

Profile of Diabetic Nephropathy in Southern Morocco

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Abstract

Diabetic nephropathy (DN) has a steadily increasing prevalence, particularly because of the increase in sedentary lifestyle and obesity. It is defined as the persistent presence of albuminuria in a diabetic patient and requires early management to prevent progression to end-stage renal failure. The purpose of this work is to describe the epidemiologic profile and the progression of DN for the first time in a southern Moroccan region: Guelmim Oued noun - Moroccan Sahara.

Patients and methods: It is a retrospective study conducted at the 5th military hospital in Guelmim and including all diabetic patients seen in nephrology consultation between January 2015 and December 2018. We collected the following parameters of our patients: demographics, comorbidities, prescribed treatments and biological data (Albuminuria, renal function and glycated hemoglobin) during their nephrology follow-up.

Résultats: During the study period 267 diabetic patients were included among 1042 patients, which represented 25.9% of the nephrology consultation activity. Their average age was 64.3 years with a slight male predominance (60%) and only two patients had type 1 diabetes. At the first nephrology consultation the average duration of diabetes was 14.6 years, 61 (22.8%) patients were on diet alone, 95 (35.5%) on oral antidiabetic drugs (OADs), 94 (35.2%) on insulin and 35 (13%) on OAD and insulin. Half the patients were hypertensive and 107 (40%) already had a cardiovascular complication (arterial disease, coronary artery disease or stroke). The average initial albuminuria was 388 mg/24h and the average glomerular filtration rate (GFR) was 67 ml/min ; 115 (43%) patients being in renal failure. 46 (17%) patients had no renal function assessment during their previous follow-up and only 139 (52%) were on renin-angiotensin system inhibitors (RASIs). After 12-month-follow-up in nephrology, the average GFR was 70 ml/min and 64 ml /min after two years.

Conclusion: Diabetic nephropathy accounts for at least a quarter of nephrology consultation activity in the region of Guelmim Oued Noun. It is characterized in this context by the delay in treatment using renin angiotensin system inhibitors and late nephrology referral hence the need to strengthen preventive strategies in this region especially continuous training.

Introduction:

Diabetes represents, in different ways, one of the major public health challenges in the world. The World Health Organization (WHO) estimates that 422 million adults are living with the disease. In Morocco, a country in the midst of demographic, nutritional and epidemiological transition [1, 2], the incidence of diabetes is increasing, with more than 1.5 million type 2 diabetics in 2010 [3]. This figure is expected to reach 2.5 million by 2030 [3].

Diabetic nephropathy (DN) is the most serious microangiopathic complications of diabetes [4], on one hand for its high risk of progression to end-stage renal disease (ESRD) and on the other hand for the high cardiovascular risk associated with it. It is defined as the persistent presence of albuminuria in a diabetic

patient. This disease therefore requires early management to prevent its progression to end-stage kidney failure. The purpose of this work is to describe the epidemiological profile and the progression of DN for the first time in the region of Guelmim Oued Noun representing thereby the population of the Moroccan Sahara.

Material And Method:

This is a retrospective study conducted at the 5th Military Hospital in the city of Guelmim that includes all diabetic patients who presented in nephrology consultation between January 2015 and December 2018.

Demographic, clinical and biological data were collected for each patient during the first nephrology consultation and each nephrology consultation afterwards.

We determined demographic characteristics such as age and gender, the clinical features : the duration of diabetes, cardiovascular comorbidities : coronary syndrome or heart failure, Obliterating arteriopathy of the lower limbs (OALL), stroke, diabetic retinopathy, diabetic neuropathy, and medication intake : Oral antidiabetic agents and/or insulin. Antihypertensive treatment: angiotensin-converting enzyme inhibitors (ACEIs), angiotensin II receptor blockers (ARBs) and other antihypertensive agents. Statins and other hypolipidemic agents.

WHO defines systemic arterial hypertension as a systolic blood pressure > 140 mmHg and a diastolic blood pressure > 90 mmHg.

Renal function in our patients was estimated using creatinine clearance according to the Modification of Diet in Renal Disease (MDRD) study equation.

The albuminuria assessment was carried out on a 24-hour urine collection and/or a urine sample. Three stages have been defined : Normoalbuminuria : Urinary albumin excretion rate (AER) was 30 mg/day on a 24-hour collection of urine. Microalbuminuria : AER was between 30 and 300 mg/day on a 24-hour urine collection. Macroalbuminuria: AER was > 300 mg/day on a 24-hour urine collection [5].

