Quality of Life among Amputees with Diabetes Mellitus Attending Two Tertiary Healthcare Centres in Khartoum, Sudan

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Abstract

Background: Diabetes Mellitus is a leading global cause of morbidity and mortality. Diabetic Foot Ulcers, a severe complication of diabetes, often lead to Lower Extremity Amputation, significantly reducing patients' Quality of Life (QoL). This study assessed the QoL of Sudanese diabetic amputees and diabetic non-amputees using the validated Short-Form-36 questionnaire.

Methods: A cross-sectional hospital-based study was conducted between April and August 2019, involving 200 amputees and 200 non-amputees from Ribat University Hospital and Jabir Abu-Ezz Diabetic Centre in Khartoum. Physical and mental health components were analysed alongside demographic and clinical characteristics to determine their impact on QoL between the two study groups.

Results: Amputees had significantly lower QoL scores than non-amputees, with physical health scores of 64.6±15.3 vs. 81.6±10.3 and mental health scores of 56.3±19.4 vs. 86.2±12.4, respectively. Males had better QoL than females, and below-knee amputees fared better than above-knee amputees. In general, QoL scores were 60.5±17.4 in amputees compared with 83.9±11.3 in non-amputees.

Conclusion: Diabetic amputees experience a significant decline in QoL, necessitating a multidisciplinary care approach addressing both physical and psychological needs. Specialised rehabilitation centres, including diabetes specialists, educators and dietitians, are needed to manage the physical as well as the psychological sequelae of diabetic amputations.

Keywords: Diabetes mellitus, Diabetic foot ulcers, Amputation, Quality of life, Sudan

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Introduction:

Diabetes mellitus (DM) is a chronic condition that affects millions worldwide, leading to various complications, including diabetic foot ulcers (DFUs) and lower extremity amputations (LEAs). (1) DFUs are among the most serious complications of DM as they increase the risk of infection and the inevitable need for amputations. (2)

Research has shown that up to 85% of all LEAs in diabetic patients are preceded by DFUs, and once a patient undergoes an amputation, their Quality of Life (QoL) is drastically affected. (3, 4) Kizillkurt et al found that the impact of amputations on the QoL is not simply due to the loss of function but is strongly linked to social and psychological factors. (5)

According to the International Diabetes Federation, Sudan's country report, there were 3.9 million people with diabetes in 2024. (6) This figure is expected to rise to 8.7 million by 2050. The Sudanese Diabetes Association reports the prevalence of diabetes as 19% based on a total population of 24,192,200 and a total number of cases of 3'860'600. (7)

The World Health Organization (WHO) defines QoL as an individual's perception of their position in life within the context of the culture and value systems in which they live.(8) Migou et al highlighted that diabetic amputees will often lose their circle of friends and family following the loss of mobility and independence in activities of daily living; moreover, Phantom limb pain, new infections, and inability to perform daily tasks exacerbate the issue.(9) Once the diabetic complications lead to amputation, it is often associated with other chronic conditions such as cardiovascular disease and hypertension, further hampering rehabilitation efforts and general well-being.(10)

The International Committee of the Red Cross indicates that healthcare resources are scarce in Sudan. This forces the country to focus on emergency care, diabetic care and rehabilitation are inevitably knocked down the priority list. (11) Apart from Abdelgadir et al's (12) pilot study that used a pre-tested questionnaire to assess the psychological impact of DFU in Sudanese patients living in rural areas; no other studies were looking at the overall QoL in Sudanese diabetic amputees using a pre-validated questionnaire. Highlighting this gap is highly needed, allowing for tailored interventions that can enhance both physical and mental well-being.

The current study aimed to fill this gap by evaluating the QoL of Sudanese diabetic amputees, focusing on both physical and mental health components. The aim is to provide insights to develop targeted interventions to improve QoL among amputees.

