**PATTERNS AND INDICATIONS OF AMPUTATION IN CAPE COAST TEACHING HOSPITAL; A FOUR YEAR RETROSPECTIVE REVIEW**

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**ABSTRACT**

**Background**

Limb amputation is reported to be a major but preventable public health problem that is associated with profound economic, social and psychological effects on the patient and family especially in developing countries where prosthetic services are unavailable, inaccessible or unaffordable.

**Aim**: The purpose of this study was to determine the patterns of and indications for limb amputations.

**Methodology**

A retrospective study, covering a 4-year period, involving 126 patients who underwent amputation at a teaching hospital was carried out. Data on patients including indication for amputation were obtained from theatre record books and folders and analyzed using SPSS and MS Excel. Data was presented in frequencies and percentages. Chi square tests were used to compare categorical variables and differences were considered significant if p<0.05

**Results**

The mean age of the 126 patients was 60.92(SD19.03) years with a median of 67years. There were 68 females and 58 males giving a female to male ratio of 1.2:1. Lower limb amputations were performed in 114(90.48%) and upper limb amputations in 12(9.52%) patients. The commonest indication for amputation was diabetic foot gangrene accounting for 54(42.86%) patients, followed by peripheral vascular disease 43(34.13%) and trauma 12(9.52%). Twenty-one of the patients who had amputations for indications other than diabetic foot gangrene also had diabetes mellitus. Below knee amputation was the commonest procedure performed (43.65%). One hundred and twenty (95.2%) were unilateral and 116 (92.1% ) were performed in a single-stage procedure.

**Conclusion**

Most of the amputations in the Cape Coast Teaching Hospital were performed in elderly patients, with a slight preponderance of women over men. Lower limb amputations were far more common than upper limb ones. The commonest indication for amputations was diabetic foot gangrene, with below knee amputation being the commonest type. There is an urgent need for public education on diabetes and its complications and on diabetic foot care. The establishment of a multidisciplinary diabetic foot care clinic is advocated if the incidence of limb amputations is to be reduced in the Cape Coast Teaching Hospital.

**Keywords**: Limb amputations, pattern, indications, Cape Coast Teaching Hospital

**Introduction**

Amputation is one of the oldest known surgically performed procedures dating back to prehistoric times1. Amputation is defined as the intentional surgical removal of a whole or part of a limb or body part through a bone or joint. During the neolithic era, amputations were performed for ritualistic and punitive rather than therapeutic reasons. The earliest description of therapeutic amputation was by Hippocrates in *De Articularis* for vascular gangrene in 460-377BC1,2.

Presently, amputations are performed to remove diseased tissues or to relieve pain. Indications for amputation vary among and within countries. Temporal changes have also been observed 2. The indications may include trauma, peripheral vascular disease, tumours, infection, uncontrolled diabetes and congenital limb anomalies. Peripheral vascular disease is the commonest indication in the western world1,2,3. In developing countries however trauma, uncontrolled diabetes and traditional bone setter’s gangrene are the commonest.3,4,5 Males are at a higher risk for amputations.2

Most amputations are preventable. Amputation in any form is considered a treatment failure1; a last resort when limb salvage is impossible or when the limb is dying, dead, viable but non-functional or endangering the patient’s life6. Delay in presentation and management increases the risk of amputation7.

Most amputations are performed in the lower limbs and below knee amputations are the most common procedures performed. A lower limb to upper limb ratio of 4:1 has been reported.2 In other studies elsewhere, above knee amputations were observed to be the commonest procedure.8,9

The Cape Coast teaching hospital however does not have data on the patterns and indications of limb amputations which may influence management of patients. Risk stratification for amputation is also not available. Education and public awareness on the risk factors for amputation is inadequate.

The aim of this study was to determine patient demographic characteristics, indications, pattern and levels of limb amputations at the Cape Coast Teaching Hospital.

