ORIGINAL ARTICLE

Clinical Diagnosis of Dengue Haemorrhagic Fever in Children*

by

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Abstract

Investigation on 111 patients clinically suspected suffering from Dengue Haemorrhagic Fever (DHF) admitted to the Department of Child Health, University of Gadjah Mada Hospital, was conducted. Laboratory examination of peripheral blood consisting of platelet count, hematocrit, and WBC count, as well as serologic examination for DHF were performed. The results of serologic examination showed that 56 out of 111 patients were found to be positive for DHF. The results showing the relationship between peripheral blood examination and serologic examination from those 56 patients are as follows : Group I (patients without thrombocytopenia, leucopenia, and haemoconcentration) consisted of 31 patients all of them showed negative results on serologic examination; Group II (patients with only thrombocytopenia) consisted of 8 patients, only one patient (12.5%) was found serologically positive; Group III (patients with thrombocytopenia and haemoconcentration) consisted of 15 patients, 14 patients (93.3%) were found serologically positive; Group IV (patients with thrombocytopenia and leucopenia) consisted of 11 patients, 9 patients (81.8%) were found serologically positive; Group V (patients with thrombocytopenia, haemoconcentration and leucopenia) consisted of 32 patients, all of them were found serologically positive. The calculation of sensitivity and specificity in grouping the patients on the basis of laboratory symptoms showed that: Group III sensitivity = 93.5% and specificity = 87.5%; Group IV sensitivity = 90% and specificity = 77.7%; Group V sensitivity = 96.9% and specificity = 100%.

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Introduction

Many investigations on Dengue have been conducted. The presence of Dengue infection can be determined by various methods of examinations. As a definitive diagnosis for Dengue, viro-serologic examination should be done (Ismangoen et al., 1972).

Since viro-serologic examination for Dengue needs a complete laboratory facility, whereas the district hospital can not provide such a facility, a simple examination, therefore, is needed to assist in diagnosing Dengue as early as possible. The latter is very important, because an accurate and immediate diagnosis followed by an appropriate management could prevent the occurrence of complications (Ismangoen, 1969).

It has been known that Dengue is an endemic tropical disease (Nelson, 1975; Halstead. 1966), it is due to the availability of conditions which provide the maintenance of the life cycle of virus uninterrupted in the tropic area throughout the year (Jawetz et al., 1964), which attains its culmination in the rainful months (Kho et al., 1972).

The serologic investigation using haemagglutination inhibition tests (H.I. tests) on 137 patients suspected having Dengue Haemorrhagic Fever (DHF) in Yogyakarta showed that 78 patients (60%) were positive (Ismangoen et al., 1972). Whereas WHO reported that viro-serologic examinations are able to fulfil 90% of the criteria established by WHO (WHO, 1975).

The objective of the present investigation is to obtain clinical and laboratory data of the early course of DHF, which are then correlated with the results of the serologic examination (H.I. tests).

Material and methods

One hundred eleven patients clinically suspected suffering from DHF admitted to the Department of Child Health, University of Gadjah Mada Hospital, aged 3 - 14 years, from January to October 1977, were investigated. Patients showing clinical symptoms such as, acute fever about 2 - 7 days, haemorrhagic manifestation (Tourniquet test positive), rapid and small pulse, epigastric pain, nausea and weakness were included in this study.

Laboratory examinations on WBC count, platelet count, and haematocrit were performed on the first day of hospitalization. Sero-virologic examinations of acute and reconvalescent sera were conducted in Namru II Laboratory Jakarta.

