

PREVALENCE OF DENGUE FEVER AND DENGUE HEMORRHAGIC FEVER IN HOSPITAL TENGGU AMPUAN RAHIMAH, KLANG, SELANGOR, MALAYSIA

I Jamaiah, M Rohela, V Nissapatorn, MM Maizatulhikma, R Norazlinda, H Syaheerah and HP Tan

Department of Parasitology, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia

Abstract. Dengue fever and dengue hemorrhagic fever have been known to be endemic and reportable diseases in Malaysia since 1971. Major outbreaks occurred in 1973, 1982 and in 1998. For the past few decades until now, many studies have been performed to investigate the importance of these two diseases in Malaysia. A retrospective study was carried out in Hospital Tengku Ampuan Rahimah Klang to find the prevalence of these diseases. The data was collected from the record department of this hospital starting from the year 1999 until 2003 (5 years). A total of 6,577 cases of dengue fever and 857 cases of dengue hemorrhagic fever were reported. From the year 2000 onwards, cases of dengue fever had increased tremendously. However for the year 2001, there was a slight decrease in the reported cases. Most cases occurred in 2003, increasing from 674 in 1999 to 2,813 in 2003. Highest incidence was seen in Malay males more than 12 years of age. However, the cases of dengue hemorrhagic fever declined tremendously throughout the years. Most cases occurred in 1999 with 674 cases, then declining to only one in the year 2001 before it increased to 60 and 72 in the years 2002 and 2003, respectively. Most cases occurred in patients above 12 years old, the majority of which were Malay males.

INTRODUCTION

Dengue is endemic in all continents except Europe and epidemic dengue hemorrhagic fever (DHF) occurs in Asia, the Americas and some Pacific islands. The incidence of DHF is much greater in Asian countries than in other regions. In Asian countries the disease continues to affect children predominantly although a marked increase in the number of DHF cases in people over 15 years old has been observed in the Philippines and Malaysia (Pinheiro and Corber, 1997). The last 50 years witnessed a resurgence of dengue fever (DF) epidemics and an emergence of dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) throughout tropical and subtropical regions around the world (Guzman and Kouri, 2002). The causative agents of these syndromes, dengue viruses, are members of the Flaviviridae family and occur as four antigenically related but distinct serotypes, designated DEN-1, DEN-2, DEN-3, and DEN-4 (Mairuhu *et al*, 2004). Today, an estimated 50-100 million cases of dengue fever and 500,000 cases of DHF, resulting in around 24,000 deaths, occur annually, depending on the epidemic activity (Rigau-Perez *et al*, 1998). Over half the world's population lives in areas potentially at risk for dengue transmission, making dengue the most important human viral disease transmitted by arthropod vectors in terms of morbidity and mortality (Mairuhu *et al*, 2004).

Dengue fever and dengue hemorrhagic fever are transmitted by *Aedes aegypti* and *Ae. albopictus* mosquitoes. *Ae. aegypti*, breeding almost exclusively in containers in and around houses, is predominantly anthropophilic and feeds mainly indoors or in the immediate neighborhood of houses during the daylight hours. *Ae. albopictus* occurs in urban as well as sylvatic (rural) areas and is responsible for the transmission of jungle dengue viruses to monkeys and possibly also of a mild form of classical dengue to man (Sandosham, 1973). Several factors have been implicated in the global resurgence of dengue: failure to control the *Aedes* populations, increased airplane travel to dengue-endemic areas, uncontrolled urbanization, and an unprecedented population growth (Rigau-Perez *et al*, 1998).

