

## EPIDEMIOLOGICAL STUDIES OF DENGUE HEMORRHAGIC FEVER IN INDONESIA, 1975-1976

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### Ringkasan:

Suatu penelitian tentang daya transmisi virus dengue di masyarakat telah dilakukan di 3 kota yaitu. Ujung Pandang (bebas DHF), Surakarta (endemis DHF) dan Jepara (sekali wabah DHF kemudian menghilang).

Infection rate ketiga kota tersebut ternyata besarnya sama (berkisar dari 70.0%, 81.5% dan 81.9%), sehingga seperti kota Ujung Pandang termasuk daerah dengan endemisitas virus dengue yang tinggi walaupun belum pernah ditemukan kasus DHF.

Sedangkan Conversion rate selama musim hujan tahun 1975-1976 ditemukan 27.7% untuk Jepara, 61.2% untuk Surakarta dan 70.0% untuk Ujung Pandang. Disini ditunjukkan juga bahwa walaupun conversion rate (menunjukkan aktifitas virus dengue) di Surakarta dan Ujung Pandang pada waktu itu sama-sama tinggi. Tetapi didapatkan perbedaan gambaran DHF yaitu: Surakarta sebagai daerah endemis dan Ujung Pandang masih bebas DHF.

Contoh larvae *A. aegypti* dari Ujung Pandang dan Jepara dibiakkan dan dilakukan pemeriksaan susceptibility terhadap virus dengue 2, ternyata keduanya sama-sama rendah.

Di ketiga kota tersebut ditemukan juga bahwa tingginya transmisi virus dengue berhubungan dengan aktifitas penduduk (pasar, sekolah dan lain-lain) dan tidak tergantung pada kepadatan nyamuk *A. aegypti* atau kepadatan penduduk. Penelitian ini menunjukkan bahwa adanya suatu virus dengue saja tidak menjamin terjadinya suatu DHF.

L. K. : VIRUS DENGUE

Dengue hemorrhagic fever (DHF) has been known in Indonesia since 1969, from outbreaks which occurred in Jakarta and Surabaya. Subsequently, the number of reported cases increased each year with peaks occurring in 1970 and 1973. The number of reported cases in these two outbreaks were 477 and 10,189 or an increase of approximately 3 and 8 times respectively over the previous year.

The disease became endemic in almost all big cities in the western part of Indonesia and lately outbreaks of DHF occurred in small cities and remote areas as well.

In 1969 N.I.H.R.D. (Lit. Bang. Kes) initiated research programs of DHF and ... mostly at improving vector control method. ... clinical

diagnosis and treatment of DHF cases. J. Sulitansi S. studied the conversion of dengue antibodies in school children in Jakarta. It was found that during the rainy season of 1969-1970 the conversion rate of 7-9 years old children was 25% and 30% against dengue 1 and 2 respectively.

Another study was concerned with epidemiological surveillance of dengue virus in Indonesia to find the correlation of dengue virus or viruses with DHF outbreaks and severity of illness. This study included all DHF outbreaks occurring in Indonesia and also 6 Sentinel hospitals located in 4 endemic cities. The results so far show that all four dengue serotypes have been isolated from DHF patients, mostly dengue 2 during the DHF outbreaks in 1973 in Central Jawa and Surabaya. And in 1976 in Jakarta, dengue 1, 2 and 3 have been isolated in about equal number. Dengue 4 was

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isolated less frequently.

The death rate of DHF is decreasing each year due to physician awareness of diagnosis and treatment.

This present study was recommended by Dr. S.B. Halstead to determine how dengue virus or viruses are maintained in the communities and representing different epidemiological pattern of DHF such as, endemic or free areas, etc. A survey of anti-dengue antibodies among children is a useful method to determine distribution of dengue viruses in the respective communities. The total number of children who possess antibody before the rainy season will give Dengue Infection Rate (DIR) and those sera which converted after the rainy season are Dengue Conversion Rate (DCR) and represent the transmission pattern of dengue viruses during rainy season.

This conversion of antibody against dengue virus in school children during the rainy season from three epidemiologically different areas might measure the transmission difference and will answer the various DHF pattern in communities (free, endemic etc).

## MATERIAL AND METHOD

Three cities were selected on the basis of DHF report since 1969, these are:

*Jepara*: a coastal town in Central Jawa. 111 cases were reported during the DHF outbreak in 1973 and confirmed by serological test. Mostly children at age 6-9 years and subsequently no DHF cases have been reported during the following two years. This area considered as "One DHF outbreak and then disappeared".

