

IMPACT OF AMPUTATION LEVEL ON FUNCTIONAL OUTCOMES
AND PSYCHOLOGICAL STATUS IN DIABETIC PATIENTS
WITH MAJOR LOWER EXTREMITY AMPUTATION

تأثير مكان البتر على النتائج الوظيفية والحالة النفسية
لدى مرضى الداء السكري بحالات البتر الكبيرة في الطرف السفلي

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ملخص البحث

هدف البحث: تهدف هذه الدراسة إلى استقصاء تأثير مكان البتر (عبر الفخذ وعبر الساق) على النتائج الوظيفية والحالة النفسية لمرضى الداء السكري الذين لديهم بتر كبير بالطرف السفلي.
طرق البحث: تم إجراء دراسة مقارنة راجعة في مركز جابر أبو العز للداء السكري، وهو مركز متخصص وشامل لعلاج القدم السكرية. شملت الدراسة 100 من مرضى الداء السكري الخاضعين لبتر كبير في الطرف السفلي، تم تقسيمهم إلى مجموعتين: الأولى تتكون من 60 مريضاً تم بتر طرفهم السفلي عند الساق، والثانية تتكون من 40 مريضاً تم بتر طرفهم السفلي عند الفخذ. تم تقييم مستوى القلق والاكتئاب بعد 6 أشهر من الجراحة عن طريق مشعر HADS لقياس القلق والاكتئاب في المشفى. أما بالنسبة لمستوى الحركة فقد تم استخدام أداة تقييم تتناسب توقعات المرضى، واحتياجات المرضى للحركة في سياق المعايير الاجتماعية للسودانيين. تم تصميم استبيان وجمع البيانات عن طريق المقابلات المباشرة مع المرضى أو عبر الهاتف.

النتائج: شملت الدراسة 100 مريض من مرضى البتر في الطرف السفلي، 60 منهم لديهم بتر عبر الساق و40 لديهم بتر عبر الفخذ. كان متوسط العمر لدى مرضى البتر عبر الساق 10 ± 60 سنة، بينما بلغ لدى مرضى البتر عبر الفخذ 8 ± 57 سنة. كان عدد الذكور في الدراسة 68 (39 لمرضى البتر عبر الساق و29 لمرضى البتر عبر الفخذ)، بينما كان عدد الإناث 32 (21 لمرضى البتر عبر الساق و11 لمرضى البتر عبر الفخذ). شكلت العكازة التي توضع تحت الإبط الوسيلة الأساسية المستخدمة للحركة لدى مرضى البتر عبر الفخذ، أما الطرف الصناعي فكان الوسيلة الأساسية للحركة لدى مرضى البتر عبر الساق، بينما استخدمه مرضى البتر عبر الفخذ بحالات نادرة، حيث توقف معظمهم عن استعماله. استخدم المرضى في كلتا المجموعتين الكرسي المتحرك كوسيلة حركة مساعدة في بعض الأحيان للتحرك داخل المنزل والأماكن القريبة منه. كان مستوى الرضا عن الطرف الصناعي وسهولة لبسه وخلعه لدى مرضى البتر عبر الساق أكبر من مستوى الرضا في مجموعة البتر عبر الفخذ. تسببت مشاكل

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التصنيع وعدم جودة الطرف الصناعي المتوفر في عدم لبس الطرف الصناعي بصورة منتظمة عند 85% من مرضى البتر عبر الفخذ مقارنةً بـ 40% من مرضى البتر عبر الساق. عانى 47.6% من مرضى البتر عبر الفخذ من الاكتئاب والقلق مقارنةً بـ 40% من مرضى البتر عبر الساق. لوحظ في كلتا المجموعتين وجود علاقة وثيقة بين مستوى القلق والاكتئاب لدى المريض من جهة، وعدم وجود دعم كافٍ من الأسرة والأصدقاء والإحساس بعدم الرضا عن شكل الجسم بعد البتر من جهةٍ أخرى.

الاستنتاجات: شكلت العكازة التي توضع تحت الإبط وسيلة الحركة الأساسية لدى مرضى البتر عبر الفخذ، بينما شكل الطرف الصناعي وسيلة الحركة الأساسية لدى مرضى البتر عبر الساق، كما استخدم المرضى في كلتا المجموعتين الكرسي المتحرك للأنشطة المنزلية. كانت إمكانية الحركة والتنقل والنتائج الوظيفية الملاحظة بعد عمليات البتر عبر الساق أفضل من مثيلاتها بعد عمليات البتر عبر الفخذ. توجد مشكلة تصنيع حقيقية في الأطراف الصناعية المخصصة لمرضى البتر عبر الفخذ. كانت نسبة القلق والاكتئاب عند مرضى البتر عبر الفخذ أعلى من مجموعة مرضى البتر عبر الساق. شكل عدم الرضا عن شكل الجسم بعد البتر وعدم وجود الدعم النفسي الكافي من الأسرة والأصدقاء السبب الرئيسي للقلق والاكتئاب عند مرضى البتر.

