

## ORIGINAL ARTICLE.

## Dengue shock syndrome. An evaluation of clinical experiences.

by

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### Abstract.

Experiences on the clinical management of 187 criteria accepted cases of Dengue Shock Syndrome were evaluated. The case fatality rate was 8 per cent or 15 out of 187 cases. It was closely related to the severity of shock, the respiratory rate, the body temperature during shock, and the development of recurrent shock. It was also found that the risk to develop recurrent shock was higher among cases with severe shock, high respiratory rate, and high fever.

Received 12th. February 1984.

### Introduction.

Dengue hemorrhagic fever is one of the prominent infectious diseases in South East Asia including Indonesia. It frequently becomes a serious child health problem, since it is not only a public health problem with a sudden widespread outbreak, but also a clinical problem where 30 - 40% of the cases fall into shock. This condition, is very life threatening, and known as Dengue Shock Syndrome (DSS).

In Indonesia this disease was reported clinically for the first time by Kho et al.

(1969) in Jakarta, and since then it has been reported throughout Indonesia with a significant death rate among shock cases. In Manado the first outbreak occurred in 1974 with a high number of deaths. (Tjandra and Munir, 1976). As the result of our first experience in managing Dengue Shock Syndrome many changes have come about in its treatment. The following is a report of a four-year-experience in managing DSS.

### Material and method.

Material for this study were cases with a clinical diagnosis of Dengue Shock Syndrome admitted to the Pediatric intensive ward from January 1979 to December 1982. The clinical diagnosis of DSS was based on the following criteria :

1. Cases with serological confirmation.
  - 1.1. Shock : characterized by the evidence of hypotension or by the narrowing pulse pressure of 20 mm Hg or less, or by unmeasurable blood pressure.
  - 1.2. 2 - 7 days of acute fever of unknown origin preceding the shock.
  - 1.3. Positive serological test.
2. Cases without serological confirmation with a total score of 6 or more (Munir et al., 1982), associated with shock.

Serological tests were performed by using a filtered paper disc 2 times with an interval of 5 days. The first sample was taken on admission. These samples were sent to the Biomedical Research, Ministry of Health, Jakarta.

The regimen of treatment was as follows :

1. IVFD of Ringer-lactate in 5% dextrose solution, instituted immediately (this mixture was made by adding 62.5 cc of 40% dextrose into 500 cc of Ringer lactate solution). The amount of fluid given was calculated as follows :
  - 1.1. 30 cc/kg Bw given for 1 hr, followed by
  - 1.2. 10 cc/kg Bw for 4 - 6 hrs, followed by
2. A maintenance IVFD of 2900 cc/m<sup>2</sup> b.s/day of half strength physiological sodium chloride solution in 5% dextrose solution. Body surface was measured by using the hormogram of Dubois (a ratio of weight to height).
3. When recurrent shock occurred during the maintaining IVFD, the rate of fluid drip was increased to the amount equivalent to 20 cc/kg bw for 1 hour, and then followed by maintenance. A quick digitalisation by using cedilanid was given.

4. Blood transfusions were given when necessary, such as in cases of hematemesis or melena, or recurrent shock.
5. Lasix was given in cases with recurrent shock.
6. Antibiotics were given only in severe cases.

The severity of shock was classified into 4 categories :

1. Impending shock : symptoms and signs of shock with narrowing pulse pressure of 20 mm Hg or less
2. Moderate shock : evident hypotension with a systolic pressure of less than 90 mm Hg.

3. Profound shock : unmeasurable blood pressure
4. Moribund cases : unmeasurable blood pressure associated with general cyanosis.

A strict routine clinical observation was done with the following procedures :

