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Is there a changing trend in the Etiology of major lower limb amputation in the developing nations?

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Abstract

Background: Amputation is the removal of part or the whole of a limb and when done on the lower limb proximal to or at the ankle is called major lower limb amputation. Specific indications include trauma, peripheral vascular disease, tumor, infection and congenital anomalies and others. The mortality rate is especially high in those with peripheral vascular disease, also high are complications concerning stump healing, and difficulty in rehabilitation. There seem to be some changing trend in the etiology of lower limb amputation in the developing nations which if reported at all is under. The study sets to determine if there is a changing trend in the indications of lower limb amputation to enable planning by the hospital towards improving services and to influence government policy in Terms of instituting preventive measures. Multi disciplinary team approach to rehabilitation offers the most effective means for successful re-integration of the patient with an amputated limb to their previous life style

Methods: Folders of patients perused for information as regards their bio-data, indications, clinic-pathological variables and early outcome of managements. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 16.0 for windows. Frequency distribution tables of variables were generated and charts formed. Measure of central tendency and dispersion of quantitative variables as well as proportion for qualitative variables were determined.

Results: Age ranged was 18-82years with a mean age of 52.61±19.03. Majority were of the working age group 18-60yrs (94.4%).

There were 53(67.1%) males with a male: female ratio of 2.04:1

Peripheral vascular disease accounted for 70.5% of the patients followed by trauma (19.2 %). Thirty seven (46.8%) had below knee amputations.

Seventy one (89.9%) of them were discharged home, 3(3.8%) signed against medical advice and left while 5(6.3%) died.

Conclusion: The etiology of major lower limb amputation is really changing towards what we normally see in the developed nations with peripheral vascular disease taking over from trauma as the major cause of amputation and not only is it changing it comes with its documented unwanted consequences such as high morbidity and mortality.

Keywords: Etiology, major lower limb, developing nations

Introduction

Amputation is one of the oldest surgical procedures dating to prehistoric times ^[1]. It is the removal of part or the whole of a limb and when done on the lower limb proximal to or at the ankle its called major lower limb amputation ^[2]. It was mostly practiced for punitive and ritualistic reasons in the past, but currently to treat a diseased limb or improve its function in general ^[3]. Specific indications include trauma, peripheral vascular disease, tumor, infection and congenital anomalies and others ^[4]. In the developing world the non availability and sometimes non-affordability of appropriate prosthesis worsens amputee's mobility and makes rehabilitation after amputation a very difficult task ^[5, 6].

It is considered the last, albeit valuable option when limb salvage is impossible ^[7, 8]. The decision to amputate a limb is an emotional process for the patient and the patient's family.

Early decision and a multidisciplinary approach even though most rewarding is infrequent in developing countries and where available remain poorly coordinated ^[9]. It is good to understand that amputation is not failure of treatment, but is a first step towards patient's

return to a more comfortable and productive life^[9, 10]. Improvement in prosthetic design does not compensate for a poorly performed amputation. Because of the complexity of the conditions that can lead to an amputation and how it affects the whole being, a treatment team is required that includes the surgeon, a physical therapist, a prosthetist and a social worker just to mention few^[11, 12].

The mortality rate is especially high in those with peripheral vascular disease, also high are complications concerning stump healing, and difficulty in rehabilitation^[11]. The result is often loss of economic power of the individual and his/her independence when not sufficiently rehabilitated back into the society^[5].

There seem to be some changing trend in the etiology of lower limb amputation in the developing nations which if reported at all is under reported^[13].

The study sets to determine if there is a changing trend in the indications of lower limb amputation, and to make recommendations towards preventing, treatment and rehabilitation.

It is a hospital based 5 year retrospective study to find out if there is a changing trend in the etiology of lower limb amputation in the developing nations

The findings in this study may assist Clinicians and policy-makers in understanding the changing trend in the conditions causing lower limb amputations and how best to redirect services to address the burden of amputation to the institution handling amputation cases, the victims of amputation and their relatives especially in resource poor countries like ours.

