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Prevalence of Coinfection Malaria-Covid-19 at the International Hospital Center of Kinshasa during the 3rd Wave of the Pandemic

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Abstract

Background: Since 2019, Covid-19 pandemic has afflicted the world and countries of Africa. Despite the limited resources, these countries already disturbed by multiple diseases that have not yet been controlled such as malaria, must face this pandemic whose success in the management depends on the early detection of the disease. The objective of this study was to determine the prevalence of Malaria-Covid-19 coinfection in our environment. **Methods:** This was a retrospective analysis of patients' data with Covid-19 infection from May to July 2021 at the International Hospital center of Kinshasa "CHIK". We collected data and analysis was performed on the sociodemographic parameters, the notion of anticovid-19 vaccination as well as the duration of the symptomatology before the consultation, the clinical manifestations and the laboratory data available while including the data of the thick drop. **Results:** A total of 84 patients were registered with an average age of 35.23 ± 12.74 years. The male sex was predominant (82.1%). The Indian community was the most affected (44.2%). The average of days elapsed before the consultation of 3.63 days. The anti-Covid-19 vaccination rate was 20.3%. The prevalence of Malaria-Covid-19 coinfection was 29.76%. In coinfected patients, fever and cough were more reported (64%). Regarding biological and inflammatory parameters, 31.8% of coinfected patients had a platelet count less than 150,000 elements/mm^3 compared to 11.6% in non-Co-infected ($p = 0.046$). **Conclusion:** The Malaria-Covid-19 comorbidity prevalence is high in Malaria endemic country like Democratic Republic of Congo (DRC). It is necessary to make better distinction, to detect early the comorbidity in order to better guide care and not be limited to treating malaria, letting the Covid-19 evolve.

Keywords

Coinfections, Covid-19, Malaria, Prevalence

1. Introduction

Covid-19 is a viral infection transmitted by the SARCOV2. Since the end of 2019, it has been afflicted populations around the world and causing many deaths among the population creating a pandemic [1].

Malaria is a parasitic disease transmitted by the bite of female Anopheles mosquito [2]. Both of these illnesses are febrile and have several common signs [3].

According to the Center for diseases control and prevention (CDC), the clinical signs of Covid-19 are Fever or chills, Cough, Shortness of breath or difficulty breathing, Fatigue, Muscle or body pain, Headache, New loss of taste or smell, Sore throat, Congestion or runny nose, Nausea or vomiting, Diarrhea [4].

Africa, already afflicted by malaria, which is still not controlled and continues to cause death, must face this pandemic despite limited resources.

Several million have been spent since the start of this pandemic to try to respond effectively to this Pandemic that is causing both a health and an economic disaster. These sums far exceed the amount spent on the fight against malaria [5].

Prevention measures involving distribution campaigns of long-lasting insecticide-treated mosquito nets and efforts to provide essential and antimalarial drugs to remote areas have been challenged by the constraints imposed on the world by this new disease. Some studies have predicted an increase in malaria deaths worldwide [6].

While studies recommend that during the pandemic, the presence of a fever should raise suspicion of infection with SARCOV2. In DRC, fever is still considered synonymous of Malaria infection. Therefore, the majority of Covid-19 positive patients at the moderate and severe stage have a notion of taking antimalarial before admission [7].

The success of the management of Covid-19 depends on the early detection of the disease. It is necessary to make the distinction, to detect Covid-19 and Malaria coinfection early, in order to guide efficiently care and not limit ourselves to treating malaria, allowing Covid-19 to evolve.

The objective of this study was to assess the prevalence of Malaria-Covid-19 coinfection in patients treated for Covid-19 at the "Centre Hospitalier International de Kinshasa", DRC during the 3rd wave of the Covid-19 pandemic.

2. Methods

2.1. Setting, Nature and Study Population

This study was conducted among patients treated for Covid-19 during the third wave of Covid-19 at the Centre Hospitalier International de Kinshasa, from May

to July 2021.

All patients followed for Covid-19 with positive RT-PCR Covid-19/SARCOV2 antigen results who had undergone an examination for Malaria during the third wave of Covid-19 were included.

Malaria has been diagnosed by both a rapid diagnostic test (RDT) based on the detection of Plasmodium antigen and/or by microscopic visualization of Plasmodium on a thick drop with Giemsa staining.

2.2. Data Collection

Demographic, clinical, and laboratory data were extracted from medical record using a pre-established survey questionnaire.

The interested variables were: 1) Socio-demographic: age, gender, nationality; 2) Clinical: symptoms, pulse, blood pressure, respiratory rate, temperature, height, weight, saturation, Covid-19 vaccination notion, and disease evolution; 3) Biological: C reactive Protein(CRP), Malaria thick smear, haemoglobin (Hg), Hematocrit (Hct), white blood Cells (WBC), Platelets, D-Dimer, Procalcitonin(PCT), Urea, Creatinine and D vitamin. Coinfected patient was patient with positive test on both Sarscov2 and Malaria, non-coinfected patient was patient with a positive Covid-19 test with a negative Rapid Diagnosis Test for Malaria (RDT-Malaria) and thrombocytopenia defined as a platelet count below 150 000/mm^3.

