

Management of Adult Dengue Shock Syndrome Patients Not Improving with DEAG Guidelines Based Therapy

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Abstract

Background: Dengue Expert Advisory Group (DEAG) guidelines are used for management of dengue patients in our scenario. It was observed in last consecutive dengue epidemics at Rawalpindi that some of the dengue shock syndrome (DSS) patients don't improve unless modifications in DEAG guidelines are made. This study was conducted to evaluate modified DEAG management guidelines in DSS patients with decompensated shock who were not improving with treatment based on standard DEAG guidelines.

Methods: This quasi experimental study was conducted at Dengue Units of Hospitals attached with Rawalpindi Medical College during Rawalpindi dengue epidemic 2015. Dengue Shock Syndrome (DSS) patients who were not improving with DEAG guidelines based treatment, were managed as per modified treatment plan i.e., continuing with colloid or blood depending on HCT in tapering way for initial few hours after hemodynamic stabilization is achieved. Outcome was recorded in terms of improvement/recovery and mortality. Poor outcome (mortality was correlated with mean age, gender, primary or secondary dengue infection, presence of additional illnesses and mean duration of hospital stay by Chi² and t test wherever relevant.

Results: Seventeen patients were included in the study. 64.7% were female. Mean patient age was 31.29±9.56 years. Thirteen patients (76.47%) recovered and were discharged. Four patients (23.52%) expired. Poor outcome had statistically significant association with presence of additional illnesses and shorter duration of hospital stay (p value <0.05).

Conclusion: Modification in DEAG treatment plan lead to better outcome in majority of DSS patients who did not improve with DEAG standard management.

Key Words: Dengue shock syndrome, Guidelines, Mortality

Introduction

Dengue has emerged as important healthcare issue in Pakistan during last two decades.^{1,2,3} Hyper-immune response and plasma leakage are hallmarks of complicated version of dengue infection which is termed as dengue hemorrhagic fever (DHF).^{4,5} Dengue shock syndrome (DSS) is worst form of dengue infection.^{4,5} It occurs when shock develops in DHF scenario.

Plasma leakage leading to depletion of intravascular volume is hallmark of DHF/DSS. Fluid resuscitation is thus main stay of therapy in DHF/DSS management.⁸ Preventing shock and overload along with maintenance of hemodynamics are goals of DHF/DSS treatment. Dengue patients in Punjab province of Pakistan are managed according to the guidelines issued by Dengue Expert Advisory Group (DEAG).⁴ On the basis of these guidelines, fluid quota is calculated for every DHF/DSS patient during critical phase in order to achieve the desired goals of DHF/DSS management. It is calculated by formula: maintenance + 5% of body weight. For an adult ≥50Kg, it is 4600 ml.⁴

Rawalpindi city is continuously been hit by dengue epidemics for last few years. 339, 802, and 1468 DHF/DSS patients were managed at 3 main public hospitals (Holy Family Hospital, Benazir Bhutto Hospital, and DHQ Teaching Hospital) of Rawalpindi that are attached with Rawalpindi Medical College during the years 2013, 2014, and 2015 respectively.

Difficult situations were encountered during management of DHF/DSS patients while using DEAG based guidelines/algorithms. In some of the DSS patients either patients remained in shock or went into shock again while complying with DEAG based treatment. We have noted in the last years that DSS patients improve following stabilization with colloid or blood bolus, if colloid or blood are continued in tapering way for some time instead of shuffling to crystalloid at once per DEAG guidelines. Such modification of DEAG guidelines lead to good outcome. We thus in this year devised algorithm for managing DSS patients who remained in shock despite

