



Original Article

Prevalence and Seroprevalence of Covid-19 in Suspected Malaria during the Second Wave in Yaounde, Cameroon

Prévalence et séroprévalence de la COVID-19 en cas de suspicion de paludisme au cours de la deuxième vague à Yaoundé, Cameroun

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ABSTRACT

Background. The COVID-19 pandemic has added an additional burden in countries with already fragile health systems. Our objective was to determine the prevalence and seroprevalence of COVID-19 in suspected malaria during the second wave in Yaounde. **Methods.** A descriptive cross-sectional study was conducted at the Jordan Medical Services for 8 weeks from April 19 to June 13, 2021, i.e., during the second wave in Cameroon. For the 86 patients with suspected malaria, nasopharyngeal and blood samples were taken for SARS-CoV-2 antigen and anti-SARS-CoV-2 IgG and IgM using the STANDARD™ Q COVID-19 Ag kit from SD BIOSENSOR, Korea, 2020 and Standard™ Q COVID 19 Ac IgG/IgM kit from SD BIOSENSOR, Korea, 2020 respectively. Confirmation of malaria was done by microscopic examination of stained blood smears. **Results.** Malaria was confirmed in 20.9% (18) of cases. The prevalences of COVID-19 and COVID-19/malaria co-infection were 8.1% and 0.9% respectively. Of the 25.6% (54) of patients with anti-COVID-19 IgM, no positive microscopic cases were found. On the other hand, a little more than half of the patients had IgG antibodies against COVID-19 whether they had a positive thick drop or not (56.0% (42/75) and 52.2% (71/136) respectively). **Conclusion.** In case of suspicion of malaria in a malaria area, it seems important to consider COVID-19 as a differential diagnosis.

RÉSUMÉ

Introduction. La pandémie de la COVID-19 a ajouté un fardeau supplémentaire dans les pays aux systèmes de santé déjà fragiles. **Objectif :** déterminer la prévalence et la séroprévalence de la COVID-19 en cas de suspicion du paludisme au cours de la deuxième vague à Yaoundé. **Méthodologie.** Une étude transversale descriptive a été menée au Centre Médical le Jourdain pendant 8 semaines du 19 Avril au 13 Juin 2021 soit durant la deuxième vague au Cameroun. Pour les 86 patients avec suspicion de paludisme, des prélèvements nasopharyngé et sanguins ont été réalisés pour la recherche d'antigène du SRAS-CoV 2 et des IgG et IgM anti-SARS-CoV-2 grâce aux kits STANDARD™ Q COVID-19 Ag de SD BIOSENSOR, Corée, 2020 et Standard™ Q COVID 19 Ac IgG/IgM de SD BIOSENSOR, Corée, 2020 respectivement. La confirmation du paludisme a été faite grâce à l'examen microscopique des étalements de sang colorés. **Résultats.** Le paludisme était confirmé dans 20,9% (18) des cas. Les prévalences de la COVID-19 et de la coinfection COVID-19/Paludisme étaient de 8,1% et de 0,9% respectivement. Sur les 25,6% (54) des patients avec des IgM anti-COVID-19, aucun cas de microscopie positive n'a été retrouvé. Par ailleurs un peu plus de la moitié des patients avaient des anticorps IgG anti-COVID-19 qu'ils aient une goutte épaisse positive ou pas soit 56,0% (42/75) et 52,2% (71/136) respectivement. **Conclusion.** En cas de suspicion du paludisme en zone impaludée, il paraît non négligeable de considérer la COVID-19 comme un diagnostic différentiel.

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Mots clés : Prévalence, Séroprévalence, COVID-19, Paludisme, Cameroun.

INTRODUCTION

The health crisis related to the coronavirus 2019 (COVID-19) pandemic has had a considerable impact worldwide since its discovery in China [1, 2]. During the second wave in Cameroon, Africa, it was one of many health priorities with a relatively low impact with less than 8 million cumulative cases and less than 160,000 deaths [3]. Other public health priorities such as malaria remains a major global burden with 241 million cases and nearly 627,000 deaths in 2020, according to the World Health

Organization (WHO) [4, 5]. Africa is the region most affected by the disease, accounting for 94.6% of cases and 96% of deaths [5]. WHO has emphasized that the response to COVID-19 must utilize and strengthen existing infrastructures to control malaria and other infectious diseases worldwide [5, 6]. The coinfection of SARS-CoV-2 with malaria in sub-Saharan African countries such as Cameroon, presents a bipartite challenge. On the one hand, malaria has been reported to have an effect on

HIGHLIGHTS**What is already known on this topic**

The coinfection of SARS-CoV-2 with malaria in sub-Saharan African countries presents a lot of challenges.