2.3. Statistical Analysis

SPSS 21 was used for all statistical analysis. We calculated frequency and standard deviation (SD) in normal distribution and medians plus the interquartile range (IQ) in non-Gaussian distribution were calculated. Comparison was made between coinfected and non coinfected patient using the Student's T test for quantitative and qualitative variables. The Chi-square test was used at $p < 0.05$.

3. Results

A total of 84 patients were included in this study (Table 1). The mean age was 35.23 ± 12.74 years. Among the patients treated, the majority were male (82.15%) with a sex ratio of 4.3 men for 1 woman. While the majority of participants were of Indian nationality (48.8%), Congolese treated for Covid-19 during this period represented 8.3% and other nationalities represented 14.3% (Zimbabweans, Malians, Cameroonians and Bangladeshis).

Seventeen patients (18.95%) were vaccinated against Covid-19. Among them, 15 (17.9%) received one dose of Covid-19 vaccine and 2 (2.4%) received 2 doses of the same vaccine (Table 2). The prevalence of Malaria-Covid-19 coinfection was 29.76% (Figure 1).

The average number of days elapsed was evaluated at 3.63 days. The majority of patients (83.16%) were consulted within 5 days of the onset of symptoms (Table 2).

Table 1. Sociodemographic characteristics.

Variables	All n = 84 (%)	Male n = 69 (%)	Female n = 15 (%)	p
Age (years)	35.23 ± 12.74	34.72 ± 10.50	37.53 ± 20.46	**0.022**
<18 years	4 (4.8)	2 (2.9)	2 (13.3)	
19 - 59 years	75 (89.3)	65 (94.2)	10 (66.7)	
≥60 years	5 (6.0)	2 (2.9)	3 (20.0)	
Nationality				**0.020**
Congolese	7 (8.3)	3 (4.3)	4 (26.7)	
Others	12 (14.3)	8 (11.6)	4 (26.7)	
Lebanese	24 (28.6)	22 (31.9)	2 (13.3)	
Indian	41 (48.8)	36 (52.2)	5 (33.3)	

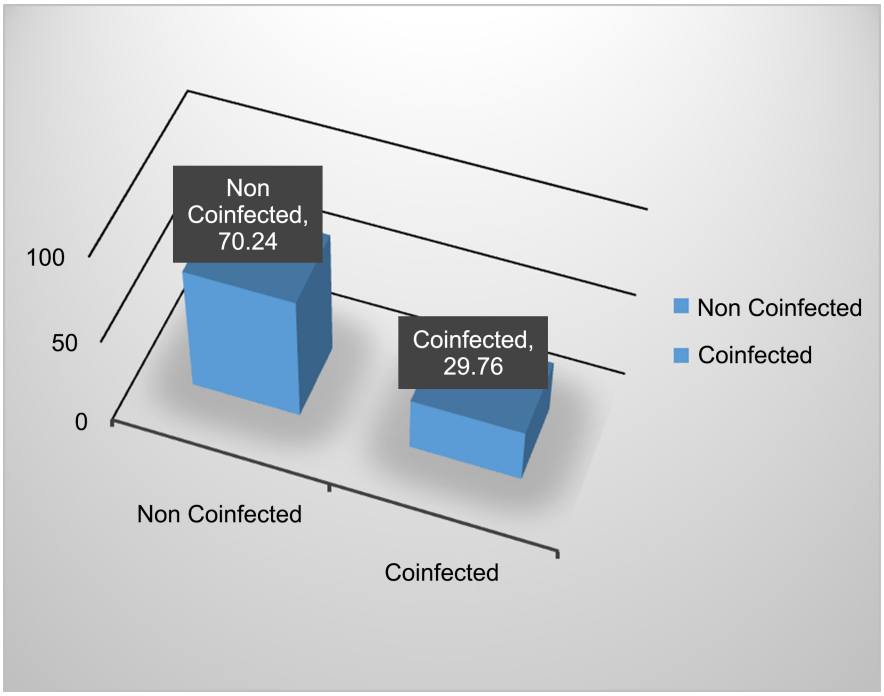

Figure 1. Prevalence of coinfection Malaria-Covid-19.

Median weight was 72.86 ± 17.72 Kg and mean respiratory rate, pulse, temperature and SaO_2 were respectively 20.57 ± 3.89 cycle per minute, 94.54 ± 15.55 pulse per minute, 37.04 ± 0.84˚C and 96.41 ± 1.85%.