Materials and Methods:

Study Design and Study Area

This research is an analytical, cross-sectional, hospital-based study to evaluate the QoL among diabetic amputees. The study was conducted in two large tertiary healthcare centres in Khartoum, Ribat University Hospital and Jabir Abu-Ezz Diabetic Centre (JADC).

The diabetic centres and hospitals provide specialized diabetic care, including those with advanced complications such as DFUs and amputations. These facilities were selected based on the high number of diabetic patients they serve, ensuring a sufficient sample size for the study.

Study Population

The study population consisted of Sudanese diabetic patients attending Ribat University Hospital and JADC during the study period. The population was divided into two groups: a test group from the diabetic patients who had undergone lower extremity amputations (amputees) and a control group from diabetic patients who did not have amputations (non-amputees).

In addition to the amputation status, the inclusion criteria for the study were that Sudanese participants, of both genders, aged 18 years or older. Patients with psychiatric disorders, or those who were critically ill and unable to participate in the interview, were excluded from the study.

Study Duration

The research was conducted over five months, from April to August 2019. This time frame allowed for the enrolment of the intended sample size.

Sample Size

According to the hospital records, it was estimated that each hospital would treat around eighty diabetic patients per month, which provided, over the five months, a pool of 800 participants. The sample size was calculated using the Raosoft® sample size calculator (http://www.raosoft.com/samplesize.html) with the following parameters: 5% margin of error, 95% confidence level, 50% response rate. The minimum recommended sample size, as per the calculator, was 260 participants.

Four hundred participants were chosen as it offered a reasonable sample size for statistical analysis, allowing for meaningful comparisons between the two groups. The 200 diabetic amputees and 200 non-amputees were selected by convenience sampling over the study period.

Data Collection Tools and Process

The study examined the QoL of diabetic amputees and diabetic non-amputees using the Short Form-36 (SF-36) questionnaire. (13) The SF-36 is a validated tool used to assess both the mental and physical QoL. According to Zhang et al (14)the Cronbach's alpha for this questionnaire falls between 0.76 and 0.9, indicating good to excellent internal consistency reliability.

The SF-36 questionnaire comprises 36 items assessing eight key dimensions of health: physical functioning, limitations due to physical problems, limitations due to emotional problems, social functioning, mental health, energy and vitality, pain, and general health perception. The short survey is translated into numerous languages to facilitate its use; the study used Arabic versions. This tool was selected for its comprehensive scope in evaluating both physical and mental health among diabetic patients, particularly those who had undergone amputations. The printed format of the survey was filled manually during the patient's interview and then entered onto an online version that calculated percentages for each of the eight domains. The scores ranged from 0 to 100, with higher scores indicating better quality of life. (15, 16)

Alongside the SF-36 questionnaire, a structured form was used to collect demographic and clinical data, including variables such as age, gender, educational level, occupation, and place of residence. Clinical data focused on the duration of diabetes, type of treatment (insulin or oral hypoglycaemic agents), presence of comorbidities (e.g., hypertension or renal disease), and, in the case of amputees, the cause (neuropathy or ischaemia) and level of amputation (below-knee or above-knee). The causes of diabetic ulcers were based on the available medical notes and the surgeon's clinical assessment of each case. There was no clear classification or assessment documented in the notes to indicate how the cause of the ulcers was determined. Most of the records indicate the cause as either ischemia or neuropathy. The level of amputation was documented and analysed.

The validity of the tool was ensured through expert review, during which subject matter specialists evaluated the questionnaire for relevance and clarity. Their feedback was carefully considered, and suggested revisions were incorporated to enhance the content validity of the instrument, ensuring that it accurately reflected the constructs it was intended to measure. The data collection process was conducted through face-to-face interviews administered by trained healthcare professionals, thereby ensuring accuracy, consistency, and appropriate interpretation of responses.

Study Variables

The study's independent variables included demographic characteristics such as age, gender, occupation, educational level, socioeconomic status, and body mass index (BMI). Clinical variables such as the duration of diabetes, treatment type and regimen, presence of comorbidities, and the level and cause of amputation were also considered. The primary dependent variable was the QoL score, as measured by the SF-36 tool.(17) The QoL score was divided into the Physical Health Composite (PHC), Mental Health Composite (MHC), and the overall QoL score.

