

## INDICATIONS AND COMPLICATIONS OF MAJOR LIMB AMPUTATIONS IN KANO, NIGERIA

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### SUMMARY

**Objectives:** To determine the indications and complications of major limb amputations in a Nigerian hospital.

**Design:** A five-year retrospective descriptive study.

**Setting:** National Orthopaedic Hospital, Dala, Kano, Nigeria.

**Participants:** Patients who had amputations above the wrist or ankle between January 2006 and December 2010.

**Main outcome measures:** Indications, complications and mortality.

**Results:** There were 132 unilateral amputations. The patients were mostly males and below the age of 40. Lower limb amputations (74.2%) exceeded upper limb amputations (25.8%). The commonest indication was trauma (42.4%) followed by TBS gangrene (31.8%) and malignant tumours (12.9%). Wound infection, the commonest complication, occurred in patients who had identifiable predisposing factors. The 3 deaths that occurred were in patients who had had traditional bone setter intervention: 2 were due to septicaemia; 1, due to severe tetanus.

**Conclusion:** Trauma and traditional bone setter gangrene were the commonest indications. Most of the amputations were avoidable. Institution of preventive measures is imperative. Paying attention to predisposing factors can reduce complications.

**Keywords:** Major amputation, limb amputation, developing country, Nigeria

### INTRODUCTION

Amputation is the removal of the whole or part of a limb by cutting through bone or joint. A major amputation is one that is performed proximal to the ankle or wrist. An ancient surgical procedure, amputation retains its relevance in modern time to save life or remove a dead or useless limb. The physical disability that is associated with the procedure has been mitigated by sophisticated modern prosthetic technology, which sadly is poorly available and often non-affordable in developing countries. Knowledge of indications and complications of amputation is helpful in instituting

preventive strategies. Indications for amputation vary between and within countries. In the Western world, peripheral vascular disease is the commonest indication for amputation.<sup>1</sup> In Nigeria, however, trauma and traditional bone setter (TBS) gangrene are the leading indications.<sup>2-5</sup> Temporal change in indications also occurs.<sup>6</sup> Complications of amputation may involve the skin, muscle, artery, nerve, joint or bone. They may interfere with proper use of prosthesis.

The National Orthopaedic Hospital, Dala, Kano, is a referral centre that provides orthopaedic and plastic surgical services to the entire population of Northern Nigeria. At the time of writing this report, there was no previous published data on amputation from the centre. We conducted a five-year retrospective descriptive study to assess the indications and complications of major limb amputation in the hospital.

### SUBJECTS AND METHODS

A retrospective study of major limb amputations performed from January 2006 to December 2010 was carried out. Data were collected on age, gender, indication, duration of injury before presentation, level of amputation, number of stages in which amputation was performed, complications and duration of follow-up. Data was analyzed with Epi Info (Version 3.5.1; 2008). Results are presented with descriptive statistics.

### RESULTS

Major limb amputations were performed in 132 patients comprising 114 (86.4%) males and 18 (13.6%) females (M:F=6.3:1) with mean age ( $\pm$  standard deviation) 30.43 ( $\pm$  16.28) years. Ninety-three (70.5%) patients were below the age of 40 and the peak age was 30-39 years.

The distribution of level of amputations is shown in Table 1. There were 98 (74.2%) lower limb amputations and 34 (25.8%) upper limb amputations. All amputations were unilateral. Seventy-nine (59.8%) amputations were done in one stage while 53 (40.2%) were done in two stages.

The former included below knee amputations done for mangled foot or diabetic foot gangrene, above knee amputations for gangrene or sepsis localized to the leg and amputations for malignant tumours. In one patient a below knee amputation was converted to above knee amputation because of ascending sepsis. Only 2 (1.5%) of the amputees had documented evidence of prosthetic fitting.

**Table 1** Levels of Amputation

Level	Frequency	%
Below knee	48	36.4
Knee disarticulation	5	3.8
Above Knee	41	31.1
Hip disarticulation	4	3.0
Below elbow	8	6.1
Elbow disarticulation	3	2.3
Above elbow	19	14.4
Shoulder disarticulation	4	3.0
<b>Total</b>	<b>132</b>	<b>100.0</b>

The commonest indication was trauma (42.4%) followed by TBS gangrene (31.8%) and malignant tumours (12.9%) as shown in Table 2.