**Methodology**

**Study area**

The study site was the Cape Coast Teaching Hospital in Cape Coast, the Central Regional capital of Ghana. It is a 400-bed capacity tertiary/referral hospital situated in the northern part of the city. The hospital provides a comprehensive range of specialist healthcare services across the Central and Western Regions of Ghana. It also serves part of the Ashanti, Greater Accra and Eastern Regions.

**Study design**

This was a retrospective study of all limb amputations performed at the Cape Coast Teaching Hospital from January 2014 to December 2017, a period of 4 years.

**Inclusion criteria**

* All patients who had undergone any form of limb amputation at CCTH, during the stated period.

**Exclusion criteria**

* Patients whose folders could not be retrieved.
* Patients who did not have a complete documentation of clinical parameters.

**Data collection and analysis**

Data was obtained from patient folders and theatre record books and analyzed using SPSS and MS Excel. The information extracted from the data sources were demographic characteristics, and indications for and levels of amputations. Categorical variables were compared using chi square tests and differences were considered significant if p<0.05.

**Results**

During the period of the study, 160 patients underwent amputations. A total of 5,893 major surgical procedures were performed in the CCTH during the same period; thus amputations formed 2.7% of these. The folders of 34 patients who had amputations could not be retrieved or had inadequate information and were excluded. One hundred and twenty-six patients were therefore used in the analysis.

**Gender and age (Table 1)**

Sixty-eight (53.97%) were females and 58 (46.03%) were males, giving a male: female ratio of 1:1.2. Patients ranged between 13 and 94 years of age, with a mean age of 60.92(SD19.03) and median age of 67 years. Most of the patients, 76 (60.3%), were in the 7th to 9th decades of life at the event of amputation.

**Occupation (Table 2)**

Forty-three (34.1%) of the patients were unemployed, 29(23.0%) were pensioners, 4(3.2%) were formally employed (security personnel, teachers), 5(4.0%) were students or apprentices and 45(31%) were traders, farmers, fisherman/fishmongers, drivers and masons).

**NHIS status**

100 (79.4%) out of the 126 patients had National Health Insurance while 26(20.6%) were without insurance.

**Indications for amputations (Table 3)**

 Diabetic foot gangrene was the commonest indication for amputations involving 54(42.1%) patients, followed by peripheral vascular disease and trauma that involved 43 (34.1%) and 12(9.5%) patients respectively. There was no significant difference, between males and females, in the proportions who had indications of diabetic foot gangrene, infection/ulcer or malignancies. However, females were significantly more likely to have had amputations because of peripheral vascular disease (p<0.0001) while males were significantly more likely to have had amputations because of traumatic injury (p=0.0009).

**Diabetes**

Although 54 patients had the amputation for diabetic foot gangrene, a total of 75 (59.52%), of the patients (32 males and 43 females) were diabetic. Of the 21 remaining diabetic patients, 18 had peripheral vascular disease, and one each was due to trauma, osteosarcoma and chronic osteomyelitis.

**Frequency of upper/lower limb amputations**

Lower limb amputations were performed in 114(90.48%) patients and upper limb amputations in 12(9.52%) patients. Six males and 6 females had upper limb amputations while 52 males and 62 females had lower limb amputations. The difference in the male and female distribution between upper and lower limb amputations was not statistically significant (p = 0.78).

**Type/Level of amputation (Table 4)**

Fifty-five (43.7%) had below knee amputations followed by above knee amputations in 53 (42.1%). Six (4.6%) had Ray’s amputation and one patient had a knee disarticulation. Twenty-two males and 33 females had below-knee amputations; 24 males and 29 females had above knee amputations. There was no statistically significant difference in levels of lower limb amputations between the sexes (p=0.58).

**Frequency of unilateral or bilateral amputation**

120 (95.2%) had unilateral while 6 (4.8%) had bilateral amputations. All 6 bilateral amputations involved the lower limb of which 5 were due to diabetic foot gangrene and one due to peripheral vascular disease.

