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Blood Group (ABO/Rh) and Clinical Conditions Common in Children with Nephrotic Syndrome and Sickle Cell Anemia in Angola

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Abstract

Introduction: The ABO system has been the subject of hundreds of publications, some reports suggest associations with gastric cancer, hepatitis B infection, selective cholera pressure, gastrointestinal infections, malaria, and other diseases, but few studies have shown a relationship between blood groups and genetic disorders.

Objective: Determine the blood group (ABO/Rh) and clinical conditions common in children with nephrotic syndrome and sickle cell anemia in Angola.

Methodology: An analytical, descriptive, prospective study with a quantitative approach was conducted; fifty children in the pediatric hospital were enrolled.

Results: The ORh (+) group in nephrotic syndrome (42%) and sickle cell anemia (60%), followed by ABRh(+) in nephrotic syndrome (32%) and sickle cell anemia (34%), the average age of patients with nephrotic syndrome (7.7 years SD=4.2) and sickle cell anemia (7.8 years SD=4.1), the time of the pathology, it was higher in patients with sickle cell anemia (6.8 years SD=4.1) when compared in nephrotic syndrome (1.4 years SD=0.6). Bleeding was frequent in sickle cell anemia (43%) than in nephrotic syndrome (32%), edema and fever were more frequent in nephrotic syndrome (66% and 52% respectively) when compared to sickle cell anemia (10% and 24% respectively); however, myalgia was more frequent in sickle cell anemia (100%) compared to nephrotic syndrome (24%). The anemia complication in patients with sickle cell anemia (50/50=100%) compared to nephrotic syndrome (2/50=4%), kidney disease in patients with nephrotic syndrome (32/50=64%) when compared to sickle cell anemia (5/50=10%). Patients with nephrotic syndrome were treated with nonsteroidal anti-inflammatory drugs (50%) and hemodialysis (24%), in patients with sickle cell anemia, the use of folic acid + hydroxyurea was the most used treatment, especially in group O (above 80%).

Conclusions: We can conclude in this study that children in the blood group ABRh (+) and ORh (+) are more committed to nephrotic syndrome and sickle cell anemia. However, there are no significant differences in the other aspects evaluated.

Keywords: Blood groups; Nephrotic syndrome; Sickle cell anemia; Clinical conditions; Angolan children

Background

The ABO system is, without a doubt, the most well-known blood group. Still, the most functionally mysterious genetic polymorphism in humans since in clinical practice, the ABO system is the most crucial blood group related to compatibility. Since its antigenic discovery, it has been associated with infections and other diseases that have been the subject of hundreds of publications, and some reports suggest associations with gastric cancer, hepatitis B infection, selective cholera pressure, gastrointestinal infections, malaria, and other diseases [1-3].

Nephrotic Syndrome (SN) is a set of signs and symptoms that involve increased permeability of the glomerular membrane, due to the breakdown of its structural and functional barrier, which allows the extravasation of proteins to the glomerular filtrate [4]. The estimated annual incidence of nephrotic syndrome in healthy children is 2 to 7 new cases per 100,000 children under 18 years of age, so the disease has become relatively common in pediatrics, with approximately 50% of children affected between 6 months and five years and 75% older than five years and less than ten years old [5]. According to data from the Pediatric Hospital of Luanda referring to the statistics for the year 2019, it is estimated that of the 21,644 hospitalized children, 46 of them were diagnosed with nephrotic syndrome in the year 2019 alone, representing about 0.21% of children with diabetes with the disease in a single hospital in the capital of Angola, Luanda [6].

Nephrotic syndrome can be classified into two categories: primary, associated with acquired and idiopathic or secondary malformations, which is responsible for severe metabolic disorders that affect the development and growth of the child, which can lead to renal failure and even death, and it is characterized by the presence of edema in varying degrees, massive proteinuria (qualitative proteinuria with +3 and +4 in the urine test or quantitative proteinuria above 50mg/kg/day); hypoalbuminemia (<2.5g/dL) and hypercholesterolemia (above 200mg%) [7]. The secondary nephrotic syndrome, which is associated with systemic diseases, such as diseases of autoimmune, metabolic deposits, solid or hematopoietic tumors, and bacterial or viral infections, drugs or neoplasms, and others, where the underlying systemic conditions associated with nephrotic syndrome, the most common are type 2 diabetes mellitus and systemic lupus erythematosus, and for this, the diagnosis of NS is made through clinical criteria. Laboratory tests must be performed by histopathological analysis on renal biopsy [4].

Sickle-cell disease is an autosomal recessive blood disorder characterized by abnormal red blood cells due to a mutation in the hemoglobin-encoding gene [8]. It is also known as a black race disease because of its origin. Historically, the highest frequency of hemoglobin variants was found in Africa, mainly in the Midwest and South West-Atlantic regions. Currently, this chronic and incurable disease is found in several countries around the world due to miscegenation between different races [8,9]. It is also known as a black race disease because of its origin. Historically, the highest frequency of hemoglobin variants was found in Africa, mainly in the Midwest and South West-Atlantic regions [10].

Currently, this chronic and incurable disease is found in several countries around the world due to miscegenation between different races [8]. In Africa, this disease is expected in areas such as sub-Saharan equatorial regions, located north of the Kalahari Desert where it appears as a natural barrier to the expansion of *Plasmodium falciparum* (malaria-transmitting mosquito). Annually more than 300 000 children are born with the sickle-cell disease each year in Africa, the disease prevalence is 20-30% in Cameroon, the Republic of Congo, Gabon, Ghana, and Nigeria [9]. At the same time, in Uganda, it is around 45%. The majority of these children die before five years old (OMS, 2020). In Luanda, approximately 16,000 babies are born with sickle cell disease each year [11]. Annually, the David Bernardino Pediatric Hospital of Luanda receives about 1,500 new patients with this disease despite the absence of neonatal screening [10,11].