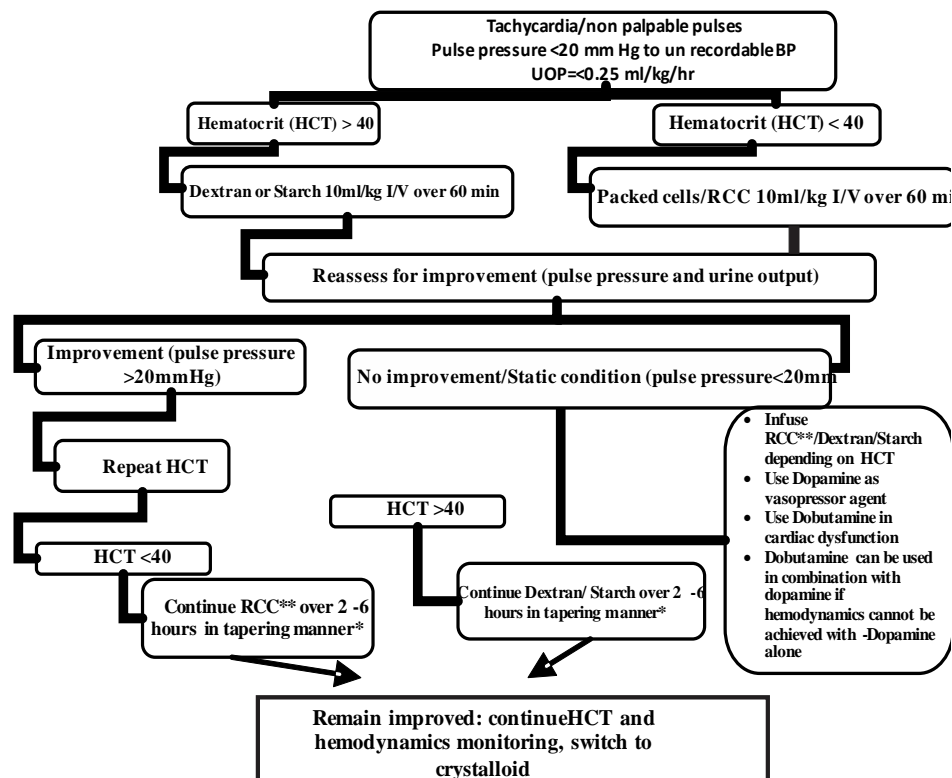


Figure1: Modified treatment algorithm for DSS patients

DEAG guideline based management(Figure 1).This study was conducted to evaluate these modified guidelines in DSS patients with decompensated shock who were not improving with treatment based on standard DEAG guidelines.

Patients and Methods

This quasi experimental study was conducted in Dengue Units of hospitals attached with Rawalpindi Medical College, Rawalpindi during the Rawalpindi dengue epidemic 2015 (1st August to 20th December 2015). Approval was taken in this regard from Ethical & Research Committee of Rawalpindi Medical College. All adult patients diagnosed as DSS who were not improving with management as per DEAG guidelines were included after informed consent. DSS patients who suffered from co-infections (malaria, enteric fever, acute hepatitis),neoplastic disorders, complicated diabetes, cardiac, and renal failure etc. were excluded.

DSS diagnosis: DHF/DSS diagnosis was based on DEAG criteria. DHF was diagnosed when a confirmed case of dengue infection and hemorrhagic tendency developed plasma leak due to increased capillary permeability.^{4,5} If a DHF patient developed hypotension for age along with cold clammy skin and

restlessness, he was diagnosed to be suffering from DSS.^{4,5}

Not improving with DEAG based management: It meant that hemodynamic stability was not achieved despite complying with management based on DEAG guidelines i.e., patients continued to have circulatory failure manifested by tachycardia, bare to non-palpable pulse, <20 mm Hg pulse pressure to un-recordable blood pressure, and persistently decreased urinary output <0.25ml/Kg/hour.⁴

Guidelines based treatment: All patients were managed at High Dependency Units or Intensive Care Units. Treatment was instituted according to algorithm given in Figure 1. Each patient was monitored per DEAG monitoring sheets for DSS.⁴ Additional illnesses/co-

morbidities, complications of the disease and treatment modalities were sought and managed accordingly.

