





chikungunya viruses was reported from Calcutta, India between the months of August and December, 1963. In Bangkok, three cases of severe hemorrhagic fever in young adults with serologic confirmation have been observed. Five other adults with dengue infections have had febrile diseases accompanied with abnormal bleeding. Preliminary data from the 1962 outbreak suggests that hospitalization rates for Thais and Chinese were proportional to their representation in the Bangkok population. Children from the lowest income group when infected with dengue virus sought hospital admission twice as frequently as did children from the highest are more likely to be cared for at home or a variation in severity of infection is not certain. However, hemorrhagic fever does not spare either Chinese or upper income Thai. Both groups have a different pattern of nutrition and presumably better balanced diet than low income Thai. Factors influencing the spread of hemorrhagic fever in urban areas are under study. This project is actively continuing.

BODY OF REPORT

SEATO Medic Study No. 1: Epidemiology of Thai Hemorrhagic Fever  
Project No. 3A 025601 A 811: Military Medical Research Program  
S.E. Asia  
Task 01: Military Medical Research Program  
S.E. Asia  
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SEASIA (Thailand)  
Reporting Installation: US Army-SEATO Medical Research Laboratory  
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Period Covered by Report: 1 April 1963 to 31 March 1964  
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**Objective:** To gather information on factors which influence and control the occurrence of mosquito borne hemorrhagic fever.

**Description:** The study consists of primary collection of data including enumeration of hospitalized patients and analysis of disease attack rates by age, sex, race, socio-economic class, geographic area, type of housing, meteorologic data and mosquito populations. In particular epidemiological studies have been directed toward the following problems:

1. The number of cases of hemorrhagic fever among residents of Bangkok-Thonburi.

2. The distribution of cases throughout the rest of Thailand.
3. Age, sex, race and death rates of hospitalized hemorrhagic fever.
4. The proportion of hospitalized hemorrhagic fever cases caused by dengue and chikungunya and other viruses.
5. The number of recognizable hemorrhagic fever infections not admitted to hospital.
6. The number of mild illnesses caused by dengue and chikungunya viruses.
7. The total infection rate for dengue and chikungunya viruses.
8. The urban pattern of spread of hemorrhagic fever.
9. The vector or vectors for dengue and chikungunya viruses.
10. The influence of race and socioeconomic status on infection and hospitalization rates of hemorrhagic fever.
11. The type of syndrome acquired by Caucasians when infected with Thailand dengue or chikungunya viruses.

Data has been accumulated and answers obtained for many of these questions. These are presented and discussed in SEATO Medic Studies 1 as well as 2, 6, 7 and 8.

Progress: Observations of consecutive outbreaks of hemorrhagic fever over 2 years ending 31 March 1964 have been completed. Shown in Figure 1 are hospitalization data for hemorrhagic fever in Bangkok and Thonburi, 1958-1963. In this period there have been a total of 10,345 cases with 685 deaths. The number of cases admitted to hospitals outside Bangkok and Thonburi has been estimated only for the year 1962 (see below) and is not included in Figure 1.

1962 Epidemic

The number of hospitalized hemorrhagic fever cases and deaths occurring in and outside Bangkok-Thonburi in 1962 is shown in Table 1. Case fatality rate showed little variation by sex or race. Cases outside Bangkok and Thonburi were largely distributed in 12 large towns in Central and South Central Thailand. The disease did not occur in Northeast or North Thailand. This data is published and discussed elsewhere (1).

By comparing the percent of Chinese or Thais hospitalized with hemorrhagic fever with the percent of these ethnic groups found in our city study sample (SEATO Medic No. 8) and finally with the hemorrhagic fever cases occurring in

in Chinese and Thai in the study sample, it has been demonstrated that in 1962 HF occurred proportionately in each of the two largest ethnic groups in Bangkok (Table 2).

