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Lower Limb Amputations among Diabetics Admitted with Diabetic Foot Disorders in Three Major Hospitals in Jeddah, Saudi Arabia

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Abstract. Diabetic foot disorders are responsible for at least 50% of limb amputations in Jeddah, and usually associated with long hospital stay and low rehabilitation rate. To identify the percentage of lower limb amputations in patients admitted with diabetic foot disorders, a multicentre retrospective study was conducted over one year in Jeddah area in three major public hospitals. Two hundred and twenty-nine files were reviewed to identify the percentage of lower limb amputations among diabetic patients admitted with foot disorders. One hundred and twenty-eight records (the total number of patients who underwent amputations) were reviewed to obtain information about the presentation, associated factors, level of amputations, rates of post-operative complications, re-amputations, mortality, hospital stay and rehabilitation. Ulcer was the most common presentation (85.9%). Sixty percent of patients who were admitted with diabetic foot ended up with lower limb amputation. Toes amputation was the most common type followed by below knee then above knee amputation. Re-amputation, post-operative complications and mortality within 30 days were 3.9%, 4.7% and 7%, respectively. Only 12.5% of the amputees have been rehabilitated. Amputations on diabetics are a major health problem. Every effort should be made to avoid it particularly with limited resources for rehabilitation in developing countries.

Keywords: *Diabetes mellitus*, Amputation, Peripheral arterial disease, Peripheral neuropathy.

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Introduction

Diabetes mellitus (DM) is reaching epidemic proportions and with it carries the risk of complications. It is a major public health problem in Saudi Arabia in parallel with the worldwide diabetes pandemic[1]. Alnozha *et al.* quoted an overall prevalence rate of DM in Saudi which reached up to 23.7%[2]. Foot disorders are among the most feared complications of diabetes. Ulcer is the most common presentation in diabetic foot disease[3]. The ultimate endpoint of diabetic foot ulcer is amputation if not well treated. Furthermore, when amputation happens, it is usually associated with significant morbidity[3] and mortality[4-8], in addition to immense social, psychological and financial consequences[9,10]. However, many amputations can be avoided if the causative factor is prevented. In this study, it was reviewed the amputations pattern, clinical presentation, percentage of diabetic limb amputation, the incidence of re-amputation in those patients and rehabilitation rates among amputees. These findings will be compared with similar findings reported by our group Al Zahrani *et al.* two decades ago[3].

Materials and Methods

A multi-central retrospective study was designed to review the amputations carried out in three major hospitals in the Jeddah area in one year period (January 2008 - December 2008). The medical records of all of the diabetic foot disorders were reviewed according to a pre-designed performance in three major public hospitals in the Jeddah area; King Abdulaziz University Hospital (KAUH), King Fahd General Hospital (KFGH) and King Abdulaziz Hospital and Oncology Center (KAH&OC). These three hospitals are considered the largest and busiest centers in town covering a population of around 3 million people. KAUH is the only teaching hospital, which deals with a lot of emergency and elective cases with bed capacity amounting to 715 beds. KFGH is the largest public hospital in Jeddah and deals with a lot of elective cases also with bed capacity of 825 beds. KAH&OC is a busy public general hospital and it is also a trauma and oncology center with bed capacity of 250 beds.

Case records of diabetic patients admitted with diabetic foot disorders (229 files) were reviewed to identify the percentage of patients

who underwent amputations. Those patients who underwent amputations (129 files) their files were analyzed further to establish the pattern of amputations and clinical presentation. Surgeon's qualification and specialty were identified. In cases of re-amputations, the cause of failure of primary amputation and subsequent complications were also reported. Mortality was defined as death within 30 days of amputation irrespective of the cause. Progress with rehabilitation, if any, was recorded during the follow up period.

Inclusion criteria for analysis: any diabetic foot patient who was admitted with diabetic foot ulcer and ended up with amputation was included.

Exclusion criteria: deficient files, any amputation which was not related to diabetic foot patients.

Results

The current study was conducted to identify the percentage of patients who underwent amputations, and to elaborate the pattern of lower limb amputations among those patients in the three main general hospitals in Jeddah Governorate. The total bed capacity of the three hospitals is 1,790. Accordingly, the records of diabetic patients who were admitted with diabetic foot disorders in 2008 were reviewed and relevant data were retrieved plus used for data analysis. The total number of patients accounted for were 229; they were distributed as 130 patients in KFGH, 47 patients in KAUH and 52 patients in KAH&OC.