Dengue fever has been known to be endemic in Malaysia (Ministry of Health, 1980, 1998, 1999). Dengue and dengue hemorrhagic fever continue to remain a public health problem in Peninsular Malaysia since the major outbreak of the disease in 1974 (Ministry of Health, 1980; Wallace *et al*, 1980). Outbreaks occurred in Malaysia in the years 1973, 1982 and 1998 (Fang *et al*, 1984; Ministry of Health, 1974, 1984, 1998, 1999; Lim *et al*, 1974). In 1982, Malaysia experienced the worst dengue/dengue hemorrhagic fever outbreak in its history. All the states in Peninsular and East Malaysia were similarly affected. There were a total of 3,005 cases with 35 deaths, with the majority of cases occurring between the months of July to October (Fang *et al*, 1984). There were changing patterns in the trend of epidemiology of the disease in

Correspondence: Dr I Jamaiah, Department of Parasitology, Faculty of Medicine, University of Malaya, 50603 Kuala Lumpur, Malaysia.
E-mail: jamaiah@ummc.edu.my

each outbreak throughout these years. From the year 1988, the number of notified cases had increased until 1998 with an exception of a slight decrease in number of reported cases in 1994. According to the annual report by the Ministry of Health Malaysia (1998, 1999), 26,240 cases of dengue fever and 1,141 cases of dengue hemorrhagic fever were reported during the outbreak in 1998. One of the most important reasons for the increase in cases was due to rapid development and urbanization, which provided breeding sites for *Aedes aegypti*. Kobayashi *et al* (1999) sequenced cDNAs from nine 1993-1994 dengue virus type-3 (DEN-3) isolates in Malaysia and the result indicated that the dengue epidemic during that time in Malaysia was due to the introduction of DEN-3 viruses previously endemic to Thailand.

There have also been reported cases of outbreaks of dengue hemorrhagic fever in Indonesia (Sukri *et al*, 2003), Thailand (Kittigul *et al*, 2003; Tuntaprasart *et al*, 2003; Cummings *et al*, 2004), Myanmar (Thu *et al*, 2004), Cuba (Pelaez, 2004), Singapore (Goh *et al*, 1987), America, Vietnam, Cambodia, India, Sri Lanka, Colombia, Nicaragua and Mexico (Pinheiro and Corber, 1997).

The emerging pattern of this disease and its correlation to community development provoked our interest to study the prevalence of dengue and dengue hemorrhagic fever. There was also a need to know the relationship between risk factors and the patients' susceptibility to infection. We made a comparison between patients with dengue and dengue hemorrhagic fever for each risk factor to see if there is any significant correlation. The study was carried out in Hospital Tengku Ampuan Rahimah Klang. Most of the patients admitted to the hospital were from rural areas.

MATERIALS AND METHODS

The Record Department of Hospital Tengku Ampuan Rahimah contained data of dengue fever and dengue hemorrhagic fever cases from the hospital wards. Data that we collected in this study were taken from database of the Record Department. All the data that were saved in the database were collected from the patients that were admitted to the hospital from the year 1999 until 2003.

RESULTS

From the results, we can see that a total of 6,577 cases of dengue fever occurred in Hospital Tengku Ampuan Rahimah Klang from the year 1999 to 2003, with the majority of cases occurring in 2003 (Fig 1).

The cases of dengue fever showed an increasing trend. For dengue hemorrhagic fever, a total of 857 cases were reported from 1999 to 2003 with the highest cases occurring in 1999. The cases of dengue hemorrhagic fever showed a decreasing trend from 1999 to 2001. Sixty cases were reported in 2002 and the number increased in 2003 to 72 cases.

For dengue fever (Fig 2), over these five years, patients aged above 12 years showed the highest proportion with 5,742 cases, while 788 cases were reported in children between one to 12 years old and 47 cases were among infants younger than one year. Most cases occurred in the year 2003. All age groups

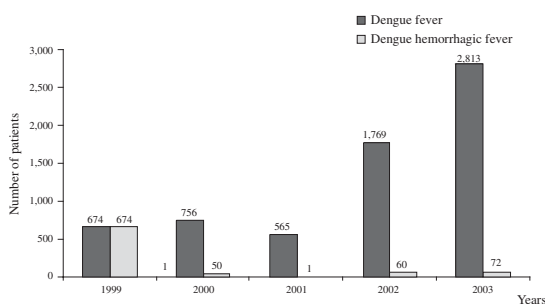


Fig 1- Number of cases of DF and DHF in Hospital Tengku Ampuan Rahimah Klang from the year 1999 to 2003.

