INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD • INDIA

Research and Publications

Chikungunya Epidemic Mortality in India:

Lessons from "17th Century Bills of Mortality" still relevant

Dileep Mavalankar
Priya Shastri
K.V. Ramani

W.P. No.2007-07-12
July 2007

INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD-380 015
INDIA

Chikungunya Epidemic Mortality in India:
Lessons from "17th Century Bills of Mortality" still relevant

Dileep Mavalankar
Priya Shastri
K.V. Ramani

Abstract

Chikungunya is a virus spread by the bite of the Aedes mosquito, which recently reemerged as a massive epidemic in the Indian Ocean islands and India. Chikungunya is generally considered self-limiting and has been reported as non-fatal but, since March 2005, one-third of the 770,000 people in the Indian Ocean Island of Réunion (a French territory) have been affected by Chikungunya with 237 deaths. India reported 1.3 million cases of Chikungunya however the Government of India has not reported any deaths. However there is evidence that deaths due to Chikungunya did occur. The lack of official reports of deaths is mainly due to the poor recording of 'Causes of Death' in India. The London Bills of Mortality from the 17th provides a very good example of the importance of proper reporting of deaths especially during an epidemic period. This paper reflects on the London bills of mortality and modern day lessons to be drawn from it as well as the reasons behind the apparent lack of death reporting in 2006's Chikungunya epidemic.

Chikungunya Epidemic Mortality in India:
Lessons from "17th Century Bills of Mortality" still relevant

Introduction

Chikungunya is a virus spread by the bite of the Aedes mosquito, which recently reemerged as a massive epidemic in the Indian Ocean islands and India. Severe morbidity and a rise in mortality have also been reported. This disease was discovered in Africa in 1953.[1] The clinical picture of Chikungunya is similar to Dengue (high fever and body ache); but it is also characterized by symptoms of severe joint pain. Chikungunya is generally considered self-limiting and has been reported as non-fatal in the past. However, severe forms of the disease affecting the Central Nervous System and fulminant hepatitis have been reported recently along with several deaths. Since March 2005, one-third of the 770,000 people in the Indian Ocean Island of Réunion (a French territory) have been affected by Chikungunya with 237 deaths.[1] Researchers have also reported an overall increase in mortality on this island during the epidemic.[2] The Chikungunya strain found on the Réunion Island has also undergone some mutation and microevolution and therefore better adapted to the mosquito vector.[3] This could help explain the high virulence of Chikungunya virus, increased morbidity and mortality seen in the recent epidemic.

In spite of the 1.3 million reported cases of Chikungunya, the Government of India has not reported any deaths.[4] Poor reporting of deaths and 'cause of death' recording in India could have contributed to no records of Chikungunya deaths. In contrast, the detailed 'London Bills of Mortality' initiated 400 years ago did a much better job of documenting deaths due to the plague in England. These bills also started the 'Cause of death' recording for public health use.[5] In this paper evidence of the presence of Chikungunya deaths in India is discussed. Learning from the "Bills of Mortality"; the Government of India, World Health Organization (WHO) and other international agencies, must ensure proper recording of deaths and detailed investigation of the cause of death during epidemics in developing countries like India.

The Chikungunya Epidemic in India

Chikungunya re-emerged in India in December 2005 after a gap of 32 years. Official figures from the government of India indicate 1.39 million suspected Chikungunya cases from 152 districts across 10 states in India.[4, 6] The epidemic spread rapidly and affected many communities with an attack rate as high as 40-60% .[7] The most likely explanation of this rapid penetration of the virus could be the lack of herd immunity in the population, unplanned development, poor public health systems- specifically the vector control systems and perhaps mutation in the virus.

Recently, the first reported Chikungunya deaths on the Réunion Island took the French authorities and the world by surprise as Chikungunya was previously considered non-fatal. French scientists reported a mortality rate of about 1 per 1000 cases on this Island.[2] The strain of virus in this Indian Ocean Island's outbreak and the Indian subcontinent were found to be of the same African Sub-type.[8] Surprisingly, the Government of India has not reported any deaths in spite of 1.39 million officially reported cases.

Ahmedabad city and other parts of Gujarat State (population ~ 50 million) were in the grip of a massive epidemic of Chikungunya during July- October 2006 with more than 70,000 officially reported cases. Our observations in the city of Ahmedabad and reports from other parts of the country during the epidemic months (August-October 2006) indicate the strong evidence of many deaths due to Chikungunya. The evidence for deaths is as follows:

1. One Non Governmental Organization (NGO) hospital and two private hospitals in Ahmedabad have issued several death certificated or case summaries showing Chikungunya as one of the causes of death.
2. Two crematoria in Ahmedabad have recorded substantial increase in the total number of bodies cremated during the epidemic months, with several deaths indicating Chikungunya as cause of death as entered in the crematorium register.

