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REVIEW ARTICLE

Chikungunya- An Update

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ABSTRACT

Chikungunya is an arboviral disease which is transmitted 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 as a self-limiting disease and has been reported to be non-fatal. The Chikungunya virus (CHIKV) was isolated in Tanganyika (now Tanzania) in 1953. Chikungunya outbreaks were reported in India in 2005, and 1.4 million Chikungunya cases were reported from different states. This disease has reemerged in India after 32 years. It should be pronounced as CHICK_EN_GUN_YAH not as CHICKENGUINEA. There are many cases which have been noted, but very few deaths have been reported. The lack of any official reports of the deaths could remain as a poor recording of the 'Causes of Death' in India. Correct reporting, recording and monitoring are essential for the screening of this disease for the purpose of the proper management and the prevention of the spread of this disease.

Key words: Chikungunya fever, epidemic, polyarthritis.

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INTRODUCTION

Chikungunya virus (CHIKV) was isolated in Tanganyika (now Tanzania) in 1953[1]. The name is derived from the word 'Makonde', meaning 'that which bends up', with reference to the stooped posture which develops as a result of the arthritic symptoms of the disease [2], [3]. In Asia, this virus is transmitted almost exclusively by Aedes aegypti mosquitoes. India had its first CHIKV outbreak in 1963, which was followed by epidemics in other parts of the country [4]. Recently, massive outbreaks of CHIKV have been reported from many islands in the Indian Ocean [5]. Like CHIKV, the dengue virus (DENV) is also transmitted by Ae. Aegypti and is endemic to the urban and semiurban areas of India [6]. In Asia, the CHIKV-affected areas overlap with the DENV-endemic areas [7], [8] and provide opportunities for mosquitoes to become infected with both the viruses. The co infection of CHIV with [4] dengue viruses (DENV-1 and DENV-4) was reported in Puerto Rico in 1982 [9]. Since then, many cases of concurrent infections with multiple DENV serotypes have been reported in many countries.

The aim of the present article is to enlighten the health professionals in detail regarding the epidemiology, clinical features with the mode of spread, complications, different treatment modalities and precautions which need to be taken to prevent the spread of the disease.

DISCUSSION

This disease was first described by Marion Robinson and W.H.R.Lumbsden in 1955, following its outbreak on the Makonde Plateau, in 1952 [10].

Virology

Recent search by the Pasteur institute in Paris claims that the virus has suffered a mutation that enables it to be transmitted by Aedes Albopictus (Tiger Mosquito). Chikungunya is closely related to the O'nyong'nyong virus [10]. Chikungunya is a dengue-like disease which is transmitted by the Aedes, Culex and the Mansonia Mosquitoes [11]. 'Chikungunya' is a local word, meaning 'Doubling Up", owning to the excruciating joint pains [12].

Clinical Features

Clinically [10] the patients develop fever which can reach 39 degree Celsius. The fever lasts for 2 days and comes down. Petechial or maculopapular rashes are noted, involving the limbs and trunk, and arthralgia or arthritis affecting multiple joints are observed, which can later be debilitating. However, joint pain, intense headache, insomnia and an extreme degree of prostration lasts for about 5-7 days; other manifestations include nasal blotchy erythema, lymhoedema over the acral area, nasal blotchy erythematic, multiple echymotic spots, vesiculobullous lesions, sublingual hemorrhage, photourticaria and acral urticaria. Orally, lichenoid eruptions, apthous ulcers and freckled pigmentation over the facial area are noted in some cases [10].