What question this study addressed

To determine the prevalence and seroprevalence of COVID-19 in suspected malaria during the second wave in Yaounde.

What this study adds to our knowledge

The prevalence of COVID-19 was 8.1% with that of COVID-19/malaria co-infection 0.9% during the second wave.

How this is relevant to practice, policy or further research.

In case of suspicion of malaria in a malarious area, it seems important to consider COVID-19 as a differential diagnosis.

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reducing mortality from COVID-19, with a highly significant association in sub-Saharan Africa [7-10]. On the other hand, a significant but diverse impact of the COVID-19 pandemic has been described on malaria, from diagnostic and clinical aspects to reduced access to health care services, to reduced availability of curative and preventive measures [11] leading to an increase in the number of cases [5]. Malaria can be difficult to distinguish from COVID-19 due to similarities in clinical presentation that can lengthen the diagnostic process [12, 13]. Suspicion of COVID-19/malaria coinfection should be routinely raised to avoid serious complications. According to a meta-analysis, the cumulative prevalence of *Plasmodium sp* infection in COVID-19 individuals is 11% [14]. Because coinfection is a reality, WHO encourages the population to seek prompt care in case of fever and suspected malaria [5]. The objective of our study was to determine the prevalence and seroprevalence of COVID-19 in cases of suspected malaria during the second wave in Yaounde.

MATERIALS AND METHOD**Type, location and duration of the study**

A cross-sectional analytical study was conducted at the Jordan Medical Services (JMS). It is located in Yaounde in the Centre-Cameroon region. The choice of the collection and analysis site was made because of its high patient capacity (more than 100 consultations per day with an average of 25 malaria diagnostic examinations performed per day: internal statistics). Its technical platform allows it to diagnose and manage not only malaria patients but also cases of COVID-19. The duration of the data collection was 8 weeks from April 19 to June 13, 2021.

Study population

The patients included in the study were men and women of all ages who consulted the JMS with a working diagnosis of suspected malaria. All those presenting with respiratory signs such as cough, breathing difficulties, rhinorrhea and sneezing were excluded. Recruitment was consecutive and non-probabilistic.

Procedure

Participants meeting the selection criteria were identified through the consulting physicians. Recruitment was done by obtaining free and informed consent for adult patients and parental assent for minors to participate in the study, preceded by presentation of the information leaflet. The latter notified the purpose, advantages and disadvantages of the study. The patients were then welcomed to the sampling room where they were given a questionnaire. Once the questionnaire was completed, a nasopharyngeal swab was taken for SARS COV-2 antigen testing and a blood sample was taken in a tube with ethylenediaminetetraacetic acid (EDTA) for SARS COV-2 antibody testing, malaria microscopy, and plasmodium antigen testing. Samples were sent directly to the laboratory for testing.

Laboratory testing

SARS-COV 2 antigen and antibody testing was performed by immuno-chromatographic assays, Standard™ Q COVID 19 Ag from SD BIOSENSOR, Korea, 2020 and Standard™ Q COVID 19 Ac IgG/IgM from SD BIOSENSOR, Korea, 2020 respectively. Three drops of sample were added to the test area and the reading was taken 15 minutes later.

For microscopic diagnosis of malaria, two types of spreads were made and examined under the microscope at objective 100: thick drop (thick spread) and smear (thin spread). The thick drop stained with Giemsa was used to look for malaria parasites. The May-Grunwald-Giemsa-stained smear was used to confirm the parasite species when this was not possible from the thick drop. Parasitemia was expressed as the number of trophozoites per microliter of blood. The calculation was made by counting the number of parasites in 200 white blood cells, reduced to the exact number of white blood cells [15]. The reading of the thick drop and the smear, if necessary, was done in double blind with a third reading in case of discrepancy.

Testing for Plasmodium antigens was done using a rapid diagnostic test (RDT) based on the principle of immunochromatography. The SD Bioline Malaria Ag P.f/Pan kit from Standard Diagnostics, Inc, Korea, 2021 based on the detection of histidine rich protein 2 (HRP-2), parasite lactate dehydrogenase and aldolase was used. It consisted of transferring 2 drops of blood into the sample well, then adding 1 drop of buffer solution. Ten minutes later, the result was read.

