

## Brief Original Article

# Malaria epidemic in humanitarian crisis settings the case of South Kordofan state, Sudan

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### Abstract

**Introduction:** Malaria remains one of the most common public health problems worldwide, especially in Sudan. With this short communication we aimed at reporting on the latest malaria epidemic that had occurred in the humanitarian settings in South Kordofan state, south-western Sudan, during 2018 and 2019.

**Methodology:** This is a cross-sectional study analyzing malaria surveillance reports between February 2018 to September 2019. Malaria was reported from febrile patients with confirmed malaria diagnosis using Giemsa stain. According to age, patients were distributed across three categories: less than 5 years, 5 to 15 years, and more than 15 years.

**Results:** In 2019 and 2018, 63,214 and 63,224 cases of malaria were reported, respectively, constituting around 5.5% of the state population (1,152,900). In 2018, 3,571 malaria cases were reported in February, then they decreased in August followed by increase in September-October. In 2019, 15,610 malaria cases were reported in September. Malaria cases aged less than 5 years were 21,848 and 23,561 cases in 2018 and 2019, respectively.

**Conclusions:** The reported sudden epidemic of malaria is alarming. Therefore, identifying the risk factors associated with this epidemic is crucial to malaria prevention and control, and hence successful achievement of malaria elimination.

**Key words:** Malaria; epidemic; humanitarian settings; Sudan.

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### Introduction

Malaria remains one of the most important public health problems worldwide, with a significant burden and effect on the Sub-Sahara African countries such as Sudan [1]. In 2018, the global burden of malaria was estimated at 228 million cases worldwide [2], which is less than 2017, when malaria cases estimated at 231 million cases [3]. Africa reports the majority of annual malaria cases [1]. In 2019, Africa reported 93% of the global malaria episodes and 380,000 related-deaths [1].

In Sudan, more than 36 million people are living at high risk of malaria. However, there is a gradient in malaria endemicity across Sudan in accordance with the different ecological zones of the country [4]. Malaria in the northern part of the country is considered hypo

endemic and mesoendemic in central Sudan. While in the eastern part malaria is hyperendemic [4]. The transmission seasons in the southern and the western parts showing flocculating endemicity; meso and hyperendemic, depending on the seasonal variation in the rainfall besides mosquitos' abundance and reemergence [4]. Still, malaria control measures are not completely considered in the fight against malaria. Where there is no mass screening is undertaken, and no case reporting from private sectors was obtained [5]. Also, no vaccine deployment was considered [6]. However, the adopted malaria treatment is Artesunate Combination Therapy for uncomplicated *P. falciparum* infection and Chloroquine in case of *P. vivax*. In severe

cases of *P. falciparum*, the recommended treatment is quinine [7].

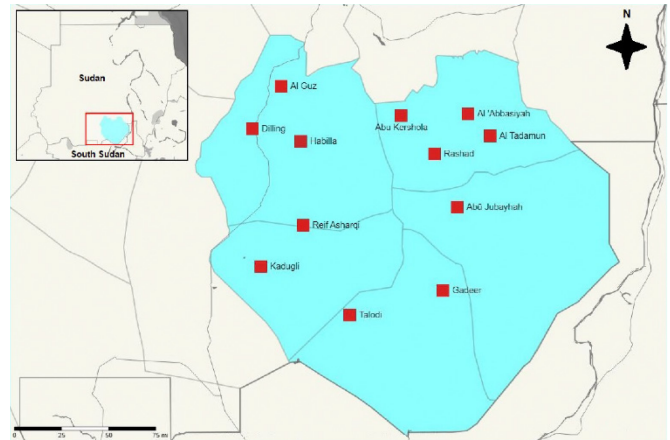
The south-western region of Sudan has suffered from a long-lasting war and constituted a humanitarian crisis setting. The socio-economic changes associated with armed-conflict have led to severe environmental disruption that has made the area more favorable for vectors breeding and increased the communities' vulnerability to infectious diseases [8]. This short communication aimed at reporting the latest malaria epidemic that occurred in the humanitarian settings in South Kordofan, south-western Sudan, during 2018 and 2019.

**Methodology**

*Study area, data collection and analysis*

South Kordofan state is considered a humanitarian crisis zone, and it is located in South-western Sudan. We performed a cross-sectional study analyzing data obtained through the routine surveillance system of the state between 2018 and 2019. The surveillance reports included malaria suspects reported from South Kordofan locality's health centers. Malaria suspects were diagnosed for malaria using microscopy Giemsa staining technique. Localities of South Kordofan includes; Kadugli, Reif Shargi, Habeela, Edleling, Elguz, Elabassya, Rashad, Abugbeha, Eltadmun, Gadeer, Abukrshola, and Talodi (Figure 1). Reports from June to July 2018 were not available because of the political violence that escalated throughout the Country [9]. Malaria cases were grouped into three categories based on age; less than 5 years, 5 to 15 years, and older than 15 years. The number of malaria-related deaths was collected; those who were reported by their