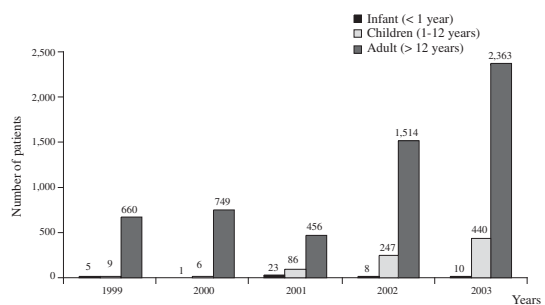


Fig 2- Number of DF patients according to age.

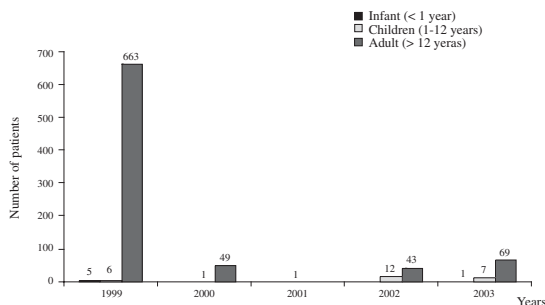


Fig 3- Number of DHF patients according to age.

showed an increasing trend from the year 1999 to 2003. For DHF (Fig 3), patients aged above 12 years showed the highest proportion with 824 cases, while 27 cases were among children between one to 12 years old and only 6 cases were in infants younger than one year. Most cases occurred in the year 1999 with those over age 12 showing the highest preponderance with 663 cases. All ages showed a decreasing trend.

For the DF cases (Figs 4 and 6), Malays showed the highest proportion (3,873 cases), followed by Indians (1,501 cases), Chinese (694 cases) and others (509 cases). All the races showed an increasing trend. For the DHF cases (Figs 5 and 7), Malays showed the highest proportion with 410 cases. This is followed by Indians (278 cases), Chinese (132 cases) and others (37 cases). All races showed a decreasing trend.

There were 6,577 cases of DF reported from 1999 to 2003 that involved 3,874 males and 2,703 females (Fig 8). For DHF, only 857 cases were reported which involved 445 males and 412 females (Fig 9). For both DF and DHF cases, there were more males than females. For both genders, there was an increasing trend for DF and a decreasing trend for DHF. For the whole five years, there were more cases of DF than DHF.

Table 1 shows the main clinical features presented by both DF and DHF patients. All DF and DHF patients had fever, followed by vomiting, myalgia and arthralgia. Gum bleeding was seen only in DHF.

DISCUSSION

According to the 1999 annual report by the Ministry of Health Malaysia, the number of dengue cases reported in 1998 was 27,381. The number of cases had declined tremendously to 10,146 in 1999 (Ministry of Health, 1999). In this study, 6,577 cases of dengue fever and 857 cases of dengue hemorrhagic fever were reported from 1999 until 2003 (five years) in Hospital Tengku Ampuan Rahimah, Klang. Dengue fever and dengue hemorrhagic fever were highest in male patients above 12 years old. It was also observed that Malays showed the highest preponderance of contracting dengue fever and dengue hemorrhagic fever.

In 1999, the Ministry of Health Malaysia reported that males showed a higher preponderance of getting infection than females, with a ratio of 1.5:1 (Ministry of Health, 1999). From our study, we can see that both dengue fever and dengue hemorrhagic fever cases among gender shows the same pattern, with the number of male patients higher than female patients every year.

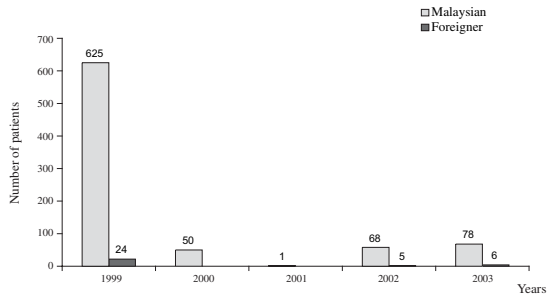


Fig 4- Number of DF patients according to nationality.

