

## Two Decades of Dengue in Malaysia

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**Abstract :** Dengue is endemic in Malaysia and the first case was documented in 1902. The disease was made notifiable in 1973 and the first outbreak of dengue haemorrhagic fever was reported in 1962. During the decade of 1973–1982, there were 12,077 dengue cases with a case fatality rate of 3.38%. In the following decade of 1983–1992, the number of reported cases increased to 26,361 but the case fatality rate dropped to 0.55%. The increase in incidence could be due to rising economy, rapid industrialization and urban migration. The reduction of case fatality rate could be due to patients seeking early medical treatment and to better case management. Based on 6,970 laboratory confirmed cases since 1983, the male to female ratio was 1.2 : 1 and the ratio among the three major ethnic groups (Chinese : Malays : Indians) was 5.1 : 2.9 : 1.

All four dengue serotypes are present in Malaysia but one serotype usually predominates for at least two years. The case fatality rate for dengue 3 outbreak is highest (0.77%), followed by dengue 2 (0.54%) and dengue 1 (0.35%). From our experience in the last two decades, it is possible to predict the severity of dengue outbreaks based on the circulating predominant serotype.

The dengue situation in Malaysia during the last two decades has worsened with an ever increasing number of reported cases. Vector control measures have not been successful and it is unlikely that the situation will improve in the next decade. The only solution is through dengue vaccination which hopefully will come about in the not too distant future.

*Key words :* Dengue, Dengue Haemorrhagic Fever, Epidemics, Malaysia

### INTRODUCTION

Dengue has remained endemic in Malaysia since the first case was documented in 1902 (Skae, 1902). The disease was made notifiable in 1973 and the first outbreak of dengue haemorrhagic fever was reported in 1962 (Rudnick *et al.*, 1965). Major outbreaks of dengue was reported in 1974, 1978, 1982 and 1990, exhibiting a 4-year cycle (Fig. 1). Since 1990, the trend has changed and the number of notified cases has been on the increase. To date, the largest outbreak of dengue in Malaysia was in 1991 with over 6,000 cases.

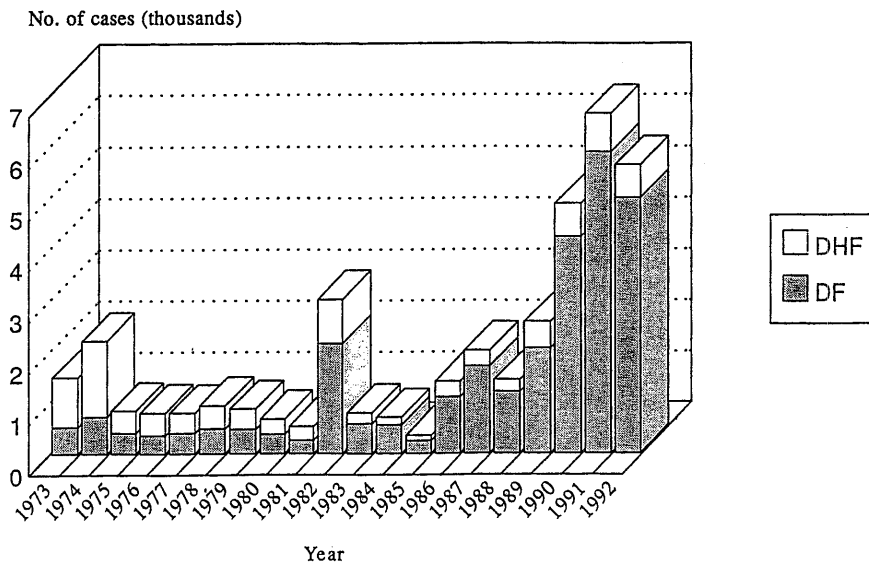


Fig. 1. Number of dengue cases between 1973 and 1992.