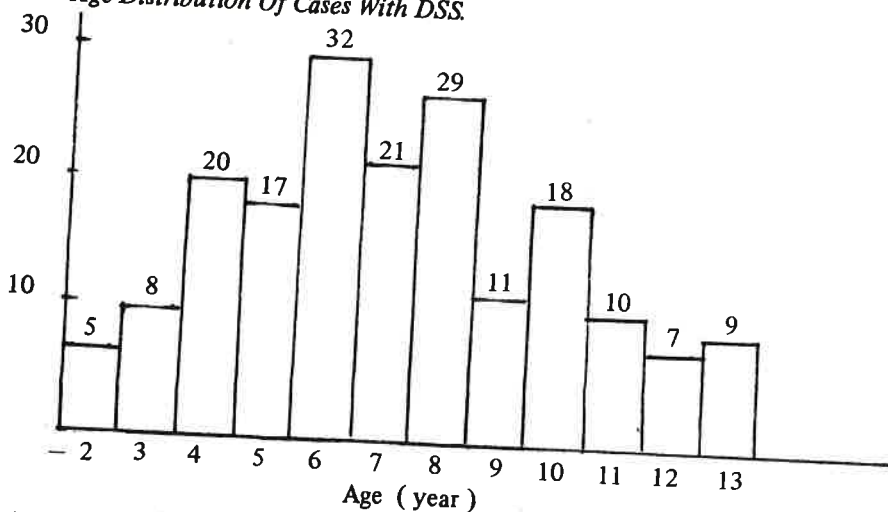
- Blood pressure, measured every 4 hrs or whenever necessary
- Pulse, observed every ½ hr.
- Hematocrit, measured on admission, 1 hr after, and then every 6 hrs on the first day then every 24 hrs or whenever necessary.

### Result

There were 187 cases admitted to the Pediatric intensive ward with the clinical diagnosis of Dengue Shock Syndrome. Age

distribution as shown in figure 1, ranged from 2 to 13 years old with a peak between 6 - 8 year.

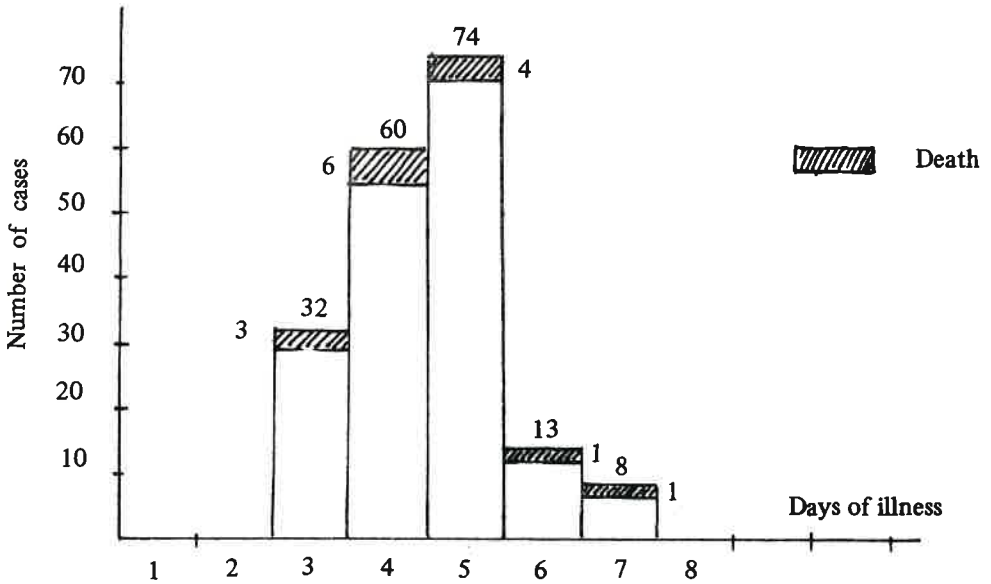
FIGURE 1 : Age Distribution Of Cases With DSS.



The vast majority of shock occurred on the 4th and 5th day of illness, and none on the second and 8th day or beyond.

The onset of shock in relation to days of illness was as follows (Figure 2) : 3rd day of illness : 32 out of 187 cases (17.1%);

4th day of illness : 6 out of 187 cases (32.1%); 5th day of illness : 74 out of 187 cases (39.6%); 6th day of illness : 13 out of 187 cases (6.9%); 7th day of illness : 8 out of 187 cases (4.3%).

FIGURE 2 : *Onset of Shock in Relation to Number of Days of Illness.*TABLE 1 : *Sex Distribution in Relation to Age Group.*

Age group	Male	Female	Total
2 years or less	—	100% (5)	5
2 – 5 years	44.4% (20)	55.6% (25)	45
5 – 13 years	43% (59)	57% (78)	137
Total	42.2% (79)	57.8% (108)	187

TABLE 2 : Correlation Between Severity of Shock and Hematocrit.