Fever (76.2%), Cough (60.7%), body aches (50.0%), Headache (58.3%), Physical asthenia (40.5%), Chill (40.5%), Sore throat (25.0%), Dyspnea (8.3%) were the most reported signs.

There was no statistically significant difference between the two groups re-

garding clinical characteristics (Table 2). Thrombocytopenia was more associated with co-infected patients (31.8%) compared to non-coinfected patients (11.3%) while the other biological parameters were similar (Table 3). All patients were treated and cured, no deaths were reported.

Table 2. Clinical characteristics and symptoms.

Variables	All (n = 84)	TD− (n = 59)	TD+ (25)	P
Vaccine				0.234
Vaccinated patient (1 dose)	15 (1.9%)	13 (22.0%)	2 (8.0%)	
Vaccinated patient (2 doses)	2 (2.4%)	1 (1.7%)	1 (4.0%)	
Unvaccinated patient	67 (79.8%)	45 (76.3%)	22 (88.0%)	
Number of days of symptoms before consultation	3.63 ± 4.19	3.16 ± 2.89	5.85 ± 7.80	0.192
<5 days	69 (82.1)	59 (85.5)	10 (66.7)	
5 - 10 days	11 (13.1)	8 (11.6)	3 (20.0)	
>10 days	4 (4.8)	2 (2.9)	2 (13.3)	
Clinical parameters				
Weight	72.86 ± 17.72	71.87 ± 18.12	75.19 ± 16.86	
Respiratory rate	20.57 ± 3.89	20.84 ± 4.37	19.93 ± 2.35	
Pulsation	94.54 ± 15.55	94.43 ± 17.24	94.80 ± 10.83	
Temperature	37.04 ± 0.84	37.01 ± 0.83	37.11 ± 0.89	
SaO_2	96.41 ± 1.85	96.34 ± 2.05	96.59 ± 1.28	
Symptomatology				
Fever	64 (76.2)	48 (81.4)	16 (64.0)	0.79
Cough	51 (60.7)	35 (59.3)	16 (64.0)	0.687
Aches	42 (50.0)	27 (45.8)	15 (60.0)	0.340
Headaches	41 (58.3)	34 (57.6)	15 (60.0)	1
Physical asthenia	34 (40.5)	26 (44.1)	8 (32.0)	0.340
Thrill	34 (40.5)	24 (40.7)	10 (40.0)	1
Sore throat	21 (25.0)	16 (27.1)	5 (20.0)	0.589
Dyspnea	7 (8.3)	6 (10.2)	1 (4.0)	0.668

TD+: patient with malaria. TD−: patient without malaria.

Table 3. Biological parameters.

Variables	All	TD−	TD+	p
Hemoglobin	14.28 ± 1.57	14.25 ± 1.70	14.37 ± 1.21	
Hematocrit	43.48 ± 4.26	43.36 ± 4.65	43.76 ± 3.21	
White blood cells	**(n = 78)**	**(n = 55)**	**(n = 23)**	0.383
<3500	4 (5.1)	3 (5.5)	1 (4.3)	
3500 - 10,000	73 (93.6)	52 (94.5)	21 (91.3)	
>10,000	1 (1.3)	0 (0.0)	1 (4.3)	
Neutrophils	**(n = 78)**	**(n = 55)**	**(n = 23)**	0.983
<50	10 (12.8)	7 (12.7)	3 (13.0)	
50 - 70	48 (61.5)	34 (61.8)	14 (60.9)	
>70	20 (25.6)	14 (25.5)	6 (26.1)	
Lymphocytes	**(n = 78)**	**(n = 55)**	**(n = 23)**	0.739
<20	28 (35.9)	20 (36.4)	8 (34.8)	
20 - 40	45 (57.7)	32 (58.2)	13 (56.5)	
>40	5 (6.4)	3 (5.5)	2 (8.7)	
CRP	**(n = 67)**	**(n = 46)**	**(n = 21)**	0.910
<5 mg/L	42 (62.7)	30 (65.2)	12 (57.1)	
5 - 100 mg/L	19 (28.4)	11 (23.9)	8 (38.1)	
>100 mg/L	6 (9.0)	5 (10.9)	1 (4.8)	
Platelet	**(n = 75)**	**(n = 53)**	**(n = 22)**	**0.046**
<150,000	13 (17.3)	6 (11.3)	7 (31.8)	
150,000 - 400,000	62 (82.7)	47 (88.7)	15 (68.2)	
D-dimer	**(n = 37)**	**(n = 25)**	**(n = 12)**	0.662
<500	30 (81.1)	20 (80.0)	10 (83.3)	
500 - 1000	4 (10.8)	4 (16.0)	0 (0.0)	
>1000	3 (8.1)	1 (4.0)	2 (16.7)	
Vitamin D	**(n = 8)**	**(n = 6)**	**(n = 2)**	0.537
<20	4 (50.0)	3 (50.0)	1 (50.0)	
20 - 30	1 (12.5)	0 (0.0)	1 (50.0)	
>30	3 (37.5)	3 (50.0)	0 (0.0)	

TD+: patient with malaria. TD−: patient without malaria.