To generate data to enable planning by the hospital towards improving services and to influence government policy in Terms of instituting preventive measures, when applicable

The Study encompasses all etiologies including those believed to be uncommon in our environment and Patients were followed-up for three months

Lower limb amputation impacts negatively on patient's participation in valued activities, body image perception and quality of life^[5, 6].

Amputated is reported by most writers in the developing nations to occur between the ages of 20-60 years^[1, 6, 8, 14, 15, 16].

This is the productive age group in the economy; this has an obvious disadvantage especially in the developing countries. Contrary to the general opinion in the developing nations, Ofiaeli *et al* in Nnewi South-eastern part of Nigeria and Jawaid in Pakistan noted higher amputations in older age groups^[13]. The incidence of amputation is more common in the 6th decade of life among the developed nations^[14, 17].

Worldwide, amputation is more common in males with figures ranging between 60-72%^[1, 5, 6, 18]. Ajibade A. and colleagues in a retrospective study on indications and complications of major limb amputation at the National Orthopaedic Hospital Dala Kano found that as high as 86% are males^[2].

Whatever the indication for amputation, the goal remains length preservation and surgical reconstruction that maintains the most functional limb possible^[3].

The indications for limb amputations are generally considered as the three Ds: "dead limb, deadly limb and a damn nuisance of a limb"^[19]. The only absolute specific indication for amputation is irreversible ischemia in a diseased or traumatized limb^[11].

Trauma is the most common indication in Nigeria and other developing countries as reported by most studies^[5, 20, 21]. Most of the traumatic causes are due to road traffic accidents, other

contributors include assaults, industrial accidents, falls from heights, traditional bone setters gangrene etc. Contrary to the general opinion in the developing nations, Ofiaeli *et al* in Nnewi South-eastern part of Nigeria and Jawaid M. *et al* in Karachi noted it as second to peripheral vascular disease which aligned with most common indication for lower limb amputation in the developed world^[13].

Advances in diagnostic imaging, chemotherapy, radiation therapy, and surgical technique for limb reconstruction has now made limb salvage a reasonable option for most patients with bone or soft-tissue tumors. Ogeng'o J. *et al* in a study in rural Kenyan children and adolescents reported amputations due to tumor to be 11.4%^[22]. Yakubu and colleagues in a 10year review of cases of amputation in Zaria and Ajibade *et al* in a 5 year retrospective review of major limb amputations found tumor the most common and only next to trauma respectively as a cause of amputation contrary to many other studies in the developing world^[2, 23]. The high incidence may be explained by the fact that limb salvage facilities is lacking in this part of the world. Amputation is performed less frequently as a primary treatment modality for bone tumors these days, but is still a valuable treatment option in palliation and in some cases can even achieve cure^[10].

Amputation may be necessary for acute life threatening infection or chronic infection that is unresponsive to antibiotics and surgical debridement.

Ogunlade S.O and colleagues in a 5 year review in Ibadan Nigeria found soft tissue infection to be responsible for 13% of amputations and Ogeng'o J *et al* in rural Kenyan children and adolescence found an incidence of 12.5%^[18, 22].

Most writers do not consider burns as a separate entity rather it is considered alongside trauma. Ogeng'o J *et al* noted that 27% of trauma causes were due to burns among Kenyan children^[22]. In another study in Kenya, Phillip reported burns as a separate entity with incidence of 1.9% of amputations^[5].

The goal is to optimize a patient's function with little or no morbidity^[12]. In the lower limbs the higher the level, the greater the energy expenditure^[11]. The patients overall wellbeing, general medical condition and rehabilitation are important factors in determining the level of amputation. There should be a balance between increased function with a more distal level of amputation and a decreased complication rate with a more proximal level of amputation^[9].

Level of major limb amputations in the lower limb includes; ankle disarticulation, symes amputation, trans-tibial amputation, knee disarticulation, trans-femoral amputation, hip disarticulation and hind quarter amputation^[3, 9].

