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Incidence of sickle cell disease in hemolytic anemias in the city of Kinshasa province

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Abstract
Introduction: Hemolytic anemia is defined as anemia characterized by premature and excessive destruction of red blood cells. Several etiologies are at the root of these anemias, including sickle cell disease. In this work, we evaluated the incidence of sickle cell anemia in the hemolitic anemia in the city of Kinshasa in order to contribute to the improvement of the care of people suffering from anemia.
Materials and methods: 512 patients with anemia from 0 to 37 years old, of whom 335 girls and 177 boys participated in the study. The anemia of the patients was confirmed by the hemogram. The haemolytic character of the anemia was confirmed by indirect bilirubin, lactate dehydrogenase assay and reticulocyte count. Sickle cell disease was diagnosed by isoelectric focusing electrophoresis.
Results: Hemoglobin levels (6.1 +/- 2g / dl) and hematocrit (20.5 +/- 6.5%) achieved by the hemogram showed that all subjects had anemia. Levels of LDH (479,04 ± 76,79 IU/l), indirect bilirubin (21.06 ± 3.34 µg / l) and reticulocytes (231.118 / mm3) confirmed the haemolytic nature of anemia of patients in 465/512 is 90.8%. Isoelectric focusing electrophoresis revealed that 4.7% of the subjects were homozygous (SS); 7.3% of subjects were heterozygous (AS); 88% of the subjects were normal (AA).
Conclusion: The study showed an incidence of sickle cell disease of 4.7% in hemolytic anemias in city of Kinshasa. The hemoglobinopathies including sickle cell disease must be taken into account in the diagnosis of haemolytic anemias in the city of Kinshasa province in particular and in DR Congo in general in order to improve the care of people suffering from anemia in DR Congo.

Keywords: Sickle cell disease, hemolytic anemia, incidence, hemogram

1. Introduction

Hemolytic anemias are defined as anemia characterized by premature and excessive destruction of red blood cells. This hemolysis can occur either in the circulation, we talk about intravascular hemolysis or in macrophages, we talk about intra-tissue hemolysis. There is a shortening of the average life span of red blood cells without compensation by the equivalent medullary production of erythrocytes [1]

They are accompanied by an increase in the level of bilirubin, lactate dehydrogenase (LDH), and the collapse of haptoglobin with a reticulocyte level greater than 150,000 / mm 3 [2, 3]. The classification of hemolytic anemias is essentially based on the origin of hemolysis.

On the one hand, there are corpuscular haemolytic anemias, which are hereditary in the majority of cases, among which membrane abnormalities, enzymatic abnormalities and abnormalities of hemoglobin are considered as main etiologies; and, on the other hand, extracellular hemolytic anemias caused by an external agent such as an infectious agent, antibodies, and toxic agents acting on the red blood cells [4, 5]. The diagnosis consists in confirming the anemia, especially the haemolytic characteristics of this anemia, and then making a differential diagnosis in order to consider an adequate treatment for good management [6, 7].

Sickle cell disease is the most common genotypic condition in the world affecting the Black, Mediterranean, Middle East and Southeast Asia. The disease is found throughout the African continent with several million carriers of the tare. The latter reaches in some peri-equatorial countries up to 30 or 40% of the population, particularly in the Democratic Republic of Congo [8, 9, 10].

It is characterized by the presence in the blood of sickle-shaped cells [11, 12]. The disease is associated with several acute clinical manifestations such as vaso-occlusive attacks, acute thoracic syndrome, acute anemia or and chronic manifestations such as hemolytic anemia, infectious

episodes, osteonecrosis of the hip, leg ulcers, nephropathy, or failure to thrive [13, 14, 15]. This disease constitutes a public health problem. As a result, most countries have systematic screening programs in place [16, 17]

Sickle cell disease it is one of the factors likely to cause haemolytic anemia, we wanted in this study to establish the incidence of sickle cell disease in haemolytic anemia in the city of Kinshasa. This study will establish the share of sickle cell disease in haemolytic anemias in the city of Kinshasa, especially since these anemias have multiple etiologies. Excluding malaria, hemoglobinopathies, enzymopathies, membrane abnormalities and immunological causes [18, 19]

Our investigation was focus in the three hospital in Kinshasa city, which are: Kingasani Hospital Center, The Bondeko Clinic, The Lisungi Hospital Center. These are centers drawn from 10 centers that had to collaborate with us in the framework of a newborn screening project for the fight against sickle cell anemia and research in hematological chemistry. The choice was guided by the location and appreciation of the center during the first collaboration.