Data Analysis

The collected data were analysed using the Statistical Package for the Social Sciences (SPSS) software, version 21.0. Descriptive statistics were employed to summarise the demographic and clinical characteristics of the study population. Continuous variables were described using means and standard deviations, while categorical variables were presented as frequencies and percentages, providing a clear overview of the sample composition.

To examine the relationships between demographic and clinical characteristics and QoL scores, various comparative statistical analyses were performed. Chi-square tests were used to assess associations between categorical variables—such as gender, occupation, and socioeconomic status. For continuous variables like age and BMI, Analysis of Variance (ANOVA) was conducted to evaluate differences between amputees and non-amputees. Additionally, independent t-tests were applied to compare mean QoL scores between these two groups. A p-value of <0.05 was considered statistically significant, denoting a meaningful relationship between the variables under investigation.

Ethical Considerations

Ethical approval for the study was obtained from the Sudan Medical Specialization Board (SMSB). Written informed consent was obtained from all participants after explaining the purpose of the study, the procedures involved, and their right to withdraw at any time without any consequences. Confidentiality was maintained by assigning each participant an identification number, and no personally identifiable data was included in the report. All data were stored securely in an encrypted format to protect participants' privacy, and the study adhered to the highest ethical standards in line with international research guidelines.

Results:

Demographic and Socioeconomic Characteristics

The study included 400 diabetic patients, comprising 200 amputees and 200 non-amputees. Demographic and socioeconomic characteristics are presented in Table 1. The majority of participants in both groups were male (amputees: 78%, non-amputees: 75%). The amputee group was predominantly aged 40–60 years (57.5%), with 38% over 60 years old. In contrast, a larger proportion (70%) of non-amputees were in the 40–60-year age group, with only 21% over 60. There were no statistically significant differences between the two groups in the various demographic and socioeconomic characteristics of the study population.

Table 1: Demographic and socioeconomic characteristics of the study population

		Amputee (N= 200)	Non-amputee (N= 200)	P. value
Gender	Male	156 (78%)	150 (75%)	0.479
	Female	44 (22%)	50 (25%)	
(Age) years	<40	9 (4.5%)	18 (9%)	0.072
	40-60	115 (57.5%)	140 (70%)	
	>60	76 (38%)	42 (21%)	
Education	Illiterate	9 (45%)	15 (7.5%)	0.399
	Primary	74 (37%)	65 (32.5%)	
	Secondary	114 (57%)	109 (54.5%)	
	University	3 (1.5%)	11 (5.5%)	
Occupation	Not work	133 (66.5%)	115 (57.5%)	0.095
	Worker	52 (26%)	48 (24%)	
	Employee	15 (7.5%)	37 (18.5%)	
Residence	Rural	76 (38%)	91 (45.5%)	0.215
	Urban	124 (62%)	109 (54.5%)	
Socioeconomic status	High	3 (1.5%)	20 (10%)	0.12
	Moderate	39 (19.5%)	56 (28%)	
	Low	158 (79%)	124 (62%)	

Table 2 summarizes clinical features and comorbidities in both groups. Duration of diabetes was longer among amputees: 96% had diabetes for more than five years compared to 86% of non-amputees. With respect to treatment, insulin use and Combination therapy with oral hypoglycemic agents were used in both groups. Comorbidities included hypertension, renal disease, and cardiovascular disease in both groups. However, the differences were not statistically significant in all these aspects.

