality of post-operative care. Lower educational levels are associated with delayed presentation to healthcare facilities, poor adherence to medical advice, and increased reliance on traditional healers. Educated parents are more likely to understand the importance of early medical intervention and follow prescribed medical regimens.⁷ Comprehensive educational programs targeting parents and caregivers are necessary to improve awareness about the dangers of traditional bone setting and importance of timely medical care.

Despite most patients being right-handed, the left hand was the most common site of gangrene, followed by the right leg. This unexpected finding could be due to several factors, including injury patterns specific to this population or the methods used by TBS. Previous studies have suggested that TBS often use tight bandaging techniques, which can lead to compromised blood flow and subsequent gangrene.⁸ Understanding the specific practices and injury mechanisms can help develop targeted prevention strategies.

The management of these cases is majorly amputation, with an average surgery time of 81 minutes. General anaesthesia with endotracheal intubation was the preferred method, reflecting the need for comprehensive perioperative care in these complex cases. The use of tourniquets and the need for blood transfusions in nearly half the cases highlight the severity of these conditions and the challenges faced during surgery.^{9,10} Proper perioperative planning and management are crucial to handle the complexities of these surgeries and minimize complications.¹¹

The post-operative phase revealed significant challenges. The average hospital stay of 13 days suggests complicated recoveries, and over 43% of patients experienced post-operative complications, with SSI being the most prevalent. High infection rates point to a critical need for enhanced infection control measures. Implementing stricter aseptic protocols, proper wound care, and timely use of antibiotics can mitigate these complications.¹² The findings indicate that current infection control measures may be inadequate, necessitating an overhaul to prevent post-operative infections.

One of the most striking findings was the severely limited use of occupational therapy, with only 8.7% of patients receiving this crucial rehabilitative care. This may be

explained by the fact the service is expensive and not readily available. Considering the socioeconomic value of the studied populations, majority could not afford the care. Occupational therapy is essential for improving functional outcomes and quality of life post-amputation. It helps in the adaptation to prosthetics, development of fine motor skills, and psychological adjustment.¹³ Increasing the utilization of occupational therapy services is vital for comprehensive post-operative management. This requires investment in training and resources to support these services and ensure they are accessible to all patients who need them.

The socio-economic factors revealed by this study, particularly the low educational levels of parents, suggest a need for comprehensive educational programs. Community-based health education can play a significant role in changing perceptions about traditional bone setting and promoting modern medical care. Public health campaigns can raise awareness about the risks associated with traditional bone setting and encourage timely medical intervention for injuries.¹⁴

The findings from this study have several implications for clinical practice. First, targeted interventions are needed to reduce the incidence of gangrene, particularly among male children. Public health campaigns and educational programs aimed at parents and caregivers can help in this regard.

Secondly, enhancing infection control protocols is essential to reduce post-operative complications. This involves strict adherence to aseptic techniques, proper wound care, and appropriate antibiotic use.

Additionally, increasing the availability and utilization of occupational therapy services can significantly improve rehabilitation outcomes for pediatric amputation. Healthcare providers should also consider the cultural context and work with community leaders to promote awareness about the risks associated with traditional bone setting practices.

Future research should consider long-term follow-up studies to assess the impact on quality of life and functional outcomes for these young patients. Longitudinal studies can provide valuable data on the effectiveness of different interventions and the long-term rehabilitation needs of pediatric amputees. Additionally, research into the specific injury patterns and practices of TBS can help develop targeted prevention strategies. Understanding the long-term psychological and social impacts of amputations on children and their families is also crucial for developing comprehensive care plans.¹⁵

