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## Indications and Pattern of Limb Amputation: A Tertiary Hospital Experience, South-South, Nigeria

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# Indications and Pattern of Limb Amputation: A Tertiary Hospital Experience, South-South, Nigeria

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**Abstract**
The aim of this paper was to study the indications and patterns of limb amputations in the University of Calabar Teaching Hospital, a retrospective study of 142 limb amputations performed in patients admitted to the University of Calabar Teaching Hospital, South-South, Nigeria. Data was obtained from theater records and the medical record department of the hospital after due ethical approval. The data spanned a period of 10 years (from January 2004 to December 2014). A total of 142 patients were seen. The age ranged from 8 to 87 years with a mean age of 46 years ± SD 17.9 years and a male to female ratio of 2.3:1. Adults accounted for 95.8% while 4.2% were children. Emergency procedures accounted for 47.9% of the amputations. Diabetic foot gangrene was the major cause of lower limb amputation 91 (64.1%), trauma accounted for 27 (19%) of these, 15.5% were due to road traffic accidents, and 3.5% were cases of gunshot injuries. Tumors and limb ischemia accounted for 9.2 and 2.8%, respectively. Electrical injury, industrial accidents, and ischemic limbs from tight tourniquet splints by traditional bonesetters were the common causes of upper limb amputations. Most of the amputations were on the lower limb (83.7%) with the left lower limb accounting for 47.8% and the right lower limb accounting for 35.9% .Upper limb amputations accounted for 15.4% with right and left upper limbs being 8.4 and 7.0%, respectively .Only one patient had bilateral lower limb amputation(0.7%). For the levels of amputation, the majority were below knee 54 (38%) followed by above elbow 38 (26.8%) amputations (Figure 1); others were ray amputation of the foot and hand as 28 (19.7%) and 8 (5.6%), respectively. The least was below elbow amputation 6 (4.2%). The study showed that 96% of the causes were potentially preventable, and that establishment of a prosthetic-orthotic center is needed in this part of the country.

**Keywords:** Limb amputations; Indications; Patterns.

## 1. INTRODUCTION

Amputation is the surgical removal of an external part of the body, most often a limb or part of it as a form of treatment [1]. Amputation is a very old surgical procedure that dates back to the primeval times of Hippocrates with a narration of more than 2500 years [2, 3]. Though wrongly viewed by some as a failure of treatment, it is important to know that amputation has been practiced for different reasons, ranging from punitive measures for some offences to ritualistic practices. But therapeutic reasons includes peripheral vascular disease, trauma, infection, congenital anomalies, and tumors [4,5]. It is estimated that between 40 and 70% of all limb amputations occur in people with diabetes, resulting in the loss of over a million legs within a year worldwide [6,7]. Throughout the western world, peripheral vascular diseases are the leading causes for amputations [8].

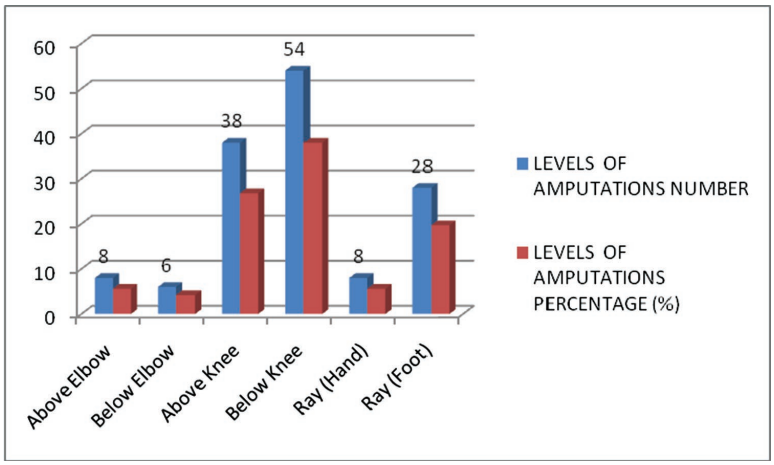
When limb salvage is impracticable, as in conditions where the limb is dead or dying or viable limbs that are nonfunctional or are considered as endangering the life of the patient, limb amputation becomes the only option [3]. Losing a limb in developing countries is almost a sentence to poverty and beggary [8]. This is because prosthetic fittings are still for the rich, and rehabilitation facilities are still in their rudimentary stages. Hence, there are weighty economic, social, and psychological consequences for the suffering patient and by extension, for their family and the society at large [8,9]. Complications of amputation range from different forms of hemorrhages, surgical site infections, wound dehiscence, neuroma, phantom limb and pain, and flap necrosis to osteomyelitis and stump atrophy.