To simplify the analysis of the results of the present investigation the following codes were applied to indicate the presence of the symptoms. Clinical symptoms as mentioned above are coded as A, thrombocytopenia (the number of thrombocyte $<$ 150.000/ml) as B, haemoconcentration (haemotocrit $>$ 40%) as C, and leucopenia (the number of leucocyte $<$ 5.000/ml) as D, (the normal values of the number of thrombocyte $=$ 150.000 — 400.000/ml, haematoc-

TABLE 1 : *Correlation between duration of illness, number of patients and results of serologic examination*

Day	Number of patients	%	Serologic examination	
			Positive	Negative
2	14	12.6	4	10
3	39	35.1	21	18
4	26	23.5	14	12
5	21	18.9	11	10
6	9	8.1	6	3
7	2	1.8	0	2
	111	100	56 (56.5%)	55 (41.5%)

TABLE 2 : *Correlation between number of thrombocytes and results of serologic examination*

Number of thrombocytes/mm³	Serologic examination		Number of cases
	Positive	Negative	
< 150.000	53	9	62
> 150.000	3	46	49
Total number of cases	56	55	111

$X^2 df\text{-}1 = 68{,}9670 \rightarrow p < 0{,}01$

TABLE 3 : *Correlation between haematocrit and results of serologic examination*

Haematocrit %	Serologic examination		Number of cases
	Positive	Negative	
> 40	47	13	60
< 40	9	42	51
Total number of cases	56	55	111

$X^2 df\text{-}1 = 40{,}6138 \longrightarrow p < 0{,}01$

TABLE 4 : *Correlation between number of leucocytes and results of serologic examination*

Number of leucocytes/mm³	Serologic examination		Number of cases
	Positive	Negative	
< 5.000	37	8	45
> 5.000	19	47	66
Total number of cases	56	55	111

$X^2 df\text{-}1 = 30{,}5611 \longrightarrow p < 0{,}01$

TABLE 5 : *Correlation between group of patients and results of serologic examination*

Group	Clinical and Laboratory signs	Serologic examination	
		Positive	Negative
I (n = 31)	A	0 (0%)	31 (100%)
II (n = 8)	A + B	1 (12.5%)	7 (87.5%)
III (n = 15)	A + B + C	14 (93.3%)	1 (6.7%)
IV (n = 11)	A + B + D	9 (81.8%)	2 (18.2%)
V (n = 11)	A + B + C + D	32 (100%)	0 (0%)
		56	41

TABLE 6 : *Sensitivity and specificity of group III*

Group	Clinical and Laboratory signs	Serologic examnation	
		Positive	Negative
III	A + B + C	14	1
II	A + B	1	7
	T o t a l	15	8

Sensitivity = 93,3%
Specificity = 87,5%

TABLE 7 : *Sensitivity and specificity of group IV.*

Group	Clinical and Laboratory signs	Serologic examination	
		Positive	Negative
IV	A + B + D	9	2
II	A + B	1	7
	Total	10	9

Sensitivity = 90%
Specificity = 77,7%

TABLE 8 : *Sensitivity and specifivity of group V.*

Group	Clinical and Laboratory signs	Serolokic examination	
		Positive	Negative
V	A + B + C + D	32	0
II	A + B	1	7
	Total	33	7

Sensitivity = 96.9%
Specificity = 100%

rit = 36% — 45%, and the number of leucocyte = 5.000 — 15.000/ml) (Dacie and Lewis, 1975).

The patients, then, were classified according to their symptoms :

— Group I consisted of patients with symptom A.
— Group II consisted of patients with symptoms A and B.
— Group III consisted of patients with symptoms A, B and C.
— Group IV consisted of patients with symptoms A, B and D.
— Group V consisted of patients with symptoms A, B, C and D.

Results

In the present study it was found that from 111 patients investigated 56 patients (50.5%) showed DHF positive serologically.

The relationship between the day of illness, number of patients and the results of serologic examination is depicted in table 1. The table shows that most of the patients suspected suffering from DHF came to the hospital on the 3rd, 4th and 5th day of illness. It can also be seen that 46 patients were serologically positive whereas 40 patients were negative. It means that only 53,5% of the accuracy of the diagnosis can be reached by relying just on the clinical symptoms only.

