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Research Article

Skin Lesions During Diabetes Mellitus: A Descriptive Study in a Hospital Setting in Kinshasa

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Abstract

Background: Skin lesions are a significant cause of morbidity in people living with diabetes mellitus in Kinshasa hospitals. Their precise identification is the guarantee of adequate care.

Objective: To identify the epidemiological and clinical profile of skin lesions in diabetics in hospitals in Kinshasa.

Methods: Descriptive cross-sectional study of 431 diabetic subjects followed on an outpatient basis and hospitalized in the selected medical facilities in order to represent the private and public sectors.

Results: The mean age of the participants was 60.7±10.6 years, with a sex ratio (F/M) of 1.3. The frequency of skin lesions was 49.6%. Type 2 diabetes (55.9%) was the most common clinical form. Diabetes-associated dermatoses, diabetes-complicating dermatoses, and diabetic treatment-related dermatoses accounted for 2.8%, 78.4%, and 2.3% of cases, respectively. Vitiligo (50%) and lichen planus (50%) were, with equal frequency, the two types of dermatosis associated with diabetes. Athletics football (25.1%), diabetic foot (17.4%), vaginal candidiasis (9.6%) and pruritus (9.6%) were the main types of dermatosis complicating diabetes. Lipodystrophy secondary to insulin injections (60%) was the main mucocutaneous manifestation related to diabetic treatment.

Conclusion: Almost one in two diabetics had skin lesions. A better knowledge of these lesions could help to define practical and effective prevention guides in this population at high risk of developing skin lesions.

Keywords: Diabetes Mellitus; Skin Lesions; Hospital Setting; Kinshasa

Introduction

Diabetes mellitus is a group of abnormalities characterized by persistent hyperglycemia resulting from a defect in insulin secretion and/or an abnormality in insulin action [1].

In 2021, nearly half a billion people (537,000,000) were living with diabetes mellitus worldwide, i.e. 11% of the world's population [2].

In sub-Saharan Africa, the number of diabetics in 2011 was estimated at 14.7 million [3], an estimate that translates to 737,090 cases in the Democratic Republic of Congo (DRC) [4]. In Kinshasa, a study estimated the prevalence of diabetes at 7% among adults in 2011 [5].

All forms of diabetes are associated with multiple degenerative complications affecting the cardiovascular system, eyes, peripheral nervous system, and skin in the long term [6].

Indeed, during diabetes, skin damage is frequent, affecting 50 to 80% of diabetic patients, whether type 1 or type 2 [7].

These skin manifestations can be classified into three categories: dermatoses strongly associated with the presence of diabetes, dermatoses related to diabetes complications, and dermatoses related to diabetes treatments [7].

These skin disorders are secondary to abnormalities of biochemical, metabolic, immunological, vascular and neurological origin. These are sometimes intertwined in the same patient. The effects of diabetes on the skin are complex, multifactorial [8]. Hyperglycemia has a direct effect on the proliferation and functions of keratinocytes and these fibroblasts. It also increases the non-enzymatic glycosylation of proteins, carbohydrates and nucleic acids, leading to an exaggerated production of advanced glycation products, which are responsible for structural and functional alterations in the skin [9].

Diabetes can also act indirectly through vascular, micro- and macro-angiopathy abnormalities, and neurological, sensory, motor and neurovegetative abnormalities [8].

Rapid recognition of often underestimated skin manifestations can trigger not only metabolic evaluation, but also prompt referral and appropriate treatment minimizing the side effects of diabetes in the long term.

Effective strategies for the management of mucocutaneous manifestations in diabetics in Kinshasa can only be effective if there is prior precise knowledge of the types of dermatosis specific to Congolese diabetics in general, and to those of Kinshasa in particular. Hence the purpose of this study.

Methods

Study framework

This study was carried out in six public or religious and private hospitals and clinics in the city-province of Kinshasa. These six health facilities were chosen according to a simple and stratified random sampling plan to ensure the representativeness of Kinshasa's hospital environment. These include.

For the private medical sector: two private medical training courses were randomly selected: the Saint Joseph Hospital and the Life Clinic.

For the public medical sector:

- At the primary health care level: Two health centres were randomly selected from all the 533 health centres listed in the city of Kinshasa at this level of care: the Mosalisi Health Centre and the Mokengeli Health Centre.
- At the secondary health care level: The Kinshasa General Reference Hospital (HGRK) was randomly selected from among the five secondary level care training courses registered by the Ministry of Health in the DRC
- At the level of tertiary health care: The medical training included at this level was the University Clinics of Kinshasa (CUK).