Because host factors may determine the dengue pathogenetic sequence it has been considered important to assess the effect of nutritional status on the course of dengue infection. One approach to this question is to study the virulence of hemorrhagic fever in various socio-economic levels of society. To determine disease virulence it is necessary to know how many overt illnesses occurred per infection of susceptible individuals. Unfortunately, methods of measuring human dengue susceptibility reliably by serologic means have not yet been established. Because of this limitation, data from the Bangkok Area Study relates hospitalized and non-hospitalized hemorrhagic fever per 1,000 dengue virus infections (calculated from the number of persons in sample converting from HI negative to HI positive to dengue 1 virus then multiplied by the total area population). The data in Tables 3 and 4 show that when all hemorrhagic fever infections are counted, disease rates are proportional in each income group. Considering hospitalized hemorrhagic fever alone there are fewer admissions in the upper income group and more in the lowest income group. Lower hospitalization rates in upper income groups may reflect the fact that private patients in Bangkok are more likely to be treated at home or in private hospitals than are low income patients. Alternatively, lower hospitalization rates may reflect a lessened virulence of disease for upper income groups.

#### 1963 Epidemic

The 1963 hemorrhagic fever epidemic has been the first major inconsistency in the alternate year epidemicity of hemorrhagic fever since 1958. The outbreak was unusual in several respects: (a) high mortality rate---nearly 10% for entire epidemic, (b) large number of cases during the cool season---over 100 patients have been admitted to hospitals each month from December 1963 through February 1964, (c) predominance of cases in Amphur Dusit---the outbreak for over 12 months has centered in Amphur Dusit and portions of adjacent amphurs. Nearly 50% of admissions came to Children's and Wachira Hospitals (located in Amphur Dusit). Statistics for the 1963 outbreak are shown in Tables 5-8.

#### Hemorrhagic Fever in Adults

Although hemorrhagic fever remains almost exclusively a disease of children below the age of 14, a small number of cases in adults predominantly young adults, has been recognized. Most cases have been mild without all criteria of hemorrhagic fever. However, some have been accompanied with various hemorrhagic phenomena, hepatomegaly, or shock and in 2 instances, death. Those cases with serologic evidence suggesting dengue virus etiology are summarized in Tables 9 and 10.

### Hemorrhagic Fever in Southeast Asia, 1963

Recently, outbreaks of hemorrhagic fever have been reported in three new areas of Southeast Asia. Between November 1962 and June 1963 approximately 40 hospitalized children in Penang, a city in north Malaysia, have been clinically and virologically diagnosed as having hemorrhagic fever (A. Rudnick, personal communication). There have been 4 deaths. All viruses isolated from patients have been dengue or dengue-like. This may represent an extension of the Thai outbreak of 1962 which was known to have progressed to a railroad town in Thailand 700 kilometers south of Bangkok and 150 kilometers north of Penang.

Between June and October 1963, 331 cases of hemorrhagic fever with 116 deaths were recognized in children in South Vietnam. Cases occurred in villages on the Mekong River 10-50 kilometers south of the Cambodian border and also in the city of Saigon. Dengue type 2 viruses have been isolated from patients and Aedes aegypti from this outbreak.

Finally, during the months of August through December 1963, cases of a previously unrecognized hemorrhagic fever occurred in Calcutta, India (J.K. Sarkar, Bull. Cal. Sch. Trop. Med. ). Records from burning ghats in the city indicate that deaths associated with the outbreak may have been as high as 300. Total hospitalizations are unknown. Serologic evidence of dengue virus infection and chikungunya virus isolations have been reported (J.K. Sarkar, personal communication).

Summary and Conclusions: Observations of hemorrhagic fever in Thailand have continued. Disease incidence in 1963 in Bangkok was surprisingly high (1657 cases) and severe (144 deaths). During the year hemorrhagic fever outbreaks were reported from South Vietnam, India and Malaysia. Definite evidence of occurrence of the hemorrhagic fever syndrome in Thai adults is reported. No marked ethnic or economic predilection of the disease was noted within the resident oriental population of Bangkok. Epidemiologic data fails to show a marked variation in hemorrhagic fever severity which can be correlated with nutritional differences found in Thai and Chinese ethnic groups and in upper vs. lower income groups.

Table 1. Hospitalized cases and deaths of hemorrhagic fever by race and sex, Thailand, 1962.