Epidemiology

Chikungunya virus is an important human pathogen, a member of the Alphavirus genus in the family of Togaviridae, which causes a syndrome which is characterized by fever, chills, headache and severe joint pain, with or without swelling (usually the smaller joints). Chikungunya fever outbreaks had affected many countries since January 2005. The outbreak which occurred in 2006, appeared to be the most severe and one of the biggest outbreaks which was caused by the chikungunya virus (CHIKV) in India, affecting over 13 lakh people [13], [14]. This disease was first described in 1955, following an outbreak on the Makonde Plateau, along the border of Tanganyika and Mozambique [15]. The Chikungunya virus is no stranger to the Indian subcontinent. Since its first isolation in Kolkata [16], [17] in 1963, there have been reports of its incidence from different parts of India viz. Vellore [18], Chennai [19], Nagpur [20], Barsi and Solapur District [21]. Since the last outbreak of chikungunya fever, there had been hardly any active or passive surveillance which was carried out in our country, which suggested the disappearance of the virus from the subcontinent. However, large scale outbreaks of fever which have been caused by this virus in several States of India, including Andhra Pradesh and Maharashtra, have confirmed its re-emergence [22]. Recently, massive outbreaks of CHIKV have been reported from many islands in the Indian Ocean [15]. Since 2005, co-infections with DENV serotypes have been reported in Delhi, India [23]. Co-infections with DENV and CHIKV were reported in Calcutta, India, in 1967 [24]. Subsequent serological investigations in southern India indicated that the 2 viruses can coexist in the same host [25]. For many years, it appeared that CHIKV had disappeared from India, but late in 2005, the virus reemerged on Reunion Island and in India [22]. Confirmed cases of CHIKV infection have been reported from Delhi, Haryana, Uttar Pradesh, and Rajasthan provinces in northern India, although these states did not have large-scale epidemics [26]. DENV infections are endemic to northern India; in recent years, increasing trends of the co circulation of multiple DENV serotypes in Delhi, suggest that DENVs are becoming hyper endemic to this region [23]. During 2006, DENV and CHIKV were detected in Delhi [26]. Because the clinical features of DENV and CHIKV are similar, CHIKV infections may go undiagnosed in the DENV-endemic areas. In India, the Ae aegypti mosquitoes are the primary vectors for DENV and CHIKV, and opportunities for co-infections in humans are increased by the feeding behaviour of the mosquito [27], the low socioeconomic conditions, and the high population density.

Various complex diseases [28] are generally influenced by more than one gene or an environmental factor, and as a consequence, do not exhibit a simple mode of inheritance. In community, although only a small percentage of exposed individuals will develop the disease. Some individuals often show variation in the susceptibility/resistance to certain diseases. Therefore, host susceptibility, genetic factors and, possibly, environmental factors may be important for the development of these diseases. A study [29] noted that Rh positive blood group individuals are more susceptible than others. Among them, the blood group O +ve individuals are more susceptible to chikungunya than those with other blood groups.

No blood group with Rh negative was found to be affected with chikungunya; it indicates that people with the Rh -ve group have more resistance to chikungunya. Chikungunya disease is an acute arboviral illness which is characterized by a sudden onset of fever, skin rashes and incapacitating arthralgia [30].

Diagnosis

A suspected case [31] is confirmed by either the isolation of Chikungunya virus, or a detection of the antichik IgM in serum with a two fold rise in its titres, or by the detection of the CHIK nucleic acids in the serum by RT-PCR.

Pathophysiology

Human epithelial [32] and endothelial cells, primary fibroblasts and monocyte-derived macrophages are susceptible to infection with these viruses. Lymphoid and monocytoid cells, primary lymphocytes and monocytes and monocyte-derived dendritic cells are not susceptible to infection. Viral entry occurs through pH-dependent endocytosis. The infection is cytopathic and is associated with the induction of apoptosis in the infected cell. The infection is highly sensitive to the antiviral activity of type I and II interferon's.

Spread of Disease

Chikungunya re-emerged in India in December 2005 after a gap of 32 years. The official figures from the Government of India indicate 1.39 million suspected Chikungunya cases from 152 districts across 10 states in India [33], [34]. This epidemic disease has spread rapidly and has affected many communities with an attack rate of 40-60% [35]. The most likely explanation of this rapid spread 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, a 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 to be non-fatal. French scientists reported a mortality rate of about 1 per 1000 cases on this island [36]. The strains of the virus in this Indian Ocean Island's outbreak and in the Indian subcontinent were found to be of the same strain as that of the African sub-type. [37] Surprisingly, the Government of India has not reported any deaths in spite of 1.39 million officially reported cases.

The key [38] reasons for not finding any Chikungunya deaths could be due to:

1. Poor reporting of death, and the 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 a 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 as to which of them were caused 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.