Table 2: Clinical Features and Comorbidities

		Amputee (N= 200)	Non-amputee (N= 200)	P. value
Body Mass Index (BMI)	Normal	141 (70.5%)	160 (80%)	0.253
	Overweight	15 (7.5%)	16 (8%)	
	Obese	6 (3%)	24 (12%)	
	Underweight	38 (19%)	0 (0%)	
Diabetes duration (years)	<1	0 (0%)	10 (5%)	0.067
	1-5	8 (4%)	18 (9%)	
	>5	192 (96%)	172 (86%)	
DM treatment	Insulin	115 (57.5%)	96 (48%)	0.153
	OHA*	34 (17%)	56 (28%)	
	Combined	51 (25.5%)	48 (24%)	
Co-morbidities	None	69 (34.5%)	100 (50%)	0.221
	Hypertension	52 (26%)	45 (22.5%)	
	Renal diseases	38 (19%)	33 (16.5%)	
	CVD	32 (16%)	15 (7.5%)	
	Thyroid diseases	9 (4.5%)	7 (3.5%)	

***OHA = Oral Hypoglycemic Agents**

Clinical Features and Amputation Profile

Table 3 shows the QoL scores by demographic and clinical variables among the amputee group. Gender analysis showed higher QoL scores among male amputees (62.2±14.4) than female amputees (51.8±8.6; p=0.021). Patients with below-knee amputations (BKA) had higher QoL (65.8±17.6) compared to those with above-knee amputations (AKA) (58.9±17.6; p=0.03). However, other factors such as age, level of education, type of occupation, being rural or urban in residence or BMI had no significant effect on QoL scores.

Table 3: Mean and SD of QoL Scores by Demographic and Clinical Variables Among the Amputee Group

		Mean	SD	P. value
Gender	Male	62.2	14.4	**0.021***
	Females	51.8	8.6	
Age (years)	<40	59.8	9.1	0.47
	40-60	57.6	11.3	
	>60	52.8	7.9	
Education	Illiterate	52	15.1	0.533
	Primary	55.2	19.9	
	Secondary	57.2	16.5	
	University	61.3	13	
Occupation	Not work	57.7	18.5	0.063
	Worker	59.2	13.2	
	Employee	60.5	20	
Residence	Rural	60.1	19.3	0.432
	Urban	54	17.4	
Socioeconomic status	High	68	14.9	0.178
	Moderate	61.2	19.4	
	Low	60	17.8	
BMI	Normal	60.4	17.8	0.391
	Overweight	57.7	15.9	
	Obese	62.8	15.1	
	Underweight	60.7	19.5	
DM duration (Years)	1 – 5	60.4	14.4	0.785
	>5	59.5	18.3	
Amputation cause	Neuropathy	61.3	18.4	0.839
	Ischemia	60.5	15.6	
Amputation levels	Above knee	58.9	17.6	**0.030***
	Below knee	65.8	19.4	

Quality of Life Outcomes

QoL scores were significantly lower in amputees. The mean physical health component score was 64.6±15.3 in amputees vs. 81.6±10.3 in non-amputees (p<0.001). The mean mental health component score was 56.3±19.4 in amputees vs. 86.2±12.4 in non-amputees (p<0.001). Overall QoL scores were 60.5±17.4 in amputees compared with 83.9±11.3 in non-amputees (p<0.001) (Table 4)

Table 4: Comparison of Total Scores and the Sub-scales of the SF-36 among Amputees and Non-amputees

	Amputee	Non-amputee	P. value
	(N= 200)	(N= 200)	
	Mean±SD	Mean±SD	
Physical Health Composite (PHC)	64.6±15.3	81.6±10.3	<0.001
Mental Health Composite (MHC)	56.3±19.4	86.2±12.4	<0.001
Overall SF-36 QoL score	60.5±17.4	83.9±11.3	<0.001

Discussion:

The findings of this study showed that diabetics who undergo LEA, have a significant reduction in their QoL. Amputations do not only have profound physical implications, but they also substantially impact mental health and overall well-being, as reflected by the lower SF-36 scores among amputees.

In light of previous studies on DFU and its significant global burden, where prevalence ranges from 11.4% to 29.7%, the risk of LEA increases from 2% to 16%, depending on the study design and population examined (18).

