

Epidemiological Investigation of an Outbreak of Chikungunya in Hyderabad and Nalgonda Districts of Andhra Pradesh, India

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Abstract:

After about three decades, Chikungunya infection has re-emerged in India and the first cases were reported in December, 2005. The outbreak has currently affected about 8 states in the country. Although known to be commonly non fatal, since the present outbreak involved a large population, it has been raised as an issue of public health concern and also attracted wide media attention. The clinico-epidemiological and entomological review of the Chikungunya outbreak situation in Hyderabad and Nalgonda Districts of Andhra Pradesh, which started in December 2005, revealed that it is under control. However, preventive efforts need to continue and disease surveillance for early detection of potential outbreaks further strengthening. Given the significantly high House Index, all the three study areas remain at significant risk of outbreaks in the future if appropriate control measures are not put in place. Community support and participation is also crucial for the prevention of future outbreaks and improving the health and well being of population in the districts.

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Introduction

Chikungunya is an acute viral infection transmitted to humans through the bite of an infected adult female *Aedes aegypti* mosquito which usually bites during daylight hours. It is characterized by sudden onset of fever, chills, headache, nausea, vomiting and severe joint pain with or without swelling, lowback pain and rash. The incubation period is usually 2-3 days but can range from 1-12 days. These symptoms are usually self-limiting and rarely fatal. The term "chikungunya" is derived from a Swahili word which literally means "that which bends up" this refers to the stooped posture attributed to arthritic symptoms of the disease.

The Chikungunya virus was first isolated in Tanzania in 1953. The virus has also been reported in Central and South Africa and Western Africa and many parts of Asia between 1960 and 1980s. Since its isolation in 1953 the Chikungunya virus has caused numerous well documented outbreaks both in Africa and South East Asia affecting large populations.⁽¹⁾

In India, Chikungunya outbreak was first reported in Calcutta in 1963.⁽²⁾ Although circumstantial evidence suggests introduction of the virus from countries of South East Asia the origin of the epidemic remains unknown. Outbreaks have also been reported in 1964 from Vellore, Madras, & Pondicherry in Southern parts of India.⁽³⁾ From 1965-1972 there has been a decline in Chikungunya cases in India. The last report of a localized outbreak was in 1973 from Barsi, Sholapur district, Maharashtra State. No outbreaks were reported in India from 1973 till 2005. Past epidemics of Chikungunya have all been reported in urban areas infested with *Aedes aegypti*.

After about three decades, Chikungunya infection has re-emerged in India and the first cases were reported in December, 2005. The outbreak has currently affected about 8 states in the country. Although known to be commonly non fatal, since the present outbreak involved a large population, it has been raised as an issue of public health concern and also attracted wide media attention.

General Objective

To develop skills to investigate and learn the methodology of outbreak response and control in a field situation.

Specific objectives

To review and assess the situation of Chikungunya fever outbreak in Hyderabad and Nalgonda districts of Andhra Pradesh (A.P.).

To determine the causes of current outbreak

To conduct a rapid fever survey and also an entomological survey in some of the affected areas in the two districts.

To recommend remedial measures to overcome the current outbreak and prevent occurrence of outbreaks in future.

Methodology

Discussion with Central/ State/ District authorities and medical and paramedical staff of the affected areas about the background information of affected areas, genesis of outbreak, investigations carried out so far and control measures undertaken;

Discussion with the physicians who treated cases about the clinical presentation of cases, results of laboratory investigations and the outcome of cases;

Interview and clinical examination of some of the cases;

Visit to affected areas and various hospitals/ PHCs in the areas. Examination of hospital records for morbidity profile;

Surveys in the selected areas in Hyderabad and Nalgonda districts to find out the fever rate and entomological indices for *Aedes* mosquito;

Rapid Fever Survey by house to house visit;

Examination of water storage practices;

The sera samples of patients admitted to Fever Hospital at Hyderabad were collected for Antibody titre estimation at NICD, Delhi, India

Study Tools

Discussion with Central, State and District authorities and medical and paramedical staff of the affected areas.