A study carried out in a laboratory in Angola to assess the sickle cell trait and the blood groups in which they perform electrophoresis, concluded that the incidence of the sickle cell trait was high among the study participants and although the number of participants was small (59 patients) to estimate the incidence of sickle cell anemia in the Angolan population, the incidence of the disease and sickle cell trait was high among suspected individuals, especially among those with a family history of the disease. The most common blood group was the O-Rh (+) and AB group -Rh (+) [12].

Although several studies are showing the relationship between blood groups and various diseases, especially infectious diseases, few studies have shown whether there is a relationship between blood groups and genetic disorders, especially nephrotic syndrome and sickle cell anemia, and much fewer studies that present if blood groups may be associated with different symptoms of nephrotic syndrome and sickle cell anemia, for this reason, the present study sought to determine the blood group (ABO/Rh) and clinical conditions common in children with nephrotic syndrome and sickle cell anemia in the pediatric hospital in Luanda David Bernardino, in Angola in the first half of 2020.

Methodology

An analytical, descriptive, prospective study with a quantitative approach was conducted. The study was approved by the Human Research Ethics Committee of the Higher Institute of Health Sciences (Official Letter No. 67/GD/ISCISA/2020) and authorized by the Clinician's direction of Luanda Pediatric Hospital David Bernardino (Official Letter No. 110/DPC/HPL/2020). All patients who agreed to participate in the study had to sign the informed consent form after being informed about the nature and objectives of the study.

Patient recruitment

The study was carried out in all patients with nephrotic syndrome (50 children) and 50 children out of 60 patients with sickle cell disease seen at the hospital between January and June 2020, for patients with nephrotic syndrome the confidence index was 99% without no margin of error, for patients with sickle cell anemia the confidence index was 99% with a margin of error of 7.5%. All patients with nephrotic syndrome who were treated at the David Bernardino hospital were included, while patients with sickle cell anemia were included only those patients who were close to the ages of patients with nephrotic syndrome.

Diagnosis of nephrotic syndrome, sickle cell anaemia and blood groups (ABO/Rh)

All patients included in the study were already patients diagnosed with Nephrotic Syndrome and Sickle Cell Anemia (HbSS) by clinical methods and appropriate laboratory techniques and for this reason were followed up in a specialist consultation by the medical, nursing, and laboratory staff of Hospital David Bernardino, therefore, the diagnosis of the disease was not the responsibility of the research team. The clinical conditions presented in the article were described by the patients and their families and filled in by the investigators after an interview with open and closed questions, other information was obtained by consulting the patients' clinical records, and only information contained in the medical records and described by the patients was included in the study. For the clinical data presented in the article, a blood sample was taken from the patients in test tubes containing EDTA (Ethylenediaminetetraacetic Acid) anticoagulant specific for the ABO and Rh blood group phenotyping tests and the electrophoresis examination. Blood group determination was performed by the microplate technique, which is an agglutination test between patient serum and Anti A, Anti B, and Anti D reagents in each of the wells for phenotypic identification of blood groups (ABO and Rh). Additional information was collected through a questionnaire of open and closed questions applied to their parents, as long as they were the patient's father or mother and resided in the same residence with the child. Other clinical data were obtained from the patients' medical records.

Statistical analysis

All descriptive statistics information data and clinical data were entered into an SPSS v20 database statistical program (IBM SPSS Statistics, USA) and analyzed for the presentation of study results and in tables, the graphs as prepared in the Sigmaplot 12 statistical program (Systat Software, Inc.).

Results

The general data (Table 1) showed that the majority of patients

followed up in the study were in the ORh (+) group, both for patients with nephrotic syndrome 21/50 (42%) and sickle cell anemia 30/50 (60%), followed by patients in the ABRh (+) group where patients with nephrotic syndrome represented 16/50 (32%) and patients with sickle cell anemia represented 17/50 (34%), patients in the ARh (+) and BRh (+) groups, added up presented themselves in insufficient numbers both in patients with nephrotic syndrome 13/50(26%) and in patients with sickle cell anemia 3/50(6%), in the study, there were no Rh patients (-). It was noticed that in patients with nephrotic syndrome, the male/female gender presented very close numbers (24/25), however, in sickle cell anemia, there was a slight predominance of male people concerning the female gender (28/22).

It was also visible (Table 1) that children with more significant difficulties to continue studying were children with nephrotic syndrome (35/50=70%) when compared to children with sickle cell anemia (41/50=82%) and that only 4/50 (8%) of children with nephrotic syndrome had a family history of the disease, in comparison, in patients with sickle cell anemia 40/50 (80%) had a family history of sickle cell anemia. The general average age of patients with nephrotic syndrome (7.7 years SD=4.2) was similar to the average age of patients with sickle cell anemia (7.8 years, SD=3.5), with the highest age in patients with nephrotic syndrome (13.1 SD=4.1) was observed among patients in the ABRh(+) group and while among patients with sickle cell anemia (13.0 SD=0.0) it was observed in patients in the BRh(+) group, however, the time of living with the disease was shorter in patients with nephrotic syndrome (1.4 years SD=0.6) compared to patients with sickle cell anemia (6.8 years SD=4.1) and the more prolonged coexistence with the disease in patients with nephrotic syndrome (1.6 years SD=0.6) was observed in patients with ABRh(+), and in patients with sickle cell anemia (9.0 years SD=7.1) was observed in patients in the ARh(+) group.

