

Original Research Article

Investigation of a child malaria death during COVID-19 pandemic in a hamlet of Angul district, Odisha (India)

Nirupama Das*

National Vector Borne Disease Control Programme, Angul, Health and Family Welfare Department, Government of Odisha, India

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*Correspondence:

Nirupama Das,
E-mail: nirupamadas51@gmail.com

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ABSTRACT

Background: This study aimed to find out the cause of child death due to *Plasmodium falciparum* and associate co-morbidities in a hamlet of Garud village of central district of Odisha (India), Angul during the COVID-19 pandemic and to recommend necessary actions to prevent such unwanted death.

Methods: A retrospective investigation was conducted based on the death audit report of a female child belonging to Garud village of Angul district. Death was reported at the district headquarters hospital, Angul. Detailed history from the starting of first symptom till death with laboratory investigations were reviewed using the malaria death audit format of NVBDCP, Odisha. Along with in-depth interview with family members, mass screening using bivalent rapid test and slide test, treatment and malaria preventive measures were undertaken in the community.

Results: During the COVID-19 pandemic, one child death was recorded due to *falciparum* malaria infection. Along with the child, all two family members were infected with *falciparum*. The family belongs to small hamlet with eight households and 39 population. All 39 populations were screened for malaria and out of these, 11 number people were found positive of *falciparum*.

Conclusions: COVID-19 pandemic resulted the major societal disruption due to lockdown and shutdowns affecting routine health care which may be attributed to the death of a child even in a well-resource setting district of Odisha. In such pandemic situation much more attention need to be given on the traditional infectious diseases which may cause unnoticed death.

Keywords: Malaria, Death audit, *P. falciparum*, COVID-19

INTRODUCTION

Angul district of Odisha has achieved a major reduction in malaria incidence and multiple challenges. This case study was an example of malaria control over last 10 years.¹ By April 2020, the severe acute respiratory syndrome coronavirus-2 (SARS-COV2), causing COVID-19 had spread to all malaria endemic countries and by the end of the second week of November 2020, about 22 million cases and 600000 malaria deaths had

been reported in world. The COVID-19 pandemic and restrictions related to the response have caused disruptions in essential malaria services. Furthermore, early messaging targeted at reducing coronavirus transmission advised the public to stay at home if they had fever.^{1,3} In low-income and middle-income countries, a particular concern is the potential impact on malaria due to possible disruption to health services.² In a small area with low malaria transmission intensity, the variation in mosquito abundance is relatively similar across the residential areas, incidence of malaria between hamlets,

which reflects the community level of human infectious reservoirs, is an important predictor for the malaria risk among individuals within these hamlet.⁴ Malaria mortality is a public health challenges that has been met with various solutions. Malaria eradication is still a day dream for our country and perhaps for our future generation too.⁸

METHODS

Study site and study population

The study site is a hamlet/tola called JamukholKudaSahi, 2 km away from main village of Garuda under Badagovindapur subcentre of Raj Kishore nagar community health centre of Angul district (Figure 1). The

study area consists of 8 household with population 39 (thirty nine) surrounded by dense forest and a small hill. The hamlet is interconnected by narrow roads or dirt road. Houses are clustered close to a water reservoir that runs through the hamlet. Only schedule tribes are residing. Occupation is farming and houses are kuchha. The hamlet is surrounded by villages Mandarbahal, Barpali, Khadkabahal of Madhapur community health centre of Angul district within 2-3 km radius. *P. falciparum* is most common cause of malaria in that area. Although this area is classified as a low malaria transmission area (Table 1). The retrospective study on paediatric malaria death was conducted in Angul district headquarter hospital, Odisha. Around the survey and death record data due to malaria was collected in a structured proforma of NVBDCP, Odisha. The death was confirmed by clinical and laboratory findings.

