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### **Lower Limb Amputation at the 34 Military Hospital in Freetown, Sierra Leone: Causes and Indications.**

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#### **Abstract**

The global prevalence of diabetes mellitus is increasing substantially. This overall increment leads to the growth in the number of individuals with diabetic complications including lower limb amputation.

In low-income countries like Sierra Leone, lack of access to adequate health care, poverty and social stigma attached to “amputation” all prevent people from seeking early medical treatment for diabetic foot.

The purpose of this study was to document the causes and indications of lower limb amputations and to make appropriate recommendations to the health sector of Sierra Leone.

This retrospective study was conducted at 34 Military Hospital, one of the major referral hospitals in Freetown, between January 2011 and December 2014. A team of medical staff was trained to extract data. The operating theatre and ward case records were searched for information (age, gender, cause and indication for amputation) of all the patients who underwent amputation during this period. The findings were statistically documented in tables.

Twenty-seven patients (24 males and 3 females) were involved in the study. The age distribution was 15-65 years (Mean 43). Majority (77.7%) of the patients presented with gangrenous and infected diabetic feet, 18.5 % was due to Road Traffic Accident and 3.8% due to complication of HIV infection. The commonest level was transtibial amputation 85% and 67% was right sided. Hospital stay was 20-50 days (average 35). There was no postoperative mortality.

As most amputations were done for diabetic feet, there is need for diabetes sensitization and prevention campaigns for the general public and improvement of diabetic care for individual patients including proper glycaemic control and risk factors prevention. Increased funding is required by the health sector of Sierra Leone to implement these measures. Prevention of road traffic accidents by training/educating the drivers should also be considered by Sierra Leone Road Transport Authority.

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Key words: Amputation, Orthopaedics, Diabetes, Road Traffic Accident, Prevention

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### Introduction

The prevalence of diabetes mellitus has increased substantially and has reached 8.3 % in 2014 which corresponds to 387 million patients globally (International Diabetes Federation, 2014). This overall increment leads to the growth in the number of individuals with diabetic complications including peripheral arterial disease, peripheral neuropathy, and lower limb amputation.

Significant global variation exists in the incidence of lower limb amputation. Ethnicity and social deprivation play a significant role but it is the role of diabetes and its complications that is most profound (Moxey PW et al 2011). Diabetic individuals still have a largely increased lower limb amputation risk compared with non-diabetic patients (Icks A et al, 2009; Eskelinen E et al 2006). According to Vamos et al 2010. and Trautner et al 1996, people with diabetes have up to a 40-fold increased risk of lower limb amputation when compared with the general population, and also approximately half of all people undergoing non-traumatic amputations are diagnosed with diabetes.

Previously unpublished figures from Public Health England (PHE) show that 18,080 patients with diabetes underwent an amputation of some sort between 2007 and 2010, an average of 116 a week. The figures rose to 21,125 in 2011-14, equating to 135 a week. (Charity Diabetes UK).

In other countries like Trinidad and Caribbean islands where diabetes is common, diabetic foot complications are the leading causes of lower limb amputation. (Naraynsingh V, et al 2002).

The African region has the fastest growth of diabetes, which will double in the next 20 years. The main problems are the late diagnosis, the severe complications due to diabetes, the high mortality rate and the poor quality of life of people with diabetes. The diabetic foot is a complication of diabetes that carries a high morbidity and mortality rate in Africa, and is increasing as the

burden of diabetes continues to rise. Amputations remain high, despite intensive training of health workers in traditional preventive methods [DIABETES AFRICA FOOT INITIATIVE (DAFI)]

Studies show that diabetic complications such as peripheral vascular disease (PVD), neuropathic foot, ischaemic foot, infection, as well as conditions like trauma, malignancy and congenital lower limb defects result in Lower Limb Amputation, at varying rates (Lazzarini et al., 2012, Godlwana et al., 2012,). Eskelinen et al. 2004 also identified that burns, rhabdomyolysis, sepsis and cellulitis may result in lower limb amputation. Risk factors for lower limb amputation include modifiable conditions of life style such as coronary arterial disease, hypertension, tobacco smoking and end stage renal disease (ESRD) (Abou-Zamzam et al., 2003).