[Table/Fig 1]: Deaths reported by the Government, estimated by the Global Burden of Diseases (GBD) and % under reporting

Disease	Reported deaths in India ,2000[39]	Estimated deaths in India, 2000[40]	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

Management

The management of these patients is very essential, although diagnosis of these cases remains a difficult task, due to overlapping

features with that of other viral infections. The only symptomatic treatment in the form of analgesics (topical and systemic) provides a better result [10].

a. Vector control- The Aedes aegypti mosquito should be the main target of the control activities. It requires active community involvement to keep water storage containers free of mosquitoes and to eliminate other breeding places of the mosquitoes in and around houses and dwellings [41].

The organophosphorous insecticides abate are increasingly being used as laviceides. They can prevent breeding for up to 3 months when applied on sand granules, they do not harm man and they do not affect the taste of water. A new technique consisting of an aerosol spray of ultralow volume (ULV) quantities of malthion or sumithion (250 ml/hectare) has been found to be effective. These tiny droplets kill the mosquitoes in the air, as well as on water.

b. Vaccine: No vaccine has yet been developed, that has been considered as suitable for use [42], [43].

CONCLUSION

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 the causes of death. Strict monitoring and follow up of the reporting of the causes of death are needed. Non-reporting or misreporting has to be reprimanded to improve the situation. Hence, the Government of India, the WHO, the CDC, the Gates foundation and other global health leaders must invest in improving the death reporting and the epidemic analysis response mechanisms 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 people before these epidemics are even detected.

References

[1] Ross RW. The Newala epidemic III; the virus: isolation, pathogenic properties and relationship to the epidemic. J Hyg (Lond). 1956; 54:177–91.

[2] Pialoux G, Bernard-Alex Gaüzère, Stéphane Jauréguiberry, Michel Strobel: Chikungunya, an epidemic arbovirosis. Lancet Infect Dis 2007, 7:319-27.

[3] Martin E: Chikungunya: No Longer a Third World Disease.Science 2007, 318:1860-61.

[4] Shah KV, Gibbs CJ JR, Banerjee G. Virological investigation of the epidemic of haemorrhagic fever in Calcutta: isolation of three strains of chikungunya virus. Indian J Med Res. 1964;52:676–83.

[5] Ravi V. Re-emergence of chikungunya virus in India. Indian J Med Microbiol. 2006;24:83–4.

[6] Gubler DJ. Dengue. In: Monath TP, editor. The arboviruses: epidemiology and ecology. Vol. II. Boca Raton (FL): CRC Press; 1988. p.223–260.

[7] Myers RM, Carey DE. Concurrent isolation from patient of two arboviruses, chikungunya and dengue type 2. Science. 1967;157:1307–8. DOI: 10.1126/science.157.3794.1307.

[8] Mackenzie JS, Chua KB, Daniels PW, Eaton BT, Field HE, Hall

[9] RA, et al. Emerging viral diseases of Southeast Asia and the Western Pacific. Emerg Infect Dis. 2001;7:497–504.

[10] Gubler DJ, Kuno G, Sather GE, Waterman SH. A case of natural concurrent human infection with two dengue viruses. Am J Trop Med Hyg. 1985;34:170–3.

[11] Anil Govindrao ghom editor, A textbook of Oral Medicine, 2nd Edition, jaypee publications, 2010,p 773-774.

[12] Council of international organizations of medical sciences (1977). Communicable diseases, provisional International nomenclature, CIOMS? WHO>.

[13] Simpos, D.I.H (1978). Bull WHO, 56(6) 819-832.Directorate of National Vector Borne Disease Control Programme (NVBDCP), Directorate General of Health Services, Government of India. Chikungunya Fever situation in the country during 2006. Available at: http://www.namp.gov.in/chikun-cases.html, accessed on October 28, 2006.

[14] Government of India, Ministry of Health & Family Welfare. Update on Chikungunya. Available at: http://www.nvpdep:gov.in/doc/chikungunyaupdate.pdf, accessed on October 28, 2006.