Study variables

The study variables consisted of sociodemographic, clinical and paraclinical data. These data were collected using a previously tested and validated questionnaire with a coding system that guaranteed the anonymity of the participants.

Statistical analysis

The SPSS (Statistical package for social sciences) software version 23.0 was chosen for data entry and analysis. Categorical variables were expressed as numbers and proportions.

Ethical considerations

In order to carry out this work, we obtained administrative authorization for the research from the Jordan Medical Services and ethical clearance from the Institutional Research Ethics Board for Human Health of the Catholic University of Central Africa. The participants had completed and signed the free and informed consent. The information collected was used exclusively within the framework of this study and in strict compliance with medical confidentiality.

RESULTS

General informations on the study population

A total of 86 patients were selected. The majority were male (118; 55.9%). The age groups most represented were [20-30] and [30-40] years, i.e., 39.8% (84) in terms of cumulative percentage. Most of the patients had a higher education level (135; 64.0%), were employed in the public and private sector (121; 57.3%) and practiced the Christian religion (164; 77.7%). Regarding medical history, 20.9% had already had an episode of COVID-19. As co-morbidities, arterial hypertension, diabetes, and cardiovascular disease were found in 17.5% (37), 16.1% (34), and 4.7% (10) of cases, respectively. More than ¾ of the study population practiced regular hand washing. Clinically, 100% (211) of the cases presented with fever followed by headache (128; 60.7%), abdominal pain (51; 24.2%) and asthenia (49; 23.2%). Loss of taste and smell were found in 39 (18.5%) and 20 (9.5%) cases respectively (Table I).

Diagnosis of malaria

Malaria was confirmed in 35.5% (75) of the cases by the reference technique, microscopy. In addition, 11 cases were antigen positive and had a negative thick drop, a difference of 5.3% (figure 1).

COVID-19 and malaria

The prevalence of COVID-19 was 8.1% (17). There were 0.9% (2/211) cases of COVID-19/malaria co-infection. Anti-COVID-19 IgM and IgG antibodies were found in 25.6% (54) and 53.5% (113) of cases. No cases of positive microscopy and presence of IgM anti-COVID-19 were found. In addition, slightly more than half of the patients had IgG anti-COVID-19 antibodies whether they had positive microscopy or not, i.e., 56.0% (42/75) and 52.2% (71/136) respectively. (Table II).

Table I: Distribution of general information on the study population

Features	Effective	Percentage (%)
Gender		
Female	93	44.1
Male	118	55.9
Age range		
[0-10 [	15	7.1
[10-20 [	37	17.5
[20-30 [	42	19.9
[30-40 [	42	19.9
[40-50 [	27	12.8
[50-60 [	34	16.1
[60-70 [	9	4.3
≥70	5	2.4
Study level		
Not schooling	5	2.4
Primary	20	9.5
Secondary	51	24.2
Superior	135	64.0
Profession		
Student / student	56	26.5
Private	42	19.9
Public	79	37.4
Unemployed	34	16.1
Religion		
Christian	164	77.7
Muslim	8	3.8
Without religion	39	18.5
Medical history		
Diabetes	34	16.1
High blood pressure	37	17.5
Cardiovascular disease	10	4.7
Asthma	5	2.4
Gout	2	0.9
Covid-19	44	20.9
Lifestyle		
Alcoholic taking	78	37.0
Tobacco	10	4.7
Hand wash	162	76.8
Facial mask	128	60.7
Symptoms		
Fever	211	100.0
Headache	128	60.7
Asthenia	49	23.2
Arthralgia	27	12.8
Nausea	39	18.5
Vomiting	22	10.4
Diarrhea	38	18.0
Abdominal pain	51	24.2
Loss of taste	39	18.5
Loss of smell	20	9.5