3. Some newspaper and news magazine reported serious complications and deaths following Chikungunya.[9]
4. Data from Registrar of Births and Deaths (RBD) of Ahmedabad city shows gross excess number of deaths during the epidemic months as compared to the same months in the previous two years.
5. A surgeon, Dr. Astha Trivedi has presented a paper "Surgical Complications due to Chikungunya" at the annual conference of the 'Association of Surgeons' in Gujarat (15-17 Dec 2006) which showed 33% mortality in 60 selected cases of surgical complications of Chikungunya.
6. Members of Parliament (MPs) from several states have raised questions in the national parliament on cases and deaths due to Chikungunya. [10]

I.

a. Death and Chikungunya Data from the crematorium located next to the V.S. hospital

Month	**Total Deaths**	**Chiukungunya death out of total death reported**
May'06	216	**0**
June '06	152	**0**
July '06	171	1 (as fever) 80 years old
August'06	263	2 (as fever) 70 & 80 yrs. old
Sept. '06	383	**20 deaths:** **(15** as **CKG +** 5 as fever)
Oct. '06	315	**8 deaths:** **(6** as **CKG +** 2 as fever)

(Source: A.M.C. crematoriums register at crematorium located next to V.S.Hospital)

b. Death and Chikungunya Data from Dhudheshwar and Wadej Crematorium

Name of the Crematorium		**May**	**June**	**July**	**August**	**Sep.**	**October**
Dudheshwar	Total Deaths	144	139	137	226	233	189
	Chikungunya cases	0	0	0	0	12	16
	Fever cases	4	4	2	11	36	11
Wadej	Total Deaths	279	279	243	344	445	334
	Chikungunya	0	0	0	1	22	8
	Fever Cases	5	3	2	8	15	11

Why are there no reported Chikungunya deaths in India?

No deaths due to Chikungunya have been reported by the government of India even though there have been 1.3 million reported cases. On 22nd November 2006, our national health minister stated in the parliament that "*There are no reported deaths directly attributable to Chikungunya from any of the affected state in the country*" in response to a Loksabha question on "*the number of persons died during last one year of Chikungunya"*.[10] The key reasons for not finding any Chikungunya deaths, in our opinion are:

1. Poor reporting of death, and causes of death.
2. Lack of availability of blood testing facilities for the virus (with only two government institutes in the whole county). Only 13000 samples have been sent for testing out of 1.3 million suspected cases. Many hospital authorities are afraid to stamp a death case as Chikungunya without a positive blood test. Instead such deaths are attributed to fever, viral fever, multi-organ failure or Cardio Respiratory Failure (CRF).
3. The clinical case definition of Chikungunya death has not been developed or disseminated widely by any national/state health authority or any research institute.
4. No systematic efforts have been made to screen all the deaths during the epidemic to identify which of them were due to Chikungunya.
5. No system was developed to follow up the 1.3 million reported cases of Chikungunya to see if any of them had resulted in death.

When we discussed the issue of Chikungunya deaths with various government authorities, they dismissed it as a "non-fatal disease" or due to "poor clinical management by the doctors". They also stated that deaths occurred only in old people suffering from other chronic diseases and hence not attributable to Chikungunya. The government's casual attitude towards the epidemic and its deaths is very shocking. The lack of reporting of Chikungunya deaths could also be due to the fear of adverse reaction from political, social and economic fronts. Under reporting of death is very common for all deaths in India and not restricted to Chikungunya deaths, as seen in the table below.

II . Death reported by government, estimated by Global Burden of Diseases (GBD) and % under reporting

Disease	Reported deaths in India ,2000[11]	Estimated deaths in India, 2000[12]	Estimated % of underreporting by the Government.
Malaria	932	14000	93.3
Dengue	7	6000	99.8
Japanese Encephalitis	556	1000	44.4
Diarrhea	2918	553000	99.4

During the epidemic a national expert team investigated the epidemic in Ahmedabad during 12th-16th September.[13] The National Institute of Virology experts also collected blood samples from seriously ill patients in Ahmedabad city during the epidemic, but neither team systematically investigate any deaths. Instead they relied on the poorly developed routine death reporting system for data. After our insistence, the Gujarat Government and the Ahmedabad Municipal Corporation have recently begun some investigation of death records.

Estimates of Deaths Due to Chikungunya:

Applying the mortality rate of Réunion which was 237 deaths from the 258,000 cases reported we have estimated that India could have 1194 deaths from the 1.3 million cases reported. A more realistic estimate would be at least 6000 or as high as 18000 deaths during the epidemic period (Mavlankar D, Shastri P, Raman P. Chikungunya epidemic in India: A major Public Health disaster. (Unpublished Observations)

The Role of International Agencies:

It is surprising that the WHO and the Center for Disease Control (CDC) of USA have not played a proactive role in studying and documenting the epidemic including mortality or warning the countries about its possible spread. Even after recent papers published by

scientists of the French Government Public Health Institute which show mortality from the Chikungunya on Reunion island, the WHO website mentions that "*Chikungunya is rarely a life threatening infection*" [14]

What India can learn from "Bills of Mortality?"