Proforma for Rapid Fever Survey

Proforma for Entomological Survey

Profile of the Districts

Hyderabad is the capital of A.P. and is a large urban settlement spread over 130 square kilometers with an estimated population of 38.29 lakhs (2001 Census). Nalgonda district lies in the heart of Andhra Pradesh and is approximately 75 km from Hyderabad. The district is spread over 14,240 sq. km area and

has population of 32.38 lakhs of which 28.93 lakhs are rural and 3.44 lakhs urban (2001 census). Apart from agriculture the district economy is also boosted through its handloom and handicraft industries. Maps of the two districts are given at Annexure III and IV respectively.

The state government health care facilities in Hyderabad include 6 Area hospitals, 6 Sub-Unit Offices, 64 PHC/CHCs and 5 Teaching hospitals. Nalgonda district has 72 PHCs, 565 sub-centres (rural), 7 sub-centres (urban), 9 Malaria subunits and 3 Govt. hospitals under Director of Health. Besides these health facilities, 1 District Hospital, 4 Area Hospitals, 3 CHCs (50 bedded) and 4 CHCs (30 bedded) are under APVVP Control. According to local health personnel, the health facilities of both districts are stocked sufficiently with basic medicine and logistics.

Heavy rainfall is experienced during the months of July, August and September followed by cooler winter months. Summer months are hot with high humidity.

Given the large population continuous supply of piped water is not available in both the districts. As a result of the intermittent supply, water storage practices mainly in big cement and plastic tanks are common. Due to the hot and humid weather conditions, water coolers are also commonly used in the urban households.

Observations about the outbreak

According to local health personnel, increased number of cases of fever had been reported from districts of Rayalseema, Nalgonda and Hyderabad in A.P. since December 2005. The Attack rate varied from 2.3 to 39.1%. Sera samples tested at the National Institute of virology (NIV) in Pune and NICD, Delhi were positive for IgM antibodies to Chikungunya virus.

A review of fever data (2004-2006) from the Fever hospital, Nalkutta in Hyderabad district revealed a marked rise in fever cases reported in 2006 as compared to the previous two year data. Studying the seasonal trend of fever cases in 2004 & 2005 it is apparent that the incidence of fever cases is lowest in the month of January. It should also be noted that the baseline of reported cases (2004-2005) has remained above the 100 mark through out the year. The 2004 & 2005 data show a steady increase of fever cases from February to April and a slight fall in the month of June. The cases

increase in July again peaking in August but remaining below the 500 mark. However in 2006, a variation in this trend is noted, Fever cases have steadily increased after February and peaked in the month of July instead of declining. This could be attributed to the change in recent climatic conditions. Fig. (1) shows seasonal trends from 2004 to Aug., 2006.

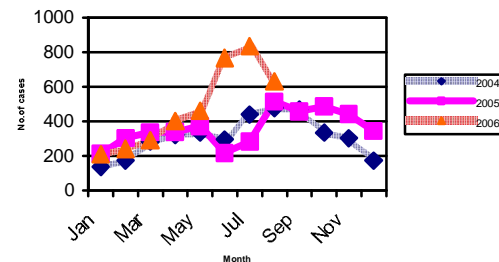


Fig. (1). Month-wise fever cases reported at Fever Hospital, Hyderabad (2004 – 2006).

Direct Causes for the Outbreak

The direct causes of the sudden surge could be classified into:

The change in the climate

The climatic changes resulting in warmer temperatures increase the population of the vector (*Aedes aegypti*), which results in an increase in the clinical cases presenting with the symptoms. With warmer temperatures, the tendency to conserve water arises, resulting in inappropriate storage of water in plastic containers and uncovered utensils and tanks, providing an excellent breeding ground for mosquitoes. The surge of cases could also be attributed to the increase in the rate of decomposition of biodegradable wastes- a source of excellent nutrient for the vector. The decomposition of organic wastes are also a suitable site for the deposition of the eggs from the female mosquito.

Poor Sanitation and Water Storage

The lack of proper sanitation/storage techniques in combination with the warmer temperatures results in an increase in the number of vectors. Without, proper controlling of the breeding ground and the factors associated with it, the number of cases is bound to rise. The storage of water in containers and utensils left uncovered increases the surface area for atmospheric exposure. The water stored in containers also have decreased buffering

capacity due to the lack of contact with the ground thereby altering its pH and making it an easy target for breeding.