Generally the frequency of amputation in decreasing order is below knee, above knee^[5, 24]. However, Kidmas and colleagues' had more cases of above knee than below knee in Jos^[16].

Post operative complication rate can be quite high. Olutola *et al*. when auditing the indications of major limb amputation in a suburban surgical setting found as high as 73.9% of cases of post operative complications^[24].

Wound dehiscence is also a common complication and is usually caused by infection, but necrosis of wound edges as well as of underlying muscle can occur in amputation for peripheral vascular disease because of inadequate blood supply at the level of amputation^[5, 24].

Phantom limb sensation is felt by nearly everyone who undergoes surgical amputation but it is not always bothersome and often diminishes over time^[9].

From the literatures, it is apparent that despite the great advances in medicine during the past 3 decades, little has been achieved to lessen the morbidity and mortality associated with amputation. Apart from the psychological morbidity, the duration of hospital stay during the provision of surgical intervention ranges between 8 to 33 days [13, 18]. Longer durations are usually attributed to complications these are considered as morbidities [5].

Most write ups recorded a mortality rate of about 11-15% [17]. Higher rates are associated with diabetes. Amputation is a triple insult that results in loss of function, body image and sensation. Multi disciplinary team approach to rehabilitation offers the most effective means for successful re-integration of the patient with an amputated limb to their previous life style [25].

Methodology

This is a 5year retrospective descriptive study done at the Jos university teaching Hospital Jos Plateau State. Nigeria Operation registers from both the main and accident are emergency theatres were perused to obtain patients identities after obtaining a permission from the hospital ethical committee and the head of the record. Patient's folders were retrieved from the records departed and treated with all confidentiality.

The Information of those that meet inclusion criteria (all adult patients 18yrs and above who had major limb amputation within the study period, August 2014-July 2015) and did not meet the exclusion criteria (Patients who have had amputation in other hospitals coming for refashion) was extracted by the investigator via a structured proforma.

The first set of information has to do with the socio-demographical characteristics i.e. age, sex, educational level, occupational, date of presentation.

The second set of data has to do with the indications for amputation.

Third set as regards the clinic-pathological details such as level of amputation, mode of presentation.

The fourth set of data has to do with information related to the outcome of management i.e. post operative complications, length of hospital stay, mortality.

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 16.0 for windows. Frequency distribution tables of variables were generated and charts formed. Measure of central tendency and dispersion of quantitative variables as well as proportion for qualitative variables were determined.

Results

Age ranged of the 79 participants is 18-82years with a mean age of 52.61 ± 19.03 . 30 (55.6%) responding patients were between the ages of 18-30yrs. Majority were of the working age group (18-60yr) 51 (94.4%) while the elderly accounted for only 3 (5.3%). Table 1

There were 53 (67.1%) males and 26 (32.9%) females. This gives a male: female ratio of 2.04:1

Of the 79 that were enrolled and completed the study, civil servants and farmers had amputations done more with 17 (21%) each. Table 1

Those who had no formal education were the most amputated accounted for 43 (54.4%). Table 1

Table 1: Demographics characteristics of study participants

Demographic characteristics	Frequency	Percentage
Age group		
≤20	3	3.8
21-40	20	25.3
41-60	24	30.4
≥60	32	40.5
Mean ± SD age	52.61±19.03	
Gender		
Male	53	67.1
Female	26	32.9
Educational level		
Nil	43	54.4
Secondary	8	10.1
Tertiary	28	35.4
Occupation		
Civil servant	17	21.5
Farmer	17	21.5
Artisan	13	16.5
Students	10	12.7
Not gainfully employed	6	7.6
Others	16	20.3

Peripheral vascular disease clearly stood out as the most common indication accounting for 55 (70.5%) of the patients

followed by trauma with 15 (19.2 %), tumors contributed 5 (6.4%) and others 3 (3.8%). Fig, 1

