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"Clinical and Evolutionary Epidemiological Aspects of Diabetic Ketoacidosis in the Elderly at Tivaouane Hospital: About 104 Cases"

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SUMMARY

Introduction: Ketoacidosis is a severe metabolic decompensation of diabetes characterized by hyperglycaemia that can vary from 11mmol/l to extreme values, an arterial pH below 7.3, a plasma bicarbonate level below 15mmol/l and ketonemia or ketonuria. It is an acute complication of diabetes that has become common in elderly diabetics with a still poor prognosis.

Materials and Methods: This was a retrospective study on the files of patients aged 60 or over hospitalized for diabetic ketoacidosis or presenting during their hospitalization with keto-acidosis decompensation of their diabetes in the internal medicine department of the Mame Abdou Aziz Sy hospital in Tivaouane over a period of 6 years.

Results: The mean age of the patients was 66.5 ± 7.8 years with extremes of 60 to 92 years. There was a female predominance with a sex ratio of 0.85. The patients mainly suffered from type 2 diabetes (96.2%). The average duration of diabetes evolution was 64.7 months ± 85.7 months. It was inaugural in 21 patients or 32.3%. Diabetes was poorly monitored in 88.5% of patients. The main reason for hospitalization was the infection observed in 38.5% of the population. Stroke was found in 9.6% of patients. The mortality rate was 8.82%.

Conclusion: Ketoacidosis is a frequent mode of revelation of diabetes in the elderly. A triggering factor must systematically be sought, giving priority to infections.

Keywords: Elderly; Ketoacidosis; Diabetes

Introduction

Diabetes is an endemic metabolic disease that represents a real public health problem. According to the WHO, diabetes affects more than 537 million people worldwide (1 in 10), including 61 million in Europe [1]. An estimated 400,000 people in Senegal have diabetes, but only 40,000 of them have been diagnosed and are receiving treatment [2]. Diabetic ketoacidosis (DKA) is a dreadful and specific complication of diabetes that occurs most often in type 1 diabetic patients, but can also occur in type 2 diabetics [3]. Delays in diagnosis mean that the disease is often discovered late, when complications are sometimes unavoidable. Among these complications, some of which are acute metabolic, is diabetic ketoacidosis, which occurs almost ineluctably during the course of diabetes. We need to diagnose

diabetes more effectively, as it requires specific treatment, bearing in mind the co-morbidities which are more common in ageing people. We are reporting the results of a descriptive study to assess the prevalence, occurrence and prognosis of ketoacidosis in elderly patients in the internal medicine department of the Mame Abdou Aziz Sy Hospital in Tivaoune.

Patients and Method

This was a retrospective descriptive study from 1 January 2012 to 31 December 2017, a period of 6 years. It included the records of all patients aged at least 60 years, regardless of sex, admitted to the Internal Medicine Department of the Mame Abdou Aziz Sy Hospital in Tivaoune. The inclusive criteria were; All patients aged 60 years and above hospitalised for diabetic ketoacidosis or presenting with diabetic ketoacidosis during hospitalisation, regardless of the cause. The diagnosis of diabetes was based on a fasting blood glucose level ≥ 1.26 g/l (7mmol) taken on two occasions and on different days, or a random blood glucose level ≥ 2g/l (11.1mmol/l) with signs of diabetes. The diagnosis of diabetic ketoacidosis was made in the presence of hyperglycaemia ≥ 2g/l (11 mmol/l) associated with ketonaemia or 2 + ketonuria with +/- the presence of an arterial pH below 7.3 and/or a plasma bicarbonate level below 15 mmol/l. Elderly diabetic patients with poorly completed or incomplete records were not included in this study. The data collection consisted of using the records. For each patient, we recorded the following information: epidemiological aspects, clinical manifestations, biological data on admission, factors leading to decompensation of the diabetes, management, and progress. The data collected was first coded and then entered using Excel. They were then polished and corrected before being analysed using SPSS 21 software.