Public Unawareness and Delay in Response

The medical personnel as well as the public were not ready for the sudden surge in the cases. The public were not well informed in appropriate water storage techniques and sanitations required to prevent the outbreak. With the increase in weather and stagnation of organic wastes there was not a relative increase in the use of insecticides to control their population.

Clinical profile of cases

According to information from district health sources, the cases of Chikungunya first reported to local health centres with symptoms of acute fever, chills and associated joint pain. The large joints of the body and small joints of the hand were reported to be commonly involved. Clustering of cases within the same family was commonly noted. All the ages were effected particularly those above 15 years. Cases have been reported in both urban and peri-urban areas. The cases admitted in the hospital were from Hyderabad and surrounding districts. The cases were treated symptomatically with paracetamol and vitamins. Most of them recovered after 4-5 days of treatment, no mortality was reported amongst Chikungunya cases.

Control Measures were taken by District Health Authorities and regular monitoring of the situation was done by District Medical & Health Officer, Deputy Medical & Health Officers, Programme Officers and District Malaria officers.

Control measures adopted by districts

District level coordination meetings were held.

Instructions were issued to all Department Heads to take measures for prevention and treatment of Chikungunya fever.

Medical camps were conducted in the affected areas.

Information, Education and Communication activities: Pamphlets containing information about the disease printed in local languages and distributed to all the Hospitals and Primary Health Centres in the areas. Posters and advertisements in local languages were also issued

Measures for source reduction were taken.

Pyrethrum space spray (2%) was used in affected areas.

Anti-larval measures with Temephos (1 PPM) were carried out.

Rapid Fever Survey

House to house fever survey was carried out by the FETP batch in three locations which were effected by the Chikungunya outbreak. The team visited Aliabad and Jiaguda under Hyderabad district and Revanpally village under Pochampally Mandal in Nalgonda district. Pre-designed fever survey forms were used.

'Case' Definition used for the Survey

Any person with a history of fever with joint pains which occurred within last one month (from 25th Sept., 2006).

The survey covered a total population of 1048 comprising of both children and adults. Out of the surveyed population 27 persons fitted the 'case definition' of Chikungunya infection. Fever was associated with arthralgia in all the cases, the knee & ankle joints and small joints of the hands were commonly involved. Joint swelling was reported in 81.4% cases. Only 14.8 % of cases reported rashes. Symptoms such as photophobia, retro orbital pain and vomiting although reported were less common. No haemorrhagic manifestations or death was reported. Symptom wise breakup of cases is given in Table (1).

The maximum number of cases (74%) belonged to the age group of 15-45 years. Number of females found affected was more than males. Age and Sex distribution of cases is given in Table (2).

History of travel outside the locality was not significant. The overall attack rate during last one month period was 2.57 %. The attack rate in 15-45 years age group was 1.9% and in the females was 1.52.

Most of the residents of the areas surveyed had already experienced fever and severe joint pain symptoms during the initial period of the outbreak from Dec.2005. Although fever had subsided, older patients continued to suffer from pain and swellings in joints. It should be noted that the team visited the affected areas only after the situation was in control and preventive measures already introduced. Blood samples of three suspected cases were taken and brought to NICD laboratory, New Delhi for serological tests.

Table (1). Clinical presentation of fever cases, Hyderabad, 2006. *(n=27).

Symptoms	Number of cases*	Percentage %
Fever	27	100
Arthralgia	27	100
Joint swelling	22	81.4
Rash	4	14.8
Others(photophobia, retro-orbital pain, vomiting)	4	14.8
Haemorrhagic manifestations	0	0

Table (2). Age and sex wise distribution of suspected cases of Chikungunya, Hyderabad, 2006.

Age group (yrs)	Sex		Total (%)
	Male	female	
0-4	—	—	—
5-14	2	—	2 (7.4%)
15-45	7	13	20 (74%)
>45	2	3	5 (18.5%)
	11(40.7%)	16(59.2%)	27 (100%)

Entomological Surveillance

House to house entomological survey was carried out by four teams in all study areas of Hyderabad and Nalgonda districts. The main objective was to detect adult *Aedes* mosquitoes and larval breeding sites. All the domestic and peri-domestic premises were searched. Containers such as tyres, plastic materials, earthen pots, tin items, cement tanks, coolers and other miscellaneous items were thoroughly searched for mosquito breeding sites in both affected and non effected households.

