



RESEARCH ARTICLE

RISK FACTORS OF AMPUTATION AT DIABETIC PATIENTS IN BUTEMBO, DEMOCRATIC  
REPUBLIC OF CONGO

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ABSTRACT

**Background:** The amputation has become a family word at diabetics' patients. Its frequency is increasing and its physical and psychological sequel decrease the productivity of survivors. The social and professional reinsertions depend on it.

**Aim:** The study aimed to identify associated factors on diabetic foot amputation and to contribute to life quality of diabetics' patients in Butembo.

**Methods:** We conducted a retrospective and descriptive study from November 20<sup>th</sup>, 2013 to April 20<sup>th</sup>, 2015 in Butembo, Democratic Republic of Congo. The study concerned known diabetics' patients and patients with glycaemia on an empty stomach 126mg% twice a day according to the WHO criteria with lesion on their members. Kish and Leslie formula was used for determining the sample.

**Results:** Of the 372 patients enrolled, 95 (25.5%) were amputated in Grade 5 of Wagner. The leg amputation was the most surgery act done among our patients (35.2%). Nicotinism, Alcoholism, age >50 year, diabetes duration >10 years with glycaemia on an empty stomach >300mg, and hypertension (Systolic >140mmHg, Diastolic >90mmHg) were factors incriminated in the amputation at diabetic patients.

**Conclusion:** Good management of diabetes complications and avoidance of risk factors remain the best solution to prevent amputation at diabetic patients. Diabetic patients must be sensitized for regular medical and surgical visits in order to assess and manage diabetic lesions.

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INTRODUCTION

The amputation has become a family word at diabetics' patients. Its frequency is increasing and its physical and psychological sequel decrease the productivity of survivors. The social and professional reinsertions depend on it [1]. Diabetic patients are 25 times more susceptible to lose a leg that the non diabetic [1]. World-widely, close to 70% of leg amputation concern diabetic patient [2,3]; 85% inferior member amputations' due to diabetes are preceded by a foot ulcer [4].

Each thirty seconds, in the world, there is someone who loses his inferior member because of diabetes [4]. In India, near 40 000 legs are amputated due to diabetes [5] and 7-10% of diabetics would present foot lesions type of ulcer [6]. In USA, 50% of all amputations on inferior member are done at diabetic patients and it is estimated that in diabetic population, the risk of developing a foot ulcer lesion during the life is 15% [7]. Theses lesions expose to the amputation risk.

The prevalence of diabetic foot lesions rises with the age. It estimates to 50% the prevalence of foot ulcer at diabetic patients since more than 20 years and 50% at more than 65 years diabetic patients [8].

The ulceration is linked to several favouring factors including diabetes badly balanced, the duration of diabetes, the maladjusted shoes, an insufficient hygiene or the podiatrist care badly done, the obesity, the arteritis and neuropathy. The triggering factors are the cold weather especially the humidity that provokes the arterial spasm and the chilblains, micro-traumatism of the extremities and the cutaneous infectious lesions [9-10].

Nowadays, the complexity of diabetic foot lesions is not certainly resolved. In the world, more than a million of amputations due to the diabetes are observed each year [11]. Indeed, real progress have been achieved in the management of the diabetic foot, notably by the surgical revascularisations such the distal bypass surgeries and more and more currently by the endovascular techniques and the hybrid methods, but the prevention still stagnates and frankly, the amputations rate in the developing countries did not lower [12]. Around 50% of the diabetics' amputees are operated again in the 5 years which follow. Only 25 to 50% of the diabetics' amputees survive 3 years after the amputation [13].

The Democratic Republic of Congo is not saved not at all by this delicate problem of public health where the prevalence of the diabetes mellitus is 7-10% in the adult population and

0.5% at the children. About 15% will present a foot wounds and 20% among these will finish by being amputated. The death rate in rural hospital area is 12% [6].

This study aimed to identify associated factors to diabetic foot amputations and to contribute to the life quality improvement of diabetic patients in Butembo, Democratic Republic of Congo.

## METHODS

This was a retrospective and descriptive study conducted from November 20<sup>th</sup>, 2013 to April 20<sup>th</sup>, 2015 in Butembo, Democratic Republic of Congo. The recruitment took place in the different services of internal medicine, of orthopaedic surgery and traumatology of the Matanda Hospital, Cliniques Universitaires du Graben, and General Referral Hospitals of Katwa and Kitatumba. The selection of hospitals where the study has been done, took into account of the frequentation and the nature of interventions achieved and of the hierarchy (structures of reference).