Results

A total of 104 patients were included. The mean age of the patients was 66.5 ± 7.8 years, with a range of 60 to 92 years. More than half the patients (65.4%) were in the 60-69 age group. Women predominated, with 53.8% (56 female patients) compared to 46.2% (48 male patients), giving a sex ratio of 0.85. The results are illustrated in the figure below. The patients were predominantly type 2 diabetics, with 100 (96.2%) and 4 (3.8%) type 1 diabetics. The duration of diabetes was recorded in 65 patients. The mean duration was 64.7 ± 85.7 months, with a range of 0 to 420 months. Diabetes was newly diagnosed in 21 patients (32.3%).Treatment follow-up was recorded in 96 patients. Treatment was mainly poorly followed up (88.5%).Hypertension was found in 35% of cases (n=36).The duration of hypertension was recorded in 13 patients, with an average of 64.6 months, ranging from 0 to 120 months. Monitoring of hypertension was reported in 33 patients. Treatment was poorly monitored in 75.8% of cases (n=25).The 40 patients (38.5%) were admitted for infection, 34 patients (23%) for polyuria-polydipsia syndrome, 7 patients (6.7%) for simple coma, 10 patients (9.6%) for stroke (with 5.8% for hemi-body deficit and 3.8% for coma with LNS), 7 patients (6.7%) for Altered General state, 5 patients (4.8%) for hypertension, and 11 patients (10.5%) for other conditions. The different reasons for hospitalisation are detailed in (Table 1). Blood pressure was recorded in 100 patients. With regard to SBP, 27 patients had normal SBP, 19 patients had high SBP, 11 patients had stage 1 hypertension and 40 patients had stage 2 hypertension.

Table 1: Reasons for hospitalization.

Reasons for hospitalisation		Frequency (n=)	Percentage (%)
Infection	Cutanous	12	11,5
	Pulmonary	7	6,7
	Gastro intestinal	6	5,8
	Urinary	5	4,8
	Cerebral	5	4,8
	Malaria	4	3,8
	ENT	1	1,0
Pure cardinal syndrome	Pure cardinal syndrome	24	23,1
Coma	Coma sans LNS	7	6,7
CVA	Hemibody deficit	6	5,8
	coma avec LNS	4	3,8
Altered general well being	Altered general well being	7	6,7
	HTA	5	4,8
Others	Urinary pathologies	2	1,9
	Gastro intestinal pathologies	6	5,8
	Malaise	2	1,9
	Dyspnoea	1	1,0

The mean was 132.3 mmHg ± 30.7 mmHg, with a range of 60 and 230 mmHg. As for DBP, 29 patients had normal DBP, 42 had high DBP and 29 patients had stage 2 hypertension. The mean was 79.6 ± 17.3 mmHg with a range of 40 and 160 mmHg. We recorded 3 patients with hypotension. Temperature was recorded in 96 patients, with a mean of 37.0° ± 1.1° and a range of 34.6 to 40°. Sixty-four patients had a normal body temperature, 12 patients were febrile, 18 patients had a fever and 2 patients had hypothermia. Blood glucose levels on admission were below 3 g/l in 11 patients, between 3 and 4 g/l in 35 patients, between 4 and 5 g/l in 26 patients, and between 5 and 6 g/l in 16 patients. It was above 6 g/l (Hi) in 16 patients (15.4%). The mean capillary glucose on admission for the 88 patients was 3.9 ± 0.9 g/l, with a range of 2.36 to 5.93 g/l. 4+ of glycosuria were found in 23 cases (282.1%), 3+ in 42 patients (40%),2+ in 34 cases (32.7%), 0+ in four patients (3.8%). Only one patient had no glycosuria on admission. Ketonuria was distributed as follows: 66 patients had 2+ ketonuria (63.55%), 31 patients had 3+ ketonuria (29.8%) and 7 patients had 4+ ketonuria (6.7%). The following figure shows the distribution

of ketonuria (Figure 1). The Glasgow Coma Score was recorded in 76 patients, with a mean of 14.1 ± 1.8 and a range from 7 to 15. Hydration status was recorded in 75 patients. Dehydration was found in 33.3% (n=25) of cases. Lipid levels were normal in 10.7% of cases.

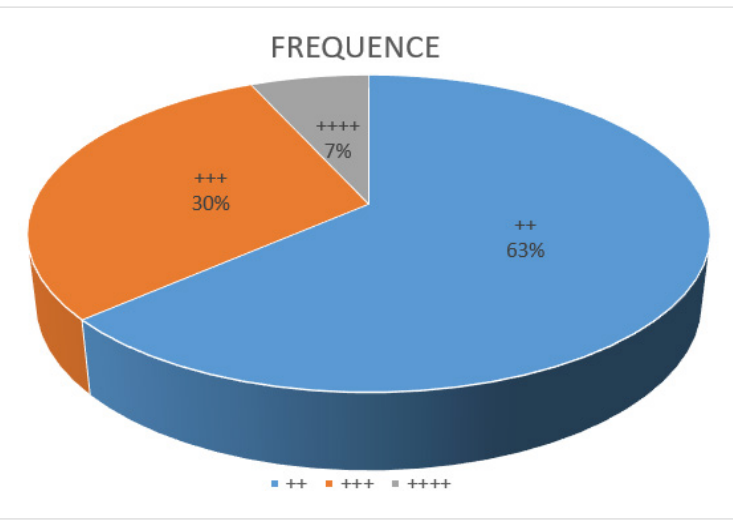

Figure 1: Distribution of patients according to ketonuria.

