



The First Outbreak of Chikungunya in a Hilly District in Bangladesh, 2018

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Abstract

A sudden increase in patients with acute febrile illness (AFI) in Rangamati General Hospital in June 2018 prompted an investigation to confirm the unusual occurrence of this condition, to identify the cause, and to recommend control measures. All patients had acute onset of fever and joint pain. We used our review of hospital records, interviews of active cases in hospital and the community, and environmental and entomological investigations to generate a hypothesis of possible etiologic agents. Blood samples were tested by Polymerase Chain Reaction (PCR) for chikungunya, dengue and Zika viruses. We identified 51 AFI cases in Rangamati Hill District, of which 64.7% were male, 25.5% were aged 21-30 years, and 76.5% were in the community. The outbreak lasted from 27 May to 19 Jun 2018. We concluded that chikungunya caused the outbreak in Rangamati because the AFI cases had fever, joint pain, rash and headache. Twenty-one (41.1%) of the cases were positive for chikungunya virus and *Aedes aegypti* larvae were found in the households near the cases. This was the first report of chikungunya in this municipal area. We recommended increased public awareness to reduce mosquito breeding places near houses, distributing leaflets on chikungunya disease and using insecticide treated nets.

Keywords: AFI, acute febrile illness, chikungunya, outbreak, Bangladesh

Introduction

An acute febrile illness (AFI) is an illness that causes a sudden rise in body temperature and is the body's natural response to invading pathogens.¹ AFI presents as fever and is often accompanied by headache, weakness, dizziness, joint pain, malaise, and rash.² It is often the predominant symptom of malaria, dengue, and chikungunya diseases, which are common in Bangladesh.²

Since 2005, chikungunya became an emerging public health problem in South Asia.⁴ The first chikungunya outbreak in Bangladesh occurred in 2008 in Dhaka City, the capital of the country.⁵ Several outbreaks were reported from 2011 to 2017 and there was one large outbreak in Dhaka City in May 2017 and in Chittagong in November 2017.⁶

On 6 Jun, the local health authority of Rangamati Hill District informed the Institute of Epidemiology, Disease Control and Research (IEDCR) about a sudden increase in the past four days of patients with AFI that were admitted to the district general hospital. Rangamati has a population of 600,000 and contains indigenous groups called Chakma, Marma, Tripura or

Pangkua. The township is located on the western bank of Kaptai Lake and has scenic landscapes, making it a popular holiday destination, and has recently experienced vigorous developmental growth.

IEDCR, the institute of the government with the responsibility to investigate outbreaks, responded promptly by sending a team to verify the cause of the outbreak. Malaria was ruled out because the symptoms of the cases were not consistent with those of malaria and the rapid diagnostic test (RDT) for malaria was negative. Chikungunya was suspected based on symptoms and previous chikungunya outbreaks in neighboring regions. Therefore, the objectives of the investigation were to confirm the existence of the outbreak, to identify the organisms causing the disease, and to give recommendations for control measures. The outbreak investigation team arrived in Rangamati on 7 Jun 2018.

Methods

To verify the outbreak and determine its scope and magnitude, the IEDCR team traveled to Rangamati General Hospital to interview patients admitted with AFI and to review their medical records. Eight patients

were identified, interviewed, and their medical records were reviewed. The team also interviewed the doctors and nurses treating the patients. The field investigation was conducted from 27 May to 10 Jun 2018 and the study period was from 27 May to 19 Jun 2018.

The initial definition of a suspected case was any person who presented with fever and lived in the Rangamati municipal area from 27 May to 8 Jun 2018. The team chose 8 Jun as the end date because it guaranteed that the maximum incubation duration from the earliest onset date of the study patients would be 12 days, which is the maximum incubation period for chikungunya. After interviewing the hospitalized patients, the team modified the suspected case

definition as any person who presented with fever, joint pain, and/or skin rash and lived in the Rangamati municipal area from 27 May to 8 Jun 2018. The initial end date for case definition was later extended to 19 Jun because, during the 11-day investigation period, the team was notified of four new cases from the hospital. A confirmed case was any suspected case with laboratory confirmation of chikungunya by multiplex Polymerase Chain Reaction (PCR).