2. Material and methods

We worked with 512 patients of 0 to 37 years old, including 315 girls and 187 boys, in three hospitals of Kinshasa, from 2016 to 2017 period. Samples were taken in ETDA tubes and dry tubes. The study was approved by the National Ethics Committee. We performed the hemogram of the patients using a hematological automaton "Sysmex". The haemolytic character was determined by the spectrometric assay (Humalyzerprimus) of lactate dehydrogenase and indirect bilirubin on the one hand and partly by reticulocyte counting under an optical microscope (Olympus). The diagnosis of sickle cell disease was made by isoelectric focusing whose system consisted of a refrigerator (Carow 205O system), a migration vessel (Amersham) and a voltage generator (Electrophoresis poweer supply EPS 3501 XL).

3. Results

Distribution of the population study by age The age of the patients is shown in Figure 1

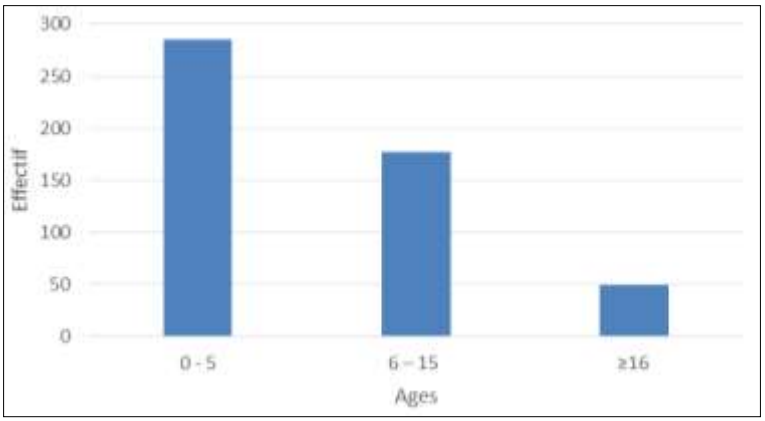

Fig 1: Age of patients

-Distribution of the population by sex Data on the sex of patients are shown in Figure 2

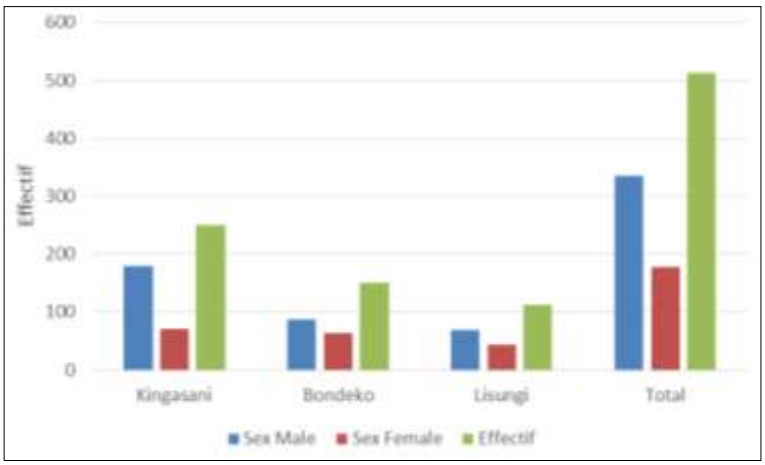

Fig 2: Distribution of the population by sex

-Complete blood count

Complete blood count performed on 512 patients showed that all patients in this study had mean hemoglobin levels of 6.1 ± 2 g / dl and hematocrit of 20.5 ± 6.5%.

-Confirmation of haemolytic character of anemia

Confirmation of the haemolytic character of the anemia was made by the assay of indirect bilirubin, lactate dehydrogenase and reticulocyte count on the 512 samples taken. The results show that 465 out of 512 subjects had haemolytic anemia with mean levels of indirect bilirubin (21.06 ± 3.34 µg / l), LDH (479,04 ± 76,79 IU/ L) and reticulocytemia (231118 / mm3)

-Diagnosis of sickle cell disease. The results are shown in Figure 3.

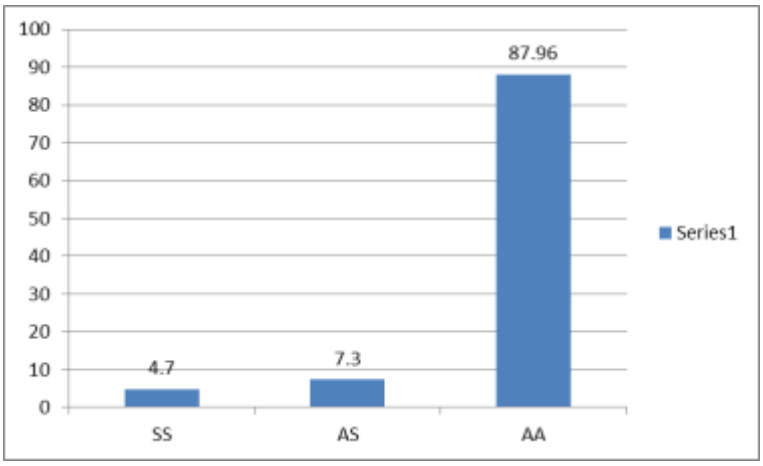

Fig 3: Incidence of sickle cell disease in hemolytic anemias: Homozygotes (SS); Heterozygote (AS); Normal (AA).

