Anemia in Diabetic Patients Hospitalized at CHUL

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ABSTRACT	Published Online: February 15, 2023

Introduction: Anemia is the most common haematological abnormality in diabetics. Understanding the pathogenesis of anemia associated with diabetes can help optimize its management. We conducted a study to determine the biological and etiopathogenic particularities that may be associated with anemia in Gabonese diabetic patients.

Patients and method: Descriptive retrospective study, carried out on the files of diabetic patients hospitalized in the endocrinology department of the Libreville University Hospital during the year 2017. Was included: any hospitalized patient with a hemoglobin (Hb) level lower than: 13g/ dl (men), 12g/dl (women). Anemia was mild if Hb in women between 10.9 and 11.9 g/d and in men between 10.9 and 12.9 g/dl Hb , moderate if Hb between 8 and 10.9 g/dl and Severe if Hb >8g/dl. Data analysis: EPI-INFO version 3.5.

Results: 153 records included/782 hospitalizations: prevalence 19.56%. Average age 54.4 years (±11.1), sex ratio: 1.4 (88 men/65 women). Probable type 2 diabetes (92.20%) Probable type 1 diabetes (6.5%). Average duration of diabetes: 9 years. Mild anemia: 34.6% with mean Hb level 11.98g/dl; moderate: 49% with average Hb level 9.65g/dl and severe 16.3% with average Hb level 6.76g/dl. Hypochromic microcytic anemia (30.7%) hypochromic normocytic (18.3%) normochromic normocytic (27.5%); microcytic normochromia (20.9%) and macrocytic in 2.6% of cases. Etiologically: Probable inflammatory origin (50.3%) Renal failure (24.1%) Iron deficiency (3.4%) etiological factor not found (22.2%). Martial assessment, at the expense of the patients, not carried out (96%).

Conclusion: Anemia is a common biological anomaly in diabetics in Gabon. It is most often moderate, and most often linked to infectious and renal causes.

KEYWORDS:
Anemia, diabetes, inflammation, renal failure.

1. INTRODUCTION

Anemia is an abnormal decrease in the level of hemoglobin in the blood. Present in red blood cells, this protein transports oxygen to organs and muscles [1]. When anemia occurs, this hemoglobin function is significantly impaired, which can lead to various health problems in the patient, including heart problems, reduced physical performance, and impaired quality of life [1,2]. Some complications of diabetes may be accompanied by anemia. Thus, anemia is frequent in diabetes, with a prevalence of 13% in a European population [3], 23% in an Australian population [4] and up to 46.5% in a Caribbean population [5].

Chronic kidney disease does not explain all cases of anemia in diabetes, which are resigned to an interaction between several factors: kidney function, functional deficiency in erythropoietin, nutritional deficiencies, chronic inflammation, the causes iatrogenic and infectious diseases [6]. As a result, the onset of the trend in diabetic patients, even in the absence of overt nephropathy, and it is more severe [7] thereby negatively impacting the quality of life of diabetic patients [8]. Anemia is also an important prognostic factor for cardiovascular disease and all-cause mortality in people with diabetes [9]. It took early identification and correction of anemia to reduce the rate of progression and even delay the onset of some microvascular complications [10] as well as improving the quality of life of diabetic patients [11] .

Current diabetes management guidelines do not recommend routine screening for anemia. Although reports on the prevalence and predictors of anemia in diabetics exist elsewhere, such information is scarce in sub-Saharan Africa where other potential contributing factors such as infectious diseases and genes as well as nutritional deficiencies are very common. and sheet to aggravate the burden of anemia. This study aimed to estimate the pathogenesis of associated anemia in patients hospitalized for diabetes in Gabon.

2. PATIENTS AND METHOD

2.1. Study design, setting and population

We conducted a descriptive retrospective study involving all consenting patients who had been hospitalized for diabetes in the endocrinology department of the University Hospital Center of Libreville (CHUL), and covered a period of activity of one year: January 1 to December 31, 2017. The CHUL is a tertiary care hospital located in Libreville, capital of Gabon (approximately 703,940 inhabitants) [12]. The endocrinology department of CHUL is the main reference center for endocrine diseases and diabetes in Libreville. Data were sought from the records of patients hospitalized for diabetes during this period and collected on a form. Patients with diagnosed type 2 diabetes, regardless of gender and aged 20 years or older, were included. All patients with known hematological disease, any diagnosis of diabetes less than one year old, or those who received a blood transfusion within the previous 4 months were excluded.

