

**KERTAS SAINTIFIK****DENGUE OUTBREAK IN 1998 - TERENGGANU EXPERIENCE**

Nor Azimi, Y.

**ABSTRACT**

*The aim of this study was to describe a dengue outbreak in 1998, the worst ever reported in Terengganu. All cases notified to the Vector Borne Diseases Control Unit, Terengganu State Health Department was included in this study and information provided in the notification forms were analysed. A total of 2060 dengue cases with 4 deaths were reported in that year, with an increase of 267.9%. Out of the 2060 reported cases, 1907 (92.6%) were dengue fever with the remaining 153 (7.4%) being dengue haemorrhagic fever. The outbreak peaked in the second half of the year between August and October and subsequently declined until the 10<sup>th</sup> week of 1999. A total of 1216 (59.0%) of the reported cases had IGM to dengue demonstrated in at least one serum sample. 652 (53.6%) of these cases were confined to urban areas while 564 (46.4%) were from rural areas. 611 (50.2%) were females and the majority of the patients were Malays. The average days taken for a patient to be admitted to a hospital from the date of onset was about 4.24 days and the average days taken for the blood specimen for dengue IGM to be taken from the date of onset was 5.05 days. A total of 193281 premises were inspected for Aedes larvae, of which 1347 were positive. A total of 1155 fines were issued amounting of RM 35,455 and 1705 notices were issued in that year. The factors relating to statistically significant Dengue IGM were gender, day after onset when the blood specimen was taken, the platelet counts and packed cell volume (PCV) as well as type of Dengue Fever. ( $P < 0.05$ ). Blood specimens for dengue IGM should be taken at the appropriate time, as this will determine the outcome of the result, which subsequently affects management decisions.*

**INTRODUCTION**

Dengue Fever (DF) and Dengue Haemorrhagic Fever (DHF) are serious mosquito-borne diseases commonly found in Southeast Asian countries including Malaysia. In Malaysia, dengue fever was first reported in 1901 and dengue fever with severe haemorrhagic manifestation was first recognized in 1962-1964. It was observed only sporadically until 1973 where the first major outbreak of DF and DHF in Malaysia occurred with a total of 1,487 cases. Of these, 969 cases were that of DHF with a case fatality rate of 5.6/100,000.

Malaysia experienced another major dengue fever epidemic in 1974 with a total of 2,200 cases reported and 104 deaths. The main epidemic focus remained in Johor. More Malays and older persons had DHF. The subsequent epidemic with

3,005 cases were notified, 1,001 laboratory-confirmed and 35 deaths occurred in 1982. Since then, a fairly low incidence rate was noted with an average of about 500-900 cases of DF/DHF reported in a year with occasional outbreaks in 1982, 1987 and 1989. However Malaysia experienced another major dengue outbreaks throughout the whole country in 1997 and 1998 of which 19,429 and 27,381 cases reported each year respectively with the case fatality rate of 0.27% in 1997 has slightly increased to 0.3% in 1998.

In Terengganu, the pattern was slightly different. Before 1997, the dengue situation in Terengganu was well controlled. Annual dengue cases were fairly low and the highest ever reported was in 1992 with 214 cases. Dengue deaths were also infrequent. Similarly with the number of dengue outbreaks whereby the locality involved rarely exceeded 10 locations except 12 outbreaks in 1992. However since 1997, dengue situation in Terengganu had changed tremendously whereby a large number of dengue cases were reported since then. The number of dengue deaths has also increased even though the case fatality rate of 7.14% in 1997 was reduced to 2.25% in 1998. The table below shows the trend of dengue situation in Terengganu from the year 1992-1998.

**Table 1: The number of dengue cases and its incidence rate in Terengganu, 1992-1998.**

<b>Year</b>	<b>Number of Cases</b>	<b>Incidence Rate (per 100, 000 population)</b>
1992	214	27.0
1993	153 (1)	18.7
1994	46 (1)	5.5
1995	86 (2)	10.1
1996	174	19.1
1997	560 (3)	57.4
1998	2060 (4)	206.0

( ) = Number of dengue deaths.

## **OBJECTIVE**

The objective of this review was to describe the epidemiology and related characteristics of a dengue outbreak in Terengganu and to analyze confirmed dengue cases and factors that may be related to that.

## **METHODOLOGY**

### **Study Design & Sampling**

This was a retrospective secondary-data based study whereby all notified dengue cases to Vector Borne Disease Control Unit were included in the study. Information

provided in the "Borang Pemberitahuan" (modified investigation forms) were studied and analysed using SPSS software (Statistical Package for Social Studies).

