

Virological and Epidemiological Studies on Encephalitis in Chiang Mai Area, Thailand, in the Year of 1982

II. Hospitalized patients

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Abstract: A total of 179 hospitalized patients were observed during the study period from July 17 to August 19, 1982, in Chiang Mai Area, Thailand. Their clinical diagnoses were 55 encephalitis, 77 dengue hemorrhagic fever (DHF), 11 fever of unknown origin, 8 meningitis, and 28 other diseases or without clinical diagnosis. DHF cases were observed mostly in Chiang Mai City and were concentrated in a short period of time, while encephalitis cases were more scattered over Chiang Mai Province and were observed more sporadically during the study period. Age distribution of the observed encephalitis and DHF patients appeared to have a shift toward older age when compared with the average in Thailand.

Key words: Encephalitis, Dengue hemorrhagic fever, Thailand, Chiang Mai.

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INTRODUCTION

Since 1969, epidemics of encephalitis presumably due to infection with Japanese encephalitis (JE) virus have been reported every year during rainy season in Northern Thailand (Statistics of the Ministry of Public Health of Thailand). Virological and epidemiological studies performed in 1969 and 1970 by several investigators have been reported (Yamada *et al.*, 1971; Grossman *et al.*, 1973a; b; c; 1974; Gould *et al.*, 1974; Johnsen *et al.*, 1974), as well as prophylactic vaccination against JE (Fukunaga *et al.*, 1974). Our study was planned to obtain recent informations on the encephalitis in Chiang Mai Area as described in the preceeding paper (Igarashi *et al.*, 1983), and this paper describes statistical data on the hospitalized patients of encephalitis, dengue hemorrhagic fever (DHF), and some other diseases which might be considered to be related to JE or dengue infections.

MATERIALS AND METHODS

Sampling: Study cases were collected from July 19 to August 17, 1982 from the following hospitals: Chiang Mai University Hospital (Departments of Pediatrics and Internal Medicine), Provincial and District Hospitals of Chiang Mai and Lamphoon Provinces, McCormick Hospital and some other private hospitals in Chiang Mai City. Some specimens were sent from other Provinces also. These hospitals were solicited to supply sera from patients with clinical diagnosis of encephalitis, DHF, fever of unknown origin (FUO), and some other diseases which might be considered as related to JE or dengue infections. The specimens were collected once in a few days by several health officers together with patient's record on the name, age sex, address, dates of onset and sampling, clinical diagnosis, and several principal symptoms of encephalitis or DHF. Upon arrival, sera were used for the virus isolation on that day, and the remaining was stored in a refrigerator for a few days until treated for the serology.

Statistical data: Data were obtained from the Ministry of Public Health of Thailand, Provincial Health Offices of Chiang Mai and Lamphoon Provinces, and Administration Office of Chiang Mai Province.

RESULTS

A total of 179 cases were examined and Table 1 shows their distribution according to their clinical diagnosis and admitted hospital with its location. Because 2 encephalitis patients were transferred from their initial hospital to Chiang Mai Provincial Hospital and Chiang Daw Hospital to the Department of Pediatrics of Chiang Mai University Hospital, total number of encephalitis in Table 1 is recorded as 57, instead of actual

Table 1. Distribution of hospitalized patients according to their clinical diagnosis and admitted hospitals

Hospital	Location		No. of patients					
	Province	Amphoe	total	Encephalitis	Menigitis	D.H.F.	F.U.O.	others
Dept. of Pediatrics Chiang Mai Univ. Hosp.	Chiang Mai	Muang	51	24	4	19	1	3
Dept. of Intern. Med. Chiang Mai Univ. Hosp.	Chiang Mai	Muang	32	15	2	14		1
Chiang Mai Provincial Hospital	Chiang Mai	Mae Rim	7	2		1		3
Fang Hospital	Chiang Mai	Fang	5	3				2
Chiang Daw Hospital	Chiang Mai	Chiang Daw	4	1	1		2	
Chom Tong Hospital	Chiang Mai	Chom Tong	3	1		2		
Sarapee Hospital	Chiang Mai	Sarapee	2			1		1
San Pa Tong Hospital	Chiang Mai	San Pa Tong	3	1		2		
Mc Cormic Hospital	Chiang Mai	Muang	43	7	1	24	2	9
other hospitals & private clinics	Chiang Mai	Muang	9	2		7		
Lamphoon Provincial Hospital	Lamphoon	Muang	10			6	4	
Pa Sang Hospital	Lamphoon	Pa Sang	9					9
others			3	1		1	1	
total			181	57	8	77	11	28