**Number of stages**

Most of the amputations, 116(92.06%), were single staged procedures; 10 (7.94%) had two-staged procedures.

**Discussion**

Amputation constituted 2.7% of major surgeries done at the Cape Coast Teaching Hospital in the study period. This is not too different from the 3.2% obtained from a study in Kenya10.

Most of the patients, 76 (60.3%), who had amputations were in the 7th to 9th decades of life at the event of amputation. The mean age of 60.92(SD19.03) years in this study is lower than that of 65 (SD14.7) years reported from Kumasi, also in Ghana; it may be mentioned that the Kumasi study involved only non-trauma indications. 9 In studies in Kano (Nigeria), and in Tanzania, the mean ages were 30.43 (SD16.28) years and 28.30 (SD13.72) years respectively,3,6 which are about half what was obtained in this study. This is possibly due to trauma contributing significantly to the indications for amputations in those studies.3,6

 Out of 126 patients who were recruited for this study, 68(53.97%) were females and 58(46.03%) were males putting the male to female ratio at 1:1.2. . This finding contrasts with findings in other studies in Ghana 2,9 and elsewhere in the sub- region where more males than females were commonly involved in amputation. A study in Tamale showed a male to female ratio of 4:1, and 1.6:1 in another study in Kumasi 2,9. The gender disparity in this study compared to others can be supported by a previous report from this study center that found that 71.5% of patients with type 2 diabetes mellitus complications were females11. In the sub-region, trauma has been the commonest indication for amputation 6,8. Comparing the gender distribution of patients who had amputations due to trauma in this study to other studies, a similarity exists, with predominance of males6,10.

Most of the patients were pensioners, unemployed or working in the informal sector. Only 4 out of the 126 worked in the formal sector. One hundred had active health insurance while 26 did not. This study shows a disturbing profile of mainly elderly, unemployed women and pensioners in their 7th to 9th decades of life working in the informal sector and now living as lower limb amputees. It is quite predictable what the quality of life will be for these disabled individuals living in a developing country. Most patients who were employed were in the informal sector as artisans, traders, and fisherfolk who were probably not too well-educated and were in the low socioeconomic bracket. This may have resulted in their lack of awareness of symptoms of their disease (diabetes) and its complications, perhaps resulting in delay in seeking appropriate medical care9.

The commonest indication for amputation in this study was diabetes related complications, with diabetic foot gangrene being the highest followed by peripheral vascular disease. This agrees with other studies within the country and elsewhere in the sub-region3,9. Most studies on amputation in Africa however report trauma as the most common indication for amputation2,12,13. In developed countries however, complications of peripheral artery disease remain a major indication for amputations14. Findings in this study therefore appear to follow the pattern observed in those countries. The gradual transition from the African way of life to westernization of our societies may also have contributed to these findings9. The high incidence of amputations resulting from complications of diabetes mellitus in this study may be due to poor understanding of foot care in patients with diabetes mellitus and the lack of comprehensive multidisciplinary approach to the management of diabetes mellitus and its complications. The significantly higher proportion of females undergoing amputations due to peripheral vascular disease requires further study.

Lower limb amputation was the commoner amputation performed at the Cape-Coast Teaching Hospital during the study period and below knee amputation was the commonest level involved followed by above knee amputation, then Ray’s amputation. A similar pattern was observed in other studies2,3,12 although some studies have also reported above knee amputation as the commonest level of amputation.9

In sub-Saharan Africa, one would expect trauma to be the commonest reason for amputation. The reason for the different findings in this study as reported above are not entirely clear and further studies are required to clarify the situation. It may be suggested that, in addition to other factors, a revamped emergency care in the hospital may have reduced the incidence of amputations due to trauma.