Severity of shock	Number of cases	H e m a t o c r i t							
		<40		40 - 45		45 - 50		>50	
I	49	10.2%	(5)	30.6%	(15)	36.7%	(18)	22.5%	(11)
II	56	10.7%	(6)	26.8%	(15)	35.7%	(20)	26.8%	(15)
III	77	3.9%	(3)	26 %	(20)	39 %	(30)	31.1%	(24)
IV	5	40 %	(2)	20 %	(1)	-		40 %	(2)
Total	187	8.6%	(16)	27.2%	(51)	36.4%	(68)	27.8%	(52)

Only 8.6% or 16 out of 187 cases had hematocrits of 40% or less; 27.2% had hematocrits between 40 - 45 %, and the remaining 64.2% more than 45%. It seems that the number of cases having hematocrits of more than 50% increased with the increase in severity of shock. The number of cases who had hematocrits more than 50% increased from 22.5% in the first degree of shock to 31.1% in the third degree.

TABLE 3 : Correlation Between Severity of Shock, Respiratory Rate, and Recurrent Shock.

Severity of shock	Total Cases	Cases with Recurrent shock	RESPIRATORY RATES (FREQUENCY/MINUTE)							
			< 30		30 - 40		40 - 60		> 60	
			Number of cases	Recurrent shock	Number of cases	Recurrent shock	Number of cases	Recurrent shock	Number of cases	Recurrent shock
I	49	2% (1)	12	-	29	-	8	-	-	-
II	56	3.6% (2)	16	-	33	6% (2)	7	-	-	-
III	77	20.8% (16)	11	-	35	28.6% (10)	29	20.7% (6)	2	-
IV	5	100% (5)	-	-	1	(1)	1	(1)	3	100% (3)
Total	187	12.8% (24)	39	-	98	13.3% (13)	45	17.8% (8)	5	60% (3)

Table 3 shows that there is a close correlation between the severity of shock the respiratory rate, and the occurrence of shock. The incidence of recurrent shock increased from 2% in the first degree of shock to 3.6% in the second degree, and sharply increased in the third degree jumping to 100% in the 4th degree of shock.

TABLE 4 : Correlation Between Severity of Shock, Case Fatality Rate and Recurrent Shock.

Severity of shock	Total Cases	Cases with recurrent shock	CFR	Onset of recurrent shock (hrs)			
				6	6 - 12	12 - 24	24
I	49	2% (1)	2% (1)	-	1	-	-
I	49	2% (1)	2% (1)	-	1	-	-
II	56	3.6% (2)	-	-	1	1	-
III	77	20.8% (16)	11.7% (9)	4	3	9	-
IV	5	100% (5)	100% (5)	5	-	-	-
Total	187	12.8% (24)	8% (15)	9	5	10	-

Table 4 shows that recurrent shock and case fatality rates were closely related to severity of shock. The number of cases with recurrent shock increased with the increase in the severity of shock.

TABLE 5 : Correlation Between Respiratory Rates, CFR and Recurrent Shock.

Respiratory rate	Number of cases	Cases with recurrent shock	CFR	The onset of recurrent shock			
				6 hrs	6 - 12 hrs	12 - 24 hrs	24 hrs.
< 30	39	—	—	—	—	—	—
30 - 40	98	13.3% (13)	6.1% (6)	4	2	7	—
40 - 60	45	17.8% (8)	13.3% (6)	2	3	3	—
60 or more	5	60% (3)	60% (3)	3	—	—	—

There was no recurrent shock in cases with respiratory rates of 30/minute or less. The risk of having recurrent shock increased when the respiratory rate was more than 30/m.

TABLE 6 : Correlation Between Severity of Shock and Liver Size.

Severity of shock	Number of cases	Liver Size		
		< 2 cm	2 - 4 cm	more than 4 cm.
I	49	20.4% (10)	63.3% (31)	16.3% (8)
II	56	23.2% (13)	48.2% (27)	28.6% (16)
III	77	18.2% (14)	41.6% (32)	40.3% (31)
IV.	5	—	80% (4)	20% (1)
Total	187	(37)	(94)	(56)

There was no correlation between severity of shock and liver size.