Table 2. Age distribution of patients and clinical diagnosis

age group	No. of patients					
	Encephalitis	Meningitis	D.H.F.	F.U.O.	others	total
0		2	1			3
1 - 3	5		9	2		16
4 - 6	8	1	7		3	19
7 - 9	4	1	7	2		14
10 - 14	14	1	11	4	1	31
15 - 19	8		13		1	22
20 - 29	5	2	18	1	2	28
30 - 39	5		3			8
40 - 49	1	1	4	1		7
50 -	5		2	1		8
unknown			2		21	23
total	55	8	77	11	28	179

number of encephalitis patient of 55, and also the total number of patients in Table 1 was recorded as 181 instead of actual number of 179. Largest number of cases were observed in Chiang Mai University Hospital, especially in the Department of Pediatrics, followed by McCormick Hospital. The number of encephalitis cases was 55 and that of DHF was 77. Age distribution of these patients is shown in Table 2. The largest numbers of encephalitis were observed in the age group of 10-14 years old, while DHF cases were most numerous in the age group of 20-29, followed by 15-19 years old. These age distribution apparently shifted towards older age especially in the case of DHF, when the data were compared with those in Thailand as a whole, where the largest numbers of encephalitis and DHF were reported in the age group of 5-9 years old (Statistics of the Ministry of Public Health of Thailand).

Table 3. Numbers of hospitalized patients according to their address in the district in Chiang Mai Province

code of Amphoe or District	name of Amphoe or District	Population	No. of patients					total
			Encephalitis	Meningitis	D.H.F.	F.U.O.	others.	
A	Mae Ai	39,106	3					3
B	Fang	102,481	1					1
C	Chiang Daw	48,960	2	1	1	2		6
D	Praw	43,829	6					6
E	Mae Tang	58,755	3		1	2	1	7
F	Doi Saked	54,382	1		1			2
G	San Sai	65,999	1		1			2
H	Mae Rim	59,024	2	1			1	4
I	Sa Moeng	20,063						
J	Muang	78,541	3	1	21		1	26
K	San Kamphang	75,468	3		9			12
L	Sarapee	62,517			2		1	3
M	Hang Dong	55,494	1		3		1	5
N	San Pa Tong	100,371	3	1	2			6
O	Mae Cham	37,234	3		1			4
P	Chom Tong	69,990	3		3			6
Q	Hod	30,689			2			2
R	Doi Taw	22,807	1					1
S	Om Koi	23,452						
T	Vieng Hang	9,273						
Total of Chiang Mai		1,058,435	36	4	47	4	5	96
Lamphoon			4	3	18	7		32
Lampang					2			2
Chiang Rai			5		2			5
others			10	1	8		23	42
total			55	8	77	11	28	179