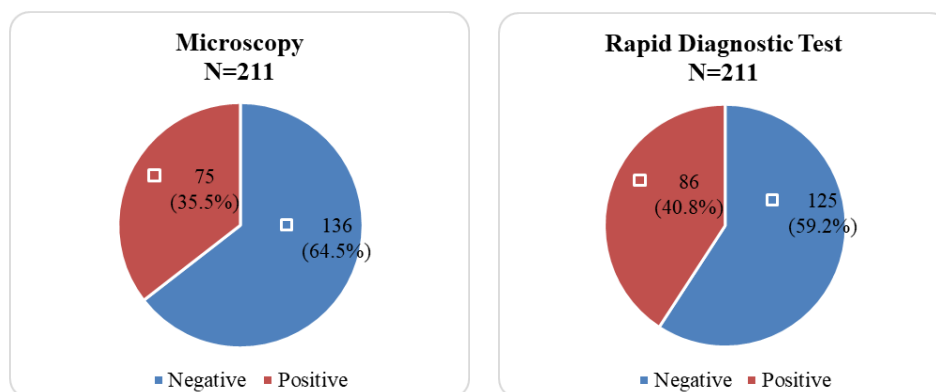


Figure 1: Malaria test results in the study population

Table II: Results of antigenic and serological tests for COVID-19 according to the thick drop in the study population

Lab tests	Blood smear positive		Total
	Yes	Not	
	No = 75	N = 136	No = 211
AG Covid-19	2 (2.7%)	15 (11.0%)	17 (8.1%)
IgM Anti Covel-19	0 (0.0%)	54 (39.7%)	54 (25.6%)
IgG Anti Covel-19	42 (56.0%)	71 (52.2%)	113 (53.5%)

DISCUSSION

Malaria and COVID-19 are two burdens that plague the world and each constitute major public health problems, hence the interest in this topic which aimed to determine the prevalence and seroprevalence of COVID-19 in suspected malaria. Suspicion of malaria was based on clinical findings. In endemic regions, any patient consulting for fever must be tested for malaria according to the World Health Organization. In our study population, clinically, all patients presented with fever followed by headache (60.7%), abdominal pain (24.2%) and asthenia (23.2%). Isolated fever may be the first reason for consultation as found by Sidibe [16]. Indeed, 46% of patients presented with isolated fever. In their cohort, 17.3% and 15.4% of patients complained of vomiting and abdominal pain respectively. Fever associated with headache was found in the study of Massiré and al in 18.3% of cases in Ivory Coast in 2020 [17]. The same symptomatology was found in case of imported malaria in Morocco, a result showed by Saoud and al [18]. These differences reveal the plurimorphic clinical presentation of malaria which leads to suspicion in medical consultation. Loss of taste and smell were found in 18.5% and 9.5% of cases respectively in our study population. Not only these symptoms that can be described in malaria as directly related to the disease or as related to co-infections, both symptoms have been widely described in cases of COVID-19 [19-22]. The positivity to *Plasmodium sp* infection was 35.5%. This result is close to the prevalence of Doutoum and al observed in Chad which was 36.56% [23]. A difference was observed between the results of the microscopy and the rapid diagnostic test for malaria. Indeed, 11 cases were antigen positive and had a negative thick drop, a difference of 5.3%. This could be explained by the fact that in endemic areas, self-medication is often a therapeutic recourse before medical consultation in case of persistent symptoms [24]. The presence of *Plasmodium sp*. antigen with negative microscopy may indicate a cure if the treatment has been well conducted, as some antigens may persist for 2 weeks in the body. The estimated prevalence of COVID-19 was 8.1% and the seroprevalence was 53.5%. This result differs from that of Voundi and al conducted in Cameroon in the context of systematic screening [25]. Indeed, this study revealed a prevalence of 0.2% and a seroprevalence of 4.6% for COVID-19 [25]. This result can be justified by the fact that the study by Voundi and al took place between the first and second waves in Cameroon, corresponding to a period when the number of cases was decreasing; on the other hand, our

study population consisted of symptomatic persons. Concerning COVID-19/malaria co-infection, the prevalence was 0.9%. Igala et al described cases of COVID-19/malaria co-infection. In this work, which aimed to systematically search for malaria in cases of COVID-19, 8 patients out of 253 presented a co-infection [26]. This is a possible association, especially in malaria endemic areas, which highlights the importance of diagnosing malaria in case of COVID-19 or to look for COVID-19 in case of malaria, even if this co-infection was not found in case of severe symptoms [26]. The principal limit was the site of recruitment which is a private medical center. It will be more reliable to conduct this study in others hospitals.

CONCLUSION

In cases of suspected malaria, about 4 out of 10 cases can be confirmed. The prevalence of COVID-19 was 8.1% with that of COVID-19/malaria co-infection 0.9%. In case of suspicion of malaria in a malarious area, it seems important to consider COVID-19 as a differential diagnosis.

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