TABLE 7 : Correlation Between Thrombocyte Count and Recurrent shock

Thrombocyte count	Number of cases	Cases with recurrent shock
50,000 or less	12	16.6% (2)
50,000 - 100,000	65	16.9% (11)
100,000 - 150,000	76	11.8% (9)
More than 150,000	34	5.9% (2)

TABLE 8 : Correlation Between Fever and Case Fatality Rate

Day of illness	TEMPERATURE (° Celcius).							
	37		37 - 38		38 - 39		39	
	N	CFR	N	CFR	N	CFR	N	CFR
2	—	—	—	—	—	—	—	—
3	8	1	15	(1)	2	—	1	(1)
2	—	—	—	—	—	—	—	—
3	8	1	15	(1)	2	—	1	(1)
4	14	—	25	—	3	—	7	(4)
5	28	—	26	(1)	14	(4)	2	(1)
6	4	—	5	—	—	—	(3)	(1)
7	1	—	3	—	1	(1)	—	—
Total	55	1.8% (1)	84	2.4% (2)	20	25% (5)	13	53.8% (7)

#### Discussion.

As in other viral diseases, dengue hemorrhagic fever is a self-limiting infectious disease, lasting for 2 - 7 days. However, around one third of the cases develop into shock frequently leading to death. Thus the main objective of the clinical management of cases with dengue hemorrhagic fever is to reduce the mortality rate of shock cases to the lowest level. In doing this one

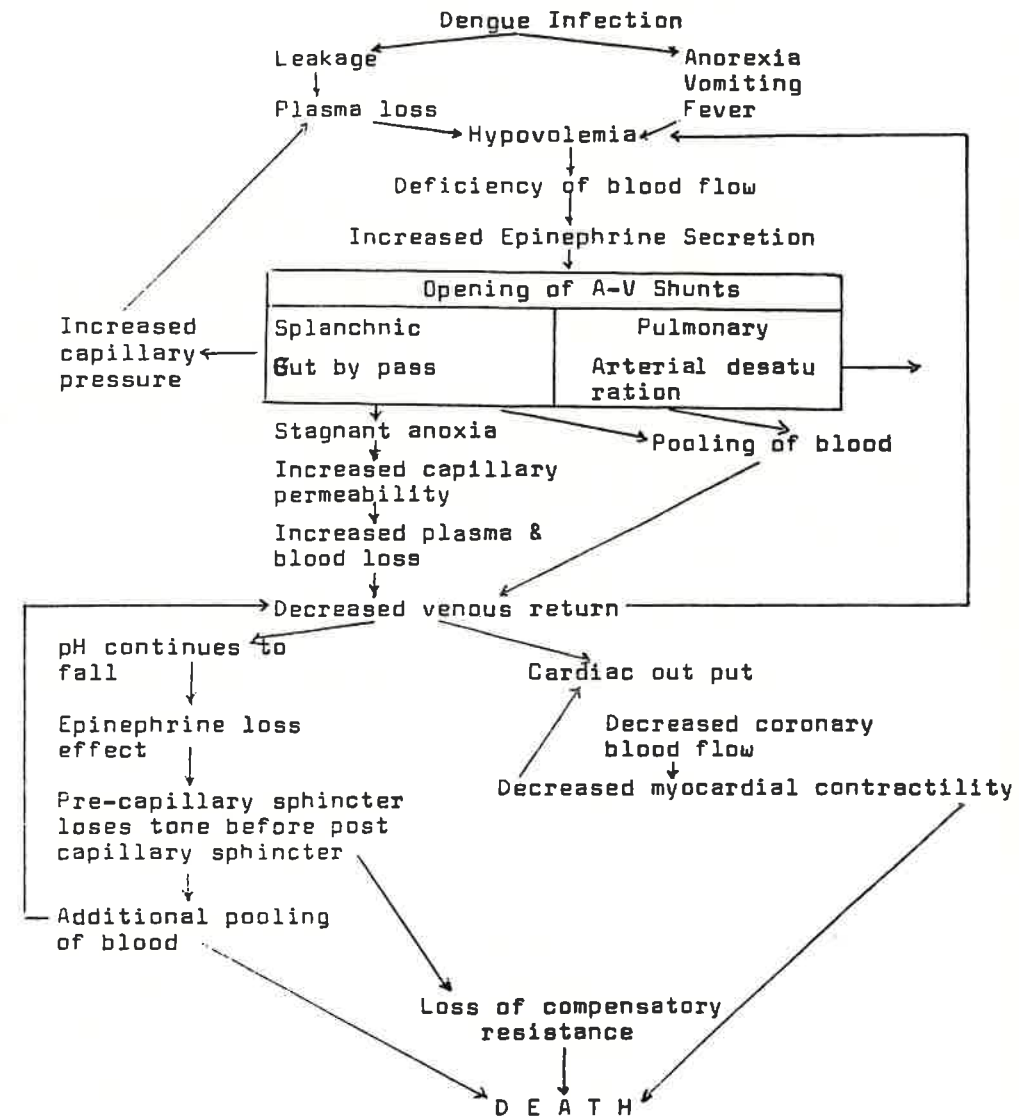
has to understand profoundly the metabolic and hemodynamic changes in shock, in order that a rational clinical approach can be applied. For this reason the cases were managed case by case according to its clinical condition. The vast majority of cases with DSS was found among the age group of 5 - 13 years, with the peak of 5 to 7 years (Figure 1).

