Comparative Study of the Disturbance of Blood Cell Parameters and Blood Biochemistry During Dengue Versus Malaria in The Infectious Diseases Department of the Yalgado Ouédraogo University Hospital.

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ABSTRACT
OBJECTIVE: to compare the disturbances in blood flow and biochemistry parameters during dengue versus malaria.

METHOD: This was a retrospective descriptive and analytical study, over a 4-year period from January 1, 2015 to December 31, 2018**.**

RESULT: A total of 43 dengue and 43 malaria cases were collected. The most represented age group was 20 to 29 in both groups. The sex ratio was 1 in both groups. The majority of patients came from urban areas. Anemia, leukocytosis, decreased hematocrit, increased creatinine and blood urea were statistically significantly associated with malaria, while leukopenia, thrombocytopenia, increased ALAT were associated with dengue. Malaria patients were 46 times more likely to have reduced hematocrit (OR=46.15), 16 times more likely to have anemia (OR=16.37), 6 times more likely to have increased creatinine (OR=6.71), 7 times more likely to have increased urea (OR=7.2) and 4 times more likely to have acidosis (OR=4.06) compared to dengue patients. Patients with dengue fever were 5 times more likely to have hypochloremia (OR=5.27) than patients with malaria.

CONCLUSION: The clinician will need to think of malaria in the face of anemia, leukocytosis, acidosis, increased creatinine and urea. He will have to think about dengue before thrombocytopenia, leukopenia, hypochloremia and an increase in ALAT.

KEYWORDS: comparison, dengue, malaria, parameters, blood count, biochemistry.

I. INTRODUCTION:

Dengue fever and malaria are major public health problems in sub-Saharan Africa. According to World Health Organization (WHO) estimates, there are 390 million cases of dengue fever worldwide, including 500,000 severe cases each year [2, 3, 4]. As for malaria, there are 229 million cases, 90% of which are recorded in Africa. The African continent pays the heaviest price for this scourge. Out of a total of 409,000 malaria deaths worldwide, 91% of cases occur on the African continent [4.8]. In Burkina Faso, malaria remains the primary reason for consultation and death in peripheral health training [9]. If in the majority of cases of malaria and dengue are benign [1], severe forms can be observed. Management of these two infections is hampered by the lack of specific antiretroviral treatment for dengue fever, and increased resistance to antimalarial [14, 15]. During these two infections, disturbances of biochemical parameters and blood count are observed, the correct interpretation of which allows optimal management of patients. The objective of this study was to compare the disruption of biochemical parameters and blood count during these two infectious diseases.

Patients and Method : Our study was carried out in the infectious disease department of the Yalgado Ouédraogo University Hospital Centre in Ouagadougou, Burkina Faso. It is a specialized department in the management of infectious diseases. It is responsible for both epidemic and non-epidemic diseases. This was a retrospective descriptive and analytical study that took place from January 1, 2015 to December 31, 2018. All patients admitted to the Infectious Diseases service for dengue or confirmed malaria, and with a minimal biological assessment (thick drop, dengue serology, NFS, transaminase, ion gram, urea creatinine), were included. Not included were patients admitted for dengue fever or malaria whose medical records were incomplete or inoperative. Patients with dengue fever and malaria were matched by pathology, sex and age. The proportions were compared using the Chi 2 test with a p 0.05 significance threshold. Reference values for biological parameters are presented in Tables I and II.

Table I: Blood Count Parameter Reference Values [9]

Parameters	Child	Adult male	Adult female
Reed Blood cells 106/mm3	3,9 to 5,3	4,5 to 6,5	3,8 to 5,8
Hemoglobin g/dl	11,5 to 15,5	12,9 to 17	11,5 to 16
Hematocrit %	35 to 45	40 to 54	37 to 47
VGM	77 to 95	80 to 100	
White blood cells 10³/mm³	4,5 to 11,5	4 to 10	
PNN 10³/mm³	1,5 to 8	1,5 to 7,5	
SOP 10³/mm³	0 to 0,6	0 to 0,5	
GNP 10³/mm³	0 to 0,2		
Lymphocyte 10³/mm³	1 to 6,2	1 to 4	
Plates 10³/mm³	150 to 400		
Reticulocytes 10³/mm³	25 to 85		

Table II: Reference values for biochemical parameters [10]

Parameters	Normal values	Abnormal values
ASAT (UI/l)	10-40	More than 40
ALAT (UI/l)	8-38	More than 38
Creatinine (µmol/l)	50-120	More than 120
Urea (mmol/l)	2,5-7	More than 7
Protidemia (mmol/l)	65-80	less than 65 and more than 80
Blood sugar (mmol/l)	3,3-6,3	less than 3,3 and less than 6,3
Calcemia (Ca2+) (mmol/l)	2,2-2,6	Less than 2,2 and more than 2,6
Magnesium (mmol/l)	0,65-1	Less than à 0,65 and more à 1
Sodium (Na+) (mmol/l)	133-145	Less than 133 more than 145
Potassium (kalemia) (mmol/l)	3,5-5	Less than 3,5 more than 5
Chlorine (Chloraemia) (mmol/l)	98-106	Less than 98 more than 106
Phosphorus (mmol/l)	0,80-1,35	Less than 0,80 more than 1,35
Bicarbonate (mmol/l)	23-29	Less than 23 more than 29

II. RESULTS

A total of 43 malaria cases and 43 dengue cases were collected. The most represented age group was 20 to 29 in both groups. The sex ratio was 1 in both groups. The majority of patients hospitalized for dengue and malaria were students and students, accounting for 46.88% of dengue cases and 33.33% of malaria cases, respectively. The majority of patients came from urban areas (73.68% of malaria cases and 94.87% of dengue cases). Hematological and biochemical disturbances are presented in Tables III and IV

Disturbances in the blood count : Anemia, decreased hematocrit and leukocytosis were associated with malaria, while leukopenia and thrombocytopenia were statistically significantly related to dengue.