Hypercholesterolaemia was found in 6.8% of cases and hypo HDL in 1.9%. Decompensation in the form of ketoacidosis was found in 90.4% of cases (94 patients), compared to 9.6% (10 patients) with purely ketotic decompensation. Ketoacidosis was considered severe in 87.5% of cases (n=91) compared to 12.5% of cases (n=13). The outcome was favourable in 86.3% of cases (n=88). The outcome according to age group was favourable in all patients aged > 80 years. The highest complication and death rates were in the age group [60-69 years]. The results are shown in Table 2. The length of hospital stay was recorded in 91 patients. The average was 6.5 days ± 5.1 days, with extremes ranging from 1 to 34 days.

Analytical Studies

The data from the cross-analysis of age and severity of ketoacidosis using Glasgow Coma score as an indicator did not vary between age groups (p value 0.896). Ketoacidosis was more severe in the 60-69 age group compared to the other age groups. However, the difference was not statistically significant (p value=0.498). Ketoacidosis was more severe in men than in women (16.7% and 8.9%). However, the difference was not statistically significant. Origin did not influence the severity of DKA (p value = 0.750). Ketoacidosis was severe in 14.1% of patients whose diabetes was poorly monitored. Severe DKA was not found in patients whose diabetes was well monitored. Ketoacidosis was higher in hypertensive patients (22.2%). The difference was statistically significant at p value 0.031. Thus, hypertensive patients were 3.5 times more likely to have severe ketoacidosis. A comparison of the course and severity of ketoacidosis showed that 15% of diabetics with the severe form of ketoacidosis developed complications, compared to 3% of those with a non-severe form. The death rate was fairly similar between the two groups. (Table 2) below shows the breakdown. Mortality was recorded in 9 cases out of a total of 102 patients, i.e. a mortality rate of 8.82%. The causes of death were stroke in 2 patients and infection in 4 patients. For the remaining patients, the exact cause of death was not mentioned in the files.

Table 2: Outcome compared to severity of ketoacidosis.

Outcoome					
DKA				**Total**	**P value**
	Favorable	**Complication**	**Death**		
Severe	10 (77%)	2 (15%)	1 (8%)	13	0.053
Non severe	80 (88%)	3 (3%)	8 (9%)	91	
Total	90 (86%)	5 (5%)	9 (9%)	104	

Discussion

Frequency

We recorded 104 cases of diabetic ketoacidosis during our study period among the 5022 patients hospitalised in the Internal Medicine Department of the Mame Abdou Aziz Sy Dabakh Hospital in Tivaoune. This corresponds to a frequency of diabetic ketoacidosis in patients aged 60 and above of 2.07%. (YM Lèye, et al. [3]) in a study carried out at Pikine hospital reported results higher than ours at 6.49% and 8.4%.This could be explained by the fact that the study was conducted on patients of all ages hospitalised for ketoacidosis.

The Mean Age

Of the patients was 66.5 ± 7.8 years, ranging from 60 to 92 years. More than half the patients (65.4%) were in the 60-69 age group. In terms of dispersion, this means that the population covered by this study is homogeneous (D Charles, et al. [4]). found an average age of 65.6 years in a study of 52 diabetic patients at the Hôpital Principal in Dakar. This could be explained by the size of their study sample.

Sex

Our study showed a predominance of women (53.8%) and a sex ratio M/F of 0.85.H. (El Ouhasi, et al. [5]) in a retrospective study of 120 diabetic patients aged over 65 years in the endocrinology department of the CHU HASSAN II in Morocco found a sex ratio of 0.76. These results are consistent with the demographic data showing, as in all other areas, an over-representation of women.

Type of Diabetes

The population encountered consisted almost entirely of type 2 diabetic patients. There were 100 type 2 diabetics compared with 4 type 1 diabetics, i.e. 96.2% and 3.8% respectively. Type 1 diabetes occurs at an early age (childhood or adolescence) and is often characterised by the onset of acute complications, which may be metabolic or degenerative infectious, correlated with the duration of the disease. These complications, combined with the lack of follow-up for diabetes in our context, mean that survival in old age remains very poor. (AJ Scheen, et al. [6]) obtained a much higher percentage of type 1 diabetics, in the order of 11.7%, in a study carried out in Belgium on an elderly population with an average age of 67. This difference in the prevalence of type 1 diabetes could be explained by the greater availability, or even accessibility, of routine immunoassays in their hospital departments, enabling more exhaustive diagnosis and better monitoring of diabetes.