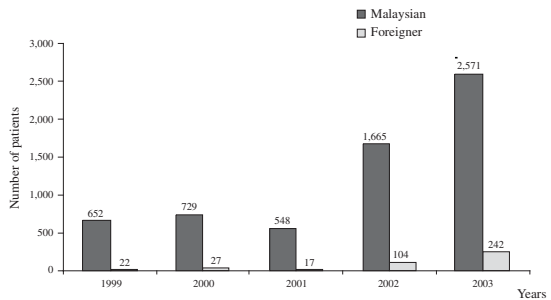


Fig 5- Number of DHF patients according to nationality. For both the DF and DHF cases, Malaysians showed the highest number of cases.

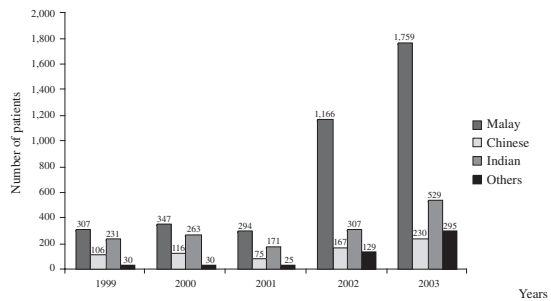


Fig 6- Number of DF patients according to race.

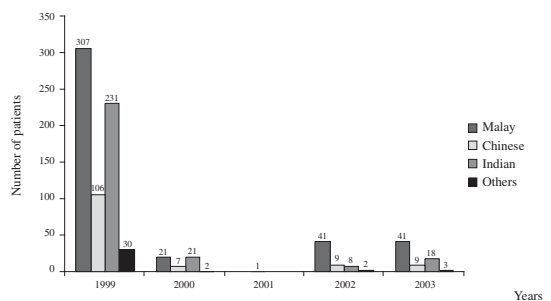


Fig 7- Number of DHF patients according to race.

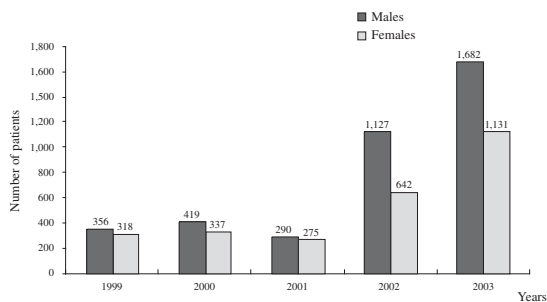


Fig 8- Number of DF patients according to gender.



Fig 9- Number of DHF patients according to gender.

Table 1
Clinical features of DF and DHF patients from Hospital Tengku Ampuan Rahimah, Klang, Selangor, Malaysia.

Clinical features	Dengue fever (DF) (%)	Dengue hemorrhagic fever (DHF) (%)
Fever	100	100
Vomiting	38	60
Myalgia	39	47
Gum bleeding	-	62
Arthralgia	25	29
Headache	27	-
Rashes	18	-

In our opinion, this somehow reflects the behavioral pattern of both sexes. Males tend to be more infected than females due to their interest in traveling to certain endemic areas.

In 1973, during the first major Malaysian epidemic of dengue hemorrhagic fever, there were 969 reported cases, with 54 deaths. Hemorrhagic manifestations were observed in 69% and shock in 18% of the patients.

The cases occurred mainly from May to September, largely in urban and suburban areas of the country. Severe disease and mortality were seen mostly in children under the age of 15 years, although a significant number of adults suffered milder illness. The Chinese population was chiefly affected, due to their living in crowded, low-income housing where the vector, *Aedes aegypti* occurred in the greatest numbers (Wallace *et al*, 1980).

In 1973, over 50% of cases occurred in children below 14 years old (Fang *et al*, 1984). In our opinion, this could be due to the large total population of children below 14 years old as had been reported by the Social Statistic Bulletin Peninsular Malaysia 1973 and 1974 (Department of Statistic, 1973, 1974). Out of the 9,874,248 total population in Peninsular Malaysia in 1973, 4,176,833 were children aged less than 14 years old. Fang *et al* (1984), stated that Malaysia experienced the worst dengue/dengue hemorrhagic fever outbreak in 1982 and that most cases occurred among the Chinese population over the age of 15 years. Although the Chinese population was mainly affected, a much higher proportion of Malays was also noted.