**Figure 1.** Map showing the study localities of malaria surveillance system in Sudan.



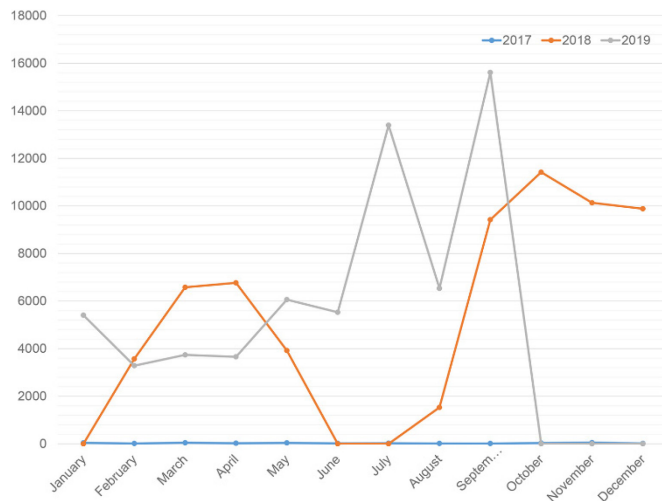
families to have very high body temperature and suffering from convulsions and severe vomiting before death were counted into malaria related deaths.

**Results**

The malaria surveillance reports between February 2018 and September 2019 indicated alarming increase in malaria infections in South Kordofan; 63,224 and 63,214 cases of malaria reported in 2018 and 2019 respectively. Out of the total number of patients attending health centers during 2018, malaria cases reached 3571 cases in February, and the incidence rate increased greatly in March and April (6,579 and 6,768), with a slow decline in May to 3,922 cases. In August, malaria cases were much lower than May, reaching 1,530 cases. In September and October, malaria cases sharply increased (9,421 and 11,418) and slowly condensed from November and December, 10,132, and 9,883 cases, correspondingly. In 2019, malaria cases continued to decrease each month with slight increase in March. The number of cases reported were 5,406 in January, 3,285 in February, 3,739 in March, and 3,657 cases in April. A steep increase followed by a scarce drop in the number of cases occurred in May reaching to 6,061 cases, and 5,530 in June. In July, an extreme increase of malaria cases was reported reaching 13,392 cases and dropped to 6,534 cases in August, followed by step increase in September; 15,610 cases (Figure 2).

The number of deaths reported during 2018 was estimated to be 84 cases, and 51 cases during 2019. In 2018, the numbers of deaths (15 deaths in March, 17 in April, and 19 in May) were higher than reported during the same period in 2019 (4, 0, and 8 deaths, in the same respective months). However, numbers of death reported in January 2019 was quite high; 11 deaths (Figure 3).

**Figure 2.** Distribution of malaria cases during January 2017 to September 2019.

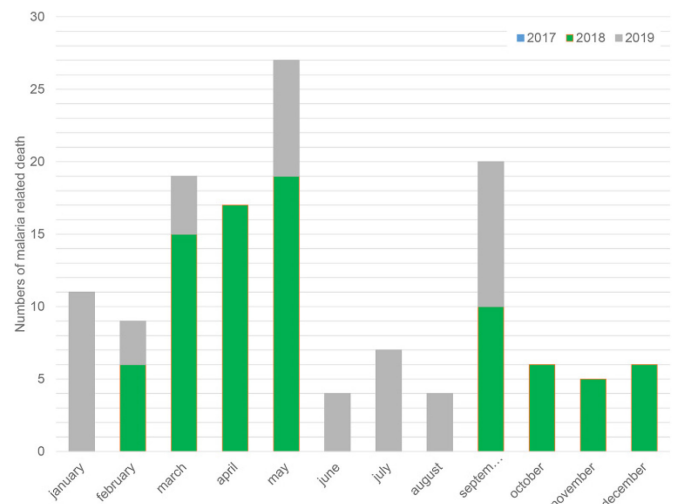


The distribution of malaria cases based on age groups of less than 5 years and more than 5 years was 21.7% and 78.3% in 2018, 21,848 and 41,376 cases, respectively. While in 2019, malaria among less than 5 years tended to increase, reaching up to 37.3% (23,561 cases) and decreases to 62.7% (39,653 cases) for those aged more than 5 years. Accordingly, the highest malaria incidence among patients aged less than 5 years was reported during May 2018 (48.7%) and January 2019 (42.9%). Whereas for those aged more than 5 years, malaria showed higher numbers of cases in October 2018 and September 2019, 68.2% and 67.9%, respectively (Figure 4).