Ignorance and late presentations contribute to the many preventable amputations in Nigeria. Hence, this study has been planned to assess the indications and pattern of amputations in our hospital with the view to enlighten the public and make recommendations to prevent the untoward experiences that follow amputations.

## 2. METHODS

This is a retrospective study of all the patients that had all forms of limb amputation in the University of Calabar Teaching Hospital. These patients were treated by three orthopedic units comprising about 10 orthopedic surgeons, resident doctors, and other ancillary staff.

**Figure 1: Levels of amputations.**




Based on a structured pro forma, patients' case files were retrieved from the medical record unit after due ethical approval and other information from theater records between January 2004 and December 2014 .The analyzed data contained age; sex; level of amputation; cause of injury; diagnosis and indication for amputation; Doppler investigation; type of amputation; type of operation, either emergency or elective, provision or elective; duration of hospital stay; prosthesis fitting; and complications. Patients who were referred from other centers after amputation were excluded from this study. The data was analyzed using Statistical Package for Social Science, version 20, for Windows, by International Business Machine 2011. Descriptive statistics were applied to determine means, frequencies, and ranges. A confidence interval of 95% was assumed, and the difference was considered significant at $p \leq 0.005$. The results are presented in frequency distributions , tables, and charts.

## 3. RESULTS

A total of 142 patients were seen (Table 1). The age ranged from 8 to 87 years with a mean age of 46 years ± SD 17.9 years and a male to female ratio of 2.3:1. In all the amputations, 136 (95.8%) were adults and 6 (4.2%) were children. Emergency procedures accounted for 47.9%, and the same numbers were provisional amputations while 52.1% were definitive. Diabetic foot gangrene was the major cause of lower limb amputation 91 (64.1%), trauma accounted for 30 (21.1%) of these, 15 (10.5%) were due to road traffic accidents, 5 (3.5%) were cases of gunshot injuries, 3 (2.1%) were electrical injuries resulting in dry gangrene, and 7 (4.9%) were due to gangrene following complications from traditional bonesetters (Table 2). Malignancies and peripheral vascular disease accounted for 9.2 and 3.5%, respectively. Electrical injury, industrial accidents, and ischemic limbs from tight tourniquet splints by traditional bonesetters as a form of stabilizing the fractures were the common causes of the upper limb amputations. Of the six children who had amputations, 4 (66.7%) were due to mismanaged fractures by traditional bonesetters and 2 (33.3%) had severe burns of the lower limbs due to an attempt to manage convulsions by a cultural belief of heating the feet over a naked flame. Most of the amputations were on the lower limb (88.3%) with the left lower limb accounting

**Table 1: Sociodemographics.**

| Age (Years) | Total (%) | Sex | |
|---|---|---|---|
| | | Male | Female |
| 1-10 | 3 (2.1) | 1 | 2 |
| 11-20 | 7 (4.9) | 6 | 1 |
| 21-30 | 22 (15.5) | 18 | 4 |
| 31-40 | 27 (19.0) | 19 | 8 |
| 41-50 | 18 (12.7) | 12 | 6 |
| 51-60 | 36 (25.4) | 24 | 12 |
| 61-70 | 19 (13.4) | 12 | 7 |
| 71-80 | 6 (4.2) | 5 | 1 |
| 81-90 | 4 (2.8) | 2 | 2 |
| | 142 (100) | 99 | 43 |