The high proportion of amputations due to diabetes can be the result of delay either in the diagnosis or in the presentation of diabetic complications. This requires urgent action by way of intense public education, especially of diabetic patients, on the prevention, treatment and complications of the disease; particular attention should be paid to education on diabetic foot care. In addition, health professionals involved in the care of diabetic patients should ensure optimum control of the condition and early identification of its complications. The establishment of a multidisciplinary diabetic foot care clinic will go a long way in reducing the incidence of lower limb amputations by optimizing the management of diabetic foot disease.15

**Conclusion**

Most of the amputations in the Cape Coast Teaching Hospital were performed in elderly patients, with a slight preponderance of women over men. Lower limb amputations were far more common than upper limb ones. The commonest indication for amputations was diabetic foot gangrene, with below knee amputation being the commonest type. There is an urgent need for public education on diabetes and its complications and on diabetic foot care. The establishment of a multidisciplinary diabetic foot care clinic is advocated if the incidence of limb amputations is to be reduced in the Cape Coast Teaching Hospital.

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 **Table 1: Age Distribution (n=126)**

|  |  |  |
| --- | --- | --- |
| Age | Frequency | Percentage(%) |
|  | 10-19 | 2 | 1.6 |
| 20-29 | 9 | 7.1 |
| 30-39 | 11 | 8.7 |
| 40-49 | 13 | 10.3 |
| 50-59 | 14 | 11.1 |
| 60-69 | 24 | 19.0 |
| 70-79 | 33 | 26.2 |
| 80-89 | 19 | 15.1 |
| 90+ | 1 | 0.8 |
| Total | 126 | 100.0 |

**Table 2: Patients’ occupation**

|  |  |  |
| --- | --- | --- |
| **Occupation** | **Frequency**  | **Percentage (%)** |
| Unemployed | 43 | 34.1 |
| Pensioner | 29 | 23.0 |
| Trader | 18 | 14.3 |
| Farmer | 14 | 11.1 |
| Fisherman/Fishmonger | 6 | 4.8 |
| Driver | 6 | 4.8 |
| Apprentice/Student | 5 | 4.0 |
| Security Personnel | 3 | 2.4 |
| Mason | 1 | 0.8 |
| Teacher | 1 | 0.8 |
| Total | 126 | 100.0 |

**Table 3: Indications for amputation with sex distribution (n=126)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Indication** | **Frequency** | **Percentage****(%)** | **Sex** | **p value** |
| **Male** | **Female**  |
| Diabetic Foot Gangrene | 54 | 42.9 | 26 | 28 | 0.68 |
| Peripheral Vascular Disease | 43 | 34.1 | 8 | 35 | <0.0001 |
| Trauma | 12 | 9.5 | 11 | 1 | 0.0009 |
| Infection/ Chronic Osteomyelitis/Chronic Ulcer with deformity | 9 | 7.1 | 7 | 2 | 0.079# |
| Malignancy\* | 7 | 5.6 | 5 | 2 | 0.246# |
| Others | 1 | 0.8 | 1 | 0 |  |
| Total | 126 | 100.0 | 58 | 68 |  |

\* 4 cases of Squamous cell carcinoma and 3 of osteosarcoma # Fisher exact test

 **Table 4: Distribution of level of amputation (n = 126)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Level of Amputation** | **Frequency** | **Percentage****(%)** | **Sex** |
| **Male** | **Female**  |
| Below Knee Amputation | 55 | 43.7 | 22 | 33 |
| Above Knee Amputation | 53 | 42.1 | 24 | 29 |
| Above Elbow Amputation | 7 | 5.6 | 5 | 2 |
| Rays Amputation | 6 | 4.8 | 4 | 2 |
| Digital - Hand | 2 | 1.6 | 1 | 1 |
| Below Elbow Amputation | 1 | 0.8 | 0 | 1 |
| Rays + AKA | 1 | 0.8 | 1 | 0 |
| Through Knee | 1 | 0.8 | 1 | 0 |
| Total | 126 | 100.0 | 58 | 68 |

AKA – above knee amputation