Diabetes Monitoring

Diabetes was poorly monitored in 88.5% of patients. (H Jamoussi, et al. [7]) in a retrospective study of 52 diabetics aged over 65 in Tunisia noted poor diabetes monitoring in 75% of the study population. The ENTRED study, carried out between 2001 and 2003 in France among all diabetics [8] showed that diabetics were well monitored. In fact, 99% of elderly diabetics saw their doctors at least 4 times a year, with HbA1c being checked at least 3 times a year in 33% of the study population. Although the recommendations for good monitoring of diabetic patients are well known, the difficulty in our developing countries lies in the fact that the elderly do not benefit from efficient medical care. This is due to financial problems, the lack of qualified medical staff to care for them, and difficulties in accessing hospital facilities.

Reasons for Hospitalization

In our study, the reasons for hospitalisation were dominated by infectious diseases, which accounted for 38.5% of cases (40 patients); 34 patients, or 23%, came for an isolated cardinal syndrome; 11 patients, or 10.5%, for a coma, 6.7% of which had no sign of neurological localisation; 7 patients, or 6.7%, for impairment of general well-being; 16 patients, or 14.5%, for other conditions unrelated to diabetes. (YM Lèye, et al. [3,9]),also found infections to be the main reason for hospitalisation, in proportions of 66.67%, 64% and 54.9% respectively. This predominance of infectious diseases in our regions could be correlated with several factors, such as the low socio-economic level of our populations, the delay in consultation and the cost of treatment, as well as the lack of therapeutic education for patients. Although in tropical environments, infection remains the primary cause of decompensation in diabetic patients, other causes of decompensation have also been identified. In our series, we have stroke with a prevalence of 9.6% and impairment of general well-being with 6.7%. This can be explained by the preponderance of macro-angiopathic complications at an advanced stage of diabetes, but also certain defects much more common in the elderly, such as neoplastic diseases, which are almost constantly accompanied by impairment of general well-being. In a study conducted in Ivory Coast in 2009, (A Lokrou, et al. [10]) found malaria to be the second most common cause of diabetes decompensation. The low prevalence of malaria as a factor in diabetes decompensation in our series (in 6th position among infectious causes) may be explained by the significant progress made in our countries in eradicating this disease.

Duration of Diabetes

The mean duration was 64.7 months (5 years) ± 85.7 months with a range of 0 to 420 months. (Y M. Lèye, et al. [3,10]) found in their studies a prevalence of 38.24% and 38.5% respectively of cases of inaugural diabetes. The relatively short duration of diabetes in our study (5 years) compared with other studies in Africa can be explained by the fact that 1/3 of our patients (32.3%) were newly diagnosed diabetics at the time of hospitalisation. This reflects the lack of medical follow-up in our patients, particularly the elderly, where systematic screening for diabetes is recommended after the age of forty.

Mode of Decompensation

Decompensation into the ketoacidotic mode was found in 90.4% of cases (94 patients), compared with 9.6% (10 patients) in the pure ketotic mode. A predominance of ketoacidosis as a mode of decompensation was found by (PK Kakoma, et al. [9]) but with a lower prevalence of 76.1%. Data in the literature suggest that ketoacidosis is the most frequent acute metabolic complication of diabetes, accounting for 4 to 9% of all consultations for diabetic patients [11]. This type of decompensation, which used to be found in type 1 diabetics, is increasingly found in type 2 diabetics, which is partly due to the delay in consultation and the lack of regular monitoring in our elderly populations.

Mortality

Nine (9) cases of death were recorded, i.e. 8.82%, of which only

one presented a severe form of ketoacidosis. M. Etoa [12] obtained a mortality rate of 7.2%. Septic shock was the main cause of death in 56.1% of cases. His study has similarities with ours where infection was also the main cause of death. (A Lokrou, et al. [9]) in a study in the endocrinology-diabetology department of the Yopougon University Hospital in Côte dIvoire presented comparable results. The following table shows the percentage of deaths in different studies of elderly diabetics.

Conclusion

Diabetes is a major public health problem throughout the world, particularly in our country. Ketoacidosis is a frequent manifestation of diabetes in the elderly. A triggering factor must be systematically sought, with priority given to infections, which are costly to treat and cause death. Our study has led to the following recommendations:

- For the general population: health promotion and primary prevention of diabetes.
- For diabetics: include therapeutic education for patients as part of their treatment.
- For medical staff: ensure early management of diabetes, carry out geriatric assessments on all elderly people admitted to hospital.
- Hospital administration: computerise patient records, promote ongoing training for the medical team in the management of diabetes and its complications.
- For the Ministry of Health: improve hospital technical facilities, promote studies on the epidemiology of diabetes in the elderly.

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