The following Table III presents hematological disturbances.

Table III: Analysis of hematological disturbances

Factors	Numbers (%)		Odds Ratio (OR)	95% CI	P
	MALARIA	**DENGUE**			
Hemoglobin					
- Aenemia	34 (79,07)	6 (13,95)	16,37	5,35-50,11	<0,0001
Hematocrit %					
- Hematocrit lowered	40 (93,02)	13 (30,23)	46,15	11,06-192,66	<0,0001
Platelet count					
Thrombocytopenia	17 (39,53)	33 (76,74)	0,2	0,09-0,57	0,0014
Leukocyte					
- <4000	0 (0)	19 (44,19)	NA		<0,0001
- >10000	17(39,53)	0 (0)	NA		<0,0004

Disturbances of blood biochemistry : Elevation of urea and creatinine was associated with malaria and elevation of ALAT was associated with dengue in a statistically significant manner. Patients with malaria were 4 times more likely to have acidosis and 6 times more likely to have high creatinine levels than those with dengue. The following Tables IV and V present the disturbances of biochemical parameters.

Table IV: Biochemical Parameter Disturbance Analysis

Parameter	Frequency (%)		Odds Ratio (OR)	95% CI	P
	Malaria	**Dengue**			
ASAT increased	6 (75)	29 (85,29)	0,52	0,09-2,89	0,48
ALAT increased	2 (25)	31 (91,18)	0,03	0,0052-0,20	<0,0001
Hypoglycemia	3 (8,11)	2 (8)	1,03	0,17-6	0,98
Hyperglycemia	15 (40,54)	10 (40)	1,03	0,36-2,92	0,96
Creatininemia increased	15 (33,88)	4 (9,30)	6,71	2,05-22	0,001
Urea incresed	18(41,86)	3 (6,98)	7,2	1,99-26,01	0,002

Disturbances in the ionogram

Table V: Ionogram Parameter Disturbance Analysis

Factor	Numbers (%)		Odds Ratio (OR)	95% IC	P
	MALARIA	**DENGUE**			
Calcemia					
- <2,2	22(51,16)	20(46,51)	0,87	0,37-2,03	0,74
- >2,6	1(2,33)	2(4,65)	1,9	0,23-15,75	0,61
Chloremia					
- <98	8(18,60)	25(58,14)	5,27	1,96-14,16	0,08
- >106	8(18,60)	2(4,65)	0,42	0,09-1,96	0,30
Kalaemia					
- <3,5	8(18,60)	4(9,30)	0,42	0,12-1,44	0,18
- >5	5(11,63)	3(6,98)	0,5	0,12-2,08	0,36
Natremia					
- <133	10(23,26)	6(13,95)	0,48	0,16-1,44	0,20
- >145	4(9,30)	1(2,33)	0,20	0,03-1,36	0,13
Magnesemia					
- <0,65	5(11,63)	3(6,98)	0,62	0,15-2,57	0,53
- >1	5(11,63)	8(18,6)	1,65	0,51-5,35	0,42
Bicarbonate					
- Reduced bicarbonate	13(72,22)	4(33,33)	4,06	0,78-20,95	0,10
- Increased bicarbonate	1(5,56)	3(25)	0,42	0,04-4,08	0,5
Phosphoremia					
Phosphoremia increased	5(27,78)	4(14,81)	2,9	0,62-13,77	0,19
Phosphoremia increased	7(38,89)	9(33,33)	1,81	0,48-6,87	0,39

III.   DISCUSSION

The most represented age group was 20 to 29, comparable to what Meena et al. reported in India [11]. Anemia was associated with malaria in our series and patients with malaria were 16 times more likely to develop anemia than a patient with dengue fever. Our results are comparable to those of Bashawri et al in Saudi Arabia [13]. While leukopenia is significantly associated with dengue, leukocytosis was associated with malaria. And patients with malaria were 5 times more likely to develop leukocytosis than patients with dengue fever. As for

thrombocytopenia, it was associated with dengue; patients with dengue were 4 times more likely to have thrombocytopenia than patients with malaria. Our results are comparable to those of Meena et al. in India [11]. In our study, impairment of kidney function was more common during malaria, while impairment of liver function was common during dengue. The same observation was made by Epelboin in Guyana [12].

IV. CONCLUSION

Our study revealed associations between dengue fever and thrombocytopenia, leukopenia and an increase in alanine aminotransferase (ALAT), on the one hand and an association between malaria and anemia respectively, hyper leukocytosis, an increase in urea and creatinine. A better interpretation of these disturbances allows an optimal management of these pathologies. Thus the clinician will have to think of malaria before anemia, leukocytosis, acidosis, an increase in creatinine and urea. He will have to think about dengue before thrombocytopenia, leukopenia, hypochloremia and an increase in ALAT.

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