It appeared that a shift in the main age group affected by the disease occurred in the 1982 outbreak. Fifty-six percent of notified cases in 1982 were over 15 years of age. This change in age group was also reflected in the mortality data. In the 1973 epidemic, all the fatalities were from 0-10 years old, whereas in 1982 only 12 of the 35 fatal cases occurred in this age group. The reason for this shift is unclear but it could be related to the immunity status of the community in which the viruses circulate and the immunopathology of the disease (Fang *et al*, 1984). In our study, patients above 12 years were the most affected age group throughout the five years.

Chinese had the highest infection rates as well as the most severe hemorrhagic manifestations that were disproportionate to their total population according to 1973 and 1982 epidemics in Malaysia. As a rule, more Chinese live in crowded, urbanized areas than the other ethnic groups (Fang *et al*, 1984). However, according to the 1999 annual report of the Ministry of Health Malaysia, Malays were the major ethnic group with dengue fever and dengue hemorrhagic fever cases, followed by the Chinese and Indians. This is probably due to the large rural to urban migration of the Malay population to the capital over the last eight years (Cardosa, 1987). In our study, Malays remain the major contributor of both dengue and dengue hemorrhagic fever cases. In our opinion, this is probably due to the

distribution of population in the Klang area where Malays are the dominant residents.

The major epidemic in Malaysia occurred in 1998 (123.45/100,000 population). This was due to an increase in the breeding places for *Aedes* mosquitoes, especially in construction sites, abandoned housing projects, illegal rubbish dumping sites, schools and offices. There was also shortage of water supply, with people keeping water in containers in their houses, thus contributing to the increase in the mosquito population (Ministry of Health, 1998)

Varied clinical presentations were noted during the years. Fever was present in 100% of the cases. Vomiting, abdominal pain, bleeding manifestations and shock were constantly reported from the first epidemic in 1962, and in 1973 and 1982 epidemics (George, 1987). However, certain unusual manifestations were observed during the years, which made the diagnosis difficult and the management tricky. These manifestations varied and were not consistent. In our study, fever was the main clinical feature present in all cases of dengue fever and dengue hemorrhagic fever. This was followed by vomiting 98%, myalgia 86%, gum bleeding 62%, arthralgia 54%, headache 27% and rashes 18%.

Dengue and dengue hemorrhagic fever have been known to be endemic in this country and remain a public health problem in Peninsular Malaysia since the major outbreaks of the disease in 1973 and 1974. An outbreak occurred in 1982 where all the states in Malaysia were affected, whereas in previous years cases had been confined to a few states in Peninsular Malaysia. Dengue fever or dengue hemorrhagic fever was reported in Perlis, Sabah and Sarawak for the first time. The upsurge of dengue in these states may be explained by rapid development, urbanization, population movement and increased public awareness in recent years (Fang *et al.*, 1984). There was a fluctuation of cases reported since 1982 onwards until 1998 when a major and most severe outbreak occurred. From 1999 onwards there was constant decline in the number of cases reported (Ministry of Health, 2000). This was due to the effectiveness of National Anti-mosquito and Cleanliness Campaign, which was carried out by the Ministry of Housing and Local Government with the Ministry of Health (Ministry of Health, 1998).

For control, various activities were also carried out which included campaigns at the state level, publicity, *Aedes* surveillance, fogging activities, "gotong-royong" enforcement and school cleanliness programs (Ministry of Health, 1998). The control measures for both dengue fever and dengue hemorrhagic fever

centered around reduction of *Aedes* breeding to an acceptable level through elimination of breeding places and application of larvicides in households, health education, enforcement of the Destruction of Diseases Bearing Insect Act (DDBIA), support of public and community groups and cooperation of local authorities (Ministry of Health, 1980).

Dengue fever and dengue hemorrhagic fever are reportable diseases in Malaysia that need proper attention from all authorities concerned including government and non-government sectors. Prompt mosquito spraying should be carried out periodically for the whole locality when a single case or an epidemic is reported.