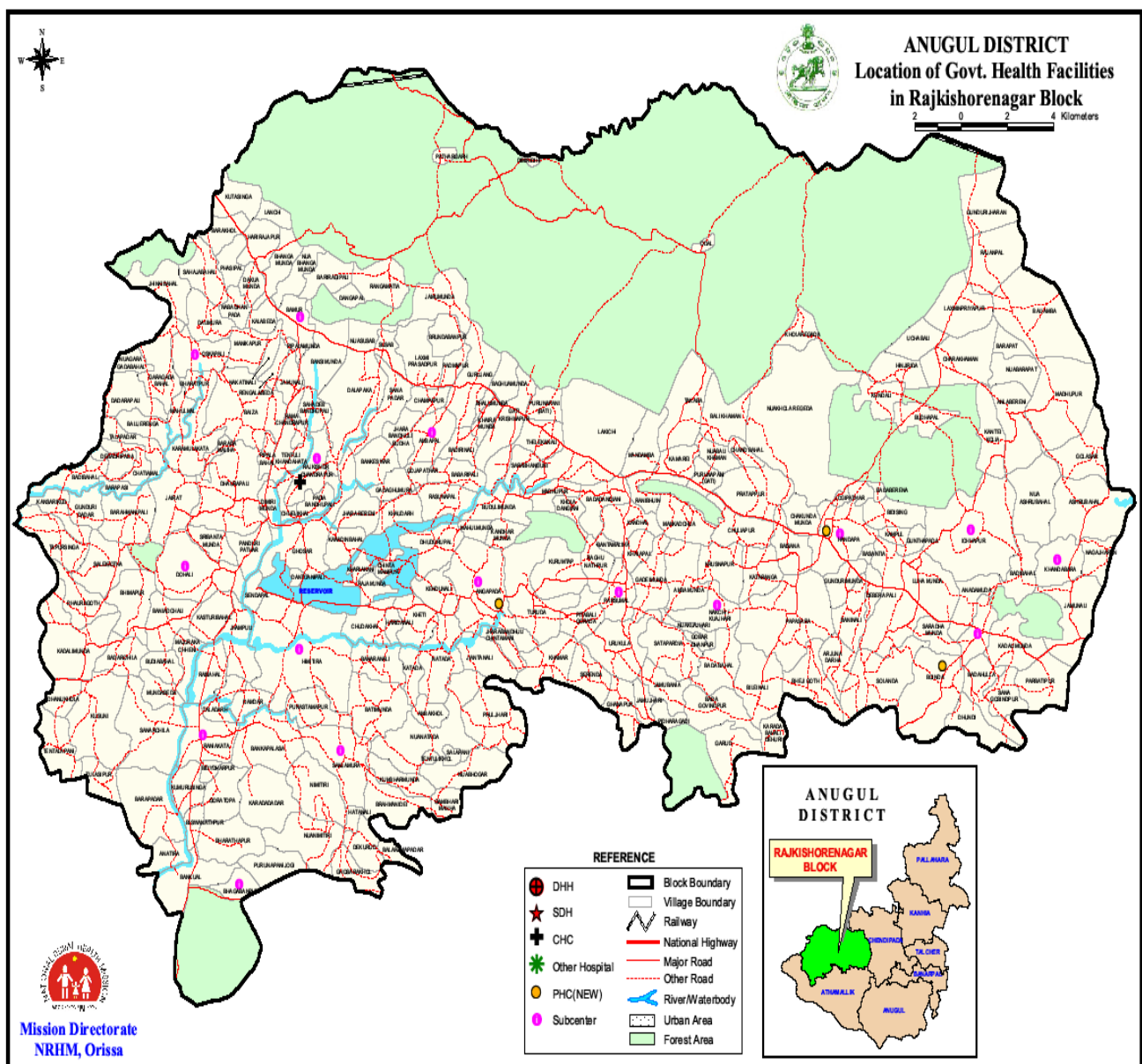


Figure 1: Study site of Raj Kishore Nagar community health centre.

Table 1: Malaria case status in Badagobindapur SC, R. K. Nagar since 2017.

Year	Total positive case	API
2017	23	3.3
2018	0	0
2019	0	0

Table 2: Presenting the symptoms of deceased at the time of admission and immediate cause of death due to *P. falciparum*.

