Predisposition to Dengue Hemorrhagic Fever : The Role of Glucose-6-Phosphate Dehydrogenase Deficiency and Abnormal Hemoglobins

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BACKGROUND : Erythocyte glucose-6-phosphate dehydrogenase (G-6-PD) deficiency affects an average of 14 % of the Thai population. G-6-PD deficiency has been found more frequently in bacterial infections such as leprosy, typhoid or pneumococcal pneumonia than in non-infected controls (1). Of the viral diseases, hepatitis has been associated with G-6-PD deficiency (2). Both G-6-PD deficiency and dengue hemorrhagic fever occur frequently in Thailand. This report summarizes studies of the relationship of G-6-PD deficiency with the occurrence and the severity of dengue hemorrhagic fever. An additional investigation of the role of abnormal hemoglobins in dengue hemorrhagic fever is also reported.

MATERIALS AND METHODS : Children hospitalized at the Bangkok Children's Hospital (BCH) with laboratory diagnosed dengue infections were studied for G-6-PD deficiency and hemoglobin type. Two milliliters of blood were obtained using Acid Citrate Dextrose (ACD) solution as an anticoagulant. G-6-PD was examined using the methemoglobin technique of Gall (3) by which the genotype of the patient could be determined. Hemoglobin typing was performed using hemoglobin electrophoresis.

RESULTS AND DISCUSSION : Forty-seven patients with serologically proved dengue infections were studied and the frequency of G-6-PD deficiency in these patients was compared to those found in 131 control patients collected in the Well Baby Clinic of the BCH (Table 1).

Table 1. Glucose-6-Phosphate Dehydrogenase Deficiency in Dengue Hemorrhagic Fever Patients and Control Study

Patients	No.	Glucose-6-Phosphate Dehydrogenase Deficiency*	
		No.	Percent
DHF	47	8	17.02
Control**	131	13	9.9

Chi square = 1.6076 $p > 0.157$

* Includes all individuals, hemozygous, hemizygous, or heterozygous for G-6-PD deficiency

** 100 of the controls were previously reported by Lampe et al. (1)

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Abnormal hemoglobins were also studied in 47 dengue infections and were compared to those found in 31 control patients collected in the Well Baby Clinic. (Table 2).

Table 2. HB Type in Dengue Hemorrhagic Fever Patients

Patients	No.	HB Type		Percent
		AE	E	
DHE	47	8	–	17.02
Control Study	31	6	–	19.35

Chi square = 0.0594 $p > 0.317$

The dengue infections were graded for severity according to criteria previously established by one of us (S.N.).

Neither abnormal hemoglobin nor G-6-PD deficiency appeared to be associated with the severity of dengue infection (Tables 3 and 4).

Table 3. Glucose-6-Phosphate Dehydrogenase Deficiency and the Severity of Dengue Infections

Dengue Patients	Total	Shock	
		No.	Percent
G–6–PD deficient*	8	6	75
G–6–PD normal	39	23	59
Total	47	29	61.5

Chi square = 0.2025 $p > 0.6$

Table 4. Abnormal Hemoglobin and the Severity of Dengue Infections

Dengue Patients	Total	Shock	
		No.	Percent
HbE trait (AE)	8	3	37.5
Normal Hb (A)	39	26	66.6
Total	47	29	61.7

Chi square = 1.3147 $p > 0.2$

SUMMARY : Forty-seven patients with serologically documented DHF were studied for G-6-PD deficiency and abnormal hemoglobin. The data reported shows no significant relationship between presence of the severity of dengue infections and the presence of either G-6-PD deficiency or abnormal hemoglobins.

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