#### THE FIRST DECADE (1973-1982)

Table 1 shows the incidence of reported dengue cases and deaths in Malaysia during the first decade. There were 12,077 cases during this decade, of which 5,992 (49.6%) were DHF with 408 deaths. The annual average incidence was 1,200 cases per 100,000 population (Lo and Awin, 1984). The overall case fatality rate based on all reported cases (DF + DHF) was 3.38% and ranged from a high of 4.94% in 1975 to 1.16% in 1982.

In the early 1970s, dengue cases were reported mainly from the more developed and populated states in Peninsular Malaysia. By the end of the decade, all the states of Malaysia, including Sabah and Sarawak in East Malaysia, were involved. Dengue cases, particularly DHF cases, were more prominent in urban and suburban areas of the more developed states and more than 80% of all reported dengue cases were from these areas.

Epidemics of dengue in Malaysia during this decade appeared to be related to the two monsoon seasons. Endemicity was low during the period from January to April, when it began to rise, reaching a peak in July or August, and then declined. Lo and Awin (1984) speculated that the variation could be related to the storage of water during the drought season from January to April, and the drizzling rainfall before the heavy monsoons, which created suitable breeding place for the main vector, *Aedes aegypti*.

Dengue infection was more prevalent in children than in adults during the early 1970s. However, a change was noted in the age distribution towards the end of this decade where the number of reported cases dropped from 64.7% in those under 15 years in 1975 to 42.5% in 1982. Fatality used to be rare in adults but in 1982, 51.4% of deaths were in

**Table 1.** Incidence of reported dengue cases and deaths in Malaysia, 1973-1982

YEAR	DF	DHF	TOTAL	Case Fatality Rate (%) DF+DHF
1973	518	969	1487 (54)	3.63
1974	718	1482	2200 (104)	4.73
1975	400	430	830 (41)	4.94
1976	349	441	790 (35)	4.43
1977	391	389	780 (38)	4.87
1978	475	454	929 (33)	3.55
1979	465	397	862 (26)	3.02
1980	369	300	669 (25)	3.74
1981	254	270	524 (17)	3.24
1982	2146	860	3006 (35)	1.16
	6085	5992	12077 (408)	3.38

Source: Epidemiology Unit, Ministry of Health, Malaysia.  
Figures in parentheses denote deaths.

patients over 15 years. There was no significant difference in the sex ratio for dengue during this period.

Among the three major ethnic groups in the country, the Chinese population was the most commonly affected, followed by Malays and Indians. In 1982, it was noted that there was an increase of dengue cases among the Malays. This could be attributed to an increasing tendency of Malays moving to urban areas for economic reasons.

Between 1973-1982, all four dengue serotypes have been isolated in Malaysia, the most common being dengue 1, while the least common being dengue 4. During the large outbreak in 1982, most of the isolates were dengue although there was a mix of dengue 1 and dengue 2 viruses (Fang *et al.*, 1984). No dengue 4 was isolated.

*Aedes aegypti* and *Aedes albopictus* are the vectors of dengue disease in Malaysia. *Aedes aegypti* is found both inside and outside of houses in urban areas whereas *Aedes albopictus* has a more peri-urban setting. *Aedes aegypti* is commonly associated with DHF in urban areas whereas there is no convincing evidence of the association of *Aedes albopictus* with severe dengue.

#### THE SECOND DECADE (1983-1992)

Since the Department of Medical Microbiology in the University of Malaya was designated a WHO Reference Center for Dengue Fever and Dengue Haemorrhagic Fever in 1982, intensive epidemiological surveillance for dengue was conducted in close collaboration with the Ministry of Health.

Table 2 shows the incidence of reported dengue cases and deaths in Malaysia during the second decade. There were 26,361 cases during the second decade, of which only 3,876 (14.7%) were DHF with 146 deaths. This was an increase of 14,284 (118.3%) cases between the two decades. The overall case fatality rate was only 0.55% as compared to 3.38% in the first decade. The marked decline in CFR can be attributed to increasing awareness of the community to the seriousness of dengue as a disease and the need to seek early medical intervention. It also reflects on the skills of the clinicians in improved patient management. The seasonal trend has not changed in the last two decades. The disease started to increase from May onwards and reached a peak in August. The number of deaths peaked a month earlier in July and the maximum cases of reported DHF coincided with the peak month of DF. It was noted that the most populated states in Malaysia still headed the list in terms of dengue notification, reinforcing the finding that dengue is still a disease of urban and suburban distribution.