Presenting symptoms	Cause of death
Continuous fever	Cerebral malaria
Headache	
Pallor	
Anaemia	
Hepatomegally	

Table 3: Family 1; clinical manifestation of all family members based on symptoms and findings.

Patients	Age/sex	Results	Symptoms	Day 0 (parasitemia) result	Day 1	Day 2	Day 3	Remarks
Patient 1	6 years/F child	Pf positive both slide and RDK	Fever, severe anaemic, unconsciousness, sweating	4+				Deceased
Patient 2	32 years/M	Pf positive both slide and RDK	Fever at night with shivering	1+	0	0	0	Cured from malaria
Patient 3	30 years/F	Pf positive both slide and RDK	Fever, headache, shivering at night	1+	0	0	0	Cured from malaria
Patient 4	8 years/F child	Pf positive both slide and RDK	Fever, headache, shivering at night	4+	2+	1+	0	Cured from malaria
Patient 5	8 months/M child	Pf positive both slide and RDK	Fever at noon	1+	0	0	0	Cured from malaria
Patient 6	50 years/F	Pf positive both slide and RDK	Headache, body ache at night	1+	0	0	0	Cured from malaria
Patient 7	60 years/M	Pf positive both slide and RDK	Fever at morning, body ache, headache	1+	0	0	0	Cured from malaria

Table 4: Family 2; clinical manifestation of all family members based on symptoms and findings.

Patients	Age (in years)/sex	Results	Symptoms	Day 0 (parasitemia) result	Day 1	Day 2	Day 3	Remarks
Patient 8	35/M	Pf positive both slide and RDK	Headache and body ache at night	1+	0	0	0	Cured from malaria
Patient 9	30/F	Pf positive both slide and RDK	Fever at night with headache and body ache	1+	0	0	0	Cured from malaria
Patient 10	8/M child	Pf positive both slide and RDK	Fever at night	3+	1+	0	0	Cured from malaria

Continued.

Patients	Age (in years)/sex	Results	Symptoms	Day 0 (parasitemia) result	Day 1	Day 2	Day 3	Remarks
Patient 11	6/F child	Pf positive both slide and RDK	Fever and bodyache at night	1+	0	0	0	Cured from malaria
Patient 12	8/M child	Pf positive both slide and RDK	Fever at evening	1+	0	0	0	Cured from malaria

Data collection

The study was conducted from 1 August 2020 to 15 August 2020. On the date of malaria death, at 4 pm, the author (VBDC), Angul had visited IPD, paediatric ward for a malaria patient follow-up at DHH, Angul. 10 min before, another paediatric patient 6 year female child expired, who got admitted at 1.30 pm and passed away at 2.50 pm on the same day, was severe anaemic and cerebral malaria diagnosed by RDK at IPD, DHH, Angul. After getting information at IPD and with help of LT patholab, a blood slide was prepared with EDTA blood sample collected from blood bank as deceased parent had come to blood bank for a blood unit. Immediately, LT patholab, DHH, Angul had checked the blood slide and found PF positive with 4+parasitaemia.

Detailed demography data of all residents were obtained through active surveillance. The clinical investigation was also obtained in hospital of malaria death of 6 year female child. In death analysis, average days of occurrence of symptoms from 1st symptom to death was 6 days.

Various classical symptoms were presented at the time of admission. Fever, severe anemia, hepatomegaly were the main symptom and unconscious condition which showed seriousness of disease and associated severe complications.

RESULTS

One day after death of that female child, all family members were tested by RDK and slide and 11 (eleven) number PF positive detected in two families at deceased resident area. Tablet ACT kit and PQ was given to all positive cases as per national drug policy on malaria 2013.¹² At night around 9 pm, on the day of mass screening of that village, three children had shown vomiting tendency and the family members informed to ASHA at night that they thought it might be the case of COVID-19. ASHA suddenly informed to BPHO, VBDS of R. K. Nagar CHC to take precautionary measures. All were admitted at CHC with supervision by covid ANM, staff nurses and LT. After clearance of malaria parasite, they got discharged. The main village Garuda also conducted mass screening showed zero malaria out of 265 tested but in the hamlet, eleven (11) PF positive detected. IRS, case follow-up and sensitisation meeting after mass screening for malaria was conducted by

VBDC, VBDS, MPW during lockdown period of COVID-19 pandemic in that hamlet. The major sign and symptoms of all positive cases were mild fever, body ache and headache at night which was common sign and symptoms to COVID-19. During the day, they usually did their daily household work. The detailed clinical manifestations of two families are Table 3 and 4.