Type and period of study

This was a multicenter cross-sectional study with a descriptive focus, which took place between February and October 2021.

Study population

It was made up of diabetic patients of all types seen in consultation in the chosen medical facilities during the study period.

Sample size

As there was no indication in the literature on dermatological manifestations in diabetics in the DRC, the prevalence of 15.7% reported in Bamako, Mali [10] was used to calculate the minimum sample size. By the formula: $n = Z^{2PQ}/d2$, (where n=sample size, Z= confidence coefficient (1.96), d=degree of precision (0.05), p=prevalence (0.601), q=complement of prevalence = 1-0.601). The required sample should include at least 51 diabetics.

Inclusion criteria

The inclusion criteria were as follows: being admitted as a diabetic, being 18 years of age or older, having been admitted to a consultation during the study period and having agreed to participate in the study, after free and informed consent.

Exclusion criteria

Patients on long-term corticosteroid therapy 2 months before the study and those who refused to participate in the study were excluded.

Parameters of interest

The parameters of interest were:

- Socio-demographic variables: age, gender, ethnicity, district of residence, occupation, financial weight
- General clinical variables: type of diabetes, treatment received, complications encountered
- Dermatological clinical variables: types of dermatosis.

Data collection technique

A structured questionnaire (survey sheet) was used to collect information, including patient identification, participant diagnosis, and the different skin manifestations presenting the person living with diabetes mellitus. Data collection consisted of an interview based on our collection sheet and a careful dermatological examination in case the participant had skin manifestations of diabetes.

Operational definitions

The following operational definitions were used for this study.

- **Diabetes mellitus:** Diabetes mellitus was defined by the presence of one of the following criteria: a casual plasma glucose ≥ 126 mg/dl, a casual plasma glucose ≥200 mg/dl associated with obvious signs of diabetes mellitus, a notion of the patient taking antidiabetic treatment.
- **Type 1 diabetes mellitus:** Type 1 diabetes mellitus was defined by the simultaneous presence of at least three of the following: age< 40 years at diagnosis, associated autoimmune disease (vitiligo, Addison's disease, Biermer's disease, documented gonadal insufficiency), history of diabetic acidosis, absolute need for insulin therapy (outside the context of infection or hyperglycemic emergency).
- **Type 2 diabetes mellitus:** Type 2 diabetes mellitus was defined by the simultaneous presence of at least three of the following: age ≥ 40 years at diagnosis, BMI ≥25 Kg/m2, waist circumference (TT) ≥ 80 cm for a woman and ≥ 94 cm for an associated autoimmune disease (vitiligo, Addison's disease, Biermer's disease, documented gonadal insufficiency), history of diabetic acidosis, absolute necessity of insulin therapy (outside the context of infection or hyperglycemic emergency).
- **Mucocutaneous manifestations:** Refers to any lesion on the skin and/or mucous membranes.
- **Public Medical Sector:** Has been defined as any health center or hospital with a government affiliation.
- **Private sector:** The private sector was defined as any health centre or hospital with a religious affiliation, a non-governmental organization or a private company.
- **Unemployed:** The unemployed person was considered to be any unemployed person as well as pensioners.

Statistical analyses

Data processing and analysis were performed using SPSS software. 21 and they are summarized in the form of tables. The statistical analyses were essentially descriptive.

Ethical considerations

This study was approved by the Ethics Committee of the School of Public Health of the University of Kinshasa (Approval No.: ESP/CE/100B/2022). Our investigation was carried out in strict compliance with the rules of ethics and deontology, while guaranteeing confidentiality

Results

The analysis involved 431 diabetic patients. The group was mainly made up of female subjects (sex ratio F/M:). The majority of participants were in the age group between 60 and 69 years old (34.3%) with an average age of 60.7±10.6 years. Table I summarizes the socio-demographic characteristics of the respondents.

The majority of patients were in the age group between 60 and 69 years old (34.3%). The Kongo ethnic group was the most frequently encountered (66.4%). The largest number resided in the district of Mont-Amba (61.7%) and the bride and groom were much more numerous (61.0%). Patients who bore their own care were the most predominant (92.8%).