4. Discussion

Our job was to evaluate the incidence of sickle cell disease in hemolytic anemias in Kinshasa city. We worked with patients who are coming for consultation in the centers selected because of anemia. We worked with 512 samples of patients of 0 to 37 years old including 335 girls and 177 boys from three hospitals: kingasani Hospital, Bondeko Clinic and Lisungi Hospital.

The distribution of the population study shown in Figure 1 shows that pre-school and school-age children are more likely to suffer from anemia. We also find that it is more the female sex who is suffering more anemia than the male sex as revealed in Chart 2. These data was confirm the results published in 2008 by WHO.

The results of the blood count showed that the population under study suffered from anemia. The biological diagnosis of anemia focused only on average hemoglobin levels. We found that the mean hemoglobin level (6.1 ± 2 g / dl) was well below the normal hemoglobin values for the both sexes. In addition to hemoglobin, we also observe very low values for hematocrit (20.5 ± 6.9%). Overall we find that these patients suffered from severe anemia although the severity of anemia depends on several parameters including age, medical condition, speed of installation [20, 21].

Confirmation of the haemolytic character of anemia was made by the assay of indirect bilirubin, lactate dehydrogenase and reticulocyte count. The results showed that out of 512 patients in the study, 465 had elevated values for indirect bilirubin, lactate dehydrogenase, and reticulocyte levels. The levels of bilirubin found are higher than those reported in the literature between 5 to 10 µmol, at most 17 µmol.

The count of reticulocytes is diagnostic in the presence of anemia and allows classification of anemias as regenerative or aregenerative anemia, depending on whether the reticulocyte levels are greater than 150000 / mm3 or less than 150000 / mm3. In our case, the anemia is regenerative because the results found are greater than 150000 / mm3 or 231118 / mm3. This means that the bone marrow works normally to compensate for the loss due to haemolysis [19, 22]. Thus, the 465 patients had regenerative haemolytic anemia (90.8%) because the reticulocyte level was greater than 150000 / mm3 [22, 23].

The evaluation of lactate dehydrogenase (LDH) activity (479.04 ± 76.79 IU / l) was higher than normal levels for 465 patients out of 512. The Lactate dehydrogenase is a ubiquitous enzyme whose activity increases in the blood in case of anemia. In our study, we find that its activity and other markers of hemolysis were both increased. So, we can attribute this increase to anemia, which in this case would be hemolytic anemia.

Isoelectric focusing results showed that 4.7% of patients with hemolytic anemia were Homozygotes (22/465), 7.3% were heterozygous (34/465) and 87.96% were normal (409). / 465). Two cases of hereditary persistence of hemoglobin F have been observed among homozygotes.

Sickle cell disease is the most common cause in familial corpuscular haemolytic anemias. It is really a real public health problem in much of the world in general and particularly in the Democratic Republic of Congo [4, 24].

In the etiological diagnosis of haemolytic anemias, after malaria, which revealed an incidence of 79.56% in a previously published study, sickle cell disease would be one of the parameters to be taken into account in the etiological diagnosis of haemolytic anemias in the city of Kinshasa.

5. Conclusion

Our study was to determine the incidence of sickle cell disease in hemolytic anemia in the city of Kinshasa. After confirming the anemia and its haemolytic character, we used electrical is focusing to diagnose sickle cell disease. The results demonstrated that sickle cell disease has an incidence of 4.7% in hemolytic anemias. Therefore, in the etiological research of anemia in general and in particular in haemolytic anemias, sickle cell disease may be considered as one of the parameters to be taken into account in view of the incidence found. We therefore recommend that the authorities make an efforts to counter the harmful effects of this disease in the Congolese population. Knowledge of these results will improve the management of people with anemia.