In this study, age did not have a significant effect on the quality of life among diabetic amputees and non-amputees. Results show that approximately 95.5% of the amputees were over the age of 40. In a similar context, Al-Rubeaan et al. (19), in their retrospective cohort study, reported that "age ⩾45 years was a risk factor for developing DFU and amputation in a Saudi population." More recently, Musa et al. (20), in their study of factors associated with amputation among patients with DFU in the same population, highlighted the "global metabolic syndrome epidemic." In general, older patients are more susceptible to risk factors for amputation, such as peripheral arterial disease, infection, chronic hyperglycaemia, and a history of previous DFU .(21)

Physical Health Decline

The physical health component of the SF-36 showed a significant decline in amputees compared to non-amputees. This is expected, as amputees experience reduced mobility, phantom limb pain, and difficulty performing daily activities. Additionally, the majority of amputees in this study were unemployed, which may further affect their ability to find work, and so they are effectively sentenced to lifelong unemployment. Studies by Atinga et al (22) and Ngwane (23) have shown that regular physical activity and employment are associated with better QoL, as they provide individuals with a sense of purpose and independence. The lack of employment among amputees in this study underscores the need for vocational rehabilitation programs to help reintegrate amputees into the workforce and improve their physical functioning.

Mental Health Implications

The mental health component of the SF-36 revealed a significant decline in amputees, with mental health scores being lower than those of non-amputees. This reflects the psychological toll of amputation, which often leads to depression, anxiety, and social isolation.(24) The loss of a limb can be a traumatic event, leading to feelings of helplessness and dependency, particularly in a culture where mobility and independence are highly valued. Moreover, amputees may experience a loss of social identity, especially if they are no longer able to fulfil their traditional roles within the family or community Kizilkurt et al. (25) Psychological support and counselling should be routinely offered for people following amputations. This may help patients navigate their disabilities and the associated challenges they face. It may also improve their mental health outcomes.

Gender Differences

One of the key findings offered by this study is the gender disparity in QoL among amputees, with male amputees reporting higher scores than females. In other words, male amputees had better QoL than female amputees. A study by Soomro et al (26) and Corey et al (27), demonstrated that the most significant predictors of lower limb amputations in people with and without diabetes were gender. Their findings indicate that males may have better coping mechanisms or greater physical and emotional resilience following amputations. On the contrary, female patients may face additional social and psychological challenges, possibly due to societal expectations and differences in social support systems. A review on diabetes in Sudan by Ahmed and Ahmed (28) showed that being a female with diabetes is associated with poor diabetic control. In the Sudanese culture, females often manage the household budget, where they tend to place their healthcare expenditure at the bottom of

the list. This reflects on their dietary choices and expenditure on medication. Another study, by Hamid et al (24), looking at the same QoL of DFU in Sudan, showed the same finding. Moreover, A study by Sana et al. (29) conducted in Saudi Arabia shares the same findings that females had significantly lower QoL scores compared to males, which might be attributable to cultural factors where females become more dependent on family members for daily activities. This is likely to make them feel like a burden and exacerbate their sense of loss following the amputation. However, contrasting studies by Cox et al.(30) reported that female amputees had better QoL scores, suggesting that these gender differences may be context-specific, varying by region, culture, and healthcare access. The lived experience of women amputees by Nayak showed that women are often independent and hold an important role in society in their capacity as housewives or working ladies.(31) In view of that, any loss of function will have detrimental effects on their roles and instead of being productive to society that will feel like a burden. Equally, young, and unmarried women will feel less able to get married because of their disability, which will lead to feelings of helplessness and depression. Regardless of which gender has the lowest QoL, there is a call for more efforts to be made to help educate patients about the consequences of diabetes and to offer good rehabilitation services post-amputation.

