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# Microcytosis: Etiological Discussion about 280 Cases

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**Abstract** **Original Research Article**

Introduction: Anemia is defined by: a decrease in hemoglobin (Hb) level based on normal values for age. We talk about microcytosis for an average globular volume (MCV); whose reference value is between 80 and 100 fl in adults; less than 80 fl. Material and method: We conducted a prospective study over a period of two months in the hematology laboratory of the Avicenne hospital in Marrakech. Complete blood counts (CBCs) were performed on samples. A blood smear, stained with the May-Gründwald-Giemsa stain, was performed for all patients. Were included in our study, all CBCs including MCV <80 fL in adults and <71 fL in children. Results: During the study period, 3682 NFS were performed. 280 microcytoses were detected. The average VGM was 73.8 fl. In the blood smear, the most common blood cell abnormalities were anisopoikilocytosis (97%), microcytosis (90%) and hypochromia (85%). Exploration of these microcytoses revealed a predominance of iron deficiency, found in 48% of cases, 21% of pseudopolyglobulie, 18% of inflammation, 3% of hemoglobinopathy, and in 10% of cases, no etiology was found. Conclusion: This study confirmed the value of a complementary assessment when detecting microcytosis. In particular, it can detect iron deficiencies and hemoglobin abnormalities. In the event of a difficult etiological diagnosis, cooperation between clinician and biologist is essential.

**Keywords:** Hematology, anemia, microcytosis, CBC, blood smear.



## INTRODUCTION

Anemia is defined by: a decrease in hemoglobin (Hb) level based on normal values for age (<13 g / dL in men, <12 g / dL in women, <11 g / dL in children, and <10.5 g / dL in pregnant women). We talk about microcytosis for an average globular volume (MCV); whose reference value is between 80 and 100 fl in adults; less than 80 fl. The causes of microcytic anemia are mainly iron deficiency, chronic inflammatory conditions and hemoglobinopathies. The objective of our work is to determine the frequency of microcytic anemia, as well as to explain microcytosis found during a biological assessment.

## MATERIAL AND METHOD

We conducted a prospective study over a period of two months in the hematology laboratory of the Avicenne hospital in Marrakech. Complete blood counts (CBCs) were performed on samples taken from the various hospital departments and from the laboratory collection room (for non-hospitalized patients). A blood smear, stained with the May-Gründwald-Giemsa stain, was performed for all patients. Were included in our study, all CBCs including MCV <80 fL in adults and <71 fL in children. Any sample not respecting the pre-analytical phase was excluded.

## RESULT

During the study period, 3682 NFS were performed. 280 microcytoses were detected (7% of the population studied). 53% of these microcytoses were found in male patients. The mean age of all patients was 41 years.

The average VGM was 73.8 fl with extremes ranging from 55.1 fl to 79.9 fl. In the blood smear, the most common blood cell abnormalities were anisopoikilocytosis (97%), microcytosis (90%) and hypochromia (85%). Other abnormalities were also found in lower percentages: target red blood cells (26%), dacryocytes (19%) as well as one case of an eliptocyte (Figure-1).

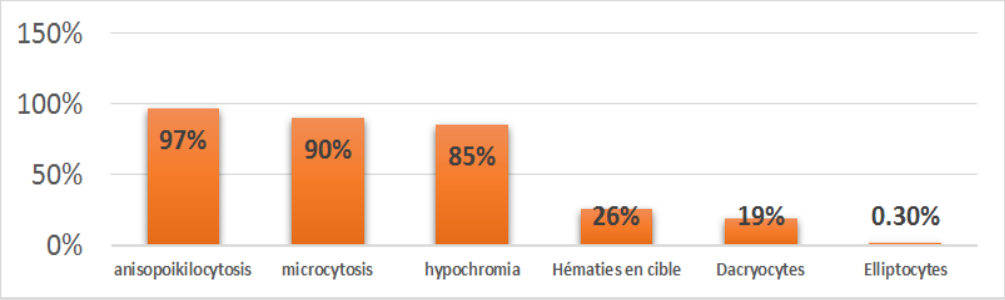


**Fig-1: Red blood cell abnormalities in blood smears**

Exploration of these microcytoses revealed a predominance of iron deficiency, found in 48% of cases. It affected the female population in 59% of cases. In the majority of cases (70%), microcytosis was associated with anemia. The VGM was between 65 fl and 80 fl.

In 18% of cases, inflammation, revealed by the increase in CRP, was found.

Hemoglobin electrophoresis was not requested for all of our patients. Only 3% were known to have hemoglobinopathy. However, we found 21% of pseudopolyglobulie on the performed CBCs, the MCV of which was between 60 fl and 80 fl.