2.2. Data gathering

The demographic characteristics of the patients, the type of diabetes, the diabetes treatments received were studied. Hemoglobin level was obtained from complete blood count. Mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), and reticulocytes were used to characterize anemia. The etiological factors of the anemia were retained from the analysis of the clinical and para-clinical signs. The complementary examinations analyzed to orient towards one cause or another of the anemia were: C- reactive protein; serum iron, serum transferrin , serum ferritin , iron saturation coefficient, serum creatinine, glomerular filtration rate.

2.3. Classification

Patients were classified as anemic according to World Health Organization (WHO) criteria (Hb <12 g/dl for women and <13 g/dl for men) [13]. Based on mean corpuscular volume (MCV), anemia was classified as microcytic (MCV <80 fl), normocytic (MCV between 80 and 100 fl), or macrocytic (MCV >100 fl). Mean corpuscular hemoglobin concentration (MCHC) was used to characterize anemia as hypochromic (MCHC <32 g/dl) or normochromic (MCHC ≥ 32 g/dl).

Anemia was central if the reticulocyte count was < 120,000. Platelets > 350,000/mm3, a C-reactive protein>10 mg/l was in favor of an inflammatory origin, the iron deficiency character was retained if the serum iron <100mg/l. Estimated glomerular filtration rate (eGFR) (ml/min/1.73 m2) was calculated using the short formula diet modification in kidney disease as eGFR = $186 \times$ [serum creatinine (mg/l)]- $1.154 \times$ [age (years)] $- 0.203 \times 0.192 \times$ (0.742 for women) [14].

Was included: any hospitalized patient with a hemoglobin (Hb) level below: 13g/dl (men), 12g/dl (women). Anemia was mild if Hb in women between 10.9 and 11.9g/dl and in men between 10.9 and 12.9 g/dl, moderate if the Hb between 8 and 10.9 g/dl and severe if the Hb <8g/dl.

2.4. Statistical analyzes

The Data were presented as mean and standard deviation for continuous variables and as numbers and percentages for categorical variables. Data were tested for normality using histograms, comparison of means and medians. Data were analyzed with SPSS for Windows: EPI-INFO version 3.5. We did not include patients with missing data in the statistical analysis.

3. RESULTS

Of the 782 records of patients hospitalized in the CHUL Endocrinology department, 153 (19.6%) met the criteria for our study and 12 were excluded (3 had a hematological disease and 9 of them were children). These patients, aged 20 to 89, had a mean age of 54.4 years (±11.1). The age group most concerned is that of 45-60 years and represented 62 cases or 40.5%.