Diabetes is unbalanced if glycated hemoglobin (HbA1c) is higher than 7%. The recommended metabolic target for most patients is a $HbA1c \leq 7\%$ particularly in the case of stage 3 chronic kidney disease (CKD) and only 8% for stage 4 or 5 CKD [6]. The target of 6.5% is reserved for patients with newly diagnosed diabetes without complications [6].

After a minimum follow-up of six months, we studied the progression of DN in 2 groups : a group of patients without renal failure and another one with renal failure, after the establishment of nephroprotective measures which consisted in reducing the AER, controlling blood pressure using renin-angiotensin system inhibitors, balancing diabetes, and balancing glycemic control.

In terms of statistics, all data was entered and analyzed using IBM SPSS Statistics 20. Quantitative variables were expressed as an average and a standard deviation. Qualitative variables were expressed

as numbers and percentages.

Results:

During the study period 267 diabetic patients were included among 1042 patients which constituted 25.9% of all nephrology consultation activity. Their average age was 64.3 ± 11.3 years with extremes ranging from 28 to 93 years and a slight male predominance (sex ratio 6M:4F), 99% of the patients suffered from type 2 diabetes, and the average duration of diabetes was 13.9 years (Table 1).

Table 1
Demographic and clinical characteristics of the studied population

Number of patients	n = 267 (%)
Average age (yrs)*	64.3 ± 11.3
Sex	159 (60%)
Male	108 (40%)
Female	
Type of diabetes	2 (0.7%)
type 1	265 (99.3%)
type 2	
Duration of diabetes (yrs)*	13,9 ± 7.7
treatment:	15 (5.6%)
Diet alone	94 (35.3 %)
OADs	93 (34.9 %)
Insulin	34 (13%)
OADs + Insulin	
RASIs :	137 (50.9%)
ACEIs	57 (21.2%)
ARBs	80 (29.7%)
Prvious renal assessment	221 (83%)
Average GFR (ml/min/1.73m2)**	59 [36 ; 90]
Average albuminuria rate (mg/24h) **	167 [37 ; 539]

* Expressed as the mean standard deviation (SD).

**Expressed as median and interquartileinterval

OADs: oral antidiabetic drugs

RASIs : renin-angiotensin system inhibitors

ACEIs : angiotensin-converting enzyme inhibitors

ARBs : angiotensin II receptor blockers

HbA1c: glycated hemoglobin

Number of patients	n = 267 (%)
Average rate of HbA1c (%)*	8.28 ± 1.4
* Expressed as the mean standard deviation (SD).	
**Expressed as median and interquartileinterval	
OADs: oral antidiabetic drugs	
RASIs : renin-angiotensin system inhibitors	
ACEIs : angiotensin-converting enzyme inhibitors	
ARBs : angiotensin II receptor blockers	
HbA1c: glycated hemoglobin	

Table 2
Prevalence of other diabetes complications (other than DN):

	n (%)
SAH	125 (46.5%)
Diabetic Retinopathy	91 (33.8%)
Ischemic Stroke	10 (3.7%)
Coronaropathy	40 (14.9%)
OALL	5 (1.9%)
SAH : systemic arterial hypertension	
OALL : Obliterating arteriopathy of the lower limbs	

At the first nephrology consultation, 5.6% of patients were on a diet alone, 35.3% were on oral antidiabetic drugs (OADs), 34.9% were on insulin and 13% were on both OADs and insulin. The majority of patients had unbalanced diabetes with an average HbA1C of 8.28%. Initial average albuminuria was 167 mg/24h and average glomerular filtration rate was 59 ml/min with renal failure in half (52%) patients. 46 (17%) patients had no assessment of the renal function during their previous follow-up and only 137 (50.9%) were on renin-angiotensin system inhibitors (Table 1).

Among the diabetics first addressed to our consultation, 67% of patients already had a cardiovascular complication (systemic arterial hypertension (SAH), arteriopathy, coronopathy or stroke).

After an average follow-up of 24 months, we determined the progression of the renal impairment as well as the glycemc control (Figures: 1,2,3). The average annual decline in our series was 7 ml/min/year, as for the AER we denoted a decrease in albuminuria in patients without renal failure (RF) whereas this rate

continues to increase in patients with RF. During follow-up, the average rate of HbA1c in patients without RF remained stable, around 8%, however we noticed that this rate was decreasing in patients with RF, this can be explained by the anemia caused by said impairment.