Bleeding was one of the symptoms cited by patients as a problem they faced most (Figure 1), among patients with nephrotic syndrome (16/50=32%), this symptom was mentioned by patients in group AB (7/16=44%), group A (2/5=40%), group O (6/21=28%) and group B (1/8=12%), among patients with sickle cell anemia (21/50=43%), this symptom was mentioned by patients in group A (2/2=100%), group B (1/1=100%), group AB (10/17=59%), group and group O (8/30=27%), for both pathologies this symptom was more frequent in male patients compared to female patients (28/22). Edema was mentioned as another symptom that impaired the lives of patients, among patients with nephrotic syndrome (33/50=66%), this symptom was referred by patients in group A (4/5=80%), group O (15/21=71%), in group B (5/8=62%) and group AB (9/16=56%), already among patients with sickle cell anemia (5/50=10%), this symptom was described by patients in group B (1/1=100%), group A (1/2=50%), group AB (1/17=14%) and group O (2/30=7%), in the two groups of patients studied, this symptom was slightly less described by male patients compared to female patients (24/26).

Fever was described as one of the biggest problems faced by patients (Figure 1), among patients with nephrotic syndrome (26/50=52%), it was mentioned by patients in group AB (16/16=100%), in group B (3/8=37%) and group O (6/21=28%) and group A (1/5=20%), in patients with sickle cell anemia (12/50=24%), this symptom was reported by patients in group A (2/2=100%), group B (1/1=100%), group AB (6/17=35%) and group O (3/30=10%), both in patients with nephrotic syndrome and sickle cell anemia, this symptom slightly similar for males and female (16/17). Myalgia was also described as one of the symptoms experienced by patients, among patients with nephrotic syndrome (12/50=24%) it was mentioned by patients in group B (4/8=50%), group A (2/5=40%), group O (5/21=24%) and in the AB group (1/16=6%), among patients with sickle cell anemia (50/50=100), patients described this symptom in the AB group (17/17=100%), A (2/2=100%), group B (1/1=100%) and group O (30/30=100%), in both groups of patients myalgia was described in very comparable data for men and women (31/30).

Among the most frequent complications in these patients (Figure 2), severe anemia was one of the most common, among patients with nephrotic syndrome (2/50=4%) this complication was observed only in patients in group AB (1/16=6%) and group O (1/21=5%), however, among patients with sickle cell anemia (50/50=100%), it was observed among patients in group AB (17/17=100%), A (2/2=100%), in group B (1/1=100%) and group O (30/30=100%), this complication adding patients with nephrotic syndrome and sickle cell anemia was more significant in men compared to women (29/23). Another common complication in the studied patients was kidney disease, which in patients with nephrotic syndrome (32/50=48%), was observed in patients in group AB (12/16=75%), group B (5/8=62%), group A (3/5=60%) and group O (12/21=57%), already among patients with sickle cell anemia (5/50=10%), was observed among patients in group B (1/1=100%) in group A (1/2=50), group O (2/30=7%) and group AB (1/17=6%), this complication for both groups studied was less frequent in male patients compared to female patients (13/20).

When evaluating which treatment was offered to patients (Figure 3), we found that most patients received more than one medicine, in patients with nephrotic syndrome (25/50=50%), steroidal anti-inflammatory drugs (SAID) were used mostly in patients in the blood group of group O (11/21=52%), group AB (8/18=50%), group B (4/8=50) and group A (2/5=40%) in a male/female relationship (16/9), another drug used in these patients (3/50=6%) was nonsteroidal anti-inflammatory drugs (NSAIDs), especially in patients in group B (1/8=12%), group

Table 1: Blood Groups and Patients Condition.

Blood Groups	Nephrotic Syndrome (NS)/Sickle Cell Anaemia(SC)						
	Pathology	Male	Female	Student	F. History	Years	Illness time
	N	n	n	n	N	Mean ± SD	Mean ± SD
ABrh+	16/17	8/10	8/7	12/17	1/17	13,1 ± 4,1/9,1 ± 3,0	1,6 ± 0,6/7,4 ± 4,2
Arh+	5/2	1/1	4/1	4/1	0/2	8,1 ± 1,1/5,0 ± 1,4	1,2 ± 0,4/9,0 ± 7,1
Brh+	8/1	3/1	5/0	6/1	0/1	5,4 ± 4,6/13,0 ± 0,0	1,3 ± 0,5/6,0 ± 0,0
Orh+	21/30	12/16	9/14	13/22	3/30	7,5 ± 4,5/7,2 ± 3,5	1,5 ± 0,6/6,3 ± 4,1
Total	**50/50**	**24/28**	**26/22**	**35/41**	**4/40**	**7,7 ± 4,2/7,8 ± 3,5**	**1,4 ± 0,6/6,8 ± 4,1**

(NS)-Patients diagnosed with Nephrotic Syndrome, (SC)-Patients diagnosed with Sickle Cell Anaemia, (F.History)-Patients with a family history of Nephrotic Syndrome/Sickle Cell Anaemia (Grandparents, parents, siblings, uncles, and cousins), (SD)-Standard Deviation