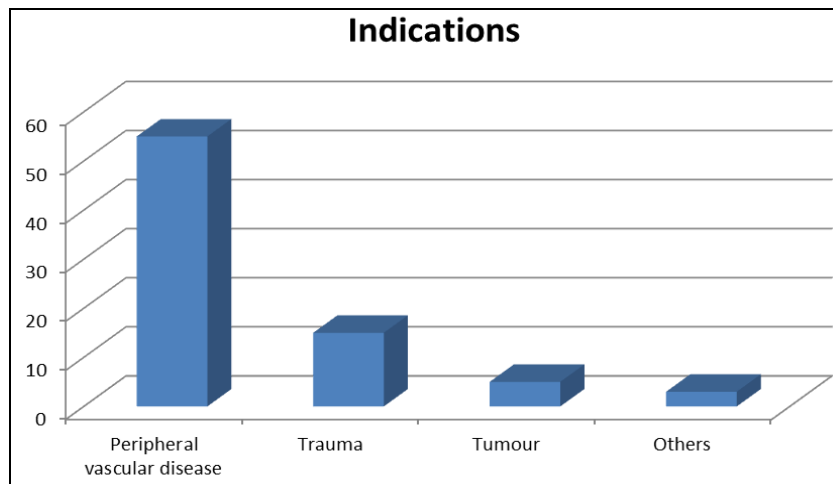


Fig 1: Indications for Amputation

38 (56.7%) of the surgeries were done on an elective bases while 29 (43.3%) were emergencies. Fig 2.

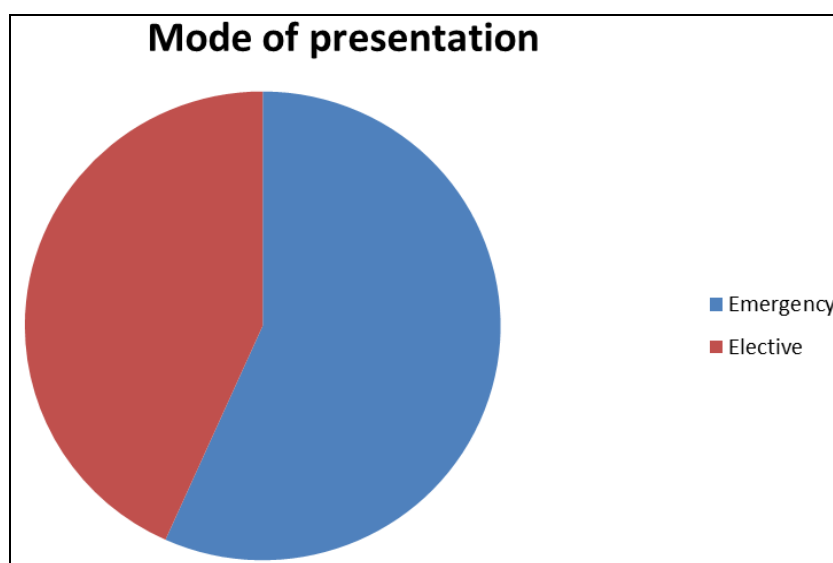


Fig 2: Distribution by mode of presentation

Of the 79 amputations, 37 (46.8%) were below knee disarticulations had 1 (1.3%) each. Others accounted for 4 amputations, 36 (45.6%) above knee while ankle and hip (5.1%). Fig 3