The House Index was found to be significantly high in all the areas surveyed. It was 26.9% in Hyderabad and 33.9% in Nalgonda district.

Container Index: A total of 660 containers were examined in the study areas (252 in Aliabad, 237 in Jiaguda & 171 in Revanpally) out of which 55 were found positive for aedes larvae breeding (Aliabad 18, Jiaguda 19, Revanpally 18) giving an overall container index of 8.3 % (Aliabad 7.1%, Jiaguda 8% & Revanpally 10.5%). Coolers used in urban settings, cement tanks and grinding stones were the most common breeding sites.

Breteau Index was 25.3 in Aliabad, 19 in Jiaguda (average 21.6 in Hyderabad) and 32.1 in Revanpally (Nalgonda). The details are given in Tables (3 – 4).

Antilarval measures were taken wherever the breeding was detected. Temephos was put in big drums or containers. The households were also advised methods to abolish mosquito breeding sites. The survey teams also trapped 10 adult (8 male & 2 female) aedes mosquitoes and brought these to NICD, New Delhi laboratory for further examination.

Conclusions

The clinico-epidemiological and entomological review of the Chikungunya outbreak situation in Hyderabad and Nalgonda Districts of Andhra Pradesh, which started in December 2005, revealed that it is under control. However, preventive efforts need to continue and disease surveillance for early detection of potential outbreaks further strengthened. Given the significantly high House Index, all the three study areas remain at significant risk of outbreaks in the future if appropriate control measures are not put in place. Community support and participation is also crucial for the prevention of future outbreaks and improving the health and well being of population in the districts.

Table (3). Area wise House Index, Container Index and Breteau Index (BI), Andhra Pradesh, 2006. S=Surveyed, HI=House Index, CI=Container Index.

S. No.	Name of Area	No. of Houses			No. of Containers			Breteau Index
		S	+ve	HI	S	+ve	CI	
District HYDERABAD								
1	Aliabad	71	18	25.3	252	18	7.1	25.3
2	Jiaguda	100	28	28	237	19	8.0	19.0
	TOTAL	171	46	26.9	489	37	7.5	21.6
District NALGONDA								
	REVANPALLY	56	19	33.9	171	18	10.5	32.1
		227	65	28.6	660	55	8.4	24.2

Table (4). Container Positivity Rates in Aliabad, Jiaguda, and Revanapally, Andhra Pradesh, 2006.

Container	Aliabad			Jiaguda			Revanpally		
	No. Seen	+ VE	Rate (%)	No. Seen	+ VE	Rate (%)	No. Seen	+ VE	Rate (%)
Tyres	7	0	0	16	1	6.2	0	0	0
Plastic	56	3	5.3	88	5	5.6	37	1	2.7
Earthern	40	0	0	35	2	5.7	29	7	24.1
Tin	52	0	0	31	2	6.4	9	0	0
Cement	70	7	10	48	6	12.5	84	11	13
Cooler	5	2	40	2	2	100	10	0	0
others	22	6	27.2	17	1	5.8	2	0	0
Total	252	18	7.1	237	19	8.0	171	18	10.5

Recommendations

The following preventive and control measures are recommended:

- Strengthening of surveillance, particularly fever and entomological surveillance, along with appropriate response is important. Surveillance should also be strengthened in other unaffected areas to ensure appropriate and timely response.
- Sensitization of medical and paramedical personnel in the government as well as private sectors need to be undertaken for appropriate and timely management of cases.
- Information, Education and Communication for the community for behavioural change, covering following aspects:

Cause and transmission of Chikungunya fever, about the vector - breeding places, specifically household container breeding, and biting habits, etc, symptoms of the disease, management including treatment of cases, and

community measures for prevention of breeding and to prevent man-mosquito contact.

Vector control measures include: intensification of entomological surveillance in the area on weekly basis, the containers should be emptied every week, scrubbed and dried, explore the possibility of providing regular water supply to residential areas, establishment of laboratory support for early diagnosis of Chikungunya fever and enactment of Bye-laws for ensuring quicker / better vector control measures.

References

1. CD Alert, Monthly Newsletter of NICD, Feb.2006, Vol.10: No 2.
2. ICMR Bulletin, May, 1980.
3. Sarkar et al, IJMR, 1964, 52, 651-660.