Then subgroup analysis was done for those patients who were admitted with diabetic foot disorders and underwent amputations. The total number of patients who underwent amputation was 128, they were distributed as 34 patients in KAUH, 63 patients in KFGH and 31 patients in KAH&OC (Table 1). There was preponderance of males (80.5%) over females (19.5%), which apply on the patients in all of the three studied hospitals, although the grand percentage of the Saudi patients accounted for 59.4%. However, this percentage varied significantly between the three hospitals according to referral patterns to these three hospitals, it ranged between 23.5% among patients in KAUH to 64.5% in KAH&OC and 76.2% in KFGH. The median age for patients accounted for 60 years.

Table 1. The percentage of patients who underwent amputation.

Hospital	Number of Patients Admitted With Diabetic Foot	Number of Patients Underwent Amputation	Percentage of Patients Underwent Amputation
KAUH	47	34	72.3
KFGH	130	63	48.4
KAH&OC	52	31	59.6
Total	229	128	55.8

KAUH: King Abdulaziz University Hospital
KFGH: King Fahad General Hospital
KAH&OC: King Abdulaziz Hospital and Oncology Center

The most common presentation among diabetic patients who underwent amputations was the foot ulcer in 110 (85.9%) cases followed by ischemia in 84 (65.6%) cases (Fig. 1). The overall percentage of patients with diabetic foot ulcers who underwent amputation was 55.8% (Table 1). The total number of diabetic patients who underwent amputation was 128. On those patients 133 amputations were performed as five patients had more than one amputation. The most frequent amputation was a one-toe amputation 69 (51.9%) followed by below knee amputation 36 (27.1%) (Fig. 2). Consequently, it was realized that frequency of above knee amputation was significantly higher among patients in KAUH (26.5%) when compared to both public hospitals, *i.e.,* KAH&OC (16.1%) and KFGH (3.2%). Accordingly, it was found that the frequency of one toe amputation was significantly higher among patients in KFGH (65.1%). The majority of the lower limb amputations for diabetics in the three hospitals were done by registrars, it ranged between 61.9% in KFGH to 77.4% in KAH&OC. Nevertheless, while 17.6% of the amputations were done by residents in the KAUH, the percentage was much lower for operating physician in KFGH (3.2%). It was stated, that the overwhelming majority of the amputations in the three hospitals were conducted by general surgeons. The other minorities of amputation were done by vascular surgeons, 4.8% in KFGH and 12.9% in KAH&OC. Amputee follow-up showed that the 5 (3.9%) patients had re-amputation, six (4.7%) patients developed post-operative complications and 9 (7%) patients died within 30 days after amputations. However, it was found that the percentage of mortalities within 30 days after amputations were almost equal within the three hospitals, and the lowest percentage were recorded among patients in the university hospital (5.9%). It was evident that almost all complications were

attributed to post-operative infection, and almost all mortalities were due to septic shock. The number of patients who stayed in the hospital for less than 10 days after amputation was almost equal within the three hospitals. Nevertheless, the frequency of those who stayed for more than thirty days was higher in those who underwent amputations in the KAUH (26.5%) when compared to other hospitals. Regarding post-operative rehabilitation, it was noted that the frequency of those who had post-operative rehabilitation was higher in KFGH (17.5%) when compared to those in the KAUH (8.8%) and KAH&OC (6.5%). Total number of patients who underwent amputation was 128 out of 229 patients admitted with diabetic foot disorders (Table 1).

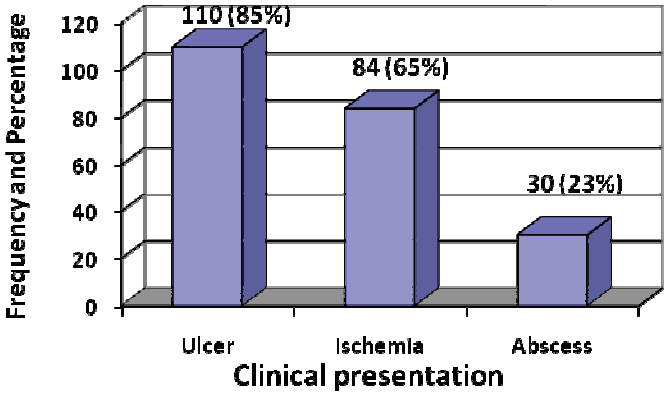

Fig. 1. Clinical presentation of diabetics who underwent amputation.