Variables	Workforce	%	Variables	Workforce	%
Age range			District		
20- 29	1	0,2	Mont-Amba	266	61,7
30- 39	16	3,7	Funa	82	19,0
40- 49	49	11,'	Lukunga	76	17,6
50- 59	123	28,5	Tshangu	7	1,6
60- 69	148	34, 3			
≥70	94	21,8			
Gender			Marital status		
Female	306	71,0	Unemployed	152	35,3
Male	125	29,0	Cultivator	18	4,2
Ethnicity			Teacher	69	16,0
Congo	286	66,4	Civil servant	31	7,2
Luba	96	22,2	H. Official	100	23,2
Ethnicity NGALA	31	7,1	Other	61	14,2
Swahili	18	4,1	Financial weight		
			Individual care	400	92,8
			In charge of the company	31	7,2

Table 1: Socio-demographic characteristics of the respondents.

The distribution of patients by sex and hospital education is shown in Table 2 below, which shows that the majority of patients were from the private sector (71.9%).

Health Structure	Total n (%)	Male n (%)	Female n (%)
Total	431 (100.0)	125 (29.0)	306 (71.0)
Public medical sector	121 (28.1)	25 (5.8)	96 (22.2)
Primary level	67 (15.5)	6 (1.4)	-
CS Maman Mosalisi	51 (11.8)	6 (1.4)	45 (10.4)
CS Mokengeli	16 (3.7)	0 (0.0)	16 (3.7)
High school level	-	-	-
HGRK	44 (10.2)	15 (3.5)	29 (6.7)
Tertiary level	-	-	-
CUK	10 (2.3)	4 (0.9)	6 (1.4)
Private medical sector	310 (71.9)	100 (23.2)	210 (48.8)
HSJK	302 (70.1)	100 (23.2)	202 (46.9)
Life Clinic	8 (1.9)	0 (0.0)	8 (1.9)

Table 2: Distribution of patients by sex and hospital education.

Of all the dermatoses classically associated with diabetes mellitus, only vitiligo and lichen planus were found with 50.0% and 50.0% respectively. The female sex was the most affected (83.5%) (Table 3).

Diabetes-associated dermatosis	Total n (%)	Male n (%)	Female n (%)	P-value
Total	6 (100.0)	1 (16.7)	5 (83.3)	
Lichen plan	3 (50.0)	1 (33.3)	2 (66.7)	0.533
Vitiligo	3 (50.0)	0 (0.0)	3 (100.0)	0.381
Lipoid necrobiosis	0 (0.0)	0 (0.0)	0 (0.0)	–
Granuloma annulare	0 (0.0)	0 (0.0)	0 (0.0)	–
Finger pebbles	0 (0.0)	0 (0.0)	0 (0.0)	–
Acanthosis nigricans	0			
Psoriasis	0			

Table 3. Distribution of the types of dermatosis associated with diabetes mellitus.

Dermatosis complicating diabetes	Total n (%)	Male n (%)	Female n (%)	P-value
Total	167 (100.0)	51 (30.5)	116 (69.5)	
Athlete's foot	42 (25.1)	16 (31.4)	26 (22.4)	
Diabetic foot	29 (17.4)	12 (23.5)	17 (14.7)	
Candidiasis vaginal	16 (9.6)	0 (0.0)	16 (13.8)	
Pruritus	16 (9.6)	6 (11.8)	10 (8.6)	
Abscess	13 (7.8)	1 (2.0)	12 (10.3)	
Hyperkeratosis	12 (7.2)	3 (5.9)	9 (7.8)	
Sclerosis of the extremities with joint stiffness	7 (4.2)	3 (5.9)	4 (3.4)	0.019
Cutaneous xerosis	7 (4.2)	1 (2.0)	6 (5.2)	
Onychomycosis	6 (3.6)	3 (5.9)	3 (2.6)	
Erysipelas	5 (3.0)	2 (3.9)	3 (2.6)	
Furunculosis	5 (3.0)	1 (2.0)	4 (3.4)	
Intertrigo	4 (2.4)	0 (0.0)	4 (3.4)	
Calluses	3 (1.8)	3 (5.9)	0 (0.0)	
Pustulosis	2 (1.2)	0 (0.0)	2 (1.7)	

Table 4: Distribution of the types of dermatosis complicating diabetes mellitus.

Data on diabetes-related dermatosis types are shown in the table below, which reveals that lipodystrophy (60.0%), bullous lesion at the injection site (20.0%) and allergic reaction to Gliben (20.0%) were the main dermatoses associated with diabetic treatment. These lesions were only observed in female subjects (100.0%).