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6. References

1. Longpré B Les anémies, Paris, Masson, 2ème édition,

1994, 89-101.
2. Carcassonne y Anémies. In BOuvenot G, Devulder B, Guillevin L, Queneau P, Schaefffer A. Pathologie médicale : Gastro-entérologie, Hématologie, Hépathologie. Masson, Paris, 1995, 378-403
3. Bernard j, Levy JP, Clauvel JP, Rain JD Varet B. Abrégé d'hématologie. Paris, Masson, 3ème édition, 1976, 234p
4. Dreyfus B, Breton-Gorius J, Rochant H, Reyes F, Vernant JP Hématologie, Paris, Flammarion médecine-sciences, 1984, 890p
5. Longpré B, Schapcott D, Anémies « notions fondamentales. Paris, Masson, 1983, 346p.
6. Hillman R, Ault KA, Rinder HM. Hématologie en pratique clinique « Guide de diagnostic et de traitement ». France, Flammarion, 2007, 471p.
7. Pequignot H, Delaye, Dormont J. Christoforov, Pathologie Médicale., Paris, Masson, 1975.
8. Naik RP, Haywood C Jr. Sickle cell trait diagnosis: clinical and social implications. Hematology Am Soc Hematol Educ Program, 2015. PMID:26637716
9. Key NS, Derebail VK. Sickle-cell trait: novel clinical significance. Hematology Am Soc Hematol Educ Program, 2010. PMID:21239829
10. O'Connor FG, Bergeron MF, Cantrell J, Connes P, Harmon KG, Ivy E, Kark J. ACSM and CHAMP summit on sickle cell trait: mitigating risks for warfighters and athletes. Med Sci Sports Exerc, 2012. PMID: 22811029
11. Chalacheva P, Kato RM, Shah P, Veluswamy S, Denton CC, Sunwoo J. Wood JC, Detterich JA, Coates TD, Khoo MCK. Sickle Cell Disease Subjects Have a Distinct Abnormal Autonomic Phenotype Characterized by Peripheral Vasoconstriction With Blunted Cardiac Response to Head-Up Tilt. Front Physiol, 2019. PMID:31031633
12. Uhelski ML, Simone DA. Sensitization of nociceptors and dorsal horn neurons contributes to pain in sickle cell disease.Neurosci Lett, 2019. [Epub ahead of print] Review.PMID:30995520
13. Habibi A, Arlet JB, Stankovic K, Gellen-Dautremer J, Ribeil JA, Bartolucci P. *et al*. centre de référence maladies rares « syndromes drépanocytaires majeurs ». [French guidelines for the management of adult sickle cell disease, 2015. PMID: 26007619.
14. Godeau B. [Emergencies in adults with sickle cell disease]. Bull Acad Natl Med, 2004. PMID: 15584659
15. Yawn BP, Buchanan GR, Afenyi-Annan AN, Ballas SK, Hassell KL, James AH. *et al*. Management of sickle cell disease: summary of the, 2014. PMID:25203083
16. Therrell BL Jr, Lloyd-Puryear MA, Eckman JR, Mann MY. Newborn screening for sickle cell diseases in the United States: A review of data spanning 2 decades.Semin Perinatol, 2015. PMID: 25979783
17. Tshilolo L, Kafando E, Sawadogo M, Cotton F, Vertongen F, Ferster A. *et al* Gulbis B. Neonatal screening and clinical care programmes for sickle cell disorders in sub-Saharan Africa: lessons from pilot studies. Public Health, 2008. PMID:18555498
18. Vignon G, Jeanneau R, Labrousse J, Aubrit S, Mottaz P, Carrère F. *et al*. How I do in front of an hemolytic anemia of unknown etiology? Ann Biol Clin (Paris). 2018; 76(5):493-503. doi: 10.1684/abc.2018.1381. PMID:30226192
19. Tuchscherer A, Chemnitz J. Hemolytic anemia]. Internist (Berl). 2015; 56(9):1000-8. doi: 10.1007/s00108-015-3661-8.[PMID:26245867
20. Quintó L, Aponte JJ, Menéndez C, Sacarlal J, Aide P, Espasa M. *et al*. Relationship between haemoglobin and haematocrit in the definition of anaemia. Trop Med Int Health. 2006; 11(8):1295-302, PMID:16903892
21. Carneiro IA, Drakeley CJ, Owusu-Agyei S, Mmbando B, Chandramohan D. Haemoglobin and haematocrit: is the threefold conversion valid for assessing anaemia in malaria-endemic settings? Malar J. 2007; 6:67. PMID:17519019
22. Barcellini W, Fattizzo B. Clinical Applications of Hemolytic Markers in the Differential Diagnosis and Management of Hemolytic Anemia. Dis Markers. 2015; 2015:635670. doi: 10.1155/2015/635670. Epub 2015 Dec 27. PMID:26819490
23. Cita KC, Brureau L, Lemonne N, Billaud M, Connes P, Ferdinand S. *et al*. Men with Sickle Cell Anemia and Priapism Exhibit Increased Hemolytic Rate, Decreased Red Blood Cell Deformability and Increased Red Blood Cell Aggregate Strength. PLoS One. 2016; 11(5):e0154866. doi: 10.1371/journal. pone. 0154866. E Collection 2016. PMID:27145183
24. Tshilolo L, AissiL M, Lukusa D, Kinsiama C, Wembonyama S, Gulbis B. *et al.* Neonatal screening for sickle cell anaemiafo the Congo Expérience from a pioneer projet on 31 204 newborns. J ClinPathol. 2009, 62(1):35-8.