ABSTRACT

Objective: Lower limb amputation is a recognized cause of great morbidity with much of social and economic cost related to its negative impact on quality of life. Diabetes mellitus is the commonest cause of non-traumatic lower limb amputation. This poor quality of life is linked mainly to restriction of physical activity, in addition to other complications related to diabetes, and this in turn badly affects their psychological status. Management and care of amputees exert great pressure upon the patient's family and health system due to demanding home care and rehabilitation services. We aim to study the impact of major lower extremity amputation level on functional outcome and psychological status among diabetic amputees.

Methods: This was a retrospective comparative study conducted among diabetic patients with major lower extremity amputation in Jabir Abu Eliz Diabetic Center (JADC), a multidisciplinary diabetic foot care centre in Khartoum, Sudan. One hundred diabetic lower extremity amputee patients, 60 with below knee amputation (BKA) and 40 with above knee amputation (AKA) were included. Patients selected randomly from those attending the clinic. Depression and anxiety symptoms were assessed 6 months postoperatively using a simple screening test, the Hospital Anxiety and Depression Scale (HADS). As regard to mobility assessment, we used a tool tailored to our patient's social standards, mobility expectations and mobility requirements. All patient's data were recorded by direct interviewing and on phone.

Results: The study included 100 amputee patients, 60 patients with BKA and 40 with AKA. Mean age of patients was 60 ± 10 years for BKA, and 57 ± 13 years for AKA. Males were 68 patients (39 BKA and 29 AKA), whereas females were 32 patients (21 BKA and 11 AKA). Crutches were the main modality of mobility among AKA amputees compared to BKA ($p=0.000$). Both groups use wheelchair sometimes at home and nearby outdoor activities. Prosthesis was the main modality of mobility among BKA amputees ($p=0.000$); on the other hand, AKA amputees used it infrequently and even most of them stopped using prosthesis. BKA amputees significantly found the prosthesis easy to wear and put off, and they were more satisfied with the prosthesis when compared to AKA amputees ($p=0.000$). Eighty five percent of AKA attributed the infrequent prosthesis use to technical problems compared to 40% in BKA. There were higher levels of anxiety and depression in BKA group (46.7% versus 40% in AKA group). There was strong association between disturbance of body image, poor family and friends support, and bad psychological status in both groups.

Conclusions: Crutches was the main modality of mobility among AKA amputees, while prosthesis was the main one in BKA amputees, and both groups use wheelchair for home activities. Better mobility and functional outcome is get after BKA. There was a real technical problem regarding the available AKA prosthesis. There was a high level of anxiety and depression among amputees, and more often in BKA patients. Main risk factors for anxiety and depression were amputees concerns about body image disturbance and poor social support.

INTRODUCTION

Lower limb amputation is done for a different reasons including diabetes, trauma, tumor, secondary infections and peripheral vascular disease. It has bad effect on health-related quality of life (HRQOL) in patients with diabetes mellitus.^{1,2} In Sudan diabetes is becoming a common disease, due to limited resources, services delivered to the patients are suboptimal and unsatisfactory, which in turn leads to high prevalence of acute and chronic complications and low quality of life.³⁻⁶

A previous Sudanese study stated that HRQOL for the diabetic subjects with lower limb amputation was found to be low compared to diabetic reference subjects, and this could be linked to their limitation in physical functioning and mobility in addition to negative effect on their psychological status.⁷

We aim to study the impact of major lower extremity amputation level on functional outcome and psychological status among diabetic amputees and we took these two parameters as reflection of their quality of life.

METHODS

Design of the study: A retrospective descriptive comparative study was conducted among diabetic amputees patients.

Study area: JADC is a multidisciplinary polyclinic founded in 1998. It lies in Khartoum, which is the capital of Sudan. It offers outpatient medical, surgical, ophthalmic, dermatological and dental care with supportive services in prophylactic foot screening, offloading and shoe-making factory.

The total number of diabetic patients registered was about 60,000 patients, the centre receives 250-280 patients with diabetes daily, of whom about 150 patients with diabetic foot problems coming for wound care, with an average of 20-25 new cases with diabetic foot seen daily.

The study population comprised of one hundred diabetic amputee, 60 with below knee amputation and 40 with above knee amputation. All patients had amputation more than 6 months duration.

Inclusion criteria included diabetic amputee attending JADC on routine follow up, and using standard governmental prosthesis and willing to participate in the study. Exclusion criteria were those using other imported prosthesis and those with advanced co morbidities.