3.1. Sex

The male sex was the most representative with 57.5% of the patients recorded, giving an M/F sex ratio of 1.4 (88 men/65 women) (Figure 1A).
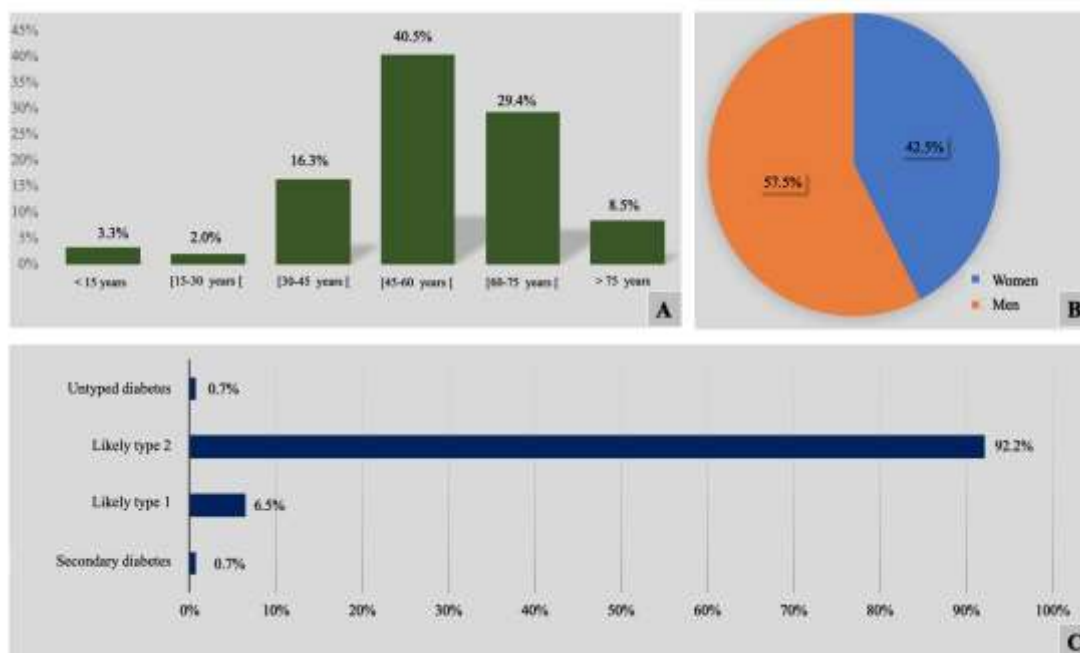
3.2. type of diabetes

Probable type 2 diabetes with 141 (92.2%) cases remains the most recurrent. Average duration of diabetes: 9 years (Figure 1B).

3.3. Form of anemia

Anemia was mild in 34.6% with an average Hb level of 11.98g/dl; moderate in 49% with an average Hb level of 9.65 g/dl and severe in 16.3% with an average Hb level of 6.76 g/dl (Figure 1C).

Table 1 below shows that moderate anemia was predominant in 75 (49.0%) cases with an average of 9.65 g/dl followed by mild anemia in 53 (34.6%) cases with an average of 11.98g/dl. And the end of severe anemia with 25 (16.3%) cases for an average of 6.76 g/dl.

Figure 1 : Distribution of patients according to certain parameters .

A) Distribution of patients according to age. **B)** Distribution of patients according to gender. **C)** Distribution of patients by type of diabetes. Univariate analysis, study on 153 patients from a group hospitalized for Diabetes.

Table 1 : Distribution according to the forms of anemia.

| Anemia	Effective	%	Mean Hb in g/dl
Lightweight	53	34.64%	11.98
Moderate	75	49.02%	9.65
Strict	25	16.34%	6.76
TOTAL	153	100.0%	

Univariate analysis, study on 153 patients from a group hospitalized for Diabetes

3.4. Classification of anemia

Hypochromic microcytic anemia was predominant with 47 (30.7%) cases, followed by normochromic normocytic anemia in 42 (27.5%) cases.

3.5. Etiological factors

Etiologically, the inflammatory origin was predominant (50.3%) followed by renal failure (24.1%). Iron deficiency represented only 3.4% of patients and in 22.2% of cases no etiological factor was retained. The iron balance, at the expense of the patients, was not available in 96% of cases.
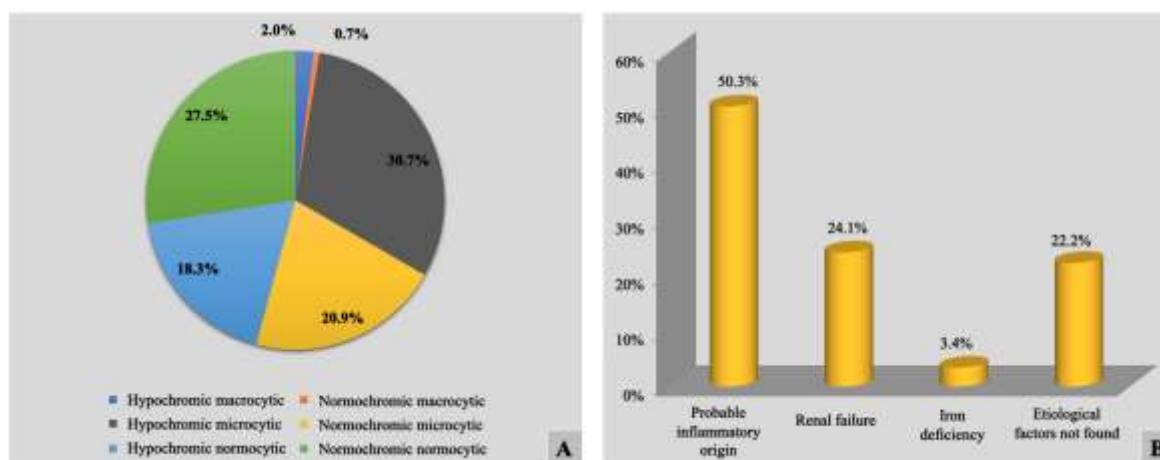
Figure 2: Distribution of patients according to type of anemia and etiological factors.