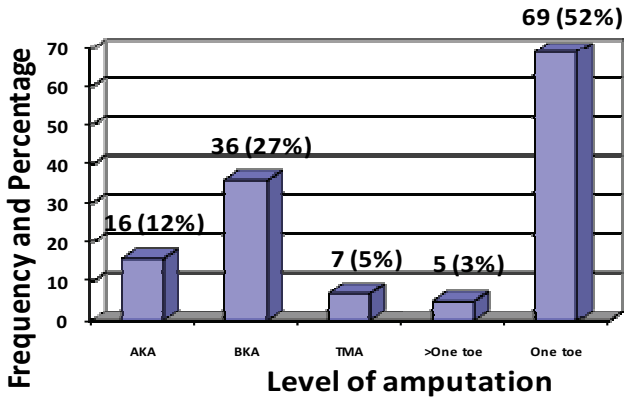

Fig. 2. Levels of amputations done for diabetic patients in the three hospitals (n = 133).

Discussion

Several reports about diabetic foot disorders and limb amputation in diabetics were reported in the last two decades. To the best of our knowledge, this is the first multicenter retrospective study reported in the Jeddah area, and perhaps in Saudi Arabia. The median age of the patients was: 56 years in KFGH, 60 years in KAH&OC and 62 years KAUH. This indicates that younger patients have been presented with diabetic foot complications when compared to similar multiple studies from the west. This may be attributed to lack of proper screening programs in Kingdom[11-12]. Similar to others, it was found a preponderance of males (80.5%) over females (19.5%) which was applied on patients of the three studied hospitals(13). Saudi Arabia is a country, which accommodates more than 6 million expatriates, *i.e.,* 30% of population. Therefore, it was not a surprise that non-Saudis represent 40% of our sample. However, the percentage varied significantly between the three hospitals. This was related to the eligibility criteria of patients' admission to these hospitals. The most common presentation among diabetic patients who underwent amputation was ulcer followed by ischemia, and these findings coincide with Al Zahrani *et al.* findings[3].

The importance of basic foot care education programs in the prevention of initial trauma, ulcer formation and subsequent limb amputation in diabetic patient was emphasized in several recent studies[11,14-18]. Furthermore, extensive investigation including a detailed vascular assessment is needed in diabetics, which may be followed by liberal use of various reconstructive vascular procedures where applicable[19,20]. In this current study, the total number of amputations conducted for diabetic patients accounted for 133 amputations. 55.8% is the percentage of patients who underwent lower limb amputations. This percentage is considered one of the highest worldwide which varies from 5.2 to 39.4%[13,21-26]. The most frequent amputation was for one toe (51.9%) followed by below knee amputation BKA (27.1%). It was realized that the frequency of above knee amputation AKA was significantly higher among patients in KAUH. A proximal amputation is a tragedy, but may be the best approach in elderly high risk patients. This was also attributed to the eligibility criteria and shortage of beds as well as the late presentation of these patients. Frequency of toe amputations was significantly higher among patients in KFGH, and this compares well with many studies[13,27].

Majority of amputations were done by registrars in the three hospitals; not only that, but 17% of the cases in KAUH actually was done by residents in training. Generally, amputation is not considered as one of the favorable operations to be done, therefore, it was determined that daily conflict between the different surgical specialties regarding the belonging of these diabetic feet cases and delegation to more junior staff. This may explain the significant post-operative complications or re-amputations. This raises the issue of establishing a well constructed fellowship program for diabetic foot surgery. The majority of amputations were done by the general surgeons followed by the vascular surgeons; this finding matches the authors' article two decades ago[3].

Generally, re-amputations and post-operative complications were higher in KAUH when compared to KFGH and KAH&OC. In a study from UK nearly half of the diabetic patients with single lower extremity amputation referred for rehabilitation underwent re-amputation within two years. Out of which 22% of those patients underwent contra-lateral lower extremity amputation[28]. In Sweden, Johansen showed that the incidence of re-amputation was 19%[29]. However, it was found that mortality rate was the lowest in KAUH where most of these cases were managed in Intensive Care Unit post-operatively. Most post-operative complications were due to infections and almost all mortalities were due to septic shock and other co-morbidities. Five year mortality rates after new onset diabetic ulceration have been reported between 43% up to 74% for patients with lower limb amputations in some studies[4,8,12,30]. The highest mortality rates were reported by Hambleton in Barbados who found that mortality rate was the highest reported worldwide, and the first and fifth years as survival rates were 69% and 44%, respectively[31].