Outcome: Outcome was divided into improved/recovered and expired.

Data collection and analysis: A specially designed performa was used with focus on age, gender, primary or secondary dengue infection, presence or absence of additional illnesses, duration of hospitalization and outcome.

Data analysis was performed employing Statistical Package for Social Sciences (SPSS). Frequency and percentage were calculated for gender, primary or secondary dengue infection, presence or absence of additional illnesses, and outcome. For age and duration of hospital stay mean ± SD was calculated. Outcome based comparison of categorical and continuous variables were done using Chi² and t test respectively.

Results

Seventeen patients were included in the study. Mean patient age was 31.29±9.56 years. 64.7% (n=11) patients were female and 35.3% (n=6) male. 52.95% (n=9) patients had secondary and the rest had primary dengue infection based on dengue serology. 11.76%

Table I. Group wise characteristics

	Recovered (n=13)	Expired (n=4)	p-value
Mean age (years)	30.69±9.12	33.25±12.17	>0.05
Female	61.54% (n=8)	75% (n=3)	>0.05
Male	38.46% (n=5)	25% (n=1)	
Primary dengue infection	53.84% (n=7)	25% (n=1)	>0.05
Secondary dengue infection	46.15% (n=6)	75% (n=3)	
Additional illness present	15.38% (n=2)	75% (n=3)	0.02
Mean duration of hospital stay*	5.92±2.06	3±2	0.02

*Days.

(n=2) patients were NS1 positive, 35.29% (n=6) were NS1 and IgM positive, 29.41% (n=5) were NS1 and IgG positive, 17.64% (n=3) were NS1, IgM, and IgG positive, and 5.88% (n=1) IgM and IgG positive. Extravascular volume overload (EVO) when actually patients had intravascular volume depletion was noted in all patients. It was diagnosed when patients had puffy face, tachypnea, shortness of breath, bilateral crackles/wheeze, neck vein distension, and increasing ascites/pleural effusion/ pedal edema.^{9,15,16} Mean duration of hospital stay was 5.23±2.35 days. 29.41% (n=5) patients had additional illness/co morbidity, while the rest did not have. These included rheumatoid arthritis, urinary tract infection, diabetes mellitus, hypertension, and combination of urinary tract infection, sepsis and eclampsia. 76.47% (n=13) patients recovered and were discharged. 23.52% (n=4) patients died. 27.27% (n=3) females

and 16.66% (n=1) male were among deceased. Statistically significant association was noted in terms of presence or absence of additional illnesses and duration of hospital stay in this group wise comparison (Table 1).

Discussion

Important points to be considered about our study are; 1) patients included in this study suffered from DSS and decompensated shock/circulatory failure, 2) they did not improve with DEAG guidelines based management for this category of patients, 3) study

focused adult patients, 4) all patients had features suggestive of EVO, and 5) modification of DEAG management algorithm for decompensated shock lead to recovery in 76.47% patients.

DEAG guidelines for dengue management are based on similar work up from South Asian countries like Sri Lanka and Thailand. According to these, for management of decompensated shock patients 20 ml/Kg normal saline bolus is administered. Those who do not improve receive another bolus of 5 ml/Kg normal saline. HCT is checked in non-responders and they are categorized to two groups. First group whose HCT decreases >10 units are transfused fresh blood, second with <10 unit change in HCT are administered 10 ml/Kg bolus of colloid. Algorithm suggests blood transfusion for further management of first group. Of