The relationship between glycemic control and amputation was addressed by West, who found a twofold increased risk of leg lesions, including gangrene, among diabetic individuals with higher blood glucose levels compared with those with lower blood glucose levels (West K M *et al* 1978).

In recent times in the developed world, amputation is no longer a dreaded procedure because artificial devices (prosthesis) have been adapted to reproduce the shape, and functions of amputated parts. On the contrary, it is not readily practicable in developing world because of ignorance, stigmatization and poverty which militate against it. Lack of adequate rehabilitation in many instances also prevents the return of the patient to a fully functional life. Therefore, the decision to accept an amputation continues to be difficult hence the need for alternative measures. Alternatives are usually less satisfactory and are only adopted in circumstances such as lack of patients' consent and or funds (Udosen AM et al 2009)

Sierra Leone is one of the poorest countries in the world and studies have documented its profound

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lack of surgical capacity (Kingham TP et al 2009; Groen RS et al 2012) According to the Sierra Leone National Health Sector Strategic Plan 2010–15, at least 20 surgeons should be trained to meet the unmet need; however, with fewer than 30 medical doctors graduating annually and few training opportunities, such goals are unlikely to be achieved soon. The distribution and skill sets of health professionals are also far from being adequate. Presently, 50% of all health professionals are concentrated in the capital of Freetown, serving just 16% of the population. Optimizing quality of care remains a persistent challenge. Total health expenditure is approximately \$95 per capita of which 24.4% comes from donors, 6.8% from government, 7.2% from NGOs, and 61.6% from private out-of-pocket household contributions (GoSL 2015). Anecdotal evidence suggests that the prevalence of non-communicable diseases (NCDs) such as diabetes mellitus, cardio-vascular diseases (CVDs), and cancer are on the increase in Sierra Leone. Evidence from hospital-based morbidity data also shows an increasing trend of cardiovascular diseases including hypertension and strokes; diabetes; cancers; sickle cell disease and epilepsy (MoHS, 2013). According to the latest WHO data published in May 2014, Diabetes Mellitus Deaths in Sierra Leone reached 1,699 or 1.80% of total deaths. The age adjusted Death Rate is 63.29 per 100,000 of population ranks Sierra Leone number 16 in the world. The National STEPS survey for the prevalence of risk factors for NCDs, conducted in November 2009, indicates that the majority (99%) of the population is exposed to at least one risk factor, such as tobacco smoke, consumption of less than 5 servings of fruits and/or vegetables on average per day, low level of physical activity, overweight, or raised blood pressure. Twenty-seven percent (27%) of the population is exposed to 3 to 5 of these risk factors. Although many studies have been conducted in other parts of the world and the sub region on diabetic lower limb

amputation, no such studies have been documented or published in Sierra Leone. There is no national data on the total number of amputees attributable to diabetes and its complications, no interventions in place to address this issue and no special diabetic clinics to manage the complications.

The purpose of this study was to establish and document the causes, risk factors, indications and complications of Lower Limb Amputations at the 34 Military Hospital in Freetown. This will serve as an eye opener for nationwide studies to be conducted. It can also serve as a guide to the health sector of Sierra Leone to increase funding to implement the prevention of diabetic foot complication.

### Materials and Methods:

This was a retrospective study that involved the review of the main operating theatre records, anaesthetists books and ward case notes of all patients who underwent Lower Limb Amputation at the 34 Military Hospital in Freetown between January 2011 and December 2014.

The purpose of this study was to establish and document the causes, risk factors, indications and complications of Lower Limb Amputations at the 34 Military Hospital in Freetown and to make necessary recommendations to the health sector of Sierra Leone. The general limitation to this study was that we relied on accuracy of written records and individual recall. Record keeping is a challenge in many institutions in Sierra Leone. The specific limitation was small number of patients and only one hospital was studied.

The 34 Military Hospital was selected because (1) it is one of the major referral hospitals in Sierra Leone. It has four departments, 150 bed capacity, 17 permanent military Medical Officer, three specialists and five consultants on contract from different specialties. It is strategically located in the Wilberforce barracks and caters for about 25% of western area population. The daily attendance is

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between 100 to 150 patients including military personnel, their dependants and the civilian populace in the Wilberforce, Hill station, Lumley, Goderich, Congo Cross, Wilkinson road and Tengbeh town communities in the western part of Freetown. (2) It has its own laboratory facility for basic investigations. (3) The medical and surgical records might include diabetic foot complications. The theatre and surgical wards staff was trained to extract the data from their records. The medical records from the Operating Theatre department, anaesthetists department and the surgical wards of all the patients admitted and treated for amputation for the period under review were retrieved, carefully searched and statistically analyzed. All records of patients who underwent other surgical procedures were excluded from the study.