[15] Marion R. An epidemic of virus disease in Southern Povince, Tanganyika Territory in 1952, 53. Clinical features. Trans R Soc Trop Med Hyg 1955; 49 : 28-32.
[16] Chatterjee SN, Chakravarti SK, Mitra AC, Sarkar JK. Virological investigation of cases with neurological complications during the outbreak of haemorrhagic fever in Calcutta. J Indian Med Assoc 1965; 45 : 314-6.
[17] Shah KV, Gibbs CJ Jr, Banerjee G. Virological investigation of the epidemic of haemorrhagic fever in Calcutta: isolation of three strains of Chikungunya virus. Indian J Med Res 1964; 52 : 676-83.
[18] Jadhav M, Namboodripad M, Carman RH, Carey DE, Myers RM. Chikungunya disease in infants and children in Vellore: a report of clinical and haematological features of virologically proved cases. Indian J Med Res 1965; 53 : 764-76.
[19] Thiruvengadam KV, Kalyanasundaram V, Rajgopal J. Clinical and pathological studies on chikungunya fever in Madras city. Indian J Med Res 1965; 53 : 729-44.
[20] Rodrigues FM, Patankar MR, Banerjee K, Bhatt PN, Goverdhan MK, Pavri KM, et al. Etiology of the 1965 epidemic of febrile illness in Nagpur city, Maharashtra State, India. Bull World Health Organ 1972; 46 : 173-9.
[21] Padbidri VS, Gnaneswar TT. Epidemiological investigations of chikungunya epidemic at Barsi, Maharashtra state, India. J Hyg Epidemiol Microbiol Immunol 1979; 23 : 445-51.
[22] Ravi V. Re-emergence of chikungunya virus in India. Indian J Med Microbiol 2006; 24 : 83-4.
[23] Bharaj P, Chahar HS, Pandey A, Diddi K, Dar L, Guleria R, et al. Concurrent infections by all four dengue virus serotypes during an outbreak of dengue in 2006 in Delhi, India. Virol J. 2008;5:1. DOI:10.1186/1743-422X-5-1.
[24] Myers RM, Carey DE. Concurrent isolation from patient of two arboviruses, chikungunya and dengue type 2. Science. 1967;157:1307–8. DOI: 10.1126/science.157.3794.1307.
[25] Yergolkar PN, Tandale BV, Arankalle VA, Sathe PS, Sudeep AB, Gandhe SS, et al. Chikungunya outbreaks caused by African genotype, India. Emerg Infect Dis. 2006;12:1580–3.
[26] Directorate General of Health Services Ministry of Health and Family Welfare. National Vector Borne Disease Control Program. Statewise status of chikungunya fever in India, 2006 [cited 2008 May 10]. Available from http://www.nvbdcp.gov.in/Doc/CHK.pdf.
[27] Scott TW, Naksathit A, Day JF, Kittayapong P, Edman JD. A fitness advantage for Aedes aegypti and the viruses it transmits when females feed only on human blood. Am J Trop Med Hyg. 1997;57:235–9.Indian J Med Res 129, April 2009, pp 438-44.
[28] Lokireddy Sudarsanareddy, Vemula Sarojamma and Vadde Ramakrishna Genetic predisposition to chikungunya – a blood group study in chikungunya affected families. Virology Journal 2009, 6:77.
[29] S.D. Suryawanshi, A.H. Dube, R.K. Khadse, S.V. Jalgaonkar, P.S. Sathe, S.D. Zawar & M.P. HolayClinical profile of chikungunya fever in patients in a tertiary care centre in Maharashtra, India. Indian J Med Res 129, April 2009, pp 438-441.
[30] Sam IC, AbuBakar S. Chikungunya virus infection.Med J Malaysia 2006; 61: 264-269.
[31] Manju George Elenjickal S Sushamabai, Outbreak of Chikungunya Disease in Kerala in 2007, Indian Pediatrics 441 Volume 46__May 17, 2009 Research Letters.
[32] http://en.wikipedia.org/wiki/Chikungunya.
[33] 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.
[34] 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.
[35] 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.
[36] 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.
[37] 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.
[38] 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.
[39] Government of India, Central Bureau of health intelligence. Health Information of India. New Delhi. Government of India Press. 2005. p. 169,173,176-7.
[40] Murray CJL, Lopez AD. The Global burden of Disease. United States of America: World Health Organization: 1996. p. 624-5.
[41] WHO (1979), World Chronicle 33:107.
[42] WHO (1972), World Health, Aug-Sept, 1972.
[43] WHO (1972), World Chronicle 26,463.