Using the Kish and Leslie formula [13-14], our sample was constituted by 372 patients. The study included known diabetics' patients and patients with glycaemia on an empty stomach 126mg% twice a day according to the WHO criteria with lesion on their members. Diabetic patients with uncompleted medical file were excluded.

To assess the gravity of the diabetic foot (the severity, the prognosis, delay of skinning, the risk of amputation and to allow a standardized management and adapted to every type of wound), Wagner's scale was used [17].

Table 1 Wagner scale

Wagner grade	Observed lesions
0	No open lesion, but possible presence of deformation and/or cellulitis
1	Superficial ulcer without penetration in the deep tissues
2	Deep extension toward the tendons, the bone or the joints
3	Abscess, osteomyelitis, osteoarthritis
4	Gangrene localized to the heel or the before-foot
5	Gangrene extended at the whole foot

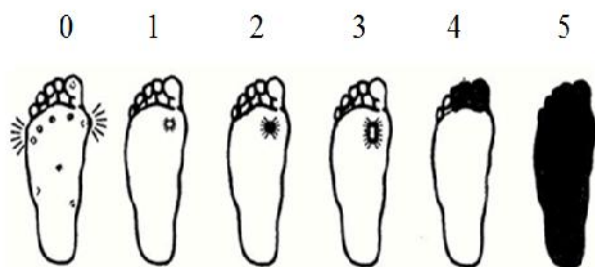


Figure 1 Classic scheme of Wagner grade [17]

The protocol of this study was submitted and approved by the Ethical reviewer of Université Catholique du Graben. Written informed consent was obtained from patients after explaining the purpose and objective of the study.

We used unadjusted logistic regression models, mean and Odd ratio to determine association between the some known risk factors and amputation. The differences in distribution were evaluated using the chi-square test. *P* value 0.05 was

considered statistically significant. All statistical analyses were done by using Epi-Info 7 and Stata 12.

## RESULTS

### Associated factors to diabetic foot gangrene

After this study, we collected 372 diabetic patients with minor or major lesions on their inferior or superior member. As it is shown in the table2, most of patient who consulted were in advance grade on the Wagner scale, respectively 95(25.5%), 81(21.3%) and 45(12%) for grade 5, 4 and 3.

Associated factors to diabetic foot amputation were nicotinism, alcoholism, age >50 years, diabetes duration >10 years, hypertension (systolic 140mmHg, diastolic 90mmHg) and hyperglycaemia 300mg% (Table 3).

Regarding diabetic patient repartition according to consultation set and amputation risk, 139 (79%) consulted after three month of beginning of the initial lesions. Among them, 34 (57.6%) were in the grade 1-2-3 of Wagner scale and 105 (89.7%) in the grade 4-5 (Table 4).

### Management done

In this study, 92 (46.9%) patients were concerned with the conservative treatment in the grade 1-2 of Wagner scale. Other grades were represented respectively 36.5%, 16.4%, 0% for the grade 4, 3 and 5 and 0 (Table 5).

Table 2 Patients repartition according to Wagner scale

Wagner grade	N=372, n(%)
Grade 5	95 (25,5)
Grade 4	81 (21,8)
Grade 1	68 (18,3)
Grade 2	53 (14,3)
Grade 3	45 (12)
Grade 0	30 (8,1)

Table 3 Associated factors to diabetic foot amputation

	Amputation		OR	95% CI	P-value
	Present	Absent			
Nicotinism (+)	10	31	1,87	0,84-4,16	0,1201
(-)	20	116			
Alcoholism (+)	32	149	1,5	0,81-2,52	0,2199
(-)	1	7			
Age > 50 years	37	120	3,02	1,65-5,49	0,0002
< 50 years	5	49			
Diabetes duration >10 y	13	22	3,9	1,82-8,51	0,0002
<10 y	10	66			
BMI (kg/m <sup>2</sup> ) > 30	10	100	1,38	0,35-5,54	0,6451
< 30	7	91			
Systolic (mmHg) >140	16	14	4,57	2,19-9,38	0,0000
<140	2	8			
Diastolic (mmHg) >90	10	95	2,89	1,52-5,62	0,0008
<90	2	55			
Glycaemia (mg%) >300	56	6	6,66	2,81-13,40	0,0011
<300	7	5			

Table 4 Diabetic patient repartition according to consultation set and amputation risk