Dermatosis related to the treatment of diabetes mellitus	Total n (%)	Male n (%)	Female n (%)	P-value
Total	5 (100.0)	0 (0.0)	5 (100.0)	

Table 5: Distribution of types of dermatosis related to antidiabetic treatment.

Discussion

This work presents for the first time the epidemioclinical profile of mucocutaneous manifestations of patients followed for diabetes mellitus in certain centers in Kinshasa.

Socio-demographic characteristics

Our patients had a slightly higher mean age than that found in the same environment, but 8 years earlier by Mafuta., *et al.* [11]. On the other hand, it is lower than that of Thai authors such as Riewpaiboon., *et al.* [12] who found an average age of 62 years. This age is surely influenced by the non-inclusion of pediatric patients.

Our study showed a predominance of female consultations and in this respects is in line with the work of Ouembe., *et al.* [13] in Mali and Konate., *et al.* [14] in Burkina Faso. She disagrees with Mafuta's [11] relationship with Kinshasa, which had found a predominance of men. These disparities could be explained by the different objectives and methodologies between these studies. However, this trend could also be due to women's increased attention to skin aesthetics.

Most of the participants were married, in line with the surveys of Medesse [15] in Benin and Ake Tano., *et al.* [16] in Abidjan The average age reported in this study is a factor that may explain this predominance.

In our study, it emerged that the majority of participants were unemployed. This observation is supported by a Finnish study [17] which found a positive correlation between diabetes and unemployment by showing that, compared with the unemployed, people at high risk of unemployment had a higher risk of developing pre-diabetes and type 2 diabetes detected by screening.

The interethnic differences observed in the present survey do not have an exhaustive a priori explanation, due to the lack of studies based on the national level. Indeed, in the DRC, epidemiological studies on diabetes have been generally fragmentary because they were carried out in hospitals or on samples that are not representative of the general population [18].

Community-based prevalence surveys in various provinces would help to clarify this parameter.

The distribution of patients according to the health facilities attended revealed a clear predominance of consultations at the HSJK and the Maman Mosalisi Health Center (85.6%). The treatment tariffs applied in these two courses are said to be at the origin of this situation. Both institutions are subsidized by religious denominations. As for the CUK, the low attendance at this institution (10%) could be attributable to the difficult geographical accessibility.

Most of the participants resided in the Mont-Amba district. This is due to their ease of access to the HSJK, which was a major contributor to participants in this survey.

Almost all the participants took care of themselves. This situation seems very worrying, given the high number of unemployed registered. In 2015, Kasiam., *et al.* [19] in a study assessing the cost of caring for people living with diabetes in Kinshasa, they had already noted the deep poverty that afflicts people living with diabetes mellitus. Indeed, this study had shown that the average overall monthly cost of diabetes mellitus management, which includes direct and indirect costs, far exceeded the average monthly income of the patient. A policy of community care (mutual health insurance, insurance, state subsidies) for diabetes is therefore imperative.

The predominance of type 2 diabetes observed in the present study is in line with the data reported in the literature. Indeed, according to IDF, type 2 diabetes is the most predominant form in the world, accounting for 85% to 95% of all diabetes cases in high-income countries and perhaps more in low- and middle-income countries [2]. This predominance could also be at least partially due to the non-inclusion of pediatric patients in whom the frequency of type 1 diabetes is known to be higher.

The frequency of mucocutaneous manifestations

Our survey revealed an overall frequency of mucocutaneous manifestations of 49.4% among the study population. This value, higher than the 15.7% reported by Samake [10] in Mali, is more so compared to the study by Willcox., *et al.* (4.3%) [20] in the United States. The high frequency of dermatosis in sub-Saharan Africa could be justified by the lack of hygiene and precariousness that characterize many households in this sub-region.

Dermatoses associated with diabetes

Regarding dermatoses associated with diabetes (n=6), the study mainly retained vitiligo and lichen planus, with similar frequencies

of association (50%). This association could be explained by the autoimmune nature of these three pathologies. These associations were more frequent in women, reflecting the influence of gender in the occurrence of autoimmune pathologies.

Dermatoses linked to diabetic treatment

Lipodystrophy secondary to insulin injections has been described in only 3 patients, all of whom are female. Indeed, with the advent of increasingly pure insulins, lipodystrophic complications are less and less frequent [21]. However, it should be noted that the diagnosis of lipodystrophy is easier to make in women than in men, whose athletic appearance is less surprising, and in adulthood than in childhood, given the prepubertal onset of lipodystrophy [22].