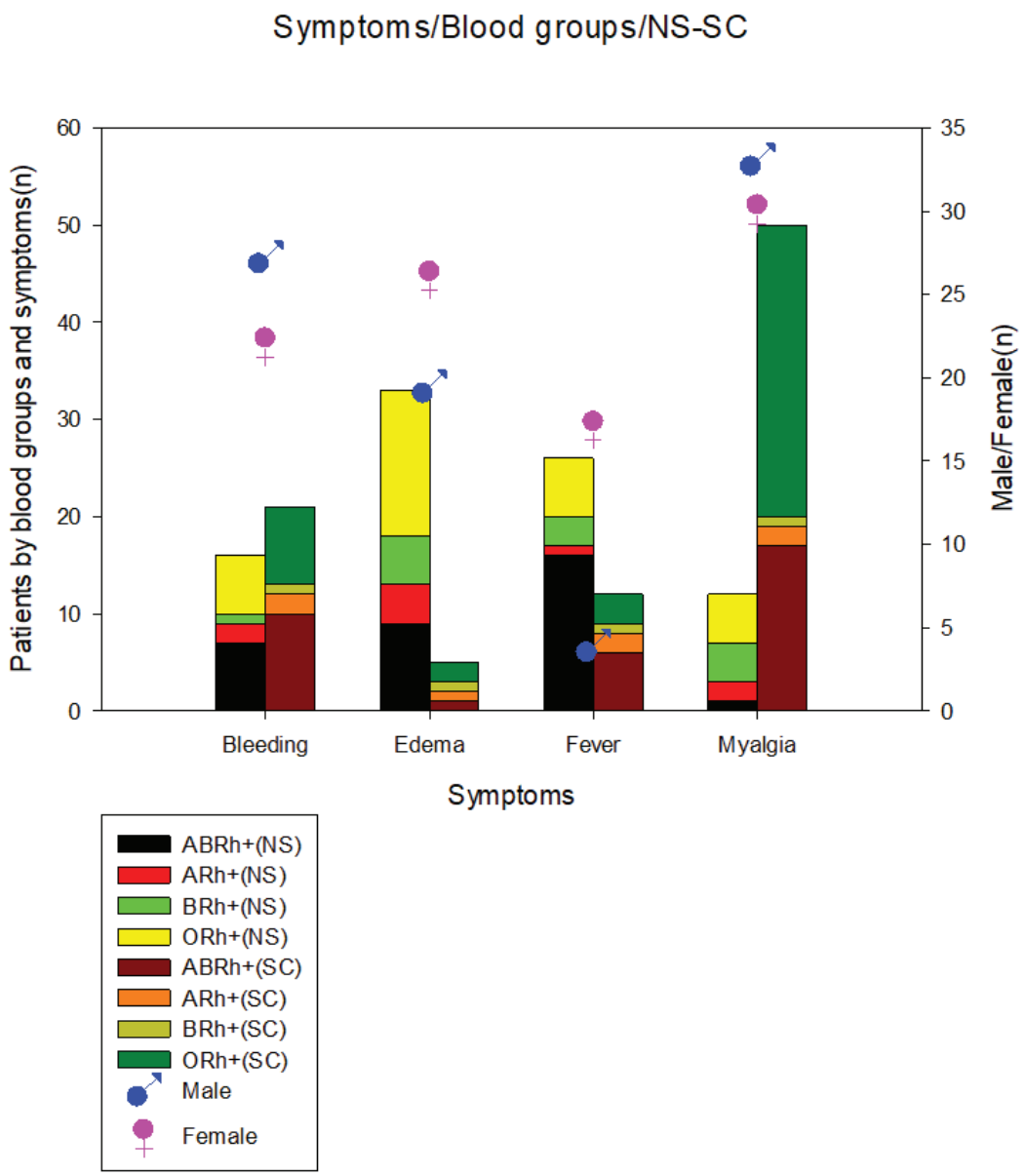

Figure 1: Blood groups and symptoms: (Bleeding): patients who had hemorrhaged. (Edema): patients who had inflammation in the upper and lower limbs. (Fever): patients with temperatures above 37.5°C. (Myalgia): patients who had muscle pain. Patients divided by the symptoms they described the most, in the first bar representing patients with Nephrotic Syndrome (SN) and the second bar representing patients with Sickle Cell Anaemia (SC), each color in the bar representing the number of patients who mentioned the symptom by blood groups.

O (1/21=5%) and group AB (1/16=6%) in a male/female ratio (2/1), hemodialysis (HDA) was another treatment used frequently in patients with nephrotic syndrome with renal complications (14/50=28), especially patients in the AB group (3/16=19%), group A (2/5=40%), group O (7/21=33%) and group B (2/8=25%) in a male/female ratio (2/12). Among patients with sickle cell anemia (36/50=72%), the association between Folic Acid+Hydroxiruea (AF+HU), were a medication used in patients in group O (25/30=83%), in group AB (10/17=59%) and group A (1/2=50%) in a male/female ratio (22/14), another drug association used in these patients(12/50=24%) was Cloxacillin+Persantin (CX+PT), especially in group B patients (1/1=100%), group AB (6/17=35%) and group O (5/30=17%) in a male/female ratio (6/6). Antibiotics (ATNB) were used in patients with nephrotic syndrome (9/50=48%), especially those in group AB (5/16=31%), group B (2/5=40%), group A (1/8=12%), and group O (1/21=5%) and among patients with sickle cell anemia (3/50=6%), antibiotics were used mainly in patients in group B (1/1=100%), in group A (1/2=50%) and group AB (1/17=6%), adding the two groups to the male/female ratio (4/8).