Discussion:

The prevalence of diabetic nephropathy is increasing. In our study, a quarter of the patients who consulted are diabetic with an average age of 64.3 +/- 11.3 years, which is quite close to the results of a Chinese meta-analysis that covered 30 studies [7] whose average age was 59.3 years. In our series the sex ratio was 6M:4F, males were also most represented in several studies [7, 8, 9]. Typically, proteinuria appears after 10 years of evolution of diabetes, in our study the average duration of diabetes was 13.9 years. Diabetic retinopathy remains the most common complication followed by cardiovascular complications [10, 11] which match what we found in our study where DR represented 33.8% of all complications followed by cardiovascular diseases with a rate of 20.5%. SAH being a factor of progression of the DN.

In the Keller et al. study, 80% of all patients were hypertensive at the time of diagnosis of type 2 diabetes [12]. In our study about half the patients were hypertensives.

68% of our patients had unbalanced diabetes with an average HbA1c rate of 8.28%, which is quite close to the results of the work of Bentata.Y and Bouattar.T where the average HbA1c rate was 8.5% and 8.4% respectively [16, 11].

Renin-angiotensin system inhibitors reduce the risk of developing DN by 16% [13]. However, only 50.9% of our patients were taking them.

Micro albuminuria is an early marker of DN progression, 80 % of our patients had positive albuminuria with an average rate of 167 mg/24h and 52% of our patients had renal failure at the first consultation, in Bentata.Y and Bouattar's studies, respectively 47.2% and 68.9% of patients were concerned by said condition. This can only be explained by the late referral of patients to nephrologists in our country.

Our patients had regular nephrology follow-up with a consultation every 3 to 6 months and nephroprotection was introduced in all our patients from the first consultation aiming to decrease AER, blood pressure and glycemic control.

Despite an optimal treatment, DN progresses rapidly. The average rate of GFR decline is about 5 ml/min/year and is highly variable from one individual to another [14, 15]. In our series the annual decline rate was 7 ml/min/year, which is satisfactory for despite nephroprotection with a decrease in urinary albumin excretion, diabetes remained unbalanced.

Conclusion:

Our study denotes that diabetic nephropathy represents 25% of the consultation activity in nephrology in the Moroccan Sahara, About half of the patients reached renal failure. Diabetic nephropathy in this population is characterized by the delayed management with renin-angiotensin system inhibitors and the late referral to nephrology consultation, hence the need to strengthen preventive strategies in this region in especially continuous training.

Declarations

- Funding:

This work has no funding support

- Conflict of interest statement:

On behalf of all authors, the corresponding author states that there is no conflict of interest.

- Ethics approval:

The study was carried out with respect for patient anonymity and the confidentiality of medical information. The study was approved by the committee of the military training hospital mohammed V

- Consent to participate:

Not applicable

- Consent for publication:

All co-authors consent for publication

- Availability of data and material:

Data are available any time for control

- Authors' contributions:

S.Benbria: writing and literature revue

M.Azizi: data collection

D.Montasser: statistic analysis

Y.Zajjari: statistic analysis

Y.Zorkani: manuscript translation

D.Ekabbaj: manuscript correction

A.Bahadi: conception of study and correction

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Figures

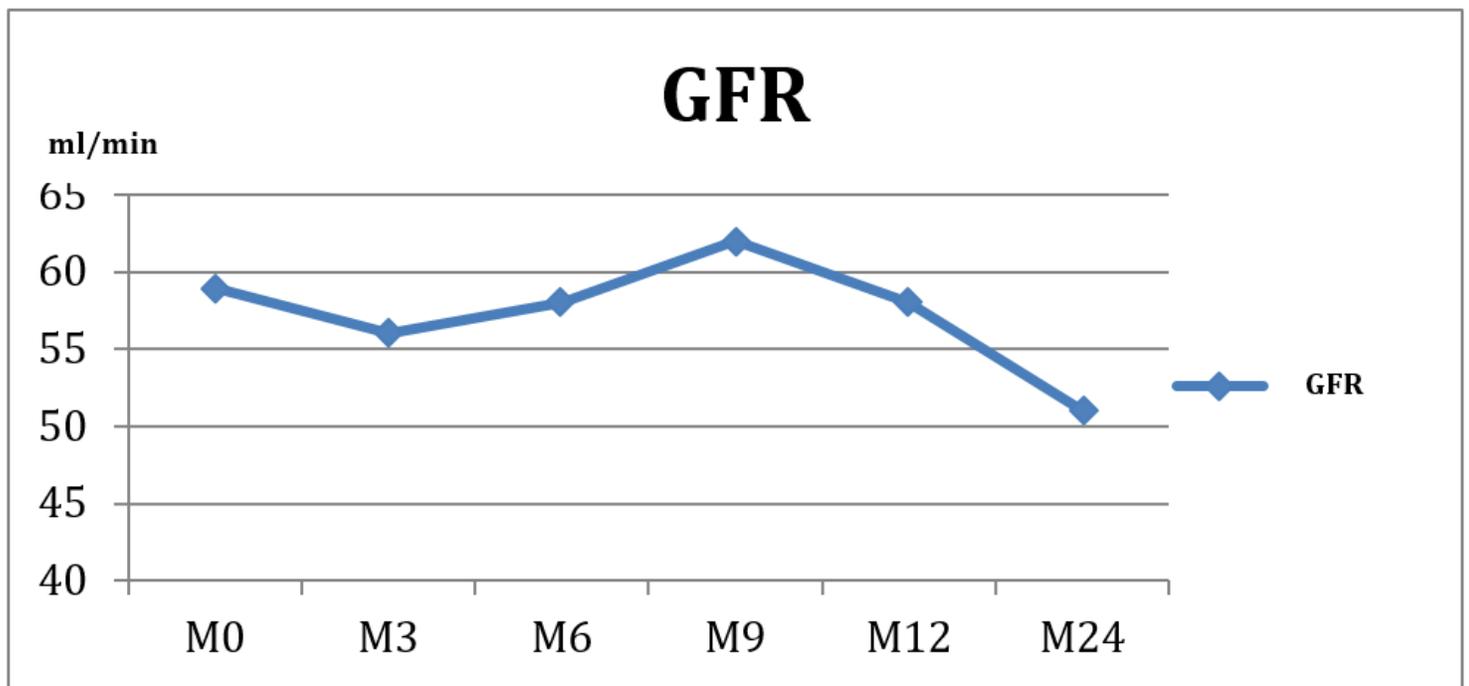


Figure 1

progression of glomerular filtration rate in our diabetic patients