### **Definition of key variables**

- A dengue case was defined as a confirmed or suspicious dengue case that was diagnosed by a Medical Officer and notified through telephone or notification form to the Health Office.
- Confirmed case was defined as a dengue case, with IGM to dengue demonstrated in at least one serum sample by using Dengue Blot Test for the Detection of IGM to Dengue.
- Dot Blot Kit for the Detection of IGM to Dengue is a test currently available only in Hospital Kuala Terengganu that is used to detect / demonstrate Dengue Virus Specific IGM in at least one serum sample (dengue case).

### **LIMITATIONS**

In any secondary-data based study, one would have expected that information provided were inadequate or limited. Similarly with this study some of the information given were inadequate, missing, wrongly filled or not available at all. Therefore further analysis could not be done.

### **RESULTS**

#### **Epidemiological description of the outbreak**

Altogether, there were 2060 dengue cases with four (4) deaths reported in that year, with an increase of 267.9% compared to 1997. 1907 (92.6%) were Dengue Fever (DF) and the remaining 153 (7.4%) were Dengue Haemorrhagic Fever. The outbreak peaked in the second half of the year between August and October and subsequently declined until the 10<sup>th</sup> week of 1999 as shown in the attached graph. Further analysis had been focused on confirmed dengue cases unless stated otherwise.

#### **Serological findings**

Of 2060 dengue cases reported, 1216 (59.0%) were confirmed cases in which IGM to Dengue had been demonstrated in them in at least one serum samples. The rest were negative.

#### **Distribution of cases according to district**

All districts showed an increased number of dengue cases compared to previous years. Cases came mainly from three (3) districts, namely Dungun, Kuala

Terengganu and Kemaman with 613, 524 and 450 cases respectively. They constituted 77% of all reported dengue cases in Terengganu.

**Table 2: Distribution of dengue cases according to district in Terengganu, 1998.**

<b>District</b>	<b>Number of Cases</b>	<b>Percentage (%)</b>
Besut	237	11.5
Hulu Terengganu	85	4.1
Kuala Terengganu	524	25.4
Marang	101	4.9
Dungun	613	29.8
Kemaman	450	21.9
Setiu	50	2.4
Terengganu	2060	100

#### **Distribution of cases according to location and residence**

Of 2060 reported dengue cases, majority 1095 (53.2%) were from the urban areas especially within the jurisdiction of a Local Authority. An increasing number of dengue cases were seen in the rural areas. Confirmed cases comprised of 652 (59.5%) of urban cases and 564 (58.4%) of rural cases. Nearly half 563 (47%) and 126 (10.4%) of the confirmed cases came from the Tradisional Villages and land schemes like Felda and Felcra respectively.

**Table 3: Distribution of dengue cases according to locations in Terengganu, 1998.**

<b>Location</b>	<b>Cases</b>	<b>Confirmed case</b>
	<b>Number of Cases (%)</b>	<b>Number of Cases (%)</b>
Urban	1095 (53.2%)	652 (53.6%)
Rural	965 (46.8%)	564 (46.4%)
Total	2060	1216

#### **Distribution of cases according to ethnic group**

Majority of the confirmed cases, 1140 (93.8%) were Malays, followed by Chinese with 69 (5.7%) cases. The rest were Indonesians.

**Distribution of cases according to age-group**

The age of the confirmed cases ranged from less than 1 year to 84 years old. The mean age was  $32.7 \pm 15.0$ . The majority were mainly in the 15-19 years group age (16.2%), followed by the 10-14 years group age (13.8%). Those aged between 5-19 years constituted 36.8% of all the cases.

**DISTRIBUTION OF CASES ACCORDING TO GENDER**

There was little difference in distribution of notified cases by gender, with 1078 (52.3%) were males and 982 (47.7%) were females. However confirmed cases comprised of 611 (62.2%) females and 605 (56.1%) males.

**Distribution of cases according to occupation**

A total of 375 (34.9%) of the confirmed cases were school children including tertiary students.

**CLINICAL PICTURES OF THOSE CONFIRMED CASES (WHO HAD POSITIVE IGM TO DENGUE)**

With regards to clinical pictures of dengue, the information required in the investigation forms were presence of fever, pain, rashes/petechial, bleeding tendency/hemorrhage, spot, presence of Hess Test and Blood Pressure. Laboratory investigations like Platelet Counts, Packed Cell Volume, Bleeding and Clotting Time were also required. However those data was very limited in the Notification Form. Despite that, interesting findings were observed as being discussed below.

Among those confirmed cases 638 (52.5%) presented with fever. Surprisingly quite a large number of patients i.e. 493 (40.5%) presented with abdominal pain. Only 99 (8.1%) had joint pain. A number of 144 (11.8%) patients did not have any form of pain/ache.