The changes of the number of thrombocyte, haematocrit and the number of leucocyte of patients with DHF positive serologically are depicted in tables 2, 3 and 4. Table 2 shows that 53 out of 56 patients with positive DHF (93%) were considered as having thrombocytopenia (the number of thrombocytes < 150.000/cc). Table 3 shows that 47 out of 56 patients with positive DHF (84%) were considered as having haemoconcentration (haematocrit > 40%). Table 4 shows that 37 out of 56 patients with positive DHF (68%) were considered as having leucopenia (the number of leucocytes <5.000/cc).

All of the above mentioned tables reveal that the presence of either thrombocytopenia, haemoconcentration or leucopenia is pathognomonically highly significant ($p < 0,01$).

The grouping of patients on the basis of laboratory symptoms (table 5) showed that :

— Group I consisted of 31 patients, all of them showed negative results on serologic examination.
— Group II consisted of 8 patients, only one patient (12,5%) was found serologically positive.
— Group III consisted of 15 patients, 14 patients (93.3%) were found serologically positive.
— Group IV consisted of 11 patients, 9 patients (81.8%) were found serologically positive.
— Group V consisted of 32 patients, all of them (100%) were found serologic

Fourteen patients who were found serologically negative were excluded from

the above mentioned grouping, because they did not fulfil the criteria for grouping. Eight out of those 14 patients were found to have leucopenia only, while the rest had haemoconcentration only.

The calculation of sensitivity and specificity of grouping the patients as mentioned above can be seen in tables 6, 7 and 8. The results of the calculation showed that the sensitivity and specificity of each group are respectively 93.3% and 87.5% for Group III, 90% and 77.7% for Group IV, and 96.9% and 100% for Group V.

Discussion

From the results of the present investigation it was found that in DHF the changes of peripheral blood such as thrombocytopenia, haemoconcentration and leucopenia were pathognomonically highly significant ($p < 0.01$).

Nelson et al. (1966) reported that they found leucopenia in 55% DHF cases without shock. In the present study it was found that 68% of DHF patients exhibited leucopenia. This discrepancy might be caused by the difference of the time of peripheral blood sampling. Other investigator found in DHF cases with shock or on more than the 6th or 7th day of illness, the day when preshock symptoms usually occur, a slight leucocytosis (10.000 leucocytes/ml) (Nelson, 1975). The peripheral blood sampling of the present investigation was conducted mostly on the 3rd, 4th and 5th day of illness.

Kho et al. (1972) reported the presence of thrombocytopenia in 75% DHF cases, while the rest showed the number of thrombocytes in the normal range. In our study thrombocytopenia was found in 93% of DHF patients. The discrepancy might be due to the criteria of thrombocytopenia. We used the number of thrombocytes < 140.000/ml as indicator for thrombocytopenia (see Dacie and Lewis, 1975), whereas other investigators generally considered that the presence of thrombocytopenia is indicated by the minimal number of 100.000 thrombocytes/ml. It has been reported that the decrease of the number of thrombocytes emerges on the 3rd day of illness which then gradually decreases and finally reaches its minimal value on the 7th or 8th day of illness, afterward it rises again rapidly to the normal value (Nimmannitya, 1975).

Haemoconcentration is always concomitant with thrombocytopenia in DHF cases (Nimmannitya, 1975), and haematocrit $> 40\%$ was found in DHF patients with shock (Pongpanich et al., 1973). From DHF cases without shock investigated we found 85% showing haemoconcentration (haematocrit $> 40\%$).

Derived from the calculation of sensitivity and spesificity of grouping the patients based on laboratory symptoms as mentioned above, evidently each group showed different results. The sensitivity of Group III showed 93,3%, it means that by using the criteria based on laboratory and clinical symptoms belonging to Group III the degree of

accuracy of DHF diagnosis was 93,3% with respect to the results of serologic examination. By applying similar reasoning, it showed that the sensitivity of Group IV and V were 90% and 96.9% respectively (tables 6, 7 and 8). The specificity of Group III was 87.5%, it means that if the criteria which were based on laboratory and clinical symptoms belonging to Group III were not fulfilled, the possibility of not suffering from DHF was 87.5%. Based on the same arguments it was found that the specificity of Group IV was 77.7% whereas the specificity of Group V was 100%.

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