Hemoglobinopathy cases were mainly represented by β-thalassemia minor found in 6 patients, as well as by sickle cell disease in its heterozygous form, found in 2 patients. The MCV for hemoglobinopathies was between 60 fl and 70 fl.

In 10% of cases, the workup did not reveal any abnormalities except microcytosis, apart from electrophoresis of hemoglobin which was not done (Figure-2).

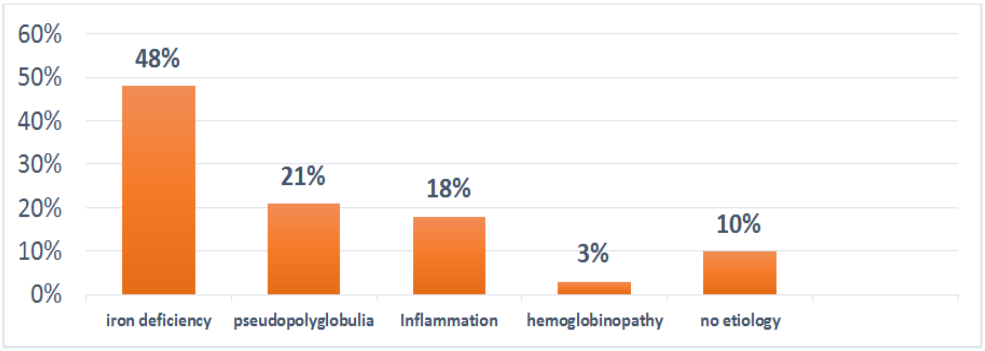


**Fig-2: Percentage of etiologies of microcytosis in the study population**

## DISCUSSION

Iron deficiency is the most common etiology of microcytosis. Lack of intake or gastrointestinal bleeding may be mentioned. In young women, menstrual losses lead to this situation [1, 2].

Faced with an iron deficiency, the etiological assessment looking for a deficiency of intake or occult bleeding is negative in about 30% of cases. Several studies have shown that these unexplained deficiencies may be due to poor absorption associated with autoimmune gastritis with or without Helicobacter pylori infection. Celiac disease should also be looked for, but found less frequently [3-6]. Microcytosis is not an early marker of deficiency, which is first evidenced by a decrease in ferritin and then in the saturation coefficient of transferrin [7].

In the study carried out in France by Désidéri et al., [7], iron deficiency was found in 44% of cases, the etiology predominant in the series. This rate is close to that of our study (48%).

Hemoglobin electrophoresis can detect the main variants of hemoglobin that are accompanied by microcytosis (C, E) but also other variants, especially if α-thalassemia is associated. HB S is only accompanied by microcytosis in association with α-thalassemia [7].

As regards the hemoglobinopathies found in the Désideri study [7] (26%), their rates are much higher than ours (3%). This is due to the fact that all their patients underwent hemoglobin electrophoresis while we only took into account the hemoglobinopathies already documented. Heterozygous β-thalassemias were the majority in our series. It is the same for the French series [7]. In the latter, MCV was less than 70 fl in 66% of heterozygous β-thalassemias. While in our study, the MCV for hemoglobinopathies was between 60 fl and 70 fl. In another study conducted

in Iraq, in patients with sickle cell traits, MCV ranged from 45 fL to 94 fl with microcytosis reported in 85.26% of cases [8]. In the population of this study, only heterozygous forms of β-thalassemia were found. They are mostly asymptomatic.

For pseudopolyglobulias, they were found, in the study by Désidéri [7], in 22.9% of cases, without any other anomaly being able to be demonstrated. Some of his patients presented with sometimes very severe microcytosis which could suggest α-thalassemia minor. In our study, cases of pseudopolycythemia represented 21%, a rate similar to the French study. However, hemoglobin electrophoresis should be performed in our patients for hemoglobinopathy.

The association of microcytosis and polycythemia without other abnormality suggests α-thalassemia minor. Thalassemia minor is characterized by the total or partial deletion of one or two genes encoding the α subunits of globin. It is manifested by microcytic pseudopolycythemia and normal levels of F and A2 hemoglobin. The positive diagnosis is made by molecular biology [7].

With regard to inflammation situations, we note a greater number of cases (18%) compared to the Désideri series (9.3%) [7]. The same is true for cases without obvious anomaly, found in 10% in our series and 5.6% in the French study [7]. However, the latter rate is likely to increase after completing patient workup with hemoglobin electrophoresis.

## CONCLUSION

This study confirmed the value of a complementary assessment when detecting microcytosis. In particular, it can detect iron deficiencies and hemoglobin abnormalities. Due to the contributions of molecular genetics, less frequent pathologies can be easily researched. In the event of a difficult etiological diagnosis, cooperation between clinician and biologist is essential, making it possible to propose the most relevant explorations on a case-by-case basis.

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