412 (33.9%) patients had rashes of some forms. Only 89 (7.3%) stated presence of hemorrhage or bleeding tendencies of any kind. Thrombocytopenia and Hess Test were found to be positive in 450 (37.0%) and 652 (53.6%) of the cases respectively. Of those confirmed cases also, 805 (66.2%) of them had their blood specimen taken for IGM to dengue at day 5 or more after the onset of illness and the average days taken were 4.57 days.

**Analytical Results**

Some analysis was done in order to identify determinants for dengue. Factors like gender, type of dengue, day after onset when blood specimen was taken, platelet counts, and packed cell volume were found to be related with the outcome of igm to dengue. The findings were shown in the tables below.

### Relationship between outcome of IGM to dengue with gender

The proportion of those who was positive for IGM to dengue is much higher (62.2%) among females compared to males (56.1%). This difference in proportion is statistically significant ( $p=0.005$ ). The odds (likelihood) of having positive IGM to dengue in females are 1.3 times compared to males (95% C.I.: 1.1, 1.5).

**Table 4: Outcome Of IGM To Dengue With Gender**

	Positive	Negative	Total
Females	611 (62.2)	371 (37.2)	982
Males	605 (56.1)	473 (43.9)	1078
Total	1216 (59.0)	844 (41.0)	2060

( ) = (%)

$\chi^2 = 7.900$ , d.f. =1,  $p=0.005$ , (95% C.I.: 1.1, 1.5)

### Relationship between outcome of IGM to dengue with type of dengue

The proportion of those who had positive IGM to dengue is much higher (68.0%) among Dengue Hemorrhagic Fever cases compared to Dengue Fever cases (58.3%). This difference in proportion is statistically significant ( $p= 0.019$ ).

**Table 5: Outcome of IGM to dengue with Type of Dengue**

	Positive	Negative	Total
Dengue Fever	1112 (58.3)	795 (41.7)	1907
Dengue H.Fever	104 (68.0)	49 (32.0)	153
Total	1216 (59.0)	844 (41.0)	2060

( ) = (%)

$\chi^2=5.468$ , d.f. =1,  $p=0.019$ , (95% C.I.: 0.5, 0.9)

### Relationship between outcome of IGM to dengue with day after onset when blood specimen was taken

The proportion of those who had positive IGM to dengue is much higher (68.5%) among those whose blood specimen was taken at day 5 or more after the onset or illness compared to those where blood specimen was taken earlier than day 5 after the onset of illness (46.5). This was statistically significant ( $p=0.000$ ).

**Table 6: Outcome of IGM to dengue with day after onset when blood specimen was taken**

	Positive	Negative	Total
< 5 days	411 (46.5)	473 (53.5)	884
≥ 5days.	805 (68.5)	371 (31.5)	1176
<b>Total</b>	1216 (59.0)	844 (41.0)	2060

( ) = (%)

$\chi^2 = 100.620$ , d.f. =1, p=0.000, (95% C.I.: 0.3, 0.5)

\* In primary dengue infection, IGM normally appears at day 5 or more after the onset of illness.

#### Relationship between outcome of IGM to dengue with platelet counts

The proportion of those who had positive IGM to dengue is much higher (70.0%) among those with thrombocytopenia compared with those with normal platelet counts (48.9%). This difference in proportion is statistically significant (p=0.000). The odds (likelihood) of having positive IGM to dengue in cases with thrombocytopenia is 2.4 times higher compared to those with normal platelet counts (95% C.I.: 2.5, 3.0).

**Table 7: Outcome of IGM to dengue with platelet counts**

	Positive	Negative	Total
≤ 100,000 mm <sup>3</sup> *	652 (70.0)	279 (30.0)	931
< 100,000 mm <sup>3</sup>	453 (48.9)	475 (51.1)	928
<b>Total</b>	1105 (59.4)	754 (40.6)	1859**

PC ≤ 100, 000 mm<sup>3</sup> = thrombocytopenia

\*\* Not=2060 because of missing data

( )=(%)

$\chi^2 = 86.783$ , d.f. =1, p=0.000. (95% C.I.: 2.5, 3.0)

#### Relationship between outcome of IGM to dengue with packed cell volume

The mean packed cell volume (PCV) of those with positive IGM to dengue is much higher (41.23 ± 5.55) compared to those with negative IGM to dengue (39.09 ± 6.11). This difference in means is statistically significant (p= 0.000) at (95% C.I.: 1.57, 2.71).