The time of living with the disease was also a verified parameter. It was noticed that some patients lived with the disease between 1 and 5 years, among the patients with nephrotic syndrome were patients in the AB group (16/16=100%), group A (5/5=100%), group B (8/8=100%), and group (21/21=100%), among patients with sickle cell

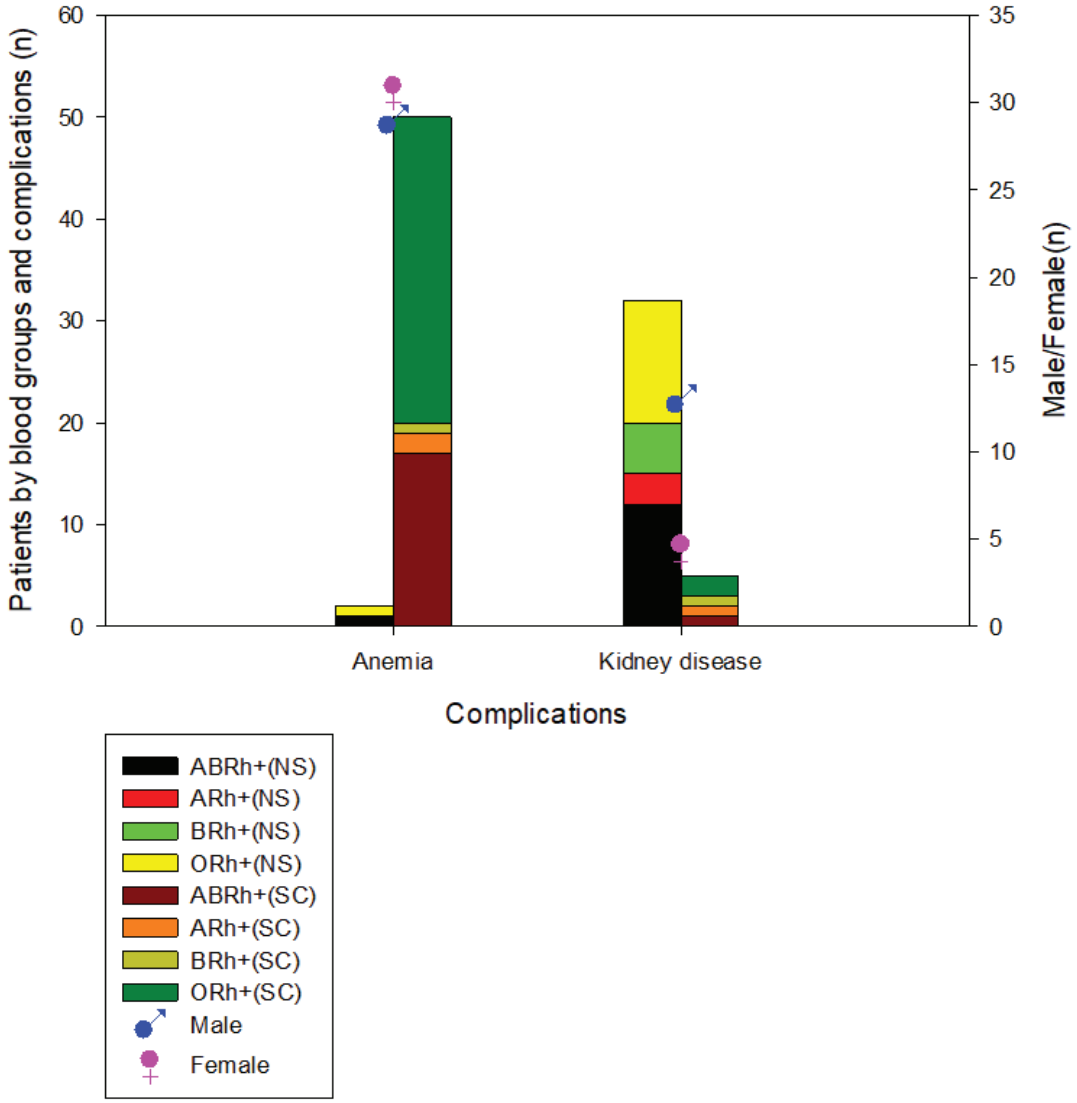

Figure 2: Blood groups and complications: (Anemia): patients who had hemoglobins below 8 g/dL. (Kidney disease): patients who presented a loss of glomerular filtration greater than 70% were assessed by the value of creatinine and urine output. Patients divided by the complication they described the most, in the first bar representing patients with Nephrotic Syndrome (SN) and the second bar representing patients with Sickle Cell Anaemia (SC), each color in the bar representing the number of patients who mentioned the complication by blood groups.

anemia, were patients in group AB (10/17=59%), group A (1/2=50%) and group O (16/30=53%), in a relationship between men/women (39/34). Patients who lived with the disease for 5 to 10 years were also found, among patients with nephrotic syndrome, there were no patients in this condition. Still, patients with sickle cell anemia were found, among them patients in group B (1/1=100%), blood group AB (6/17=35%), and group O (6/30=20%), in a male/female relationship (7/5). No patients with nephrotic syndrome living with the disease between 11 and 15 years were found. However, patients with sickle cell anemia were mostly from the AB group (1/17=6%), from the A group (1/1=50%), and the group O (6/30=27%), in a male/female ratio (6/9).

Discussion

It was noticeable in the study (Table 1), that the patients in the ORh (+) group and represented the majority of the patients studied, both in patients with nephrotic syndrome (42%) and patients with sickle cell anemia (60%), followed by ABRh patients (+) which were also frequent in patients with nephrotic syndrome (32%) and sickle cell anemia (34%), the first data was already expected, however for the second data it was a surprise because a study by our research team in the trace of sickle cell anemia in Angola showed that the ORh (+) blood group was the most affected with 45% (6/13) of the participants, blood groups ARh (+) and ORh (+) together represented 60% (15/25) of the heterozygous participants for the sickle cell trait (AS) [12]. Another

study that assessed the correlation between the ABO/Rh blood group and sickle cell disease and diabetes in Nigeria, found that blood group O has the highest frequency distribution among patients (63%), followed by blood group B (20%). Blood group A (17%), the least was blood group AB with 0% distribution [13]. The present study also differs slightly from a survey in Shanghai to assess whether the ABO blood group is associated with renal outcomes in patients with IgA nephropathy. They found that patients in the non-B (type O/A) group had lower estimated glomerular filtration rate (eGFR) baseline, higher systolic blood pressure (SBP), uric acid, lactate dehydrogenase, highly sensitive C-reactive protein, and tumor necrosis factor-α compared to patients in group B, which led them to conclude that patients with blood type O and A have an increased risk of deteriorating kidney function, which can be explained by a high level of inflammatory status [14] and a study from Ukraine that found that the highest probability of developing chronic kidney disease: glomerulonephritis with nephrotic syndrome was observed in carriers of the ORh+ and ABRh+ antigens [15].