Dermatoses complicating diabetes

Athletics football (25.1%), diabetic foot (17.4%) and vaginal candidiasis (9.6%) and pruritus (9.6%) were in order of frequency, with the main dermatoses complicating diabetes.

Athletics football accounted for a quarter of mucocutaneous manifestations complicating diabetes, a rate well above the 7% described by Yosipovitch., *et al.* [23] in non-diabetic subjects in the world population. This demonstrates the importance of systematically and repeatedly looking for this pathology in diabetics, not only because of its high frequency, but also because of its multiple complications. Similarly, the discovery of an athlet's football in a patient should make one think of the possibility of diabetes, especially if there is a predisposing terrain.

The rate of diabetic foot found during this study is much higher than that observed in the Western series. This may be due to better care for diabetics in the West. Indeed, improving the quality of follow-up helps to reduce the incidence of degenerative complications, including diabetic foot [24].

Due to a higher concentration of glucose in the blood, *candida albicans* in diabetics exhibits higher enzymatic hemolytic activity [25]. This could explain the relatively high rate of vaginal candidiasis (9.6%), among the dermatological complications of diabetes during this study.

Pruritus, found at a frequency of 9.6%, is a symptom classically found in diabetes mellitus [26]. Nevertheless, this association should be put into perspective in our context. Indeed, in a tropical environment, generalized pruritus should give rise to several etiologies. This pruritus was certainly associated with hyperkeratosis and xerosis observed in 7.2% and 4.2% of diabetics, respectively. However, the relatively high frequencies of these last two manifestations can be partly explained by the average age reported during this study.

The frequency of sclerosis of the extremities with joint stiffness (4.5%) is lower than that reported in the European literature (8 to 15%) [27]. This pathology usually occurs in insulin-dependent diabetic areas after a decade of evolution. This relatively low frequency compared to European literature could be explained by the rarity of this field in our circles. Indeed, the difficult management of diabetes mellitus in our environments and the occurrence of multiple complications during the course of the disease mean that these patients have a shorter life expectancy.

The frequency of onychomycosis reported in our study is higher than that reported by Paron., *et al.* [28]. In non-diabetic subjects. This is due to arterial disease due to diabetes mellitus. This arterial damage alters the quality of the nail plate by modifying its structural, material and biochemical properties by accumulation of advanced glycation end products in the nail matrix.

Abscess, erysipelas, furunculosis and pustulosis were the four bacterial dermatoses observed in our series. Kandjingu., *et al.* [29] found a frequency of 6.3% abscesses over an 18-year period. Konaté [30] found a frequency of 3.8% abscesses over a 6-year period. The differences observed could be explained by the duration and the prospective, cross-sectional or retrospective nature of these different studies.

Limitations and strengths of the study

The observations made during this inquiry must, however, be interpreted with caution. Indeed, the first limitation is its cross-sectional nature, which prevents any extrapolation to the general population of time-restricted hospital data. The second limitation is related to the lack of appropriate analysis, in particular logistic regression or multivariate analysis, which weakens the possible link between the observed dermatoses and diabetes mellitus.

Nevertheless, this study has the merit of being, to our knowledge, the first to have made available a map of the main dermatoses occurring in diabetics in our context; an important tool for guiding

prevention and therapeutic management strategies at the level of health actors. Another strength is that we have included structures at all organizational levels of the health pyramid in our country. Public and private hospitals are found there, as well as university-level institutions.

Conclusion

Almost one in two diabetics had mucocutaneous manifestations. A better knowledge of these manifestations could help to define practical and effective prevention guides in this population at high risk of developing mucocutaneous manifestations.

Authors' Contribution

- Mbanzulu Dimbu Christelle: Principal investigator, contributed to the design, data collection, writing, and English version of the abstract.
- Iteke Mohesa: Participated in the writing, literature review, discussion, and critical revision of the manuscript.
- Kakiesse Musumba Veronique: Participated in the design, literature review and critical revision of the manuscript.
- Kasiam Lasi On'kin: Supervised the design, writing and interpretation of the results

Conflict of Interest

The authors claim to have no conflict of interest.