Long hospitalization is another major issue in these patients. Frequency of those who stayed in the hospital for less than 10 days after amputation was almost equal within the three hospitals. Nevertheless, frequency of those who stayed for more than 30 days was higher in KAUH when compared to the other two hospitals and this is related to late presentation of patients[13]. Post-operative rehabilitation was higher in KFGH (17.5%) when compared to those in KAUH (8.8%) and KAH&OC (6.5%). Almost the same percentage of KFGH was reported two decades ago[3]. This indicates that rehabilitation services are not coping with advancement in management of these diabetic foot cases.

In view of this study finding it is believed that every effort should be made to avoid amputation, particularly with the limited resources for rehabilitation in developing countries. Therefore, in agreement with other authors that such a goal can be achieved to a great extent by more awareness about the common etiological factors, their presentation and the predictive factors for limb loss[32-34]. Public health education programs, early detection and referral to specialized centers of diabetic foot services[27,35,36] are recommended. Applying a national standardized protocol of clinical practice guidelines; how to prevent and manage diabetic foot diseases in a multi disciplinary approach are essential ingredients for any progress in saving more limbs of diabetics[11,14-18,37-40]. This implementation will hopefully help in improving the life quality of the diabetic foot patients, and it may decrease the cost of their management significantly[41-43]. Establishing fellowship training programs in diabetic foot surgery may also save resources. Vascular assessment should be a routine step in diabetic foot management[19,20,44].

In conclusion, this study demonstrates that diabetic foot disorders are fairly common health problem in our society, and if not managed properly, it will end up with high percentage of amputations. In addition, the long hospital stay and low rehabilitation rate will lead to higher management cost of these cases. More prospective and wider scales studies should be performed to accurately determine the true incidence of diabetes mellitus related amputation.

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بتر الأطراف السفلية بين مرضى السكري في ثلاثة مستشفيات كبرى بجدة،المملكة العربية السعودية

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جدة – المملكة العربية السعودية

المستخلص. تعتبر أمراض القدم السكرية مسؤولة عن نسبة خمسين في المئة على الأقل من أسباب بتر الأطراف السفلى.وعادة مايصاحبها فترة تنويم طويلة في المستشفى، بالإضافة لتدني نسبة تأهيل المرضى. قمنا بإجراء دراسة بأثر رجعي متعددة المراكز في جدة، في الفترة الواقعة بين يناير حتى ديسمبر ٢٠٠٨م، في ثلاث مستشفيات حكومية، لتحديد نسبة بتر الأطراف لدى مرضى القدم السكرية، ونمط البتر، والعوامل المصاحبة، بين المرضى المنومين بداء القدم السكرية.حيث تمت مراجعة مائة وثمانية وعشرين ملفاً، للحصول على معلومات تتعلق بالأعراض الإكلينيكية، العوامل المصاحبة، مستوى البتر، معدل المضاعفات بعد العملية، نسبة معاودة البتر، نسبة الوفيات، مدة التنويم في المستشفى، ونسبة تأهيل الأطراف المبتورة. كان التقرح هو العرض الشائع حدوثه بين المرضى المنومين بالقدم السكري(٨٥,٩٪). تم إجراء بتر للأطراف السفلى في

٦٠٪ من المرضى المنومين بداء القدم السكري، أما بخصوص مستوى البتر، فقد كانت عملية بتر الإصبع العملية الأكثر شيوعاً، ومن ثم البتر من تحت الركبة، يليه البتر من فوق الركبة. كانت نسبة معاودة البتر، والمضاعفات التي تلي العملية والوفيات في خلال ثلاثين يوم كالتالي: ٣,٩٪، و٤,٧٪، و٧٪. وتم تأهيل ١٢,٥٪ فقط من الذين بترت أطرافهم. وبهذا يعتبر البتر في مرضى السكري مشكلة كبرى ينبغي بذل كافة المجهودات لتجنبها في مرضى السكري، خاصة مع محدودية الإمكانيات لإعادة تأهيل الأطراف في الدول النامية.