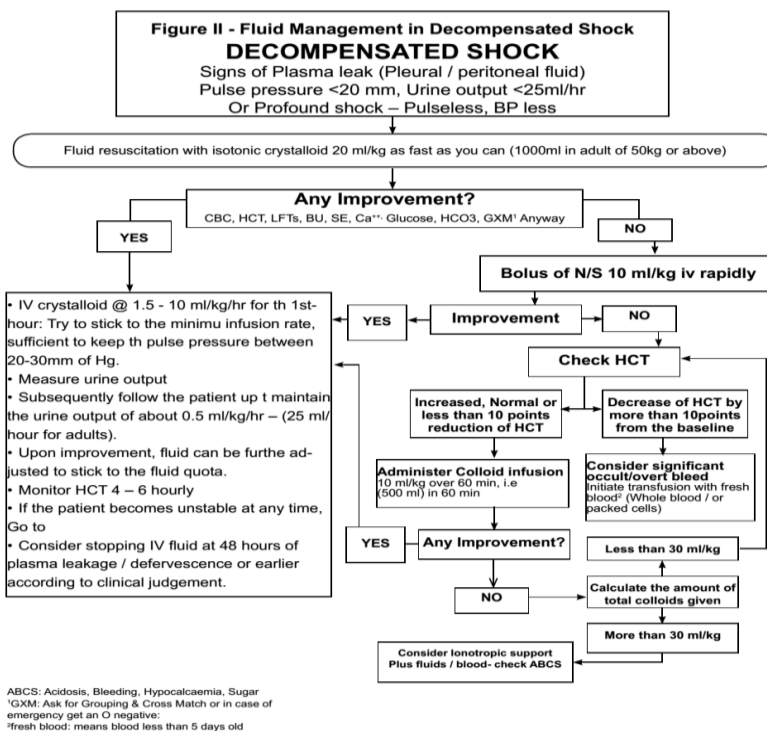


Figure 2: Fluid management in decompensated shock

the second group patients who improve are switched to crystalloid 1.5-10 ml/Kg/hour. Those who do not improve have their HCT rechecked and treatment is administered based on the two groups. Figure II give details in this regard.

According to WHO guidelines for clinical management of dengue decompensated shock patients should receive 20 ml/Kg bolus of colloid- preferably- or crystalloid. Patients who do not improve are reviewed with HCT and are categorized on the basis of their HCT into those who have fall in HCT and with higher than baseline or age, gender standardized HCT.

Patients with HCT on higher side are managed with 10-20 ml/Kg bolus of colloid which is reduced to 7-10 ml/Kg in next 1-2 hour and then subsequently changed with crystalloid in tapering way if condition improves. Adult male whose HCT is <40-45 and females with HCT <35-40 are treated with fresh whole or packed cell transfusion if there is bleeding,

been much higher. Interestingly, algorithm similar somewhat to ours, have been advocated for dengue patient management.⁶ Ours are however more detailed and were tested on adult patients in epidemic settings. Dengue related mortality is 1-2%.^{7,8,9} Fatality rates in hospitalized dengue patients which used be 20% has reduced to 0.5-2% recently.¹⁰ DHF related mortality is

5%.¹¹ 1-30% mortality has been generally described in DSS patients.^{12,13}

It can however increase up to 44%.^{8,9} It is important to note that children constitute majority of patients rather than adults in these analysis. Comparatively high (5.5%) case fatality rate has been noted in adults with DSS.¹⁴ Higher mortality (30%) has been noted in patients who have shown poor response to standard DSS management.¹³ Mortality in our patients (23.52%) seems comparably high but it should be noted that if we would not have modified the treatment algorithm higher mortality could have resulted.

Interestingly all our patients had features of EVO, which in settings of dengue generally results from excessive fluid intake by the patient or overzealous fluid administration by treating persons.²¹ This finding in all of our patients indicates

complexity of situation as all of them were not responding to routine treatment protocols. EVO occurs either in later part of critical period or after it is over.²¹ It should be managed using the strategy employed by us.

Comparing characteristic of our patients with other studies is difficult as our patient cohort consisted of critically ill adult DSS patients. In a somewhat related study focusing critically ill DSS patients 53.7% patients were female, 51.85% patients were >21 years old, and 16 out of 54 patients expired of which 10 were ≤20 years old.¹³ We noted somewhat similar results.

DHF/DSS are commonly considered as sequel of secondary dengue infection. Primary dengue infection has also been associated with DHF/DSS however.