Bibliography

1. De Clerk M. "Diabetes in Africa". Mediaspaul. Kinshasa (2000).
2. International Diabetes Federation. "FID Diabetes". Atlas. Brussels 2019: 9th edition.
3. International Diabetes Federation. "FID Diabetes". Atlas. Brussels 2012: 5th edition.
4. Bieleli E., *et al*. "Prevalence of diabetes mellitus in the population of Kinshasa". 15: 1058-1061.
5. Muyer MC., *et al*. "Diabetes mellitus in Sub-Saharan Africa, a systematic review of the literature". *Louvain Médical* 127 (2008): 153-165.
6. Francès C. "Endocrine glands". In: Dermatologie et maladies sexuellement transmissibles, Eds: Saurat JH, Grosshans E, Laugier P, Lachapelle JM, Paris, Masson, (1999): 851-857.
7. Benichou M. "Dermatological manifestations of diabetes (Excluding diabetic foot)". (2023).
8. Doutre MS. "The dermatological manifestations of diabetes". *Diabetes and Obesity* 17.157 (2012): 219-2028.
9. Hines A., *et al*. "Cutaneous manifestations of diabète". *Medical Clinics of North America* 105 (2021): 681-97.
10. Samaké ZM. "Dermatoses in diabetics at the Bamako Dermatology Hospital. Thesis Medicine, University of Bamako (2021): 68.
11. "Evaluation of the care of people living with diabetes mellitus in Kinshasa hospitals". Thesis at the end of the specialization, University of Kinshasa (2014).
12. Riewpaiboon A., *et al*. "Diabetes cost model of a Hospital in Thailand". *Value in Health* 10.4 (2007): 223-230.
13. Ouembe ADL. "Dermatoses in diabetics in the Gabriel Touré University Hospital". Thesis Medicine, University of Bamako (2009): 97.
14. Konaté A., *et al*. "Dermatological manifestations in diabetics followed at the Yalgado Ouédraogo National Hospital". Med thesis, University of Ouagadougou (2000).
15. FNH Medess. "Dietary practices and diabetes management in diabetics followed at the national hospital and university center and the insulin bank of Cotonou in Benin". Thesis Medicine, University of Bamako, (2020).
16. Ake Tano OP., *et al*. "Dietary habits among type 2 diabetic patients attending the Abidjan Diabetes Centre". *Santé Publique Journal* 29.3 (2017): 423-430.
17. https://Cordis.Europa.eu.article (page consulted on 17/07/2022
18. Ministry of Public Health. "Vertical analysis: Diabetes mellitus". Final Report (2012).
19. Kasiam JLO., *et al*. "Evaluation of the care of people living with diabetes mellitus in Kinshasa hospitals". *Annals of African Medicine* 8.4 (2015): 2110-2119.
20. Willcox PA., *et al*. "Community acquired staphylococcus aureus bactereama". *QJM* 91.1 (1998): 41-7.
21. Bieleli E., *et al*. "Lipodystrophic diabetes: about an observation". *Médecine d'Afrique Noire* 37.4 (1999): 198-199.

22. Sissons JG. "The complement abnormality of lipodystrophy". *The New England Journal of Medicine* 25 (2000): 461-465.

23. Yosipovitch G., *et al*. "The prevalence of cutaneous manifestations in IDDM patients and their association with risk factors and microvascular complications". *Diabetes Care* 21 (1998): 506-509.

24. Marsot S and Berthezene F. "Surveillance of uncomplicated type 2 diabetes". *The Practitioner's Review* 49 (1999): 30-33.

25. Mahnaz F., *et al*. "Comparative study of esterase and haemolysis activities in clinically important candida species isolated from the oral cavity of diabetic and non-diabetic individuals". *Jundishapur Journal of Microbiology* 8.3 (2015) : 20893-20896.

26. Foss NT., *et al*. "Skin lesions in diabetic patient". *Revista de Saúde Pública* 39.4 (2005): 45-47.

27. Pierard-Franchimont C., *et al*. "Cutaneous manifestations of diabetes". *Revue Médicale de Liège* 51.5 (1996): 348-354.

28. Paron NG and Lambert PW. "Cutaneous manifestations of diabetes mellitus". *Prime Care* 27 (2000): 371-383.

29. Kandjingu K., *et al*. "Clinical study of diabetes mellitus in Kinshasa". *Médecine d'Afrique Noire* 32.3 (1985) 53-61.

30. Konaté NN. "Skin and diabetes mellitus". Thesis Medicine, University of Dakar, (1997).