The team conducted a house-to-house survey in the community from 8 Jun to 10 Jun 2018 with the help of community health assistants (Figure 1). Our goal was to survey every house in the community. Due to restrictions by military and local government officials, we were not able to travel to all the households.

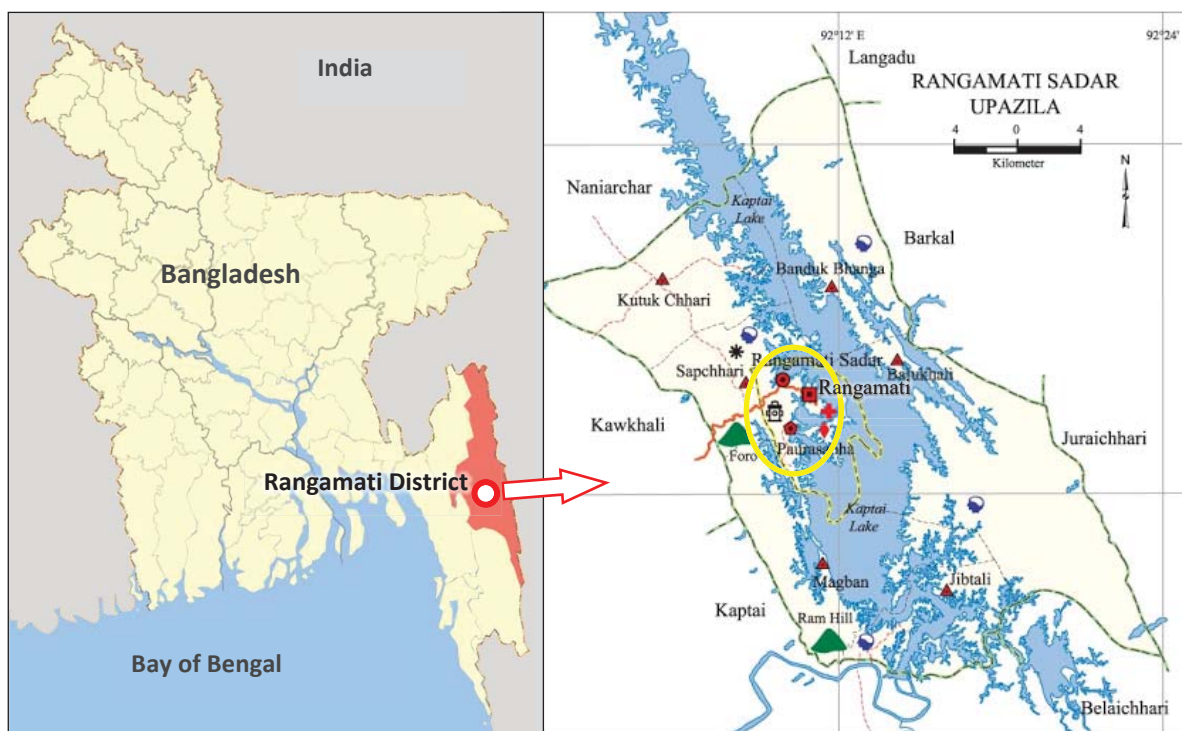


Figure 1. Residences of chikungunya cases in Rangamati municipal area, 27 May to 19 Jun 2018, Bangladesh (n=51)

In each house, we interviewed everyone with AFI using a pre-tested semi-structured questionnaire. The questionnaire was translated to Chitangya, a local language used throughout Rangamati. We collected the respondent's age, gender, address, occupation and religion, symptoms and onset date with detailed history of joint pain. The team also collected information about exposure, affected family members, and place of treatment. Self-reported items such as prescriptions were verified by examining the patient's medical records. Blood samples were collected according to a standard IEDCR protocol from patients who complained of fever for the last five days and tested by PCR for chikungunya, dengue and Zika viruses.