CONCLUSION

The study highlights challenges in post-operative care, including high post-operative complications and limited access to rehabilitative services. Socio-economic factors,

low parental education, and early medical intervention are highlighted. To address these, healthcare providers and policymakers should implement targeted interventions, enhance infection control protocols, and develop public health campaigns. It emphasizes the significance of cultural context in pediatric amputation cases, emphasizing the need for community leaders to raise awareness and initiate medical treatment. Educating patients, implementing infection control measures, and providing occupational therapy can all improve healthcare outcomes.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Bhargava A, Mahakalkar C, Kshirsagar S. Understanding Gangrene in the Context of Peripheral Vascular Disease: Prevalence, Etiology, and Considerations for Amputation-Level Determination. *Cureus*. 2023;15(11):e49026.
2. Omololu AB, Ogunlade SO, Gopaldasani VK. The practice of traditional bonesetting: Training algorithm. *Clin Orthop Relat Res*. 2008;466(10):2392-8.
3. Chika A, Onyekwelu J. Traditional bone setters' gangrene: An avoidable catastrophe, 8 years retrospective review in a private orthopedic and trauma center in South-East Nigeria. *Nigerian J General Pract*. 2016;14(1):1.
4. Joseph Sina O, Taiwo OC, Michael Ayodele I. Traditional Bone-Setters and Fracture Care in Nigeria. *Merit Res J Art Social Sci Humanities*. 2014;2(6):74-80.
5. Biddle SJH, Gorely T, Stensel DJ. Health-enhancing physical activity and sedentary behaviour in children and adolescents. *J Sports Sci*. 2004;22(8):679-701.
6. Deji-Dada OO, Dada SA, Ogunlusi JD, Solomon OA. Patients' satisfaction with emergency care services in a University Teaching Hospital in South-West, Nigeria. *African J Emergency Med*. 2021;11(2):321-4.
7. Factors influencing patronage of traditional bone setters. Available at: https://www.researchgate.net/publication/12202987_Factors_influencing_patronage_of_traditional_bone_setters. Accessed on 25 August 2024.
8. Onyemaechi NOC, Lasebikan OA, Elachi IC, Popoola SO, Oluwadiya KS. Patronage of traditional bonesetters in Makurdi, north-central Nigeria. *Patient Prefer Adherence*. 2015;9:275-9.
9. Richards O, Cheema Y, Gwilym B, Ambler GK, Twine CP, Bosanquet DC. Clinical Effects of Tourniquet Use for Nontraumatic Major Lower Limb Amputation: A Two-Center Retrospective Cohort Study. *Ann Vasc Surg*. 2024;104:53-62.
10. Choksy SA, Lee Chong P, Smith C, Ireland M, Beard J. A Randomised Controlled Trial of the Use of a Tourniquet to Reduce Blood Loss During Transtibial Amputation for Peripheral Arterial Disease. *Eur J Vascular Endovascular Surg*. 2006;31(6):646-50.
11. Gosselin RA, Thind A, Bellardinelli A. Cost/DALY Averted in a Small Hospital in Sierra Leone: What Is the Relative Contribution of Different Services? *World J Surg*. 2005;30(4):505-11.
12. Ortopedik Travma Asistan El Kitabı. Available at: <https://www.nobelkitabevi.com.tr/ortopedi-ve-travmatoloji-/20286-ortopedik-travma-asistan-el-kitabi-9786257354820.html>. Accessed on 25 August 2024.
13. Psychological Adaptation to Amputation | O and P Virtual Library. Available at: <https://www.oandp.library.org/alp/chap28-01.asp>. Accessed on 25 August 2024.
14. Traditional Bone Setting in Nigeria: Issues and Challenges. Available at: https://www.researchgate.net/publication/364815634Traditional_Bone_Setting_in_Nigeria_Issues_and_Challenges. Accessed on 25 August 2024.
15. Edelstein JE, Denninger SA. Rehabilitation for children with limb deficiencies. *Orthotics Prosthetics in Rehabilitation*. 2019;738-58.

Cite this article as: Balogun MJ, Morhason-Bello JO, Olusola IK. Paediatric amputation from traditional bone setters' gangrene in Ibadan: a malady. *Int J Res Orthop* 2024;10:1137-41.