The information collected included, age, gender, type of foot lesion, side affected, cause of the symptom, duration of disease, presence of neuropathy, dorsalis and posterior tibial artery pulsations, indication for amputation, year of amputation and duration of stay in the hospital. Simple statistical methods were used to analyze the data. The result was presented in tables 1, 2 and 3.

Results

A total of 27 patients had Lower Limb Amputation during the period under review. The age of patients ranged between 15–65 years (mean 43 yrs). Twenty-four (89%) patients were males and 3 (11%) were females giving a male to female ratio of 9:1. The commonest presenting complaints on admission were gangrene, ulceration and infection of the foot. It was established from ward notes and history of the patients that 65% had peripheral neuropathy. On examination, the posterior tibial pulsation was palpable in more than 50 % of the patients while the dorsalis pedis pulsation was palpable in less than 30 %. It was also found from the ward records that more than 60% of the

patients were first diagnosed with diabetes during hospital admission for amputation. The main indications for the amputations were complication of diabetes mellitus (77.7%) followed by Road Traffic Accident (18.5 %) and HIV complication (3.8%).

All the 27 surgeries were unilateral, and 18 (67%) were right sided. Eighty-five percent (85.2%) was transtibial (below knee) while 14.8 % was transfemoral giving the ratio 6:1. There were no partial foot, ankle disarticulation or through knee amputations. Only 3 patients (11 %) required wound debridement and secondary suturing. Two-stage operation (Change of amputation level from transtibial to transfemoral) was required in 1 patient. Twelve patients (44%) had phantom pain. Hospital stay of patients ranged from 20 to 50 days (average, 35 days). One patient left against medical advice due to depression. None of the patient died during their hospital stay. About 40% of patients came to the hospital for a postoperative follow up-visit in surgical department outpatients clinics at one month interval for six months.

See Tables 1, 2 and 3.

Table 1: Year of Amputation of the patients at 34 Military Hospital, Freetown, Sierra Leone (2011-2014)

Year	Frequency	Percentage
2011	8	29.6
2012	4	14.8
2013	5	18.5
2014	10	37.0

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**Table 2: Indication for the Amputation for the patients at 34 Military Hospital, Freetown, Sierra Leone (2011-2014)**

Indication for Amputation	Frequency	Percentage
Diabetic foot	21	77.7
RTAs	4	18.5
HIV complications	1	3.8
Level of Amputation		
Below Knee	23	85.2
Above Knee	4	14.8
Gender		
Males	24	89
Females	3	11

**Table 3: Post-Operative complications of the amputation patients at 34 Military Hospital, Freetown, Sierra Leone (2011-2014)"**

Complications	Frequency	Percentage
Surgical site infection	3	11.0
Two stage amputation	1	3.7
Phantom pain	12	44.4
Wound dehiscence	2	7.4

**Discussion**

Since it was first described by Hippocrates in 460–377 BC, limb amputation has been a common surgical procedure performed by orthopedic, general, vascular and trauma surgeons for

therapeutic reasons in order to save patient’s life. However, it is often associated with profound economic, social and psychological effects on patients and their families (Van der Meij W: 1995). Many studies have identified foot ulcer as the most common presentation of diabetic foot syndrome. (Pendsey SP. 2010). The high incidence of foot gangrene may be due to a number of factors including seeking alternative medical care where irritant topical agents were applied to the affected foot, self-medication, ignorance, and poverty, with consequent delay in presentation to hospital for appropriate medical care. (Pendsey S et al 2007). This delay presentation with advanced spreading gangrene of the foot that has involved the underlying bones may force the surgeon to opt for a higher level of amputation. (Nwadiaro HC et al 2000).