Residence of patient	Hospitalizations (deaths/cases)					
	Total	Male	Female	Thai	Chinese	Other
Bangkok-Thonburi	187/3774	100/1884(5.3%)	87/1890(4.6%)	102/2085(4.9%)	85/1668(5.1%)	0/21
Outside Bangkok-Thonburi	159/2312	65/1130(5.7%)	94/1182(7.9%)	120/1876(6.4%)	37/426 (9.1%)	0/10
Total	346/6068	165/3014(5.5%)	181/3072(5.9%)	222/3961(5.6%)	124/2094(5.9%)	0/31

Table 2. Hemorrhagic fever and race in hospitalized hemorrhagic fever patients and in Bangkok sample, 1962.

	Census sample *	Hospitalized HF	HF in areas sampled
% Thai	55.7	55.0	57.6
% Chinese	40.0	44.0	42.4

\* 2% of Bangkok-Thonburi population.

Table 3. Incidence of hemorrhagic fever in several income groups, Bangkok Area Study, 1962.

Total monthly Family income (Baht)	% Distribution		
	Census sample *	Hosp. HF in Study Areas	Hosp. and non-hosp. HF in Areas
2500+	9.7%	4.7	8.4%
1500-2500	9.7	9.0	10.9
700-1500	49.7	44.1	47.5
100-700	30.8	42.3	33.1

\* 2% Bangkok-Thonburi population.

Table 4. The occurrence of hemorrhagic fever per 1000 dengue HI antibody conversions in several income groups. Bangkok Area Study, 1962. Based upon preliminary data

Total monthly income (Baht)	Estimated dengue infections	Hosp. HF	Ratio Hosp. HF Infections	Hosp. and non-hosp. HF	Ratio
2500+	960	3	3.1/1000	16	16.6/1000
1500-2500	1,483	8	5.3/1000	21	14.1/1000
700-1500	7,238	28	3.8/1000	75	10.4/1000
100- 700	3,299	24	7.2/1000	44	10.3/1000

Table 5. Hemorrhagic fever cases and deaths in Bangkok-Thonburi by month and race of patients, 1963.

Month	Cases					Deaths	
	Thai	Chinese	Filipino	Japanese	Indian	Thai	Chinese
January	15	6	-	-	-	3	-
February	6	2	-	-	-	1	-
March	11	3	-	-	-	-	1
April	18	9	-	-	-	5	3
May	91	16	-	1	-	19	2
June	116	50	-	-	-	6	5
July	213	93	-	-	-	13	5
August	210	73	-	1	-	25	8
September	199	88	1	-	-	20	7
October	134	71	-	-	1	3	4
November	84	31	-	-	-	8	-
December	49	65	-	-	-	3	3
Total	1,146	507	1	2	1	106	38

Table 6. Hemorrhagic fever cases by residence of patients.  
Patients hospitalized in Bangkok and Thonburi, 1963.

Amphur	City	Cases	Deaths
Dusit	Bangkok	446	49
Patoomwan	Bangkok	130	13
Prakanong	Bangkok	119	8
Yannawa	Bangkok	155	8
Bangrak	Bangkok	99	6
Pomprab	Bangkok	81	4
Sampanthawong	Bangkok	29	1
Prakanong	Bangkok	51	5
Bangkapi ) Bangkane and ) Lard-kabang )	Bangkok	65	10
---	Thonburi	294	20
---	Nontaburi	33	4
---	Samutprakarn	87	10
---	Patoomthanee	15	1
---	Samutsakorn	9	2
---	Nakornpathom	11	-
---	Ayudhaya	5	-
---	Others	28	3
Total		1,657	144

Table 7. Hemorrhagic fever cases by age of patients, Bangkok-Thonburi, 1963.