It was found in the present study (Table 1), that the relationship between the health condition and the excellent family history of the disease was more remarkable among patients with sickle cell anemia (40/50) when compared to patients with nephrotic syndrome (4/50), even so, the average age of patients with nephrotic syndrome (7.7 years SD=4.2) was almost similar to patients with sickle cell anemia (7.8 years, SD=4.1). Still, over the time of coexistence with the pathology, it was higher among patients with sickle cell anemia (6.8 years SD=4.1) when compared to patients with nephrotic syndrome (1.4 years SD=0.6). In the study carried out in Angola by our group, 92% (12/13) of the homozygous participants for the sickle cell trait (Hb.SS) were younger, and the average age was 11 years (SD=7.4), and 44% (26/59) of the participants had a direct family history of sickle cell disease12]; however, the study of Shanghai for nephrotic syndrome It concluded that blood type ABO is a new risk factor for progression of IgAN and patients with IgAN blood group O or A is at an independent risk of increased deterioration in renal function, which can be explained by their high levels of markers. Inflammatory [14].

It was found in the study (Figure 1), that bleeding was a frequent symptom among patients with sickle cell anemia (43%) than in patients with nephrotic syndrome (32%) and this symptom was more frequent in patients in blood groups B and A (over 40%) in patients with nephrotic syndrome and in blood groups A, B and AB (over 59%) among patients with sickle cell anemia, while edema and fever were more frequent among patients with nephrotic syndrome (66% and 52% respectively) verified especially in patients of blood group A and O (above 71%) and A and B (above 50%) respectively, when compared to patients with sickle cell anemia (10% and 24% respectively) observing mainly in patients of blood group AB (above 99%) and A and B (above 99%) respectively, however, myalgia were more frequent among patients with sickle cell anemia (100%) compared to patients with nephrotic syndrome (24%) in all patients with sickle cell anemia (above 99%) and patients in group B and A (above 40%) of patients with nephrotic syndrome. In the screening study for sickle cell trait, all participants in the SS study stated that the symptom that motivated the consultation was joint pain (13/13), followed by anemia (9/13) [12].

The most frequent complication found (Figure 2) among patients with sickle cell anemia was anemia (50/50=100%), especially in patients of all blood groups, and this complication was also found in a smaller number of patients with nephrotic syndrome. (2/50=4%), especially in group A and O patients, kidney disease was another complication widely found in patients with nephrotic syndrome (32/50=64%) in all blood groups (over 50%). In contrast, only a small number of patients with sickle cell anemia (5/50=10%) had this complication. A Korean study reports that the complications of nephrotic syndrome are divided into two categories: complications associated with the disease and complications related to the medication and among the complications associated with the disease include infections (e.g., peritonitis, sepsis, cellulitis, and chickenpox), thromboembolism venous thromboembolism and pulmonary embolism), hypovolemic crisis (e.g. abdominal pain, tachycardia, and hypotension), cardiovascular problems (e.g. hyperlipidemia), acute kidney failure, anemia and others (e.g. hypothyroidism, hypocalcemia, bone disease, and invagination) [16]. A study carried out in France found that the number of patients with sickle cell anemia with blood group "O" was relatively higher in the group with painful crises (65%), but was not statistically significant [17]. The data from the present study in patients with sickle cell anemia reinforce another study that recognizes sickle cell disease as a condition not only characterized by vessel occlusion, anemia, and hemolysis but also with increased inflammation, hypercoagulability, increased oxidative stress and defective arginine metabolism [18].

It was found that in patients with nephrotic syndrome (Figure 3), treatment with nonsteroidal anti-inflammatory drugs (50%) and all patients studied (above 40%) and therapy by hemodialysis (24%), especially in group A and O patients (over 33%) were the most used methods, in patients with sickle cell anemia, the use of folic acid +hydroxyurea was the most used treatment, especially in group O patients (above 80%). The treatment described in the patients of the present study has already been described in the Korean study, where corticosteroids, alkylating agents, cyclosporine A and mycophenolate mofetil have been used frequently to treat nephrotic syndrome [16], some studies already developed, claim that the significant complications of nephrotic syndrome include venous thrombosis, hyperlipidemia, infection, and acute kidney injury and that patients of the blood group A, prevalence among our HD patients, was significantly lower than in the general population (P=0.0001). On the other hand, the majority of blood Group B was significantly higher than in the general population (P= 0.0001) [19,20]. In the study carried out in Angola to assess the incidence of the sickle cell trait, blood groups A and O for Rh (+) together represented 60% (15/25) of the participants with sickle cell trait Hb AS, 60% (8/13) of the participants homozygous (Hb SS) for the sickle cell and it was found that 30% (4/13) heterozygous for the sickle cell trait (Hb SS), even without a diagnosis, were already treated with chemotherapy (hydroxyurea) and antiplatelet (Persantin) as well as 62% (8/13) used folic acid and 15% (2/13) had already obtained blood transfusions [12] another confirming a study that reported that therapies targeted based on the pathophysiological mechanisms of sickle cell disease include hydroxyurea, L-glutamine, crizanlizumab and other drugs that are currently on the market or are about to become available [21]. A study that evaluated increased vasoocclusive crises in patients with sickle cell disease blood group "O", found that of 72 patients (81%) included in the study, 37 (51%) had blood group "O" phenotype, while 35 had non-O blood group [group A -18; group B-14 and AB -3], of these 37 (42%) patients were undergoing stable therapy with hydroxyurea [17].