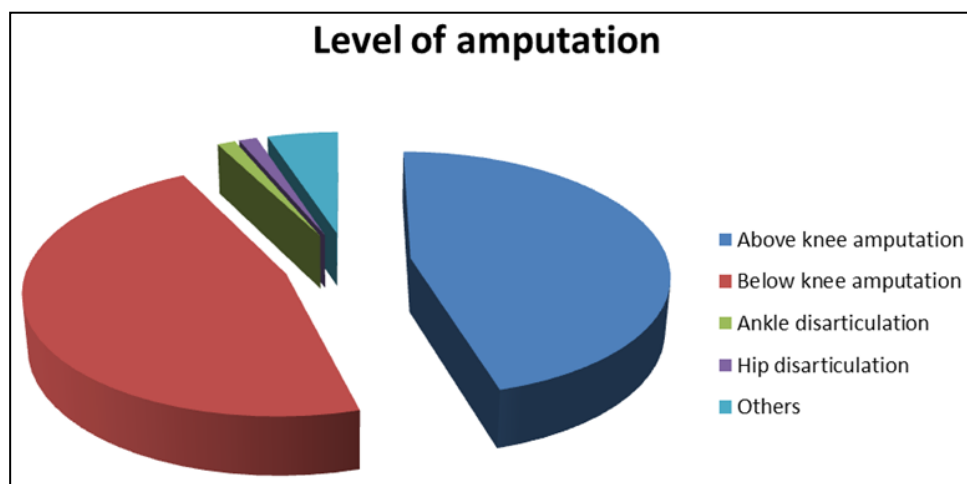


Fig 3: Levels of amputation

Of 71 (89.9%) of them were discharged home, 3 (3.8%) signed against medical advice and left while 5 (6.3%) died. Fig 4

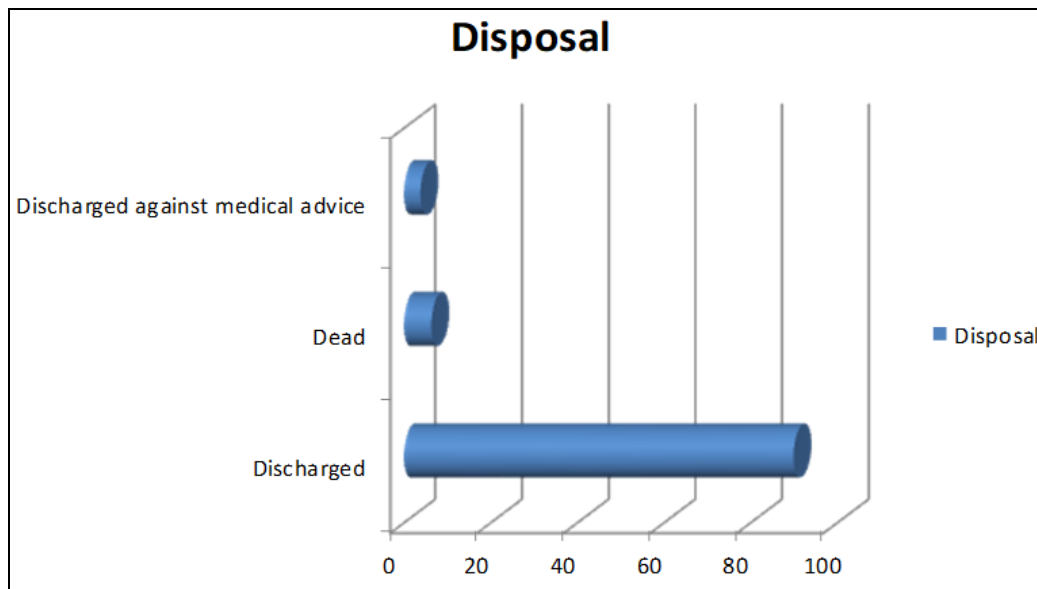


Fig 4: Patients Disposition

Table 2: Association between indications for amputation and gender

Indications	Gender		X ²	p-value
	Male	Female		
Peripheral vascular disease	34(64.2)	21(84.0)	3.698	0.296
Trauma	13(24.5)	2(8.0)		
Tumor	4(7.5)	1(4.0)		
Others	2(3.8)	1(4.0)		

Table 3: Association between indications for amputation and age group

Indications	Age group				X ²	p-value
	≤20	21-40	41-60	≥61		
Peripheral vascular disease	1 (33.3)	9 (45.0)	19 (79.2)	26 (83.9)	24.189	0.004
Trauma	1 (33.3)	10 (50.0)	1 (4.2)	3 (9.7)		
Tumor	1 (33.3)	1 (5.0)	2 (8.3)	1 (3.2)		
Others	0 (0.0)	0 (0.0)	2 (8.3)	1 (3.2)		