Age	Cases	Deaths
1 mo. - 1 yr.	203	12
1 yr. - 2 yrs.	121	16
2 yrs. - 3 yrs.	178	20
3 yrs. - 4 yrs.	199	21
4 yrs. - 5 yrs.	194	25
5 yrs. - 6 yrs.	206	21
6 yrs. - 7 yrs.	148	12
7 yrs. - 8 yrs.	119	6
8 yrs. - 9 yrs.	88	3
9 yrs. - 10 yrs.	52	2
10 yrs. - 11 yrs.	51	2
11 yrs. - 12 yrs.	41	1
12 yrs. - 13 yrs.	26	-
13 yrs. - 14 yrs.	16	-
14 yrs. - 15 yrs.	6	-
15 yrs. - 16 yrs.	3	2
16 yrs. - 17 yrs.	-	-
17 yrs. - 18 yrs.	-	1
18 yrs. - 19 yrs.	-	-
19 yrs. - 20 yrs.	2	-
20 yrs. - 21 yrs.	1	-
21 yrs. - 22 yrs.	1	1
22 yrs. - 23 yrs.	-	-
23 yrs. - 24 yrs.	2	-
<b>Total</b>	<b>1,657</b>	<b>144</b>

Table 8. Hemorrhagic fever cases by hospital admission, Bangkok-Thonburi, 1963.

Hospital	Cases	Deaths
Children	592	46
Siriraj	189	24
Chulalongkorn	280	17
Wachira	106	20
Police	80	16
Bangkok Christian	39	--
Prapinklao	134	10
Pramongkutklao	12	-
Bangkok Sanitarium	146	5
Tobacco	9	-
Women	2	2
Lertsin	15	-
Bhumipol	4	-
Kwangsiew	13	-
Sai Nadda	9	-
Sahapayaban	27	4
<b>Total</b>	<b>1,657</b>	<b>144</b>

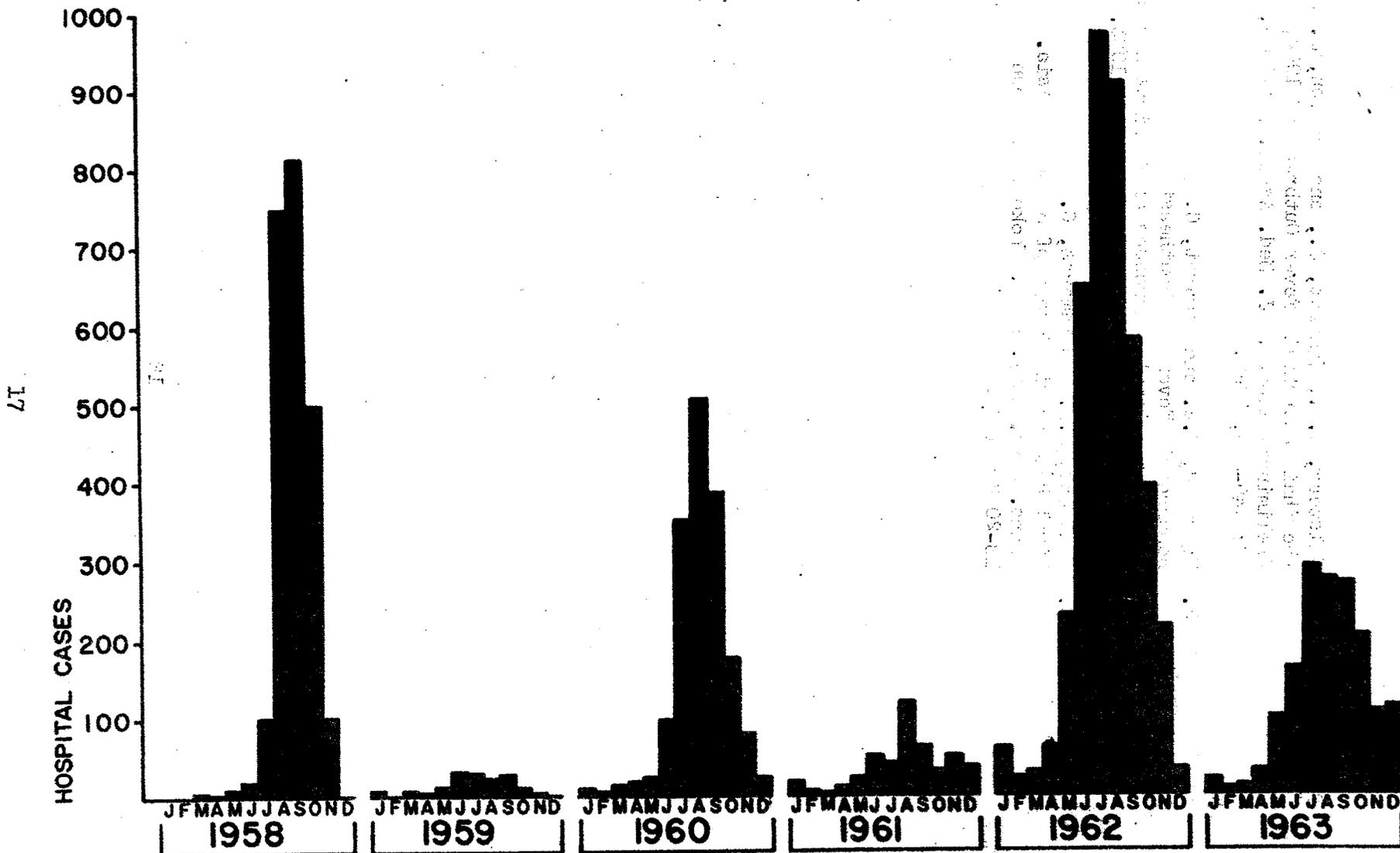
Table 9. Hemorrhagic fever in young adults. Cases without sufficient clinical diagnostic criteria to warrant diagnosis of hemorrhagic fever.