4. Discussion

Covid-19 and Malaria are febrile diseases and their systemic signs are common [8]. The clinical signs may be the same at the beginning of the disease with small differences that can be difficult for clinician to detect.

Malaria still being one of the major causes of mortality in developing countries, thus a coinfection with Covid-19 theoretically would reinforce this mortality hypothesis. In the present study, Malaria-Covid-19 coinfection prevalence was 29.76%. This prevalence is far higher than that found in a study carried out at the Ngaliema clinic in Kinshasa (DRC) where it was less than 1%. The difference can be explained by the fact that more than half of the patients admitted to their cohort had a notion of taking antimalarials before admission, probably treating malaria while allowing Covid-19 to evolve [7]. In Sudan (Khartoum), a study carried out at the Universal Covid-19 treatment center (UCTC), this prevalence was estimated at 45.7% [9].

In Libreville, Moutombi Ditombi found a Malaria-Covid-19 coinfection prevalence of 6.1% in the child population while in the general population of Burkina Faso, this prevalence was 1.9% according to López-Farfán [10] [11] and in Cameroon, Esther Voundi-Voundi found 0.9% Malaria-Covid-19 coinfection [12]. That variability of results can be explained by the different socio-demographic characteristics of these study populations. In the present study, there was no statistically significant difference between the coinfected patient and non-coinfected patient group regarding clinical characteristics, of course explained by the similarities of some symptoms between Malaria and Covid-19. This claim corroborates Hussein's writings that the similarity of symptoms of Malaria and Covid-19 may cause clinicians to misdiagnose Malaria case like Covid-19 or vice versa or overlook the possible coinfection [13].

The early detection of Malaria and Covid-19 in endemic area is important to take into account in the treatment. In the present study, the average of days before the consultation was 3.63 ± 4.19 days, which is lower compared to what was noted by Matangila [7] explaining the care delay and the occurrence of more complications found in his study.

Regarding biological parameters, a statistically significant difference related to thrombocytopenia was found between coinfected and non-coinfected patients ($p = 0.046$). Indeed, the coinfected patients were more thrombocytopenic than the non-coinfected patients.

Khermatch and Mandala [2] [14] found also a high rate of thrombocytopenia in Malaria-Covid-19 conifected patients.

Coagulation disorders, splenomegaly, bone marrow alterations, destruction of platelets by antibodies, oxidative stress and the role of platelets as cofactors in the onset of severe malaria have been cited as mechanisms that may explain thrombocytopenia in malarial infection [15]. Infections cause decrease in platelet count both due to effects on platelet production and platelet survival [16]. The mechanism elucidated explains the thrombocytopenia in virus infection: the

role of Platelet agglutination or adhesion to leukocytes, direct infection of bone marrow stromal cells and hematopoietic stem cells leading to defective hematopoiesis and thrombocytopenia. The Sequestration and Intravascular Platelet destruction via direct interaction of platelets with viruses leading to platelet activation, degranulation and clearance in liver and spleen ;direct interaction of pattern recognition receptors expressed by platelets and the virus or its genome can result in platelet activation and subsequent release of chemokine with endothelial cell signaling, leucocyte migration and direct interaction and activation of leucocytes; platelets can Induce Inflammation and Secrete Anti-Microbial Proteins and platelets act as Antigen Presenting Cells [17].

The fact that malaria and viral pathologies such as Covid-19 lead to thrombocytopenia as described by several authors who have worked on this subject may explain the occurrence of more thrombocytopenia in Malaria-Covid-19 coinfected patients [2] [14] [15] [18].

5. Conclusions

The study showed a high prevalence of Malaria-Covid-19 Coinfection, which reaches more than 25% of cases of all patients treated for Covid-19.

A predominance of thrombocytopenia was found in coinfected patients. Early management is the key to a favorable progress of the disease and detection of Malaria-Covid-19 coinfection makes it possible to properly carry out its treatment and not let Covid-19 evolve, which would significantly reduce the occurrence of complications.

Limitations

- This study has been done on basis of the medical record of patients treated and some data may be missed.
- All cases of malaria were taken into account without typing the plasmodial species.
- The present study has been done in one Center and cannot show exactly the real prevalence of this coinfection in the DRC.

Contribution of the Authors

Armand Mayala collected, analyzed the data and wrote the manuscript. Diane Diama collected the data and reviewed the manuscript. Amir Ali Diama corrected the manuscript. Fina JP reviewed the manuscript and made the synthesis. Philipe Lukanu reviewed the manuscript and make major corrections.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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