DISCUSSION

As per verbal autopsy of the parent of deceased, 6 year, female child had mild fever, headache and shivering around 2 am, 6 days back of death. Then her parents treated by a medical store (private facility) of Sanahulla village of Madhapur CHC on 2nd day of illness. They never contacted to ASHA as she is 2 km away from her village as the lockdown for COVID-19 was going on and fear of COVID-19. But at night on 5th day of illness, she suffered from severe headache and body ache as per verbal autopsy of her grandmother as the deceased slept with her. When condition deteriorated in the morning of the day of death, her parents took her to another quack at Bileinali village and then to Handapa PHC (Government facility). At that time, she was severely anaemic, with sweating and semi unconsciousness and the pharmacist of that PHC referred her to DHH, Angul for further treatment. At 1.30 pm she got admitted to DHH, Angul and given injection artesunate single dose and other treatments but expired on same day at 2.50 pm at DHH, Angul. Various hypotheses have been put forward to explain malaria pathophysiology. It was currently thought that parasitized erythrocytes bind to the endothelial cells, mediated by the tumour necrosis factor (TNF). When preventive treatment is not taken, the incidence of cerebral malaria is estimated to be between 44 and 77% of cases. *Plasmodium* is able to develop resistance to treatment.¹¹

The team of integrated campaign also visited that village before 10 days of death, at that time, no fever cases recorded. Though the deceased had no migration history but her elder sister had the migration history to nearby block. The nearby block villages were also screened for malaria, but no positive cases were detected.

From the analysis and investigation of death due to malaria showed that the COVID-19 pandemic has exerted enormous pressure on health systems in well resourced, remarkable resilience and adaptively in the face of

previous global health threats they nevertheless face the unprecedented challenge of COVID-19 with a comparatively lower health care system capacity and a higher baseline level of malaria burden. Our analysis suggested that the direct response to COVID-19 must be integrated with efforts to ensure malaria control is maintained. Failure to do so risks amplifying the mortality caused by this pandemic, especially in children and reversing of one of the most impactful public health campaigns.³ Most of the affected population belonged to low socio-economic strata where illiteracy was widely significant. It can also be assumed that high temperature and humidity followed by spells of rain may be favouring behavioural changes in vector leading to increased parasitic load and its transmission. In a small area with low malaria transmission intensity, the variation in mosquito abundance is relatively similar across the residential areas, incidence of malaria between hamlets, which reflects the community level of human infectious reservoirs, is an important predictor for the malaria risk among individuals within these hamlets. Therefore, local malaria control strategies should focus on interventions that aim to reduce the gametocyte carriage in the population, such as early detection and treatment programmes and the use of ACT for *P. falciparum*.¹²

CONCLUSION

Malaria and COVID-19 may have similar aspects and seem to have a strong potential for mutual influence. They have already caused millions of deaths and the regions where malaria is endemic are at risk of further suffering from the consequences of COVID-19 due to mutual side effects such as less access to treatment for patients with malaria due to the fear of access to healthcare centres leading to diagnostic delays and worse outcomes. In COVID-19 pandemic has resulted the major societal disruption due to lockdown and has affected treatment, prevention and control of malaria which is a major cause of death in a well-resourced setting in Angul district of Odisha. Malaria control largely depends on the mass distribution of long-lasting insecticide-treated nets (LLINs) and indoor residual spraying of insecticide (IRS) across communities and households. Together with slide based diagnosis, RDTs, case management delivered through trained health staff and increasing awareness have led to significant success in reducing malaria burden over the years. Understanding the effect of the concentrated campaigns against malaria is vital to inform future control planning during the COVID-19 crisis. In such pandemic situation much more attention need to be given on the traditional infectious diseases which may cause unnoticed death.

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