Patient Number	Age	Sex	Date Admission	Petechiae	+ Tour. Test	HI Titer in paired sera	
						Chik	Dengue
HFS 117	16	F	1 Jul 62		+	80 80	40 10,240
HFS 217	19	F	23 Aug 62		+	0 0	320 2,560
HFS 324	24	F	30 Aug 62	+		80 80	2,560 1,280
HFS 267	15	F	3 Sep 62	+	+	0 0	640 320
HFS 443	23	F	5 Oct 62	+	+	0 0	0 10,240
HFS 445	25	F	9 Oct 62		+	40 20	80 320
HFS 486	22	F	7 Nov 62	+		0 160	0 40
TH 77	36	F	26 Jul 63	+		40 1,280	320 320
TH 120	15	F	8 Sep 63		+	0 0	0 40
TH 85	19	F	10 Aug 63		+	80 80	640 20,480
TH 231	26	M	11 Dec 63	+		0 0	320 2,560
TH 261	15	F	15 Jan 64		+	320 320	5,120 10,240

Table 10. Hemorrhagic fever in young adults. Cases with clinical findings compatible with the diagnosis (i.e. shock, hepatomegaly or bleeding).

Patient Number	Age	Sex	Date Admission	Pete- chia	+ Tour. Test	Bleed- ing	Low BP	Hepato- megaly	HI Titer in paired sera	
									Chik	Dengue
HFS 116	18	F	30 Jun 62	+	+	+			80 80	320 20,480
HFS 118	19	F	1 Jul 62	+	+	+			40 80	0 10,240
HFS 155	21	F	20 Jul 62	+	+	+	+	+	320 320	40,960 163,840 DEAD
HFS 266	22	F	3 Sep 62		+	+			0 0	40 320
HFS 499	15	F	7 Nov 62	+	+	+			40 40	2,560 10,240
TH 75	15	F	25 Jul 63	0	0	+	0	0	0 0	20,480 20,480
TH 116	19	F	6 Sep 63	+			+		0 0	10,240 10,240
TH 82	21	F	5 Aug 63	+	+	+	+	+		DEAD
TH 264	17	F	16 Jan 64	+	+			+	320 320	5,120 10,240

FIGURE 1. MONTHLY HOSPITALIZATIONS FOR THAI HEMORRHAGIC FEVER IN BANGKOK AND THONBURI, 1958-1963



- Publications:
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  2. Halstead, S.B. and Yamarat, C.  
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and Malaria. Rio de Janeiro, 1-10 Sept 1963.
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Viral Hemorrhagic Fevers of Southeast Asia.  
Trans. Amer. Coll. Phys. Yokosuka, Japan  
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