The district entomology officer, his staff and the investigation team conducted an entomological investigation according to WHO guidelines.⁷ The guidelines call for dividing the survey area into zones and calculating the house index (HI), which is the percentage of houses that are positive for mosquito larva, the container index (CI), which is the percentage of water holding containers that have mosquito larva and the Breteau index (BI), which is the number of mosquito positive containers per 100 houses.⁸ Households included in the entomological survey were randomly selected. Zones were determined by the entomologist and based upon WHO guidelines. A container was considered as wet if it contained at least 5 ml of stagnant water.

Based on the clinical, epidemiological, and environmental data, the team developed a hypothesis that the outbreak was probably a mosquito borne disease. Consequently, biological samples were collected and tested for malaria and dengue. As malaria is an endemic disease in Rangamati District, patients, who present to the hospital with fever, are routinely tested for malaria. If the rapid malaria test is negative, then AFI case is reported as AFI. Although chikungunya is new to the region, the team included this disease because of the negative test results for malaria and dengue, the fact that symptoms of the cases were consistent with chikungunya, and because the disease has been spreading in the country since being first identified in Bangladesh in 2008.

Data were entered in an excel spreadsheet and descriptive statistics calculated and reported.

This investigation was approved by IEDCR director. Field investigators obtained verbal informed consent from the study subjects before interviewing or collecting blood samples.

Results

Fifty-one suspected cases were identified during 27 May to 19 Jun 2018. We considered this as an outbreak because this was the first-time chikungunya was reported in Rangamati District.

From the interviews with doctors and nurses, the clinical symptoms of patients with AFI were provided. All 51 patients lived in the municipal area. In addition, the number of AFI patients presenting to the hospital had increased over the past month. This helped verify the occurrence of the outbreak and generate the hypothesis.

The team interviewed eight patients who were still hospitalized. A community search resulted in 35

houses with active cases, of which 39 people met the suspected case definition. The response rate was 100%. Among the 51 cases in the study period, 33 were male and 13 were aged between 21 and 30 years (Table 1). Figure 2 presents the epidemic curve. The date of onset for the first case was 27 May with a peak on 4 Jun and the last case on 13 Jun. From 9 to 13 Jun, 4 cases were reported in the hospital. Active surveillance did not identify any cases from 14 to 19 Jun.

Table 1. Demographic distribution of acute febrile illness cases in Rangamati municipal area, 27 May to 19 Jun 2018, Bangladesh (n=51)

Characteristics	Frequency	Percentage
Gender		
Male	33	64.7
Female	18	35.3
Age group (years)		
<10	4	7.8
11-20	11	21.5
21-30	13	25.5
31-40	9	17.6
41-50	7	13.7
51-60	3	5.9
>60	4	7.8
Occupation		
Housewife	14	27.5
Student	14	27.5
Businessperson	8	15.6
Driver	3	5.8
Carpenter	2	3.9
Farmer	2	3.9
Others	8	15.6
Religion		
Muslim	41	80.4
Buddhist	6	11.7
Hindu	4	7.8