Figure III: Algorithm for fluid management in hypotensive shock
Hypotensive shock
Fluid resuscitation with 20 ml/kg isotonic crystalloid or Colloid over 15 minutes
Try to obtain a HCT level before fluid resuscitation

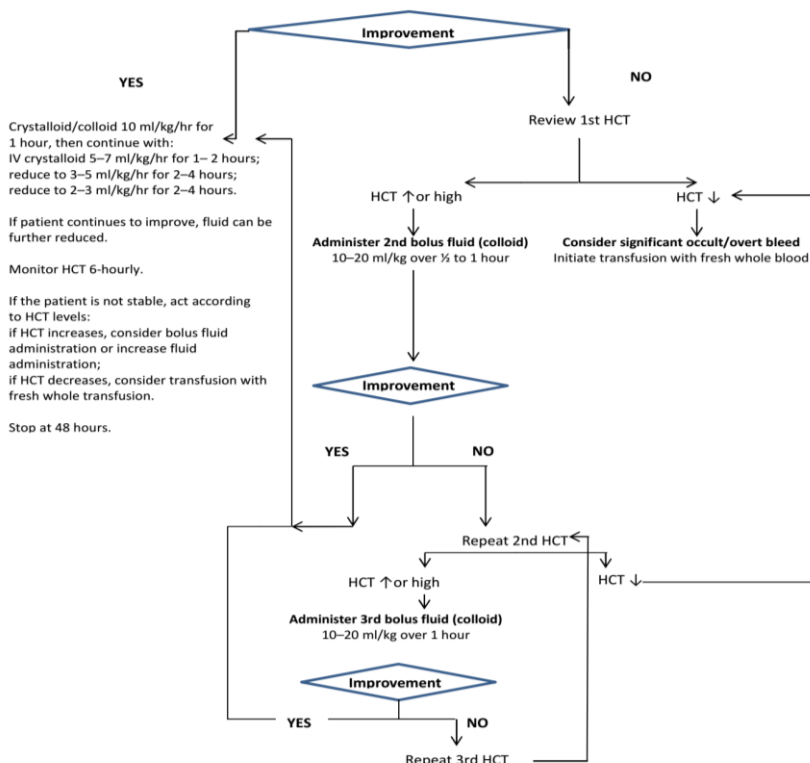


Figure 3: Algorithm for fluid management in hypotensive shock

otherwise 10-20 ml/Kg bolus of colloid is administered. Algorithm in this regard is given in Figure III.⁵

Based on our experience of managing DHF/DSS patients we had noted that patients who improve with colloid or blood administration again go into decompensated shock when switch over to crystalloid solution is done. Continuing with colloid or blood depending on HCT in tapering way for next few hours followed by switching to crystalloid solution lead to smooth recovery in these patients. This along with WHO guideline based management was the basis of DEAG algorithm modification.

Although all of our patients did not improve with our management plan however, it is clear that if such modifications were not employed mortality could have

Primary dengue infection has been noted in fatal DHF patients.¹⁷ It was frequently noted in our patients as well. Additional illnesses/co morbidities association with DHF/DSS has been variable in various studies.^{18,19,20} 42.87% of fatal DHF cases in a study from Singapore had additional illnesses.¹⁷ Additional illnesses/co morbidities were significantly more in our patients who expired compared to who improved (75%:15.38%).

1-8 days duration of ICU stay was noted in a study focusing critically ill DSS patients.¹³ In a study which focused risk factors for death in admitted dengue patients it was noted that patients who expired had longer duration of hospitalization. Our results are different in this regard.²⁰ Our patients who expired had significantly shorter duration of hospitalization.

Conclusion

DSS patients who did not improve with DEAG guideline based treatment in our study had extravascular volume overload. Simple modification in DEAG treatment plan that entails continuing with colloid or blood depending on HCT in tapering way for initial few hours after hemodynamic stabilization is achieved lead to improvement in majority of patients.

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