Impact of Amputation Level

The level of amputation played a significant role in determining QoL outcomes. Patients with BKA had significantly better QoL scores compared to those with AKA. This finding is in keeping with a study by Dominsiano and Visagie that looked at the quality of life experienced by South Sudanese lower limb prosthetic users.(32) It suggests that BKAs allow for easier mobility with prosthetics, leading to better physical functioning and overall independence. Cox et al. found similar results, where patients with BKA recorded higher functional independence and QoL scores compared to those with AKA. Above-knee amputations require more complex rehabilitation, and prosthetic fitting is more challenging, contributing to a lower QoL. This is more so in a deprived country like Sudan, where rehabilitation services are scarce.

From the author's experience of working in underdeveloped countries, surgeons and indeed other health professionals often take into account other considerations, apart from the clinical condition, when determining clinical procedures. In other words, if a patient would not be able to financially afford a revised procedure or has other comorbidities that make them unable to stand multiple operations, they

may be offered an above-knee amputation regardless of the clinical indication.

Role of Diabetes Duration and Management

The study found that most amputees had been living with diabetes for over five years, and insulin use was more prevalent among amputees compared to non-amputees. The usage of insulin suggests poor diabetic control and possibly a more advanced stage of diabetes among amputees. This supports the well-documented association between longer diabetes duration and the risk of complications, including DFUs and amputations. (33) Poor glycaemic control leads to peripheral neuropathy, which is the underlying cause of DFUs, as observed in 79.5% of the amputees in this study. Effective diabetes management, including strict glycaemic control, is essential for preventing complications. As per Swaminathan et al, the role of patient education and health promotion is fundamental in preventing early macrovascular and microvascular complications of diabetes. It follows that early interventions can prevent DFUs and the need for amputation.(34)

Comorbidities and Socioeconomic Factors

Although hypertension, renal disease, and cardiovascular disease were common comorbidities among both amputees and non-amputees, these did not significantly affect QoL scores in the amputee group. This suggests that the impact shown is primarily due to the physical and psychological effects of the amputations.

Conclusion & Recommendations

Diabetic amputees in Sudan experience significant declines in QoL, particularly in physical and mental health. It follows that early interventions and targeted rehabilitation could improve patient well-being. Recommendations include implementing psychological support programs for amputees, promoting diabetic foot care, and establishing diabetic foot clinics in different regions of Sudan to prevent DFUs and subsequent amputations. Given the financial limitations of the health services in Sudan, these clinics could be run by trained diabetic nurses who would refer urgent cases for further assessment and follow up. This relatively low-cost intervention could potentially save a lot of amputations and its subsequent devastating consequences.

Study Limitations:

The study's limitations include its cross-sectional design, which does not allow for establishing causal relationships. Additionally, the sample size was relatively small and limited to the patients in the two medical centres, which may not represent the general population. Furthermore, potential recall bias could have affected the accuracy of self-reported data. The duration of the study did not allow for long-term assessment of the effect of the disease on the quality of life over a longer period. Future

research can be improved by exploring the patient's clinical images and investigations to better determine the cause of the diabetic foot and whether this was the first amputation. The research can be expanded further to include the other major diabetic centres in Sudan. More variables can be included, such as the glycated haemoglobin, physical exercise, diet, smoking and alcohol consumption, which are all important elements that may affect the result. These details will act as a database upon which more research and correlations can be extracted. This will enhance the generalisability and validity of the current findings.

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study.

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References:

1. Zhang H, Huang C, Bai J, Wang J. Effect of diabetic foot ulcers and other risk factors on the prevalence of lower extremity amputation: a meta-analysis. Int Wound J. 2023;20(8):3035–47. https://doi.org/10.1111/iwj.14179

2. Wukich DK, Raspovic KM, Jupiter DC, Heineman N, Ahn J, Johnson MJ, et al. Amputation and infection are the greatest fears in patients with diabetes foot complications. J Diabetes Complications. 2022;36(7):108222.

https://doi.org/10.1016/j.jdiacomp.2022.108222

3. Piaggesi A, Apelqvist J. The diabetic foot syndrome. Basel: Karger Medical and Scientific Publishers; 2017.

4. Setacci C, De Donato G, Setacci F, Chisci E. Diabetic patients: epidemiology and global impact. J Cardiovasc Surg (Torino). 2009;50(3):263–73.