Discussion

Major limb amputation is considered the last resort when limb salvage is impossible [7, 8]. It is an intervention as old as recorded human history [1]. Amputation is now accepted as a of treatment and not purely a life-saving procedure in response to injury or disease with a target of restoration of body image perception of the amputee and improving his quality of life vis-a-vis returning the individual to an active productive role in the community [8].

In this study 79 patients with major lower limb amputations were enrolled after meeting the inclusion criteria. Most of the amputations were done in the age group 60yrs and above with about 40.5% of the amputations, aligning with studies done by Ofiaeli *et al* in Nnewi South-eastern part of Nigeria and Jawaid M. *et al* in Karachi also with those writers from the developed worlds and contrary to many other writers mostly from the developing countries [13]. This could be explained possibly by the fact that due to the improvement in health care delivery systems in the third world, people healthier and are living longer.

Male preponderance of 67.1% with a male: female ratio of 2.04:1 is consistent with other findings by others even though much more depicted in those from developing nations [1, 6, 8, 13]. This is not far from the fact that men as it is are much more involve in outdoor hazardous activities to earn a living and also more involved in sporting activities. They are also common figures in places of war and civil unrests and

commonly during such unrest parties tend to spare women and children.

Civil servant and farmers are equally the ones mostly affected with about 21.5% each. This is not farfetched from the fact that these groups are involved in a lot of travelling in search for means of livelihood and could be financially strong enough to present to seek for help when they need amputation.

Peripheral vascular disease topped the list of indications, outrageously dominating others with as high as 70.5% followed from a far distance by trauma with about 19.2%. This finding is in keeping with the picture in the developed nations and a few writers from the developing nations contradicting those of most writers in the developing worlds [13, 17]. This could be due to the fact that with improving health care systems in the developing nations, people are living long enough to experience peripheral vascular disease and other old age related diseases. On the other hand it could be that forced legislation as regards road traffic regulations and that to establish more trauma centers is gradually working not to mention attempts presently ventured by trauma surgeons at limb salvage.

About 56.7% of the amputations presented and had their surgeries done on elective bases while emergency amputations were done in 43.3%. This seem to differ from the norm in the developing countries and could be due to the fact that as changing as the etiology is, peripheral vascular disease

usually gradually progresses and can be planned unlike amputations due to trauma where the surgeon is in-between saving patients life and saving patients limb.

Base on the level of amputations, below knee amputations were the most commonly done with 46.8% followed closely by an above knee with 45.6% which is in line with the normal findings in most writers worldwide [1, 5, 6]. This could be attributed to early presentations especially when the disease may be limited to the leg.

Duration of hospital was 56.99 ± 75.68 which is quite a long time of a hospital stay and can be taken as morbidity however putting into consideration the changing trend in the etiology it is not surprising because most patients with peripheral vascular disease must have had other age related diseases that may prolong their hospital stay [5, 13, 18].

Almost all (89.9) were discharged formally after receiving due care, 6.3% died only 3 (3.8%) patients were discharged against medical advice. Though mortality is rare in trauma cases but not infrequent in peripheral vascular disease and this too cannot be without the contributions of the co morbidities that accompany it.

It is in general noted that there is a significant association between the indications of amputation and gender with a p-value of 0.296 and an insignificant association between amputation and age p-value 0.004

Conclusion

The etiology of major lower limb amputation is really changing towards what we normally see in the developed nations with peripheral vascular disease taking over from trauma as the major cause of amputation and not only is it changing it comes with its documented unwanted consequences such as high morbidity and mortality. Changing along side with it is the age of people being amputated with older age groups getting more amputations than the young.

A step in the right direction by the attaining care givers with help improve outcome.

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