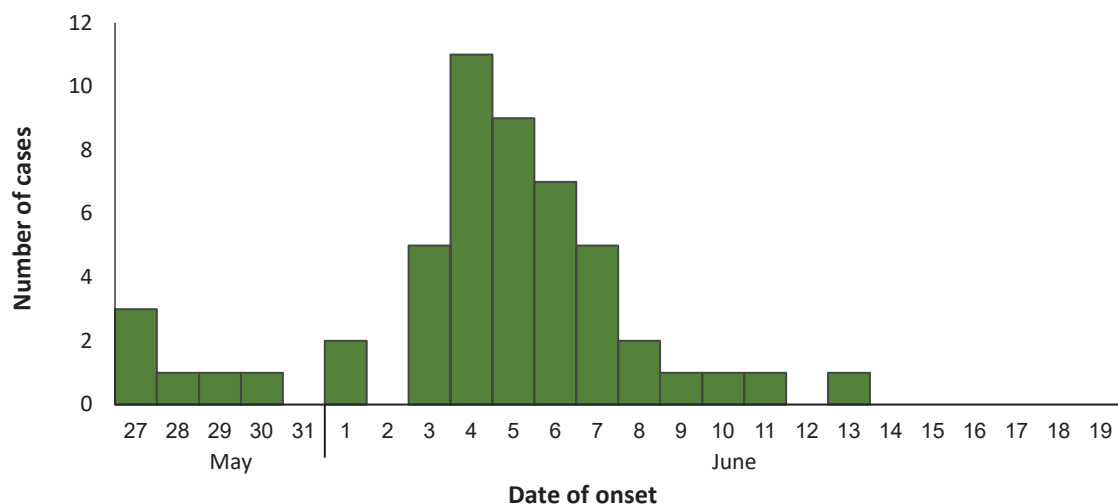


Figure 2. Date of onset of acute febrile illness cases from 27 May to 19 Jun 2018, Rangamati, Bangladesh (n=51)

Housewives and students accounted for the majority of the cases. Other occupations included businesspersons, drivers, carpenters, and farmers. As shown in Figure 3, all cases presented with fever and joint pain while headache, malaise, muscle weakness, itching, and skin rash were reported by less than half of the cases.

The team initially suspected malaria, dengue, and influenza as the cause of the outbreak as these diseases are endemic in the country, are seasonal, and cause symptoms similar to the ones reported by the study subjects. Chikungunya was also considered because it also causes similar symptoms and is spreading in the country.

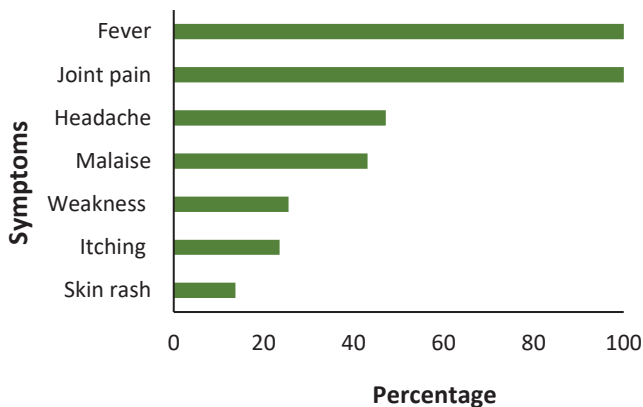


Figure 3. Clinical presentation of AFI patients in Rangamati municipal area, 27 May to 19 Jun, 2018, Bangladesh (n=51)

Among the 51 cases, 21 were laboratory confirmed for chikungunya and none had any history of malaria or dengue. As shown in Table 2, 17 cases sought treatment from a local pharmacy, 13 did not seek any treatment, and only 12 received treatment from a government hospital.

Table 2. Treatment seeking behavior among the acute febrile illness cases in Rangamati municipal area, 27 May to 19 Jun 2018, Bangladesh (n=51)

Treatment place	Frequency	Percentage
Government hospital	12	23.5
Private hospital	9	17.6
Local pharmacy	17	33.3
None	13	25.5
Total	51	100.0

The team found wet containers (including plastic containers that households used to collect drinking water) in the household areas where mosquito larvae were found with the results summarized in Table 3. With entomological support, the team collected wet containers from houses in five different zones and found *Aedes aegypti* larvae in the house and containers. Among 50 houses surveyed, the house index (HI) was 12.0%, the container index (CI) was 21.4% and the Breteau index (BI) was 18.0%. The entomologists interpreted these levels are characteristics of a high rate of mosquito breeding.