5. Kizilkurt OK, Kizilkurt T, Gulec MY,

Giynas FE, Polat G, Kilicoglu OI, et al. Quality of life after lower extremity amputation due to diabetic foot ulcer: the role of prosthesis-related factors, body image, self-esteem, and coping styles. Dusunen Adam J Psychiatry Neurol Sci. 2020;33(2):125–34.

https://doi.org/10.14744/DAJPNS.2020.00026

6. International Diabetes Federation. Diabetes in Sudan. 2024. [Internet]. 2025 [cited 2025 Jul 27].

https://idf.org/our-network/regions-and-members/middle-east-and-north-africa/members/sudan/

7. International Diabetes Federation. Sudan diabetes country report 2000–2050. [Internet]. 2025 [cited 2025 Jul 26].

https://diabetesatlas.org/data-by-location/country/sudan/

8. The WHOQOL Group. The World Health Organization quality of life assessment (WHOQOL): position paper from the World Health Organization. Soc Sci Med. 1995;41(10):1403–9.

9. Migaou H, Kalai A, Hassine YH, Jellad A, Boudokhane S, Frih ZBS. Quality of life associated factors in a North African sample of lower limbs amputees. Ann Rehabil Med. 2019;43(3):321–7.

https://doi.org/10.5535/arm.2019.43.3.321

10. Okesina A, Nsubuga I, Omoola O, Okesina H. Understanding lower limb amputation: a review of the strategies for healthcare improvement, prevention, and management. Risk. 2016;16:18. https://dx.doi.org/10.4314/rmj.v81i1.13

11. Sudan faces health crisis as conflict devastates medical infrastructure. [Internet]. International Committee of the Red Cross; 2025 [cited 2025 Jul 30].

https://www.icrc.org/en/news-release/sudan-faces-health-crisis-conflict-devastates-medical-infrastructure

12. Abdelgadir M, Shebeika W, Eltom M, Berne C, Wikblad K. Health related quality of life and sense of coherence in Sudanese diabetic subjects with lower limb amputation. Tohoku J Exp Med. 2009;217(1):45–50.

https://doi.org/10.1620/tjem.217.45

13. Alwahbany SAM, Ahmed TO, Hussien AD. Radiological assessment of closure time of around elbow secondary ossification centers in Khartoum, Sudan (December 2009–2010). Int J Orthop. 2017;3(2):806–12.

14. Zhang Y, Bo Q, Lun SS, Guo Y, Liu J. The 36-item short form health survey: reliability and validity in Chinese medical students. Int J Med Sci. 2012;9(7):521–6.

https://doi.org/10.7150/ijms.4210

15. Martinez JE. Avaliação da qualidade de vida de pacientes com fibromialgia através do Medical Outcome Survey 36 Item Short-form Study. Rev Bras Reumatol. 1999;39(6):312–6. https://doi.org/10.1590/S1413-35552010005000015

16. Nogueira R, Franca M, Lobato MG, Belfort R, Souza CB, Gomes JÁP. Qualidade de vida dos pacientes portadores de síndrome de Stevens-Johnson. Arq Bras Oftalmol. 2003;66:67–70.

17. Saris WE, Gallhofer IN. Design, evaluation, and analysis of questionnaires for survey research. Hoboken (NJ): John Wiley & Sons; 2014.