Data were collected using a predesigned data sheet and recorded by direct interviewing and on phone. It includes demographic variables, co-morbidities, psychological status, modality of mobility used by the patient (wheelchair, crutches, prosthesis) and frequency of its use, detailed information in prosthesis use, social support from family and friends. As regard mobility assessment tool we used a tool tailored to our patient's social standards, mobility expectations and mobility requirements, as the available mobility assessment tools are heterogeneous and there is no consensus about sensitivity and specificity of one of it. In this tool we classified mobility into three levels, movement just at home, nearby places like mosque and social occasions and usual premorbid level of mobility.

The levels of depression and anxiety symptoms after lower limb amputation were assessed using a simple screening test, the Hospital Anxiety and Depression Scale (HADS), which has good sensitivity and specificity when used for formal psychiatric assessment and diagnosis.⁸ HADS scale is a validated scale for screening for symptoms of anxiety and depression and avoids confounding emotional symptoms with those of physical illness.⁹

RESULTS

This study included 100 amputee patients (40 patients AKA and 60 patients BKA). Table 1 shows the general characteristics of the two groups. Crutches were the main modality of mobility among AKA amputees compared to BKA, Table 2.

Variables		AKA	BKA
Mean age		57±13 years	60±10 years
Mean duration of diabetes		15±8 years	18±8 years
Male		29	39
Female		11	21
Residence	Rural	22	29
	Urban	18	31

Table 1. General characteristics of the diabetics with major lower extremity amputation.

Both groups use wheelchair sometimes at home and nearby outdoor activities, Table 2. Prosthesis was the main modality of mobility among BKA amputees, on the other hand AKA amputees use it infrequently and even most of them stopped using prosthesis, Table 3.

Eighty five percent of AKA attributed the infrequent prosthesis use to technical problems compared to 40% in BKA, Table 4. BKA amputees significantly found the prosthesis easy to wear and put off, and they were more satisfied with the prosthesis when compared to AKA amputees.

Variables		AKA	BKA
Wheelchair use		17	22
Frequency of wheelchair use	Essential home activities	*10	*19
	Nearby activities (mosque, social occasions)	7**	**3
	Crutches use	29	20

*use only at home, **use for nearby activities eg: mosque

Table 2. Wheelchair and crutches use in the two groups of above knee and below knee amputees.

There was higher levels of anxiety and depression in BKA (46.7% versus 40% in AKA), Table 4. There was strong association between disturbance of body image, poor family and friends support and bad psychological status in both groups.

DISCUSSION

This descriptive comparative study investigated the impact of amputation level, whether BKA or AKA, on functional outcomes and psychological status among Sudanese diabetic amputees. We have shown that there was significant impact of amputation level. BKA offers

Variables	Cases under study		p-value
	AKA	BKA	
Prosthesis use	22 (55%)	38 (63.3%)	0.405
Frequency of use	AKA	BKA	0.000
Essential home activities	9 (40.9%)	13 (34.2%)	
Nearby activities (mosque, social occasions)	0	12 (31.6%)	
Normal activities as before amputation	2 (9.1%)	11 (28.9%)	
Stop it after started to use	11 (50%)	2 (5.3%)	
Total	22	38	
Justification of those using the prosthesis infrequently or stop it	AKA	BKA	0.010
Fear of falling	1 (5%)	9 (33%)	
Balance inconfidence	0	2 (7.4%)	
Technical problems with prosthesis	17 (85%)	11 (40.7%)	
Patient related factors	0	4 (14.8%)	
Both technical and patient factor	2 (10%)	1 (3.7%)	
Total	20	27	

Table 3. Prosthesis use by diabetic patients with major lower extremity amputation.

Variables	Cases under study		p-value
	AKA	BKA	
Anxiety and depression	16 (40%)	28 (46.7%)	0.511
Satisfaction with body image	22 (55%)	35 (58.3%)	0.742
Social support from family and friends			
Good support and full satisfaction	9 (22.5%)	16 (26.7%)	0.613
Good support and partial satisfaction	19 (47.7%)	26 (43.3%)	
Bad support and dissatisfaction	12 (30%)	18 (30%)	
Total	40	60	

Table 4. Psychosocial aspects in the two groups of above knee and below knee amputees.

greater chances of mobility, lesser difficulties and greater satisfaction when compared with AKA.

Above knee amputees used mainly crutches (72%), while BKA amputees used the prosthesis (63.3%). The percentage of those using the prosthesis freely and return to pre-amputation level of mobility was greater in BKA than AKA. Furthermore large proportion of AKA amputees used prosthesis infrequently and even some of them stopped using it and shifted to other modalities, in contrast with few proportion in their BKA counterparts. Moreover the bulk of BKA amputees found prosthesis easy to wear and put off greater more than AKA ones.