In preventing severe shock, it is strongly recommended to hospitalize DHF cases who still have fever on the third to fifth day of illness.

The case fatality rate of DSS in this report was 8%, far lower than that in previous reports, revealing case fatality rates from 30% to 53%. (Sumarmo et al., 1975; Tjandra and Munir, 1976). If this DSS case fatality rate is converted to the case fatality rate of DHF, it will be less than 3%, since the total of shock cases is around 30% of the total DHF cases. The vast majority of death occurred is severe shock, especially the third and fourth degree of shock. (Table 4). All of the 5 cases with fourth degree shock who showed general cyanosis and severe acidosis died. In cases with third degree shock, death frequently occurred among them who showed encephalitic symptoms and severe acidosis. Severe gastrointestinal bleeding occurred among the third and the fourth degree shock cases, showing severe metabolic and hemodynamic changes. Immediate and adequate IVFD is the clue to prevent further serious metabolic and hemodynamic changes. The severity of metabolic and hemodynamic changes can clinically be detected by observing closely the clinical course, particularly all vital signs. In acidosis the depth and rate of respiration increases. There was a close correlation between respiratory rate and case fatality rate. None of the cases with respiratory rates of 30/m or less died. But the case fatality rate of cases with respiratory rates of 30 - 40 was 6.1%, it doubled in the respiratory rates of 40 - 60, and jumped to 60% in respiratory rates of 60 or more. It is also important to point out that the risk of occurrence of recurrent shock increased with the increase in respiratory rates (Table 3). It may be reasonable to use sodium

bicarbonates to overcome acidosis instead of using sodium lactate as found in ringer lactate solution. Lactate metabolism in severe cases showing respiratory rates of 60 or more might be defected, since splanchnic organs seriously suffered. Recurrent shock is closely related to the severity of shock and to the respiratory rates, and indeed it threatens life, since the vast majority of cases with recurrent shock died. It can be used as warning that the patient is in danger. The risk of contracting recurrent shock increased with the severity of shock and with increase in respiratory rates. (Table 4 and Table 5). Inadequate IVFD, pooling, leakage, and continuous fall of blood pH might be responsible for the pathogenesis of recurrent shock (See Figure 1). Continuous fall of pH will cause a decrease in myocardial contractility and additional pooling of blood, which in turn will develop severe metabolic and hemodynamic changes, and death. The use of digitalis to improve myocardial contractility, sodium bicarbonate to overcome acidosis, and dextran 40, a medium size molecule of plasma expander to restore an effective blood volume may be helpful in recurrent shock. In cases with hematemesis or melena, blood transfusion gives a satisfactory result, except in cases with respiratory rates of 60 or more. The prognosis was poorest among cases whose recurrent shock occurred within the first 6 hours after IVFD had been started. The prognosis of cases with fever during shock and or with cerebral symptoms such as convulsion, was rather poor. The case fatality rate of cases with fever or body temperature of more than 39°C was 53.8% compared to 2.4% in cases with fever less than 38°C. The possibility of those cases with high fever to be accompanied by secondary bacterial infection could not be

FIGURE 3 : Hemodynamic and metabolic changes in shock  
(A modification of Berk et al., 1967).



excluded, and thus it needs further studies. Although the role of secondary bacterial infection in those cases has not been known yet, it might be advisable to institute broad-spectrum antibiotics.

It is also known that high fever deteriorates

a clinical condition, since water and electrolyte expenditure increase with the increase in body temperature. On account of this, hybernation with largactil and phenergan will serve a very valuable clinical measure.

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