The 'Bills of Mortality' were the first systematic collection and compilation of death statistics started in London and parts of England during the late 17th century as a way to record the total number of deaths, especially deaths due to the Plague epidemics. The recording of 'cause of death' began in 1629.[5] These causes were entered in the records by the parish clerks and were sent to the city office every Tuesday. This process was so systematic, regular, and transparent that these records were printed and distributed on every Thursday to the general public.[1] Apart from the weekly records - "*a general account of the whole year was given before Christmas day*". [15] The "Bills of Mortality" were replaced by the creation of the General Register Office for England and Wales in 1837.[5] These statistics were vital in analyzing the number of deaths, disease outbreaks and epidemics and formed the basis of public health actions in England. They were an important tool which citizens and politicians used to pressurize civic authorities to implement various sanitary reforms and health measures in England. Are these bills of mortality from the 17th century relevant to the 21st century India? The controversy on Chikungunya deaths shows that India must take action urgently to improve the system of death registration and should also publish and make public mortality data on a weekly basis with a proper cause of death analysis. This will be useful in predicting and understanding such epidemics better. This calls for a political and administrative commitment to strengthen the state, district and city/town offices of 'registrar of births and deaths' and epidemiological units. It also calls for more training of doctors, nurses and medical record clerks to accurately report cause of death. Strict monitoring and follow up for causes of death reporting is needed. Non-reporting or misreporting has to be reprimanded to improve the situation.

[1] Even today the city of Ahmedabad takes 3-4 weeks at the end of the month to come up with a total number of registered deaths, and there is no cause of death analysis.

The situation in India may not be unique. Many developing countries are in the same situation and can also learn a lot from 'Bills of Mortality'. Suppressing data or not recording the cause of death in epidemics may lead to a more expansive spread of the epidemic. Hence the Government of India, WHO, CDC, the Gates foundation and other global health leaders must invest in improving death reporting and epidemic analysis response mechanism which are the basics of any public health system. If we do not improve the cause of death reporting then in the future more dangerous diseases like SARS and the Bird flu may spread wildly and kill many more before epidemics are even detected.

References

1. Bonn, D. How did Chikungunya reach the Indian Ocean. Lancet, September 2006; 6(9): 543.
2. Josseran L, Paquet C, Zehgnoun A, Caillere N, Tertre AL, Solet J, et al. Chikungunya Disease Outbreak, Reunion island. Emerging Infectious Diseases, 2006; 12(12): 1994.
3. Schuffenecker I, Iteman I. Genome Microevolution of the Chikungunya viruses causing the Indian Ocean outbreak. PLoS Medicine, Jul2006; 3(6): 263-1070.
4. Directorate General of Health Services. Chikungunya fever situation in the country during 2006. [Online] 2006. [Cited 18 January 2007] Available from: URL: http://www.namp.gov.in/Chikun-cases.html
5. Hardy A. Mortality. Lancet, 2005; 365(9455): 209.
6. Saxena S, Singh M, Mishra N, Lakshmi V. Resurgence of chikungunya virus in India: an emerging threat. Euro Surveillance 2006;11(8):E060810.2. [Online] 2006. [Cited 5 February 2007] Available from: URL: http://www.eurosurveillance.org/ew/2006/060810.asp#2
7. Chikungunya in India. [Online] 17 Oct 2006 [Cited 3 January 2007] Available from: URL: http://www.who.int/csr/don/2006_10_17/en/index.html
8. Yergolkar PN, Babasaheb VT, Arankalle VA, Sathe PS, Sudeep AB, Gandhe SS, et al. Chikungunya Outbreaks Caused by African Genotype, India. CDC Emerging Infectious Diseases 2006; 12(10): 1580-1583.
9. MedIndia. 45% of Indian Affected by Chikungunya fever. [Online] 19 October 2006 [Cited 18 January 2007] Available from: URL: http://www.medindia.net/news/view_news_main.asp?x=15179
10. Lakshmi, P. Government of India. Ministry of Health and Family Welfare. Lok Sabha Unstarred Question number 3936. [Online] 2006. [Cited 18 January 2007] Available from: URL: http://164.100.24.208/lsq14/quest.asp?qref=28541
11. Government of India, Central Bureau of health intelligence. Health Information of India. New Delhi. Government of India Press. 2005. p. 169,173,176-7.
12. Murray CJL, Lopez AD. The Global burden of Disease. United States of America: World Health Organization: 1996. p. 624-5.

13. National Institute of Communicable Diseases, Government of India. Epidemiological investigation of an outbreak of Chikungunya in Ahmedabad, Gujarat, during 14-16 September 2006. Executive Summary. 2006, 22 September.
14. World Health Organization. Chikungunya Fever-Information sheet. [Online] 15 January 2007 [Cited 18 January 2007] Available from: URL: http://www.searo.who.int/en/Section10/Section2246.htm
15. Graunt, J. Natural and Political Observations Mentioned in a following Index, and made upon the Bills of Mortality. [Online] 25 January 1996 [Cited 18 January 2007] Available from: URL:http://www.ac.wwu.edu/~stephan/Graunt/1.html