Table 3. Entomological survey of vectors (*Aedes* sp.) in Rangamati municipal area, June 2018, Bangladesh

Zone	Households inspected	Households positive	Wet containers	Positive containers	House index %	Container index %	Breteau index %
1	10	2	8	3	20.0	37.5	30.0
2	10	2	7	2	20.0	28.6	20.0
3	10	1	9	1	10.0	11.1	10.0
4	10	1	11	3	10.0	27.3	10.0
5	10	0	7	0	0	0	0
Total	50	6	42	9	12.0	21.4	18.0

Discussion

A chikungunya outbreak occurred in Rangamati Hill District of Bangladesh in the middle of 2018. This was the first reporting of chikungunya in the district, a hilly rural area in south-eastern Bangladesh that harbors the vector for chikungunya, *Aedes aegypti*. Fifty-one chikungunya cases were identified. Of which 21 were laboratory confirmed for chikungunya. All of the cases had fever and joint pain, and although less than half reported headache and skin rash, these symptoms are typical features of chikungunya-affected patients reported in previous studies.⁶ Symptoms and

demographic characteristics of cases in this outbreak were similar with cases in other chikungunya outbreaks in Bangladesh.⁹ The most common treatment seeking behavior in our patients surveyed was through the local pharmacy. Government and private hospitals were less frequently used because of poor accessibility in Rangamati.

Although chikungunya is new in Rangamati, several outbreaks were reported in Bangladesh in Dhaka City and Chattagram.⁶ The current outbreak occurred in May/June 2018 in Rangamati, which borders Chattagram, and we suspect chikungunya may have

spread from Dhaka City to Chattagram and then to Rangamati, where it has never been reported before. Every year many people from all over the country visit the district for sightseeing.¹⁰ This group probably introduced chikungunya to Rangamati.

Studies have shown that chikungunya is an urban vector-borne disease with *Aedes aegypti* being the main vector for spreading the dengue and chikungunya viruses.^{1,11-13} The municipal area of Rangamati is experiencing increased development.¹⁰ Consequently, the areas with the most urbanization in Rangamati may be potential breeding sites for this mosquito.¹² Finding chikungunya disease in this area and the presence of *Aedes aegypti* larvae are indicators of spread of chikungunya in newly developed areas of Bangladesh such as Rangamati.

There is an active malaria surveillance programme in Rangamati. An AFI surveillance programme includes chikungunya and other AFI diseases such as dengue. Previous studies have shown that AFI surveillance at the hospital level can identify other vector-borne diseases.¹⁴ We confirmed our cases with a diagnostic PCR test; however, studies have shown that different AFI diseases were identified when a laboratory test for chikungunya were negative.¹⁵ Therefore, strengthening the existing surveillance and laboratory capacity to test for pathogens that cause AFI will enhance monitoring of future AFI outbreaks in this area.

Limitations

Some limitations of this study should be acknowledged. First, safety restrictions did not allow us to sample all households in the affected community. Second, knowledge about the AFI situation in this area could not be evaluated. Third, we did not have sufficient data to infer any association between the high entomological indices and chikungunya. The professional experience of entomologists who participated in the survey stated that the entomological indices were high, indicating a high burden of mosquito-borne diseases.

Public Health Action and Recommendations

According to our findings and the current situation in Rangamati, we recommended that people should be made aware of the presence of mosquito breeding places around their residence and to destroy them to prevent transmission of mosquito-borne diseases. Local Health Authorities, Municipality and District Administrators should increase public awareness on management of mosquito breeding places in household premises. Given these recommendations, the authorities distributed leaflets on dengue and

chikungunya disease, had the media inform residents on the current dengue and chikungunya situation in the local area, encourage reporting of AFI to local health authorities, conduct surveys to identify and remove mosquito breeding sites, and distribute insecticide treated nets. People should be encouraged to go to hospital when they are ill because there are skilled doctors who can diagnose and treat chikungunya and medicine can be obtained from the hospital at no charge. This behaviour will also help determine the burden of chikungunya.

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Suggested Citation

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