**Table 2: Indications for amputations.**

| Causes | Frequency | Percentage (%) |
|---|---|---|
| **Trauma:** | | |
| Road traffic accident | 15 | 10.6 |
| Motorcycles | 9 | 6.3 |
| Bus | 2 | 1.4 |
| Tricycles | 4 | 2.8 |
| TBS gangrene | 7 | 4.9 |
| Gunshot | 5 | 3.5 |
| Electrical injury | 3 | 2.1 |
| **Diabetic gangrene** | 91.0 | 64.1 |
| **Peripheral vascular disease** | 5 | 3.5 |
| **Malignancy** | 13.0 | 9.2 |
| **Infections** | 3.0 | 2.1 |
| **Total** | **142** | **100** |

TBS, traditional bonesetter.

**Table 3: The causes and levels of amputations.**

| Causes | Levels of amputations | | | | | | |
|---|---|---|---|---|---|---|---|
| | AKA | BKA | AEA | BEA | Ray (Hand) | Ray (Foot) | Total |
| **Trauma** | **7** | **11** | **4** | **4** | **3** | **1** | **30** |
| **Diabetic gangrene** | **24** | **38** | **0** | **0** | **3** | **26** | **91** |
| **Peripheral vascular disease** | **1** | **4** | **0** | **0** | **0** | **0** | **5** |
| **Gas gangrene** | **3** | **0** | **0** | **0** | **0** | **0** | **3** |
| **Malignancy** | **13** | **0** | **0** | **0** | **0** | **0** | **13** |
| **Total** | **48** | **53** | **4** | **4** | **6** | **27** | **142** |

**Table 4: Wagner's grade, level of amputation and complications.**

| Level of amputation | Complications | Wagner's grade | | | Total |
|---|---|---|---|---|---|
| | | Grade 3 | Grade 4 | Grade 5 | |
| **AKA** | **Phantom limb** | | **2** | **4** | **6** |
| | **Surgical site infection** | | **3** | **0** | **3** |
| | **Depressive mood** | | **4** | **8** | **12** |
| **BKA** | **Phantom limb** | | **3** | **4** | **7** |
| | **Surgical site infection** | | **0** | **6** | **6** |
| | **Depressive mood** | | **1** | **5** | **6** |
| **Ray amputation of the foot** | **Phantom limb** | **0** | | | **0** |
| | **Surgical site infection** | **2** | | | **2** |
| | **Depressive mood** | **2** | | | **2** |
| **Total** | | **4** | **13** | **27** | **44** |

for 50% and the right lower limb accounting for 38.3%. Upper limb amputations accounted for 11.7% with right and left upper limbs being 7 and 4.0%, respectively. Only one patient who suffered chronic kidney disease with associated autoamputation of both feet had bilateral lower limb amputation (0.7%). For the levels of amputation, the majority were below knee 54 (38.0%) followed by above knee 38 (33.1%) amputations; others were ray amputations of the foot and hand as 28 (19.%) and 6 (4.1%), respectively. The least were above and below elbow amputations with 4 (2.8%), respectively.

Of the 91 (64.1%) patients who had diabetic gangrene, 88 (96.7%) were of the lower limbs while 3 (3.3%) had diabetic hand syndrome. Of the 88 lower limb diabetic gangrene, 38 (43.2%) were below-knee amputations (BKA), 24 (27.3%) were above-knee amputations (AKA) while 26 (29.5%) were ray amputations of the foot (Table 3).

Complications such as surgical site infection were seen in 20 (14.1%) patients, phantom phenomenon (both phantom limb and pain) in 13 (9.2%), and depression in 27 (19%); the remaining 82 (57.7%) had no complications (Table 4). Forty-four

(73.3%) of these complications were seen in patients with lower limb amputations while 16 (26.7%) were seen in those with upper limb amputations.