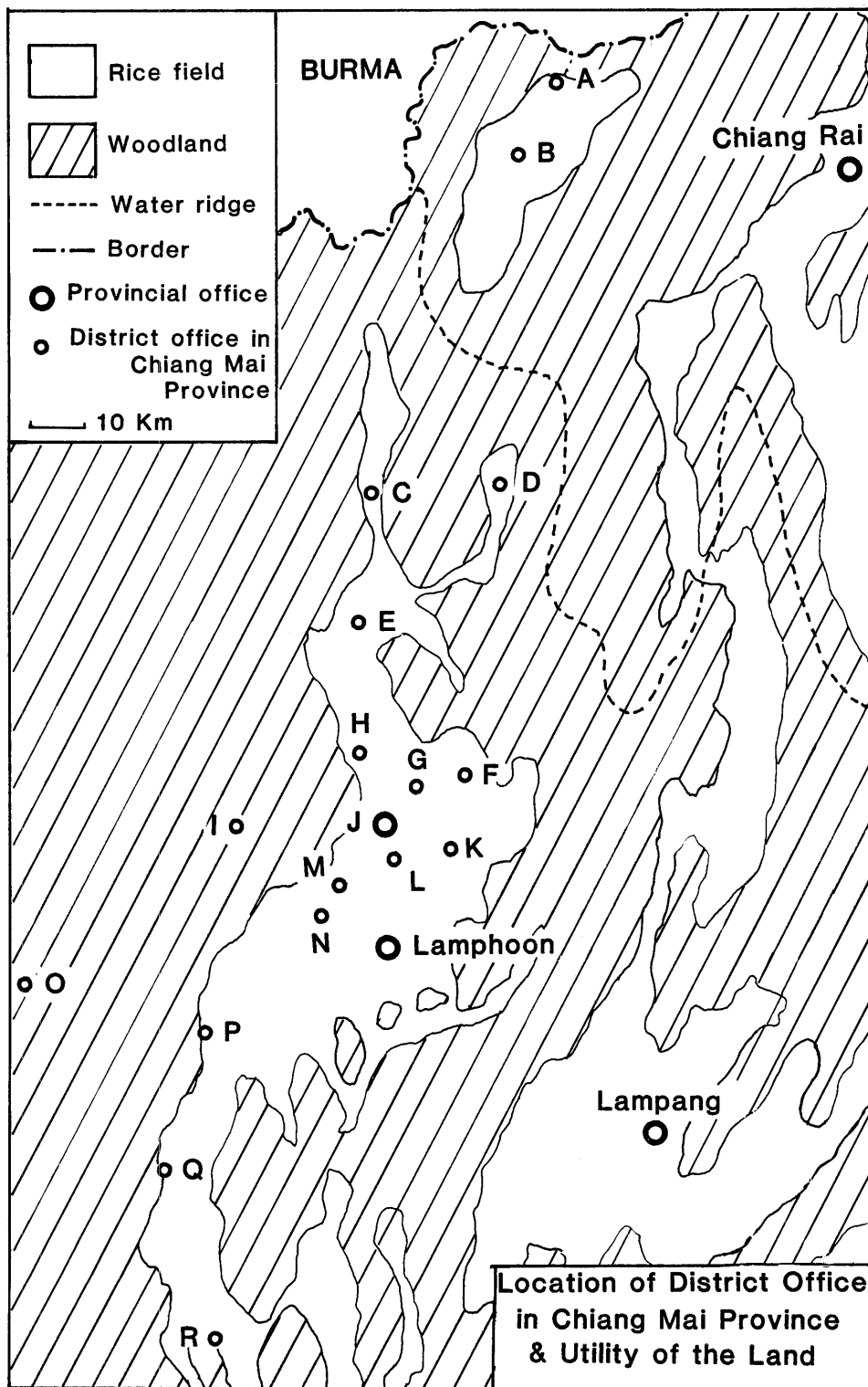


Fig. 1. Location of District Office in Chiang Mai Province and Utility of the Land.

Fig. 1 shows the location of the District Office in Chiang Mai Province and Utility of the Land, and Table 3 shows the names and population of these Districts, together with the numbers of encephalitis, DHF and other patients according to their home address. Some patients came from other Provinces and their address were not further divided into District. Patients of DHF appeared to be concentrated in Muang, that is Chiang Mai City, whereas, encephalitis were more scattered over the Province with the largest number in Praw (code D in Fig. 1). Prevalence ratio of these diseases was not dared to calculate, because we were not sure whether we had collected all the cases occurring in the study area. Table 4 shows the number of encephalitis and DHF which occurred every 4 days during our study period. Not all the patients had the record of the onset, so the number of encephalitis and DHF in this Table is 45 and 66, respectively. More than 60% of DHF cases were observed during a short period from July 17 to 28, while encephalitis occurred more sporadically from June to the end of our study period of August 12, although 42% of the cases were occurred from July 13 to 24.