It was found in the study (Figure 4) that all patients with nephrotic syndrome (50/50=100%) regardless of blood group and many patients with sickle cell anemia (27/50=54%) especially in patients in the group AB, O and A (over 50%) lived with the disease for less than six years, however, among patients with sickle cell anemia some patients lived with the disease for 6 to 10 years, especially patients in blood group B and AB and another group lived with the disease for over ten

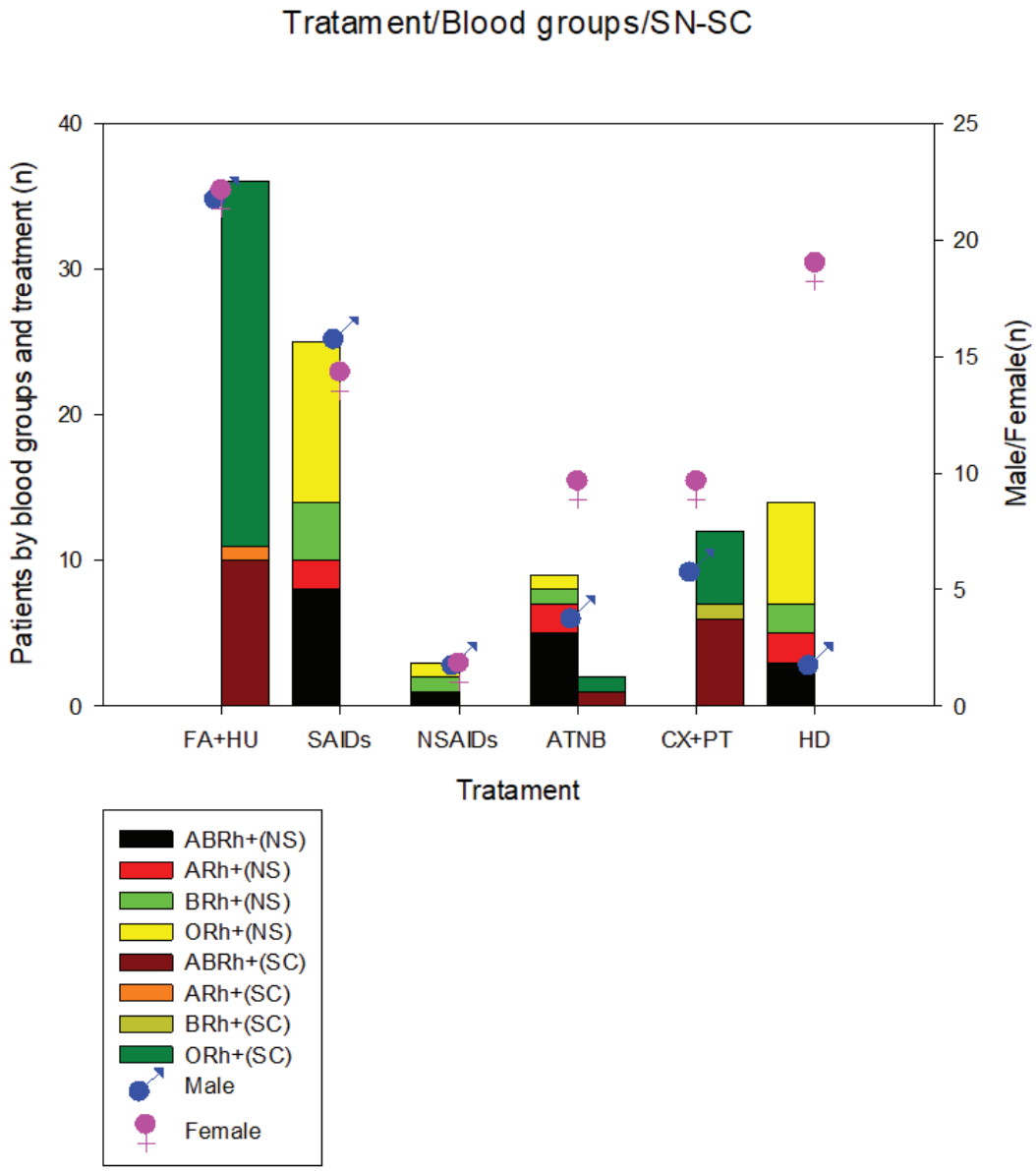

Figure 3: Blood groups and treatment: (FA+HU): patients treated with folic acid+hydroxyurea. (SAID): patients treated with steroidal anti-inflammatory drugs. (NSAIDs): patients treated with nonsteroidal anti-inflammatory drugs. (ANTB): patients treated with antibiotics. (CX+PT): patients treated Cloxacillin+Persantin. (HD): patients treated by hemodialysis. Patients divided by the treatment they described the most, in the first bar representing patients with Nephrotic Syndrome (SN) and the second bar representing patients with Sickle Cell Anaemia (SC), each color in the bar representing the number of patients who mentioned the treatment by blood groups.

years, especially A and O. A study by researchers at Western Reserve University concluded that outside North America, the life expectancy of patients with sickle cell anemia is 30 to 40 years and many guidelines have been developed to control sickle cell disease, including penicillin prophylaxis for children, blood transfusions and pneumococcal vaccination [22]. Another study by American authors reports that nephrotic syndrome represents the most common primary glomerular disease in children aged <16 years in Europe and North America, at the time of the first presentation about 80% of children reach complete remission in 4 weeks of corticosteroid therapy and are classified as having steroid-sensitive nephrotic syndrome (SSNS), despite that, patients with steroid-resistant nephrotic syndrome (SRNS) were more challenging to treat, with 36% -50% progressing to end-stage kidney disease in 10 years [23].