### Prevention and control activities

Extensive prevention and control activities had been carried out in order to contain the outbreak. A total of 193, 281 premises of all categories had been inspected for *Aedes* larvae of which 1347 were found to be positive. Majority (94%) of the larvae found was of *Aedes albopictus*. Fogging and abating had been carried out on 128, 558 and 6532 premises accordingly. Reinforcement of the Dangerous Disease Bearing Insect Act (DDBIA) 1975 was continued whereby a total of 1705 notices and 1155 fines with the amount of RM35, 455 were issued in that year. One (1) case was brought to court and fined RM 280.00 as a penalty and seven (7) construction sites were asked to close their activities under the Communicable Disease Control Act 1988 as they found to have *Aedes* breeding places in their premises.

### DISCUSSION & RECOMMENDATIONS

Generally dengue outbreak that occurred in 1998 in Terengganu was the worst so far compared to previous years. It was observed that similar situation occurred throughout the country. There could be two (2) reasons contributed to that. Firstly, better notification of dengue cases from hospital including district hospitals. This was achieved probably after a series of continuing medical education (CME) on dengue that were conducted in every hospital in which clinical pictures and the importance of dengue notification were reemphasized during that course. Subsequently the doctors were more aware and started notifying dengue cases. Despite that, there were still many dengue cases that were not notified accordingly.

Secondly, the availability of many newer breeding places especially from the non-residence areas like 'no man's land', abandoned lands, illegal dumping lands and cemeteries, which favored the growth of *Aedes* mosquitoes. Close contact between humans and mosquitoes further enhanced the transmission. Throughout the country similar pictures were observed whereby construction sites and dumping area were identified as two major breeding places. The fact that dengue was known as an urban disease previously was no longer true as rural cases were becoming more frequent. Dengue trend in Terengganu also showed that cases from the land schemes like Felda and Felcra were becoming more common.

The largest group been affected with dengue was student at the age group of 15-19 years. This was similar to national findings whereby 30% of all reported dengue cases were among students. The reason was probably because of frequency of being outside the house that predisposed them to mosquitoes bite. Children are at more risk to get infected with dengue compared to adults. Furthermore, they are out early in the morning and still are outside the house even in the afternoon at the time when *Aedes* mosquitoes are most active looking for blood meals.

More than half of reported dengue cases were confirmed serologically. This percentage was higher compared to 47.9% at the national level. Paired serum samples for the diagnosis of dengue was not regularly practiced in Terengganu. Patient was discharged before the second sample was obtained as they normally stayed in the

ward only 2-3 days and it is very hard to trace them back. Negative IGM to dengue in the first sample does not exclude the diagnosis of dengue. Therefore if we were to be able to do a paired serum samples then the positive cases would be higher.

WHO Guidelines defined dengue as an acute febrile illness characterized by frontal headache, retro-orbital pain, muscle and joint pain and rash with haemorrhagic tendencies, thrombocytopenia, and an increased in the hematocrit for dengue haemorrhagic fever. Even though similar pictures were shown in this review further conclusion would not be made as analysis done by the researcher was confined to that particular outbreak and based only on a univariate analysis in which other confounding factors were not taken into consideration in analyzing those data. Yet it is an interesting and important finding for dengue surveillance in Terengganu, whereby presence of fever and rashes together with thrombocytopenia and the increment of pack cell volume gave higher suspicious of dengue compared to other parameters.

With regards to control activities, Terengganu State Health Department had taken a greatest effort in order to control the outbreak. Various activities had been carried out from extensive health education program to activities like fogging and larvaciding. Through health education activity lectures, exhibitions, courses, and other means as well as through Radio 3RMKT were carried out which covered all groups of people. Information regarding dengue was disseminated during those activities. Gotong royong (Search and destroy) activity was also emphasized and they took place in various premises like schools, local authority compounds, private sectors, kampungs as well as in the land schemes like Felda and Felca. They were carried out in conjoint with above agencies. With such an effort fortunately, the dengue outbreak of dengue in Terengganu was finally controlled. Finally it is very important to make sure that all level in all agencies should also play an important role and they need to work hand by hand with the health department in controlling dengue outbreak. Then only the mission that dengue is no longer a public health problem would be achieved.

## CONCLUSION

- Dengue is still an urban disease even though increasing number of confirmed dengue cases are seen in the rural areas.
- Dengue affects all age group especially between 10-19 years old.
- Females are at more risk to get infected with dengue compared to males.
- Students are the largest group affected by dengue.
- Major complains in confirmed dengue patients are fever, abdominal pain and presence of rashes.
- Positive Hess Test and thrombocytopenia are major findings in confirmed dengue patients.
- Blood specimen for detecting IGM to dengue must be taken preferably at day 5 or more after the onset of illness in order to have better detection.

- Further research on certain factors need to be done in order to have more information about dengue patients in Terengganu.
- Borang Pemberitahuan (Modified Notification Form) should be reviewed and improved.
- Dengue case investigation by the Public Health Inspector (PHI) needs to be improved.

## **REFERENCES**

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