Internationally, the impact of amputation level showed that BKA -when compared to AKA- has higher rate of prosthesis fit, use and functional outcome.^{10,11}

Eighty five percent of AKA amputees who used prosthesis thought that it is technically not good (most of them said it was heavy, others said it was narrow, wide, causing pain and ulcers and length discrepancy with contra lateral healthy limb). On the other hand only half of this percentage (41%) thought that BKA prosthesis was technically deficient. This finding is different from the results of other studies. Balance confidence was the only factor associated with mobility capability and performance and social activity in the final adjusted models.¹² Satisfaction with prosthesis are not related with the amputation level.

This problem of AKA prosthesis was not addressed before, and it reflects to which extent the amputees are

lost in the health care system because of fragmentation in the continuum and the natural journey is that usually proper dressing, amputation itself, prosthesis fitting is done in separate places with nearly no connections and exchange of information. Moreover there is no dedicated rehabilitation program and this is exactly the opposite to the right, proper practice because care of amputees is a multidisciplinary team work. Each member of the amputee rehabilitation team plays a specific and important role in the care and recovery of the person with limb loss.¹³ Moreover, journey of the diabetic patient with limb loss through the American health care system is even more precarious than that of the traumatic amputee.¹⁴

Moreover our results showed that amputees usually use combination of modalities of mobility beside the basic one. Below knee amputees depends on prosthesis for outdoor activities and wheelchair or crutches for home activities while above knee amputees use crutches as main modality beside wheelchair for indoor activities.

Limitation in physical function and mobility has a negative impact on the health related quality of life among amputees. This fact was emphasized by a study carried out by Moawia et al,⁷ who studied quality of life among a group of Sudanese diabetic amputees and compared it with diabetic non amputees. They used medical outcome study questionnaire which give information about functional health and well-being from the patient's point of view, to measure health related quality of life. It is generic health survey because it can be used across age, disease and treatment group, and

are appropriate for a wide variety of applications rather than disease-specific health surveys which are focused on a particular condition or disease and is one of the most widely used tools in the world for measuring patient-reported outcomes, with more than 41,000,000 surveys taken and over 32,000 licenses issued to date. They concluded that amputees subject have poorer quality of life ,moreover functional and mobility status were suggested to play a potential role in determining the quality of life among this population. Our study went step forward, investigated functional and mobility status and the impact of amputation level on it.

Many studies have investigated the prevalence of depression and anxiety among individuals with lower limb amputations. In our study, prevalence of depressive and anxiety symptoms were 46.7% and 40% in BKA and AKA respectively, which is consistent with several previous studies that confirmed high rates of anxiety and depressive symptoms after amputation with prevalence up to 41%.¹⁵⁻²⁰

The results of our study showed that BKA amputees had higher levels of depression compared with AKA amputees. This finding is explained by another finding in our study which is the use of prosthesis, and in which we found that BKA amputees are more motivated toward prosthesis use and this reflects their activity and premorbid functional abilities and shows how valuable was the lost limb when compared their functional abilities pre and post amputation.

This result is in accordance with another study about level of depression and anxiety among Jordanian amputees.²¹ Despite the fact that above knee AKA amputations are associated with poorer rehabilitation outcomes and higher levels of activity restriction, but they have not been found to be associated with increased levels of anxiety, social discomfort, general psychiatric symptoms,^{22,23} or adjustment to amputation.²⁴

Individuals with below knee (BK) amputation were more likely to be depressed than those with AK amputations.²⁵ That was because individuals with BK amputations are less severely disabled in terms of functioning than those with AK amputations, they

may be in a better position to compare their functional abilities with their premorbid abilities and, as a result, be more sensitive to the differences between themselves and able-bodied individuals.

There was significant relation between anxiety and depression and satisfaction with body image among both both groups.²¹ Body image disturbance among amputees is one of the fixed finding that is present in diabetics amputees when compared with control sample diabetics without amputation.²⁶

Furthermore, those amputees (in both groups AKA and BKA) who received poor social support from family and friends were significantly anxious and depressed. This finding was repeated in many studies.²⁶⁻²⁹ There was significant relation between return to work and psychological status. Patients with a disability, who cannot do their former jobs and who face a loss of income will have more adjustment problems.²⁹ Employment prospects have a powerful affect on individuals, both at the level of their sense of identity and their social and financial situation.³⁰ So occupational therapy is an essential component of amputees rehabilitation and only certain jobs are suitable for this group.

CONCLUSIONS

Patients with BKA are more active and mobile, but more depressed while those with AKA are less mobile. More effort is needed to improve the made of prosthesis to be lighter. Surgeons need to make every effort to do BKA when feasible.

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