A) Distribution according to the type of anemia. **B)** etiological factors of anemia. Univariate analysis, study on 153 patients from a group hospitalized for Diabetes

4. DISCUSSION

In this study, the prevalence of anemia is estimated at 19.6%. We have also observed that the age group most concerned is that of 45-60 years. Anemia is common in diabetic patients and has a negative impact on patient well-being [9]. It also impairs the ability to work, reduces quality of life [15] and worsens cardiovascular health [9]. The prevalence of anemia in our study (19.6%) was relatively close to that reported by Moroccans (22.59%) [16]. The prevalence of anemia in diabetic patients reported elsewhere is higher than ours. results, 41% in the population of Cameroon [17], 40% in Nigeria [28] and 30.4% [19] in Tehran. This is due to the difference in the quality of our samples. Our study is conducted on a population of hospitalized diabetics while theirs are made from patients followed on an outpatient basis. Improving the care of the diabetic patient as a whole (by popularizing care and training health professionals) could explain, among other things, the lower prevalence in our population compared to studies carried out there. a few years old. However, further research is needed to investigate this prevalence of anemia in a broad spectrum of African populations with diabetes.

The high prevalence of inflammatory causes found in our study (50.3%) is comparable to several others in the literature. [16, 20] and can be explained by the choice of our population (hospitalized patients), infection being one of the most frequent causes of the diabetic imbalance. The renal cause (24.1% in our study) is the one that is more frequent in other populations made up of outpatients. [17, 18, 20]

The predominance of the microcytic form in our population, which goes hand in hand with other populations [17,19] and suggests the importance of deficiency causes, in particular iron deficiency, which is probably underestimated in our population (3.4%). This low proportion results from the inaccessibility of patients to all additional examinations despite the availability of health insurance which only partially covers medical care costs in Gabon. This also explains the absence of etiology in several cases of this work (22.2%).

Our study shows that the anemia was rather mild in most cases (49%), which is also consistent with the population of Morocco [20] and this may be explained by the improved awareness of patients who do not are more reluctant to go to hospitals in the event of a health problem, as demonstrated by similar work carried out a few years later in the same country [18] where the mild form of anemia is dominant.

We acknowledge the following potential limitations of our study: Despite being conducted in a tertiary care hospital, the results may underestimate some true causes of anemia in hospitalized patients with diabetes. Additionally, this study did not consider non-diabetic patients to identify causes that would be unique to diabetes, indicating the need for further research in this area. The number of reticulocytes and the vitamin dosage (vitamin B12 and folic acid) were not evaluated and the search for hemoglobinopathies was not carried out. However, we had a relatively large sample of diabetic patients and we used reliable statistical tests to identify the determinants.

5. CONCLUSION

The prevalence of anemia in the hospitalized diabetic population in Gabon is high. The inflammatory cause and the decline in renal function appear to be the main determinants. Our results suggest that diabetic patients should be routinely screened for anemia, and have other causes to be checked. Furthermore, the results raise questions regarding the additional economic burden for diabetic patients attributable to anemia, and the cautious interpretation of HbA1c levels among sub-Saharan Africans.

Conflicts of interest: The authors have no conflicts of interest to declare.

Abbreviations: CHUL: Libreville Hospital Center. eGFR: estimated glomerular filtration rate. Hb: hemoglobin. HbA1c: Hemoglobin glycated. MCHC: Corpuscular Hemoglobin Concentration. MCV: Mean Corpuscular Volume

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