*Surakarta*: a city surrounded by mountains in Central Jawa. A large DHF outbreak occurred in 1973 with continuous reports of 2-5 DHF cases per week confirmed by serological test. Mostly children at age 6-9 years and considered as "Endemic of DHF".

*Ujung Pandang*: a port city in South Sulawesi where no DHF cases have been found confirmed by serological test so far. The transportation to other endemic cities is very high and therefore considered as "Free of DHF".

The sampled population was taken from school children at age 6-7 years (first grade), selected from three different areas in one city. The selection of areas according to: population density, house density, *A. aegypti* figures,

population activity (shopping, school etc) and location of DHF cases (if any).

We started with children at age 6-7 years using a sample size of 2-5% of the children total population at that age. It was expected that not all of the children have had previous infection with one or more dengue virus during their life.

The microtiter technique (Clark and Cassal) was applied to measure the Hemagglutination Inhibition (H.I.) antibody titer, using 8 Unit of dengue antigen and carried out in The Centre of Biomedical Research, Jakarta.

The first bleeding was carried out in October 1975 to select those who had no dengue antibody and the negative children were bled again in May 1976. The first bleeding was done before the rainy season and the second bleeding after the rainy season. However, because of the high infection rate the number of negative children was too small to provide a conclusive interpretation of the transmission of dengue virus. Therefore, children from the lower age group (5-6 year) from the same locality were included during the second blood collection.

In addition, *A. aegypti* surveys and studies are being undertaken which would be reported separately or elsewhere.

## RESULTS

From the first blood collection, 1123 children at age 6-7 years were taken from three cities. 171 out of it had H.I. titer < 30 against dengue viruses and considered as negative children. After the rainy season only 137 children were found and bled again. As an addition, children at age 5-6 years were also bled during the second blood collection (after the rainy season) with the total amount of 326 children.

Table 1, show that Dengue Infection Rate (DIR) among children at age 6-7 year were 81.9%, 81.5% and 88.9% where as the Dengue Conversion Rate (DCR) were 27.7%, 61.2%, and 70.0% in Jepara, Surakarta and Ujung Pandang respectively. Thus, the DIR between those three cities was almost the same and very high. The DCR between Jepara (one outbreak and then disappeared) and Surakarta (endemic DHF) were 27.7% and 61.2% respectively. Although this is a 2-fold difference it is not conclusive due to the small number of sample size.

**Table 1 Serological result from three cities, among children 6-7 years old before and after the rainy season 1975-1976**

H.I. titer against Dengue virus.	Jejara <sup>1)</sup>	Surakarta <sup>2)</sup>	Ujung Pandang <sup>3)</sup>
< 30	42	86	43
30	160	209	257
60	36	80	69
≥120	9	60	21
	288	445	390
Dengue Infection Rate:	81.9%	81.5%	70.0%
No. of negative children	40	67	30
< 30	11	41	21
Dengue Conversion Rate:	27.7%	61.2%	70.0%

1) one outbreak in 1973 (111 DHF cases) and then disappeared.

2) endemic DHF

3) free of DHF

**Table 2 Sero-epidemiologic surveillance result of Dengue virus, Jejara, during the rainy season 1975 - 1976**

Area	Panggang	Mulyoharjo	Jobokuto
Population density	high	medium	low
Population type	urban	shopping	rural
DHF cases 1975-1976	nil	nil	nil
<b>Aedes aegypti density</b>			
1. Adult: Landing rate	1.5	0.0	0.4
2. Larvae:			
Breteau index	14.0	46.0	96.0
Container index	6.8%	33.0%	34.7%
Premise index	14.0%	40.0%	61.0%
<b>6-7 year old age group:</b>			
Sample size	88	100	100
No. of positive	83	95	68
<b>Dengue Infection Rate:</b>	<b>94.3%</b>	<b>95.0%</b>	<b>68.0%</b>
No. of negative children	5	5	30
No. of converted	5	5	1
<b>Dengue Conversion Rate:</b>	100%	100%	3.3%
<b>5-6 year old age group:</b>			
Sample size	55	41	15
No. of positive	nil	8	4
<b>Dengue Infection Rate:</b>	0%	19.5%	26.0%