Table 5 shows the date of serum sampling. The upper half of this panel shows the interval between the onset of the disease and the date of first bleeding, while on the lower half is shown the interval between the first and the second (or the last when the third specimen was taken) specimen. Since all the patients were not always bled the second specimen, the number of patients in the lower half is smaller than that in the upper half. Most of the patients of encephalitis or DHF were taken their first serum within 6 days after the onset of symptoms. These serum specimens were used for virus isolation and serological tests.

Table 4. Frequency of encephalitis and DHF patients according to their date of onset

Date of Onset	No. of patients					
	Encephalitis	Meningitis	D.H.F.	F.U.O.	others	total
June	5		2		5	12
July 1-4	2					2
5-8	2	2				4
9-12	5	1	1	3	1	11
13-16	7		5	1		13
17-20	6	1	12			19
21-24	6		13	4		23
25-28	2		15	1		18
29-31	3		8			11
Aug. 1-4	3		4	4		11
5-8	3		3			6
9-12	1		3		1	5
total	45	4	66	13	7	135

According to Nimmanitiva *et al.* (1969), DHF patients were classified on the base of their clinical severity described on their clinical records. There were one grade III and 22 grade II patients, however, remaining 44 patients did not have enough data to be classified into grades.

Table 5. Date of serum sampling from hospitalized patients with interval between the first and the second or the last specimens

Interval		Clinical diagnosos					Total
	(days)	Encephalitis	Meningitis	DHF	FUO	Other	
between the days of onset and the first serum	0			1			1
	1-3	14	2	21	4	2	43
	4-6	18	1	35	4		53
	7-9	5	1	7	2		15
	10-14	2		1	1		4
	15-21	2				1	4
	Total		41	4	65	11	3
between the first and the second (or the last) serum	1-3	5		25		1	31
	4-6	6		12	2		20
	7-9	12	1	11	2		26
	10-14	9	3	4		3	19
	15-21	2		1	1		4
	22-28	2		1			3
	29-	1					1
	Total		37	4	54	5	4

DISCUSSION

Difference in the geographical distribution of encephalitis and DHF patients observed in this study probably reflects different mode of transmission of JE and dengue viruses in nature. Because dengue viruses are transmitted between susceptible humans by *Aedes aegypti*, which is domestic mosquitoes, and also because humans exhibit high levels of viremia to serve as "amplifier" of dengue viruses, it is natural that dengue virus transmission and subsequent DHF cases are more frequently observed in densely populated areas rather than rural areas. On the other hand, JE virus transmission is maintained by biological cycles between *Culex* mosquitoes and swine and other vertebrate "amplifier", and humans are considered as "dead-end host" which do not serve as efficient amplifier. Thus, the transmission of JE virus would be observed more frequently in rural areas where ample rice fields serve as breeding sites of *Culex* mosquitoes. Grossman *et al.* (1973c) also showed that dengue more in and around Chiang Mai City than in rural districts. The age distribution of encephalitis and DHF patients in our study showed

shifts towards older ages compared with the averages in Thailand the data reported by Yamada *et al.* (1971) and Grossman *et al.* (1973b) for 1969–1970 epidemic in Chiang Mai. It may be speculated that epidemiological factors have changed in Chiang Mai since 1970 so that older people became more frequently suffered from these diseases, if there was no bias in our sampling process. More precise analysis should wait for further epidemiological data and patient's records.

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1982年タイ国チェンマイ地区における脳炎のウイルス学的疫学的調査. II. 入院患者

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1982年7月17日から8月19日までタイ国チェンマイ地区において179名の入院患者を観察した。

患者の臨床診断は脳炎55名, デング出血熱 (DHF) 77名, 不明熱11名, 髄膜炎8名, その他および臨床診断名のない患者28名である。DHFの大部分はチェンマイ市において一時期に集中的に見られたのに対し, 脳炎患者はチェンマイ県全体に散在性に見られ, その発生時期も調査期間を通じて散発的に認められた。この調査で得られた脳炎およびDHF患者の年齢分布はタイ国全体の平均に比べて高年齢側に偏っていた。

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