ACKNOWLEDGEMENTS

The authors wish to thank YBhg Prof Dato' Mohd Amin Jalaludin, Dean of Medical Faculty University Malaya, Dr Eileen Shanthini and Puan Hamidah from The Jabatan Kesihatan Negeri Selangor and Dr Mary Reddy, Pengarah Hospital, Tengku Ampuan Rahimah, Klang, Selangor Darul Ehsan.

REFERENCES

- Cardosa MJ. Dengue virus isolation by antibody-dependent enhancement of infectivity in macrophages. *Lancet* 1987;1:193-4.
- Cummings DA, Irizarry RA, Huang NE, *et al.* Travelling waves in the occurrence of dengue hemorrhagic fever in Thailand. *Nature* 2004;427:344-7.
- Department of Statistic Kuala Lumpur, Malaysia. Social Statistics Bulletin Peninsular Malaysia. 1973, 1974, 1998.
- Fang R, Lo E, Lim TW. The 1982 dengue epidemic in Malaysia: epidemiological, serological and virological aspects. *Southeast Asian J Trop Med Public Health* 1984;15:51-8.
- George R. Dengue hemorrhagic fever in Malaysia: a review. *Southeast Asian J Trop Med Public Health* 1987;18:278-83.
- Goh KT, Ng SK, Chan YC, Lim SJ, Chua EC. Epidemiological aspects of an outbreak of dengue fever/dengue hemorrhagic fever in Singapore. *Southeast Asian J Trop Med Public Health* 1987;18:295-302.
- Guzman MG, Kouri G. Dengue: an update. *Lancet Infect Dis* 2002;2:33-42.

- Kobayashi N, Thayan R, Sugimoto C, *et al.* Type-3 dengue viruses responsible for the dengue epidemic in Malaysia during 1993-1994. *Am J Trop Med Hyg* 1999;60:904-9.
- Kittigul L, Suankeow K, Sujirat D, Yoksan S. Dengue hemorrhagic fever: knowledge, attitude and practice in Ang Thong Province, Thailand. *Southeast Asian J Trop Med Public Health* 2003;34:385-92.
- Lim TW, Wallace HG, Rudnick A, *et al.* The 1973 epidemic of dengue hemorrhagic fever in Malaysia: (a preliminary report). *Southeast Asian J Trop Med Public Health* 1974;5:453-4.
- Mairuhu AT, Wagenaar J, Brandjes DPM, Van Gorp EC. Dengue: an arthropod-borne disease of global importance. *Eur J Clin Microbiol Infect Dis* 2004;23:425-33.
- Ministry of Health, Malaysia. Annual report 1974, 1980, 1984, 1998, 1999, 2000.
- Pelaez O. Dengue 3 epidemic, Havana, 2001. *Emerg Infect Dis* 2004;10:719-22.
- Pinheiro FP, Corber SJ. Global situation of dengue and dengue hemorrhagic fever, and its emergence in the Americas. *World Health Stat Q* 1997;50:161-9.
- Rigau-Perez JG, Clark GG, Gubler DJ, *et al.* Dengue and dengue hemorrhagic fever. *Lancet* 1998;358:971-7.
- Sandosham AA. Dengue hemorrhagic fever. [Abstract]. *Med J Malaysia* 1973;28:1-2.
- Sukri NC, Laras K, Wandra T, *et al.* Transmission of epidemic dengue hemorrhagic fever in easternmost Indonesia. *Am J Trop Med Hyg* 2003;68:529-35.
- Thu HM, Lowry K, Myint TT, *et al.* Myanmar dengue outbreak associated with displacement of serotypes 2, 3, and 4 by dengue 1. *Emerg Infect Dis* 2004;10:593-7.
- Tuntaprasart W, Barbazan P, Nitatpattana N, Rongsriyam Y, Yoksan S, Gonzalez JP. Seroepidemiological survey among schoolchildren during the 2000-2001 dengue outbreak of Ratchaburi Province, Thailand. *Southeast Asian J Trop Med Public Health* 2003;34:564-8.
- Wallace HG, Lim TW, Rudnick A, Knudsen AB, Cheong WH, Chew V. Dengue hemorrhagic fever in Malaysia: the 1973 epidemic. *Southeast Asian J Trop Med Public Health* 1980;11:1-13.