Limb amputation is a dreaded word in our society and in very rare circumstances would patients and relations accept this therapeutic procedure easily. Statements such as “I would rather die than lose my limb” and “that is not my portion” are commonly heard in our hospitals. This is because amputation carries a stigma. Therefore, the decision to amputate and the subsequent management of such patients pose problems to the surgeon and socio-economic stress to the patient and the family. On hearing of the word “amputation”, patients would go through stages of denial, anger, negotiation and depression before acceptance. (Udosen AM et al 2009).

Majority of the patients in this study were between the ages of 15 to 65 years which is comparable with most other studies which give a peak incidence at 4th and 5th decades (Masood J et al 2008) but in contrast with another study conducted in Ghana which reported high peak age incidence in the 7th decade (Naaeder SB: 1993).

In this study, more males (89%) presented with diabetic foot lesions than females (11 %). This is compared to the age-adjusted amputation rate for diabetes which was 61% higher in males than

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females (Centers for Disease Control and Prevention, 1993). The male predominance may be due to their increased risk factors to vascular disease and diabetes (smoking, hypertension), engagement in manual labour more often without wearing protective shoes. Another unpublished explanation may be that more men attend clinics and accept amputation stress better than females.

The main causes of the amputation in this study were due to foot infection, ulceration and gangrene as complications of peripheral vascular disease of diabetes, Road Traffic Accident and HIV. Complication of diabetic foot was the most common indication for major limb amputation in the present study, (77.7%). This is similar to 68% in Nigerian (Akanji *et al* 1990) but higher than 27.3% in Cameroon (Ndip *et al* 2006). Non-diabetes related lower extremities amputation have also been well documented. Obalum *et al* in Nigeria reported 61.8% trauma as the most common indication of lower limb amputation with motorcycle related accidents accounting for 61.9% of the trauma related cases. This was followed by 19.0% lower limb amputations due to pedestrians involved in road traffic accidents. This result is similar to the present study where 18.5% was due to Road traffic Accident majority due to motorcycle passengers or pedestrians. Most of the motorbike riders were untrained, drunk or in high speed with the aim of making more money. These hit and run drivers/riders leave the victims abandoned on the road side with severe injuries that may lead to amputation or death.

The 3.8% due to HIV complication is far lesser than that reported by Periard *et al*. They stated that Peripheral Arterial Disease is more prevalent in the HIV-infected population than in the general population. They reported a six fold increased risk for Peripheral Arterial Disease in HIV-infected individuals as well as earlier onset of the disease compared with HIV-negative patients. (Periard *et al* 2008).

The common level amputation in this study was transtibial (85.2%). This is relatively higher compared to a study conducted in Uganda which showed 62.8%.

It was found in this study that there was 67% (18) right sided 33% (9) left sided amputation. This may be due to right sided dominance. It is in conformation with Coxon *et al* who stated that "Only physical stresses can account for the difference in laterality of amputation. If most people favoured their right foot during movement, especially in starting and stopping, more pressure would be applied cumulatively to that foot".(Coxon PJ *et al*, 1999).

The rate of re-amputation in this study was 11% which was lower compared to that reported by Essoh *et al* in Cote d'Ivoire (23%) but higher than that reported by Kidmas *et al* in Nigeria (7.4%). These differences in re-amputation rates may be explained as follows; firstly, late presentation with advanced disease increases the risk of revision amputation. Secondly, poor management of amputation stumps.

Hospital stay of patients ranged from 20 to 50 days (average, 35 days) which is high than that reported by Yusof M I, *et al*. The length of hospital stay is an important measure of morbidity.

### **Conclusion:**

Complications of diabetic foot ulcers, trauma resulting from Road Traffic Accident and HIV Peripheral Arterial Disease were the most common indications for Lower Limb Amputation at the 34 Military Hospital in Freetown, Sierra Leone.

As most amputations were done for diabetic feet, there is a need for diabetes sensitization and prevention campaigns for the general public and improvement of diabetic care for individual patients including proper glycemic control and risk factors prevention. In addition, prevention of road traffic accidents by training/educating the drivers/motorbike riders should also be considered by Sierra Leone Road Transport Authority and

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partners. Moreover, search for risk factors for HIV, determination of asymptomatic peripheral vascular disease should begin early. Finally, it can be recommended that future plans for retrospective studies in this area by this study team, prospective studies, intervention study with better diabetic care be conducted and expanded to other hospitals nationwide. Increased funding is needed by the health sector and the Government of Sierra Leone to implement these measures.

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