Consultation set (months)	Amputation risk		Total [n, (%)]
	Grade 1-2-3 [n, (%)]	Grade 4-5 [n, (%)]	
>3	34 (57.6)	105 (89.7)	139 (79)
<3	25 (42.4)	12 (10.3)	37 (21)
Total	59 (100)	117(100)	176 (100)

**Table 5** Management according to Wagner grade evolution

Grade	Conservative management		Amputated patients		P-value
	n	%	n	%	
5	0	0	70	39,8	0,000003
4	32	16,4	52	29,5	0,03
3	72	36,7	41	23,3	0,13
2 et 1	92	46,9	13	7,4	0,000002
Total	196	100	176	100	

**Table 6** Patients repartition according to surgical treatment

Surgical treatment	n	%
Amputation	176	47.3
Stripping	96	25.8
Dressing	49	13.1
Dishing	21	5.6
None	30	8.0
Total	372	100

**Table 7** Patients' reparation according to the level of amputation

Level at amputation	n	%
Leg	62	35.2
Foot	52	29.5
Knee	15	8.7
Shoulder	10	5.6
Elbow	10	5.6
Forearm	9	5.1
Hand	9	5.1
Thigh	9	5.1
Total	176	100

Regarding to patients repartition according to surgical treatment, amputation and stripping was done respectively in 47.3% and 25.8% (Table 6).

The leg amputation was done in 35.2%. Other levels of amputation observed represented respectively 29.5%, 8.7%, 5.6%, 5.6%, 5.1%, 5.1%, and 5.1% for leg, knee, shoulder, elbow, forearm, hand and thigh (Table 7).

## DISCUSSION

### Associated factors to diabetic foot gangrene

This survey has showed that the age >50 years, the diabetes duration >10 years, hypertension (systolic 140mmHg, diastolic 90mmHg) and glycaemia 300mg% increased the risks of amputation. As it has been demonstrated by other study, nicotine, alcoholism, diabetes duration, obesity, hypertension and chronic hyperglycaemia are favouring factors for the genesis of diabetic foot lesions in general and amputation in particular [15,18]. According to the pathogenesis, the nicotine, mainly the cigarette, is the major causes of diabetic foot lesions. The mechanisms of this harmfulness are multiple. With hypercholesterolemia and hypertension, they are responsible of atherosclerosis lesions of big trunk arteries, in all their localisation. They exercise also the vasoconstriction actions and thrombogenesis. The interruption of cigarette is required in case of all types of foot lesions in all their localisations. The profit is always present and often fast, either primary prevention or secondary [16]. The chronic hyperglycaemia leads to diabetic foot lesions by sorbitol which has corrosive effects on the nerves (chronic

neuropathy) and causes the thickening of basal membrane with capillary hyper-permeability source of oedema and anoxemia [17].

### Management done

The amputation was the most done surgery act (47.3%). This has a link with, in one hand; the predominance of the advanced stages in Wagner grading (Grade 4 and 5) in our study, in another hand, this rate would be explained by the education insufficiency of most of our patient (70%) who consulted in advanced stages of lesions after spending enough time by following traditional medicine. This still remain a major public problem in Butembo. This rate corroborate with the one observed in France [9]. Meanwhile, our results are higher than those found by Diarra (17%) but less than those of Samake (60%) [11,12].

The amputation of the members was done in 74.6% of cases. This is near the result observed by Samake who noticed in his study 77.78% of inferior member amputation [12].

The leg was the most frequent amputation level with 35.2% of cases. By the amputation, the surgical treatment appeared lifesaver more often than repairing. These amputations will be able to be avoided by a fast management and a good follow-up of the diabetes and its complications. This result could be explained by the fact that the lower members are the sites of predilection of diabetes complications which lead to the amputation (arteritis and neuropathies) and are generally the more expositions to the outside aggressions [17].

## CONCLUSION

The nicotine, alcoholism, Age >50 years, the duration of the diabetes > 10 years with glycaemia>300mg% and the hypertension (Systolic>140mmHg and diastolic>90mmHg) were the incriminated risk factors of amputation at diabetic patients in Butembo. The amputation of the leg was the more indicates treatment among the diabetic patients to Wagner's stage 5. Good management of diabetes complications and avoidance of risk factors remain the best solution to prevent amputation at diabetic patients. Diabetic patients must be sensitized for regular medical and surgical visits in order to assess and manage diabetic lesions.

**Conflict of Interest:** None declared

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