H.I. antibody titer &lt; 30 : negative, ≥ 30: positive

Jejara: one DHF outbreak in 1973 and then disappear

**Table 3** Sero-epidemiological surveillance result of Dengue virus. Surakarta, during the rainy season 1975 – 1976

Area	Jebres	Laweyan	Serengan
Population density	2.000/Ha	1.200/Ha	700/Ha
Population type	urban	urban	shopping
DHF cases in 1976	19	17	16
<b>Aedes aegypti density</b>			
1. Adult: Landing rate	2.67	3.83	3.58
2. Larvae:			
Breteau index	78.0	69.0	84.0
Container index	21.8	27.7%	28.8%
Premise index	50.0%	46.0%	54.0%
<b>6–7 year old age group</b>			
Sample size	195	150	100
No. of positive	154	114	81
<b>Dengue Infection Rate:</b>	78.8%	76.0%	81.0%
No. negative children	36	26	5
No. Converted	20	17	4
<b>Dengue Conversion Rate:</b>	55.5%	73.0%	80.0%
<b>5–6 year old age group</b>			
Sample size	50	50	50
No. of positive	10	15	8
<b>Dengue Infection Rate:</b>	20.0%	30.0%	16.0%

H.I. antibody titer < 30: negative and  $\geq$  30: positive

Surakarta: endemic DHF

**Table 4** Sero-epidemiological surveillance result of Dengue virus, Ujung Pandang, during the rainy season 1975 – 1976

Area	Bontoala	Mariso	Tallo
Population density	419/Ha	213/Ha	70/Ha
Population type	urban	urban	shopping
DHF cases 1975–1976	nil	nil	nil
<b>Aedes aegypti density</b>			
1. Adult: Landing Rate	1.6	1.8	2.5
2. Larvae:			
Breteau index	55.0	81.0	85.5
Container index	40.0%	48.7%	74.7%
Premise index	43.0%	57.0%	60.8%
<b>6–7 year old age group</b>			
Sample size	135	153	102
No. of positive	118	134	95
<b>Dengue Infection Rate:</b>	87.4%	87.5%	93.1%
No. negative children	12	14	4
No. of converted	8	9	4
<b>Dengue Conversion Rate:</b>	66.6%	64.2%	100%
<b>5–6 year old age group</b>			
Sample size	25	28	12
No. of positive	8	7	2
<b>Dengue Infection Rate:</b>	32%	25%	16%

H.I. antibody titer < 30: negative and  $\geq$  30: positive

Ujung Pandang: Free of DHF

From two of these three cities (Ujung Pandang and Jepara), *A. aegypti* larvae were collected during the first blood collection and brought to Dr. D.J. Gubler Namru-2, for mosquito competence test, and both had a low susceptibility.

Table 2, 3 and 4 show the difference of DIR and DCR between each locality in the same city. The difference was little regardless population density and *A. aegypti* density. At any rate, it appeared that transmission of dengue virus was higher in shopping areas than in housing areas regardless of population density. The Dengue Infection Rate among children at age 5-6 years was very low compared with the higher age group.

## DISCUSSION

Dengue virus or viruses can cause a wide spectrum of disease, from a minor illness (dengue fever) to a frightening dengue hemorrhagic fever (Including DSS). Up to present time, it is very difficult to foretell the occurrence of DHF in a community although dengue virus had already infiltrated. Nevertheless, this sero-epidemiological study of dengue virus have given transmission pattern in the communities of three epidemiologically different DHF cities and might give guidance in preventing DHF.

So far, the transmission rate in area known as "One DHF outbreak and then disappeared" was low (27.7%), where as in "Free DHF" and "Endemic DHF" areas had 61.2% and 70.0%, respectively, which mean also higher attack rate of dengue virus in these two cities but resulting minor illnesses in one place (Ujung Pandang) and DHF in another place (Surakarta). This different pattern may be due to the variation of dengue virus as there are 4 sero-

types or to other epidemiological factors in each place. However, to pin point which dengue virus circulating in the above community and caused conversion, typing of converted sera by plaque reduction neutralization test is needed.

The lower Dengue Infection Rate among children at age 5-6 years than in the higher age group could be due to the higher risk of exposure among school children.

This study is still in progress and further results will be presented.

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## SUMMARY

A Sero Epidemiological Studies of Dengue Hemorrhagic Fever (DHF) were carried out in three cities different of pattern i.e.: Ujung Pandang as "Free of DHF", Surakarta as "Endemic of DHF" and Jepara as "One DHF outbreak and then disappeared"

The Dengue Infection rate among children at age 6-7 y.o. from those three cities were similar and very high. In each city it is agreed that the transmission rate of dengue virus is higher in shopping area than in housing area.

## REFERENCES

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