Conclusion

We can conclude in this study that children in the blood group ABRh (+) and ORh (+) are more committed by nephrotic syndrome and sickle cell anemia, although there are no significant differences in other aspects evaluated, this study seems to be the first in a sick population developed in Angola where blood group AB is present in larger numbers than blood groups A and B, raising the suspicion that this may be the reason for finding fewer numbers of people in blood group AB in adults, which suggests higher mortality in childhood,

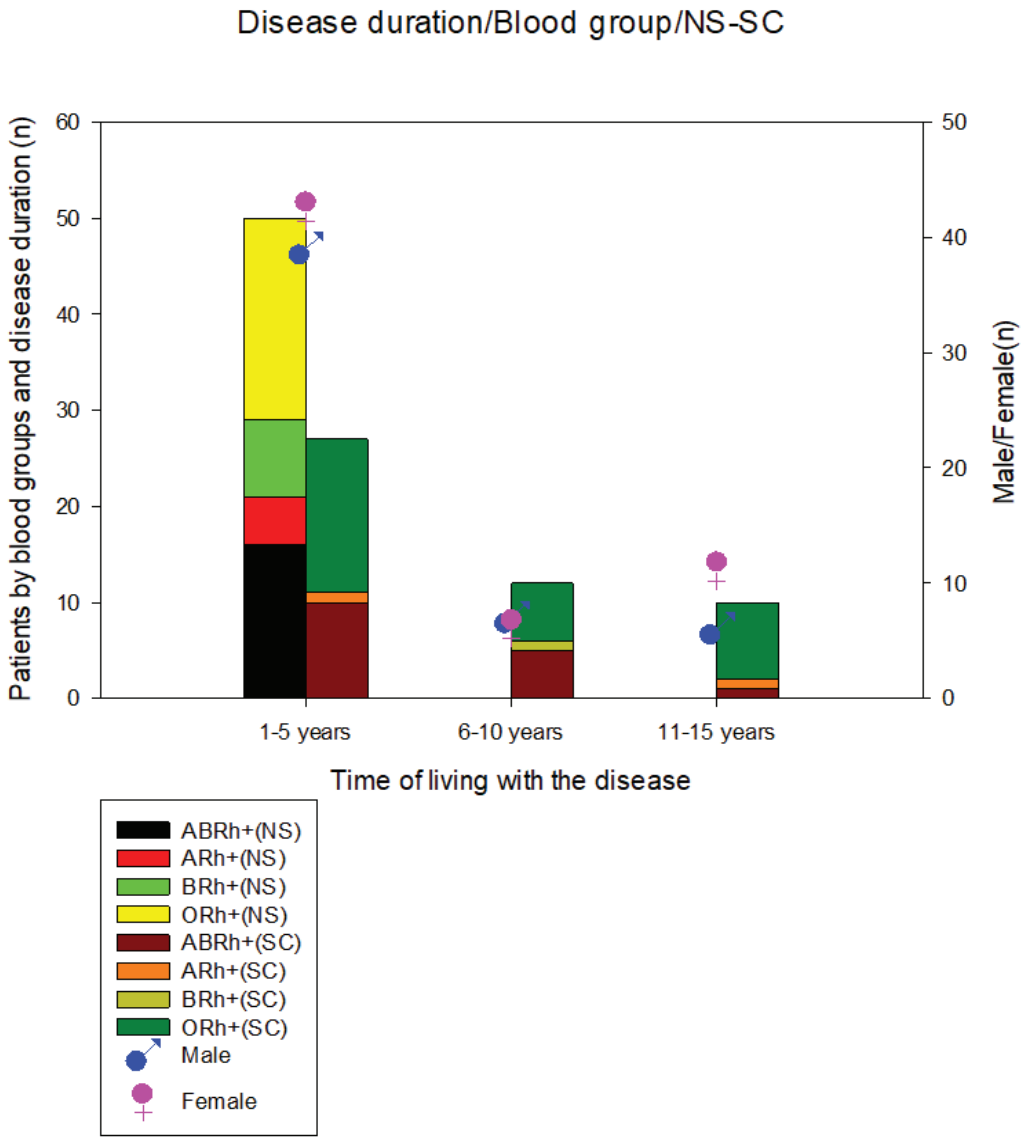

Figure 4: Blood groups and disease time: (1 to 5 years): patients living with the disease between 1 to 5 years. (6 to 10 years): patients living with the disease between 6 to 10 years. (11 to 15 years): patients living with the disease between 11 to 15 years. Patients divided by the treatment they described the most, in the first bar representing patients with Nephrotic Syndrome (SN) and the second bar representing patients with Sickle Cell Anaemia (SC), each color in the bar representing the number of patients who mentioned the treatment by blood groups.

however, further studies in children are needed to assess this possibility, not only in patients with nephrotic syndrome and sickle cell anemia, as well as in other diseases.

Limitations of the Study

One of the limitations of the study was the number of patients, which was only 50 for each group, but represented 100% of the patients with nephrotic syndrome and about 83% of the patients with sickle cell anemia so that they can be representative of the studied population. Another limitation was the fact that we did not carry out other laboratory tests to assess the clinical condition of the patients studied, as this study received no funding and was developed with funds from the researchers, which was insufficient to cover other expenses.

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