**Discussion**

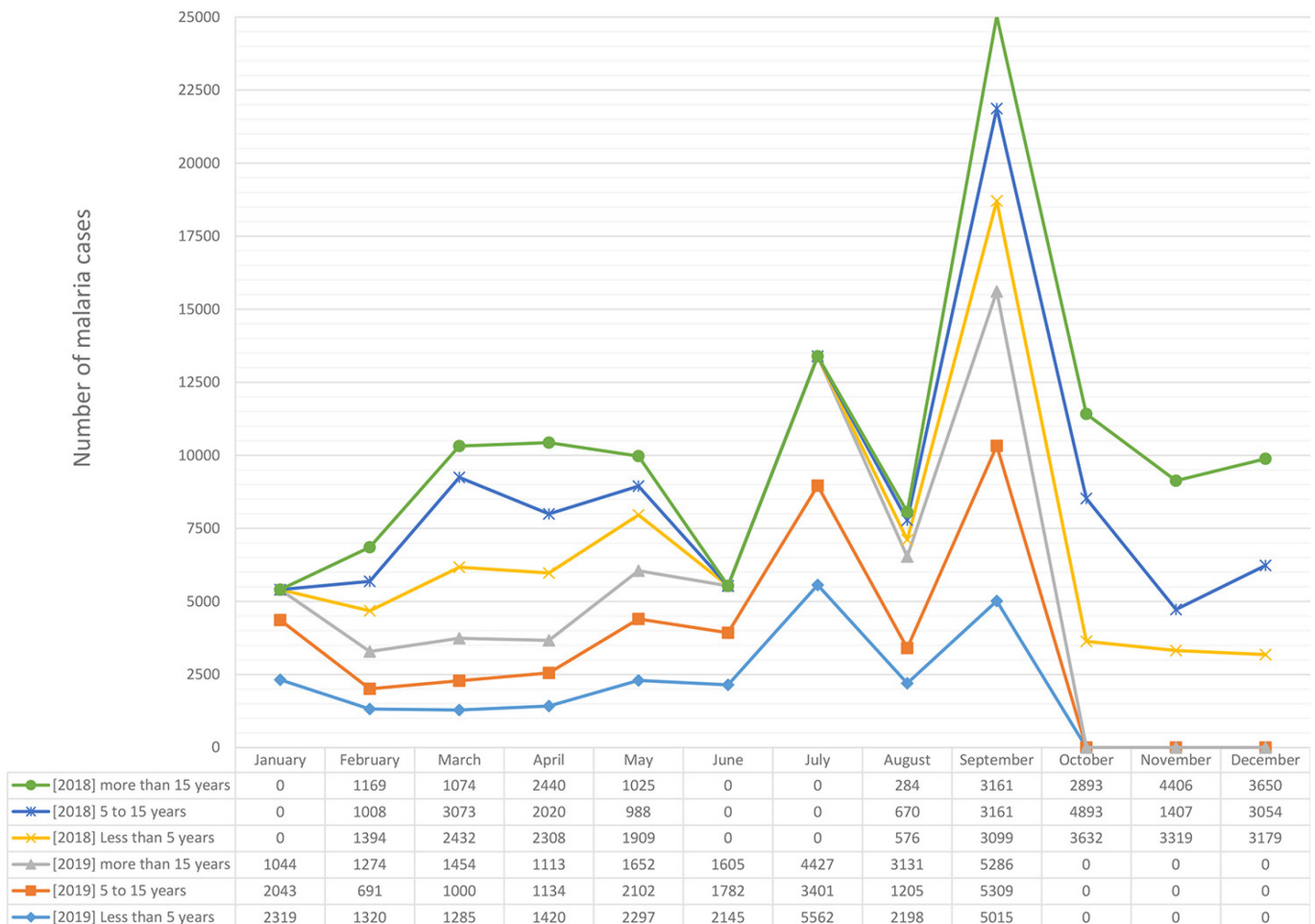
Malaria is a global public health threat, particularly in tropical and sub-tropical countries. The majority of malaria episodes reported per year worldwide are from the Sub-Saharan African countries including Sudan [1]. Unfortunately, this region suffers from several infectious diseases with overlapping symptoms creating

**Figure 3.** Numbers of malaria -related deaths per each month during January 2017 to September 2019.



additional challenges in the case definition and management. This delay in identifying the cases, reporting, and management is contributing to the increase of malaria epidemics [10]. The malaria

**Figure 4.** Monthly distribution of malaria cases based on age groups during February 2018 to September 2019.



surveillance reports between February 2018 and September 2019 indicated an alarming increase in malaria infections in South Kordofan; 63,224 and 63,214 cases of malaria reported in 2018 and 2019, respectively, compared to malaria reports for 2017; 322 cases [7]. The currently reported malaria epidemic is very alerting to the entire region, particularly that it was in parallel to another malaria epidemic that was developing in North Darfur state, another is of humanitarian concern [11]. Although, the reported number of malaria-related deaths was relatively low compared to North Darfur state [11]. This may highlight the unique role of South Kordofan healthcare providers in the swift response towards treatment of febrile cases and proper management of severe malaria cases.

### Conclusion

In conclusion, the risk factors contributed to this unexpected malaria epidemic need to be urgently investigated. Advanced spatial analysis and risk mapping need to be integrated into disease surveillance systems. Additionally, the potential influence of the political instability and conflicts in this epidemic makes it essential to follow a multi-sectorial approach for effective disease preparedness, control, and prevention.

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