**Table 2** Indications for Amputation

Indication	Number of amputations	%
Severe trauma	56	42.4
TBS gangrene	42	31.8
Malignant tumour		
Squamous cell carcinoma	7	5.3
Osteosarcoma	6	4.5
Rhabdomyosarcoma	2	1.5
Malignant fibrous histiocytoma	1	0.8
Unrecorded histology	1	0.8
Diabetic foot gangrene	6	4.5
Infections		
Chronic osteomyelitis	2	1.5
Severe surgical site infection	2	1.5
Necrotizing fasciitis	1	0.8
<b>Others</b>		
Madura foot	3	2.3
Lymphoedema	2	1.5
Severe burn	1	0.8
<b>Total</b>	<b>132</b>	<b>100.0</b>

A patient with necrotizing fasciitis still consulted traditional healers first. Diabetic foot gangrene accounted for only 4.5% of the amputations. Patients who had amputations because of trauma (mangled limb or post-traumatic gangrene),

TBS gangrene and burn were 99 (75.0%). The median duration of injury before presentation in this subset was 7 days with a range of 1.5 hours to 210 days. All patients with malignant tumors had advanced tumours at presentation.

**Table 3** Complications of Amputation

Complication	Number of Amputations	%
Wound infection	17	41.5
Phantom limb pain	6	14.6
Stump pain	4	9.8
Wound dehiscence	4	9.8
Stump osteomyelitis	3	7.3
Stump overgrowth	2	4.9
Phantom limb sensation	2	4.9
Painful bone spur	1	2.4
Hypertrophic scar	1	2.4
Severe depression	1	2.4
<b>Total</b>	<b>41</b>	<b>100.0</b>

**Table 4** Indications for amputation in amputees who had complications

Complication	Indications for Amputation	Number
Wound infection	Severe crush injury	10
	TBS gangrene	3
	Necrotizing fasciitis	1
Wound dehiscence	Diabetic foot gangrene	1
	Malignant tumour	2
	Sub-Total	17
Stump osteomyelitis	Severe crush injury	2
	Diabetic foot gangrene	1
	Surgical site infection	1
Stump overgrowth	Sub-Total	4
	Severe crush injury	2
	Lymphoedema	1
<b>Sub-Total</b>		<b>3</b>

Forty-one (31.1%) amputations had complications (Table 3). The indications for amputation in the patients who had wound infections, wound dehiscence and stump osteomyelitis are presented in Table 4. The table demonstrates the presence of predisposing factors to infection in these patients.

Ten (58.8%) of 17 patients that developed wound infection and 3 (75%) of 4 patients who had wound dehiscence had one-stage surgery. There were 3 deaths, giving a mortality rate of 2.3%.

Two deaths were caused by septicaemia while one was due to severe tetanus. All three patients presented with TBS gangrene. Excluding the 3 patients that died, 48 (37.2%) of 129 patients were lost to follow-up. The median follow-up period was 1.5 months with a range of 0-42 months.

## DISCUSSION

The patients in this study were predominantly males and below the age of 40. This is similar to the findings of others studies,<sup>5,7</sup> but our male-to-female ratio of 6.7:1 is much higher. This may be because a great number of the patients that are managed at the study centre are trauma patients.

Young males are more involved in trauma because they travel more frequently and are more likely to engage in risky behaviour. The peak age of 30-39 years in this study is the productive age group whose contribution to the economy would be optimum without the physical and psychosocial disability that accompanies amputation, particularly in a developing country like Nigeria.

The commonest indication for amputation in this study was trauma leading to a mangled limb or gangrene due to vascular injury. Other Nigerian reports have demonstrated similar finding.<sup>2-4, 7</sup> Presentation was delayed in most of the patients. The age and sex distribution might explain the leading position of trauma. In a review of Nigerian data on amputation published over a 15-year period, it was concluded that trauma was the commonest indication in Southern Nigeria (South West and South-South zones) whereas complications of TBS intervention was the leading indication in Northern and South Eastern Nigeria.<sup>8</sup>

Our finding from an orthopaedic hospital in Northern Nigeria revealed the southern regional pattern identified in the review. This is likely due to the high volume of orthopaedic trauma patients seen in the study centre, rather than a great use of motor vehicles adduced by the reviewers.<sup>8</sup> It should be noted, however, that the proportions of trauma patients and those with TBS gangrene were close in our study.

TBS gangrene is well recognized as an indication for amputation in Nigeria.<sup>3</sup> This indication may be under-documented because some workers include it under trauma, stating only proportion of trauma patients that had TBS intervention.<sup>2-4</sup> It may also be over-documented when considered as a separate indication as in this study. This is because some of the patients, due to the severity of their injury, would have ended up having amputation whether they sought TBS care or not.