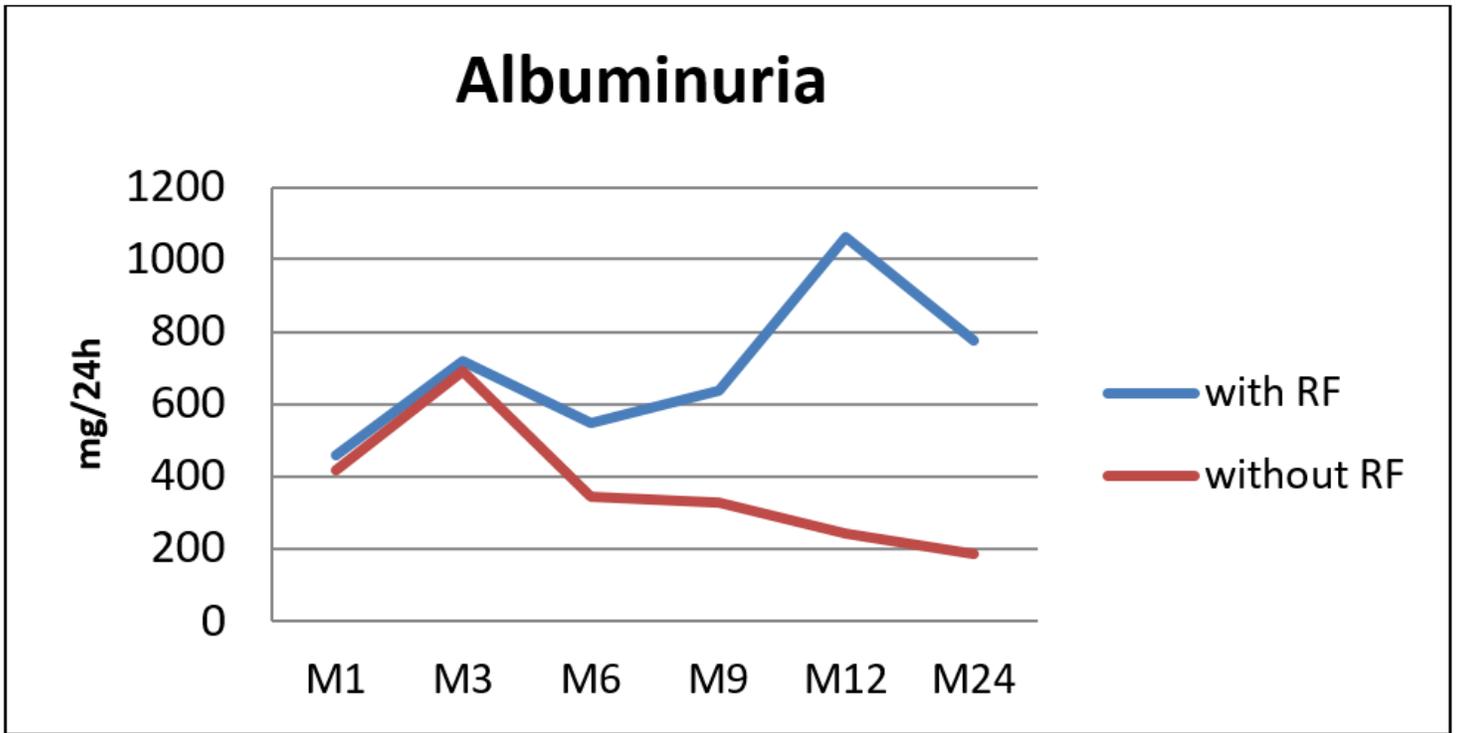


Figure 2

Progression of albuminuria in the group of patients with and without renal failure (RF)

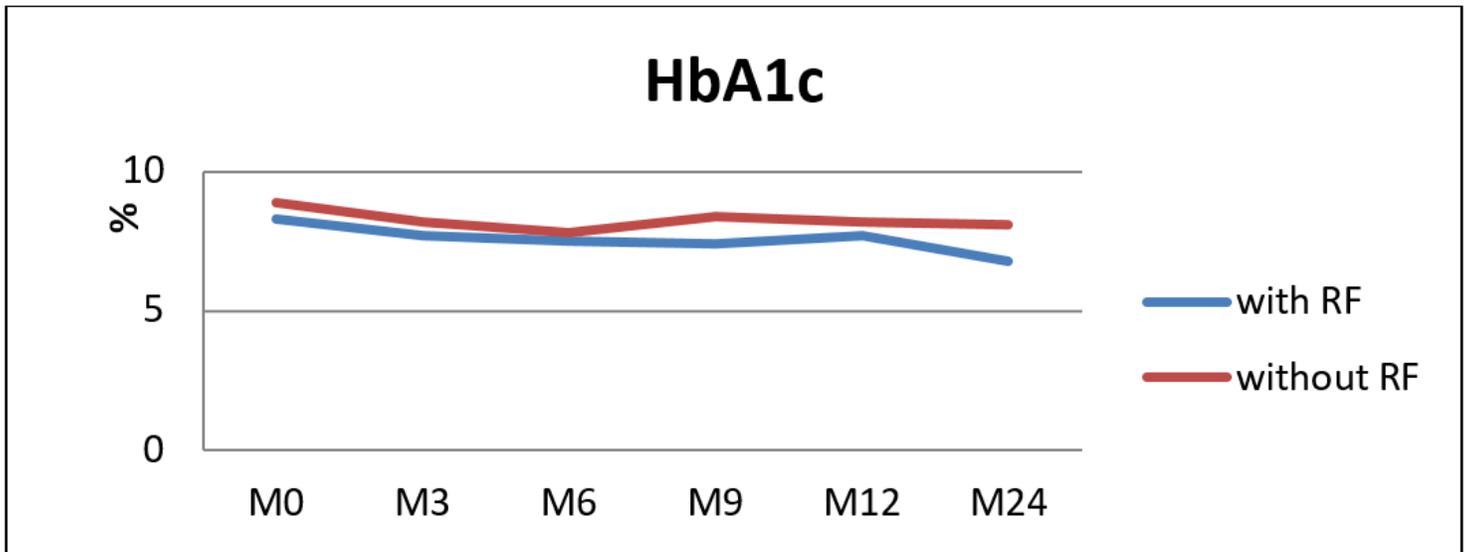


Figure 3

Progression of glycemic control in the groups of patients with and without renal failure (RF)

Supplementary Files

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