18. Frykberg RG, Zgonis T, Armstrong DG, Driver VR, Giurini JM, Kravitz SR, et al. Diabetic foot disorders: a clinical practice guideline (2006 revision). J Foot Ankle Surg. 2006;45(5 Suppl):S1–66.

https://doi.org/10.1016/S1067-2516(07)60001-5

19. Al-Rubeaan K, Al Derwish M, Ouizi S, Youssef AM, Subhani SN, Ibrahim HM, et al. Diabetic foot complications and their risk factors from a large retrospective cohort study. PLoS One. 2015;10(5):e0124446.

https://doi.org/10.1371/journal.pone.0124446

20. Musa IR, Ahmed MO, Sabir EI, Alsheneber IF, Ibrahim EM, Mohamed GB, et al. Factors associated with amputation among patients with diabetic foot ulcers in a Saudi population. BMC Res Notes. 2018;11(1):260.

https://doi.org/10.1186/s13104-018-3372-z

21. Rayman G, Krishnan ST, Baker NR, Wareham AM, Rayman A. Are we underestimating diabetes-related lower-extremity amputation rates? Results and benefits of the first prospective study. Diabetes Care. 2004;27(8):1892–6.

https://doi.org/10.2337/diacare.27.8.1892

22. Atinga B-E, Henyo A, Addah G, Ayamga CA, Perekuu T, Addah WGG. Lifestyle adjustments in diabetic individuals following lower extremity amputations: a qualitative study. Cureus. 2024;16(12):e77414.

https://doi.org/10.7759/cureus.76188

23. Atinga B et.al, Lifestyle adjustments in diabetic individuals following lower extremity amputations: a qualitative study. Cureus. 2024;16(12):e77414.

24. Ngwane EL. Examining the psychological impacts of a traumatic lower limb amputation among young adults in Cameroon. 2024.

25. Hamid YH, Mohammed M, Hamid S, Mohamedahmed W, Ahmed O, Nugud F, et al. Impact of diabetic foot ulcer on the health-related quality of life of diabetic patients in Khartoum state. Cureus. 2024;16(1):e52202.
https://doi.org/10.7759/cureus.52813

26. Soomro N, Khan M, Ahmed SI, Minhas MA. Determinants of lower extremity amputations: an institutional experience. J Coll Physicians Surg Pak. 2013;23(7):491–4.

27. Corey MR, Julien JS, Miller C, Fisher B, Cederstrand SL, Nylander WA, et al. Patient education level affects functionality and long-term mortality after major lower extremity amputation. Am J Surg. 2012;204(5):626–30.
https://doi.org/10.1016/j.amjsurg.2012.03.011

28. Mohamed Ahmed A, Hassan Ahmed N. Diabetes mellitus in Sudan: the size of the problem and the possibilities of efficient care. Pract Diabetes Int. 2001;18(9):324–7.[1]
https://doi.org/10.1002/pdi.292

29. AlSadrah SA. Impaired quality of life and diabetic foot disease in Saudi patients with type 2 diabetes: a cross-sectional analysis. SAGE Open Med. 2019;7:2050312119832092.
https://doi.org/10.1177/2050312119832092

30. Cox PSL, Williams SKP, Weaver SR. Life after lower extremity amputation in diabetics. West Indian Med J. 2011;60(5):536–40.

31. Nayak SS. The lived experience of women amputees in Odisha. Int J Sci Res (IJSR). 2022;11(6):943–50. DOI: https://doi.org/10.52403/ijhsr.20220601

32. Dominsiano LCP, Visagie S. Quality of life experienced by South Sudanese lower limb prosthetic users after rehabilitation. Afr J Disabil. 2025;14:1671.[8]
https://doi.org/10.4102/ajod.v14i0.1671

33. Yu J, Kim J-H, Kim B, Han K, Lee SH, Kim MK. The severity of diabetes and the risk of diabetic foot amputation: a national cohort study. Endocrinol Metab (Seoul). 2025 (forthcoming).
DOI: https://doi.org/10.3803/EnM.2024.2266

34. Swaminathan N, Awuah WA, Bharadwaj HR, Roy S, Ferreira T, Adebusoye FT, et al. Early intervention and care for diabetic foot ulcers in low- and middle-income countries: addressing challenges and exploring future strategies: a narrative review. Health Sci Rep. 2024;7(5):e2075.
https://doi.org/10.1002/hsr2.2075

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