Diabetic foot gangrene did not feature prominently in this study, being the indication in only 4.5% of amputations. This is in contrast to reports from Nigerian university teaching hospitals where diabetic foot accounted for 14.1-29.3% of amputations.<sup>2,7,9</sup> The higher pool of diabetic patients in these multispecialty hospitals is a possible explanation. The patients are managed by endocrinologists and referred to surgical units when indicated. A highly specialized hospital like the study centre is unlikely to have such a high pool of diabetic patients.

We found that lower limbs were more commonly amputated a result that is similar to that of most series.<sup>3-5, 9</sup> Reports are variable and values sometimes close on the relative distribution of above knee and below knee amputations. In this study there were more below knee amputations as reported by others.<sup>3-4</sup> Below knee prosthetic walking is known to be associated with less energy expenditure.<sup>10</sup>

A more recent study found that below knee amputation performed better on the timed test for walking speed ( $P=0.04$ ) even though functional outcome as determined by the Sickness Impact Profile (a self-reported measure of functional status) scores did not differ significantly between below knee and above knee amputations.<sup>11</sup> In resource-poor setting, above knee amputation is often done in diabetic patients when the popliteal pulse is absent so as to avoid re-amputation at a higher level for ascending gangrene.

However, it is known that healing of a below knee stump depends on adequacy of collateral circulation (largely flowing, below the knee, through the muscle of the proximal portion of the calf) and absent popliteal pulse or arteriographic demonstration of arterial block does not necessarily imply compromise of collateral circulation.<sup>12</sup> In the absence of sophisticated investigations we believe that a below knee amputation should be done in diabetic patients especially if the calf muscle bleeds freely,<sup>12</sup> because only a small proportion of them is likely to require revision to a higher level.

The complication rate of 31.1% is similar to that of Kidmas *et al*<sup>2</sup> but less than that of Akiode *et al*.<sup>7</sup> The commonest complication is often wound infection<sup>2, 7</sup> as also demonstrated by this study. We observed that infection and wound healing disturbance occurred in patients who had some predisposing factors like crush injury. One-stage amputation also appeared to be associated with increased risk of wound infection and wound dehiscence. Phantom limb pain accounted for 14.6% of the complications in contrast to about 80% reported in the literature.<sup>13</sup>

This may be due to under-documentation which is inevitable because of the retrospective nature of this study. It may also be that only early onset phantom limb pain was documented, as there was a high rate of loss-to-follow-up and short period of follow-up.

There are early and late peaks of onset of phantom limb pain at one month and one year after amputation respectively<sup>14</sup> but the maximum follow-up period in this study was about seven months. The commercial motorcyclist who manifested severe depression had lost his means of livelihood having had an above knee amputation without the prospect of having a modern below-knee prosthesis fitted. Prosthetic fitting is often not done<sup>3, 27</sup> as also demonstrated by this study. There is a functioning Orthotic and Prosthetic Department at the study centre. Consequently, the low number of patients who had prosthesis fitted might be due to the use of physical disability as a potential means of income through begging, non-affordability or non-documentation of prosthetic fitting in patients' case folders during follow-up.

There were three deaths (mortality rate of 0.02%). This is lower than that reported in other Nigerian studies<sup>2,7</sup> in which mortality was due to sepsis with specific diabetes-related mortality rate of 34.8-50%. The small proportion of diabetes-related amputation in this study may explain the lower mortality rate. However, we also found that sepsis accounted for 2 (66.6%) of the deaths while one death was due to severe tetanus and all three patients presented with TBS gangrene.

Considering the physical and psychological disability that is associated with amputation, prevention is paramount. Trauma prevention, training of traditional bone setters and public education on the ills of traditional bone setting and advocacy for early hospital presentation are useful preventive measures. To reduce the complications of wound infection and or dehiscence, consideration should be given to performing below knee amputation in two stages in the presence of infection or gangrene of the foot and above knee amputation in two stages in the presence of similar conditions affecting the leg.

## CONCLUSION

Trauma and traditional bone setter gangrene were the commonest indications. Most of the amputations were avoidable. The pattern of indications may be affected by the nature of specialization and location of a study centre. The commonest complication was wound infection with identifiable predisposing factors. Paying attention to predisposing factors can reduce complications. Mortality was low because of the low contribution of diabetes foot to the spectrum of indications.

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