Most patients with diabetic foot gangrene who had complications were Wagner's grade 5 (63.4%) and had AKA; this is largely because the Doppler doplex ultrasound scan reported the popliteal vessels as not been patent enough. This informed the choice for AKA since the femoral vessels were patent. BKA and ray amputations of the foot were Wagner grade 4 and 3, accounting for 29.5 and 9.1%, respectively. Depression was also seen more in those who had AKA (27.3%) than those with BKA and ray amputations of the foot. Phantom limb were seen more in BKA (15.9%) than in AKA (13.6%).

Seven (4.9%) patients had revision of their amputation stump because of wound break dehiscence.

## 4. DISCUSSION

Amputation, though a common surgical procedure among orthopedic surgeons, has weighty effects on the affected patient. These effects include economic setbacks, social deprivations, and sometimes psychological trauma [2,3]. In this study, there is a male preponderance [10,11]; this is largely because males are more active and may easily injure their feet, and if there is a background of diabetes with poor blood sugar control, this results in diabetic foot gangrene with eventual limb amputation. The majority of the patients in this study were more middle-aged, with 50% of them being male; this agrees with findings by other authors [8]; however, it was in contrast with the report by Ajibade *et al.* who had more of a younger age group, between the ages of 30 and 39 years [10]. This might explain the reason for trauma being the major indication for amputation in their study unlike in this study where we had patients who were older with more cases of diabetic foot gangrene.

The leading cause of amputation in this study was diabetic foot gangrene; this is in consonance with reports by other authors [12-15]. Some studies have reported trauma to be the leading cause of amputation [10]. Hence, it is worth noting that indications for amputation vary between and within different communities and nations [16,17]; this has prompted the need for this study to document our experiences, comparing them with other centers, and as such, help in reducing such indications or completely prevent recurrences within our center and in other parts of the world. Trauma was seen to be the next leading indication of amputation to road traffic accidents as the commonest cause of trauma with mangled extremities and electrical injuries resulting in gangrenes or gunshots injuries being the other forms of trauma. Gangrene from traditional bonesetters' tourniquets was also seen because most patients patronized traditional bonesetters for treatment and application of tight splints to stabilize the fracture, which as part of their treatment resulted in gangrene; this has been reported by some authors [18]. Other causes included malignancy from osteosarcoma, peripheral vascular diseases, and infection from gas gangrene.

BKA was the commonest level of amputation carried out and was trailed by AKA; this is similar to the work by Dada *et al.* [14], but is in contrast with that of Umaru *et al.* [4]. Others were ray amputations on the foot, above elbow amputation, and ray amputations of the hand; below elbow amputation was the least level of amputation. Most patients were diabetic and had BKA after examinations and Doppler ultrasound scans; this is also due to their early presentation to the hospital because of some level of awareness of diabetes mellitus and its complications in the community. Patients who had malignancies had more of AKA due to the extent of the tumor at presentation; many had been seen by traditional healers with several scarifications over the tumors.

Surgical site infections were second to depressive mood, contrary to reports by Esan *et al.*, which mentioned surgical site infections as the commonest postoperative complication [19]; other patients had phantom pains, two patients with malignancies died, and most patients had no complications postoperatively. Many patients were not able to afford prostheses due to financial constraints; others were not aware of it, while some were not interested at all. However, the majority were eager to use prostheses, and some were already on prostheses.

Most of the indications for amputation in this study are preventable. Therefore, an intensive and thorough health education on diabetes mellitus, its complications and preventions like blood-sugar-level monitoring and control, proper diet, foot care, and so on may go a long way in reducing the incidence. Patients will need to know the need to present themselves early and also engage in general lifestyle modification.

## 5. CONCLUSION

The changing trend seen in our study as regards the indication for amputation is a reflection of the changes in lifestyle and diet of our population. This study shows the incidence is common in the middle-age group, and more amputations were on the lower limb than upper limbs with BKA being the commonest level of amputation.

### Authors' Contributions

I.E. Abang, P.U. Agweye, I. Essiet, I.A. Ikpeme, J.E. Asuquo, C.O. Anisi: Conception and design, drafting the article, revising it critically for important intellectual content, final approval of the article for publication.
I.E. Abang: Acquisition of data.
C.O. Anisi: Analysis of data.

**Conflict of Interest**
None.

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