Based on 6,970 dengue cases confirmed by the WHO Centre, the male to female ratio was 1.2 : 1 and the ratio among the 3 major ethnic groups (Chinese : Malays : Indians) was 5.1 : 2.9 : 1. This was more or less reflected every year during this period. There was no major difference between these findings when compared to the first decade.

Prior to 1982, virus isolation was carried out by suckling mice inoculation. The WHO Centre switched over to the use of mosquito cell cultures for virus isolation in 1982 and in 1986, mosquito larvae inoculation was introduced and used alongside cell cultures. Table 3 shows the circulating virus serotypes during the last 8 years. Except for 1985, all

**Table 2.** Incidence of reported dengue cases and deaths in Malaysia, 1983-1992

YEAR	DF	DHF	TOTAL	Case Fatality Rate (%) DF+DHF
1983	575	215	790 (10)	1.27
1984	547	150	697 (5)	0.72
1985	242	112	354 (11)	3.11
1986	1089	310	1399 (9)	0.64
1987	1698	304	2002 (7)	0.35
1988	1195	233	1428 (3)	0.21
1989	2046	517	2563 (16)	0.62
1990	4234	645	4879 (21)	0.43
1991	5880	741	6621 (39)	0.59
1992	4979	649	5628 (25)	0.44
	22485	3876	26361 (146)	0.55

Source : Vector-Borne Disease Control Programme,  
Ministry of Health, Malaysia.  
Figures in parentheses denote deaths.

**Table 3.** Case fatality rate based on major dengue serotypes

Major serotype	Year	Death	Total DF+DHF	CFR%
Dengue 1	1987,1988	12	3,430	0.35
Dengue 2	1989,1990 1991	76	14,063	0.54
Dengue 3	1982,1985 1986,1992	81	10,507	0.77
Total	1982-1992	169	28,000	0.60

four dengue serotypes were isolated every year. In 1985 and 1986, the predominant circulating serotype was dengue 3 and in 1987 and 1988, it was replaced by dengue 1. From 1989 to 1991, the predominant strain was dengue 2 and this serotype accounted for a serious outbreak during these three years. It is noted that one dengue strain predominates during the peak season and can account for up to 90% of all virus strains isolated. Another interesting point to note is the persistence of the predominant virus strain for at least two years before it becomes replaced by another serotype. Based on this finding, we predicted that the 1993 dengue season would be caused by dengue 3 and that it would be a severe season because of the association of this serotype with severe illnesses as evidenced in the 1982 outbreak. This prediction is turning out to be true since 123 or 92% of 133 isolates to date have been identified as dengue 3 during the present severe dengue outbreak.

Table 3 shows the case fatality rate over the years based on major dengue serotypes isolated. During the dengue 1 outbreak in 1987 and 1988, there were 12 deaths out of a total of 3,430 reported cases, giving a CFR of 0.35%. When dengue 2 was responsible for the outbreaks in 1989, 1990 and 1991, the CFR went up to 0.54%. Surprisingly, dengue 3 outbreaks in 1982, 1985, 1986 and 1992 resulted in a CFR of 0.77%, the highest among the 3 major serotypes. The difference between the CFR for the three dengue serotypes borders on statistical significance ( $\chi^2=9.52$ ,  $p<0.05$ ). This finding is useful in predicting the severity of dengue outbreaks.

The dengue situation in Malaysia during the last two decades has worsened with an ever increasing number of reported cases. Fortunately, the case fatality rate has been significantly reduced in the last ten years. With a fast improving economy, rapid industrialization and urban migration, the situation is unlikely to improve in the next decade. The only solution may be to improve on vector control and to hope for the day when the dengue vaccine becomes available.

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