

Study of use of fluid regulator in the fluid management of dengue fever in children in a rural tertiary care hospital

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Abstract

Background: Dengue is the most rapidly spreading mosquito borne viral disease in the world. In the last 50 years incidence has increased 30 folds with increasing geographical expansion to new countries and into present decade, from urban to rural setting. **Objectives:** To study the use of fluid regulator in the fluid management of Dengue Fever in children in a rural tertiary care hospital with a good outcome with no mortality. **Material & Methods:** This study was conducted on 1537 patients aged (0-16 years) with suspected Dengue Fever and serologically confirmed Dengue fever in the Department of Paediatrics, Akash Hospital, from October 2013 to October 2016. Fluid Regulator (DOSIFLOW) was used in the management of all admitted dengue cases in the pediatric general wards without shifting them to Pediatric Intensive Care Unit (PICU), and without using Infusion pumps. Those with respiratory distress and severe shock requiring ventilator support were shifted to PICU. Otherwise all patients with hypovolemia, severe thrombocytopenia, bleeding manifestation were managed in the pediatric general ward with the help of fluid regulator (DOSIFLOW). **Results:** Out of 1537 patients, 41 were case of severe dengue (DHF and DSS), 1496 were cases of non-severe dengue (undifferentiated fever, dengue fever with warning signs, and dengue fever without warning signs). The youngest child was 2 months old. All of the cases needed intravenous fluids. All patients with warning signs, with hypovolemia, severe thrombocytopenia, bleeding manifestations were managed in the pediatric general wards with the help of fluid regulator (DOSIFLOW). Fluid could be adjusted and regulated as 10ml/kg, 7ml/kg, 5ml/kg, 3ml/kg very easily with the help of fluid regulator without the use of infusion pump. Dopamine was required in 2% of cases, all of them were severe dengue cases. Platelet concentrate and Blood transfusion were not given to any of our admitted dengue cases. Case fatality rate was 0%, as all cases were discharged successfully after recovery with fluid management. **Conclusion:** Fluid therapy is very important in the management of Dengue fever which requires a fluid regulator for effective administration of intravenous fluids. We recommend to use Fluid regulator (DOSIFLOW) for fluid management of all Dengue Cases and also routinely in all paediatric cases for fluid administration, as it is very easy to use and regulate fluid volume without causing fluid overload.

Key words: Dengue Fever, Fluid therapy, Fluid Regulator

Introduction

Dengue Fever presents as common viral fever which causes severe complications. Dengue reinfection is observed to be more severe in children due to host immune response [1]. Fifty million dengue cases occur annually and 2.5 billion people live in dengue endemic

countries (i.e, the tropical and subtropical countries)[2]. About 5 lacs people with DHF are hospitalized annually. Of these around 90% are children less than five years of age [2]. In India the annual incidence is estimated to be 7.5 to 32.5 million [3]. Most abundant vector was Aedes Albopictus, followed by Aedes Aegypti [4]. The case fatality rate in patients with complicated or severe dengue infection which consists

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of dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) can be as high as 44% [5,6].

As we have come to understand the illness, fluid therapy has become the most important aspect in the management of dengue. In 2009, WHO new guidelines for management of dengue were published [7]. In 2012, the revised comprehensive guidelines were published by WHO [8].

The aim of this study was to study the use of fluid regulator in the management of Pediatric Dengue patients in a rural tertiary care hospital, as all patients with Dengue fever with thrombocytopenia cannot be admitted in PICU, because of the cost factor involved in the admission to PICU, limited availability of Infusion pumps and there was an epidemic of dengue in the region. Fluid therapy is very important in the management of Dengue fever which requires a fluid regulator for effective administration of intravenous fluids.

Material and Methods

Place of study: Department of Paediatrics, Akash Hospital attached to Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bangalore.

Period of study: October 2013 to October 2016.

Type of study: Prospective study

Sampling method: No definite sampling technique used

Inclusion Criteria: all admitted patients in 0-16 years age group with suspected Dengue fever and serologically confirmed Dengue fever.

Exclusion criteria: Patients with Enteric fever, Rickettsial Fever, malaria, Leptospirosis, Septicemia and viral hemorrhagic fever other than dengue were excluded from this study.

Results

During the study period of 3 years from October 2013 to October 2016, total of 1537 patients aged(0-16 years) with suspected dengue fever and serologically confirmed dengue fever admitted in the pediatrics general ward were studied. Out of 1537 patients only 41 patients (2.6%) required PICU admission for monitoring. There were 1069(69.5%) males and 468(30.4%) females in our study. The male to female ratio was 2.3:1. The maximum number of cases 1283(83.4%) was seen in the age group of 5-15 years. Out of 1537 patients, 41 were case of severe dengue (DHF and DSS), 1496 were cases of non-severe dengue (undifferentiated fever, dengue fever with warning signs, and dengue fever without warning signs) according to national guidelines. The youngest child was 2 months old. Fever was present in 100% of the cases; myalgia and abdominal pain were common. Hepatomegaly was most common physical finding.

The most common bleeding manifestation in both severe and non severe dengue were petechiae. Thrombocytopenia was present in 100% of cases both in severe and non-severe dengue cases. Raised hematocrit was seen in 50% of cases.

Statistical Methods: Descriptive data are presented as percentages. Descriptive statistics was calculated.

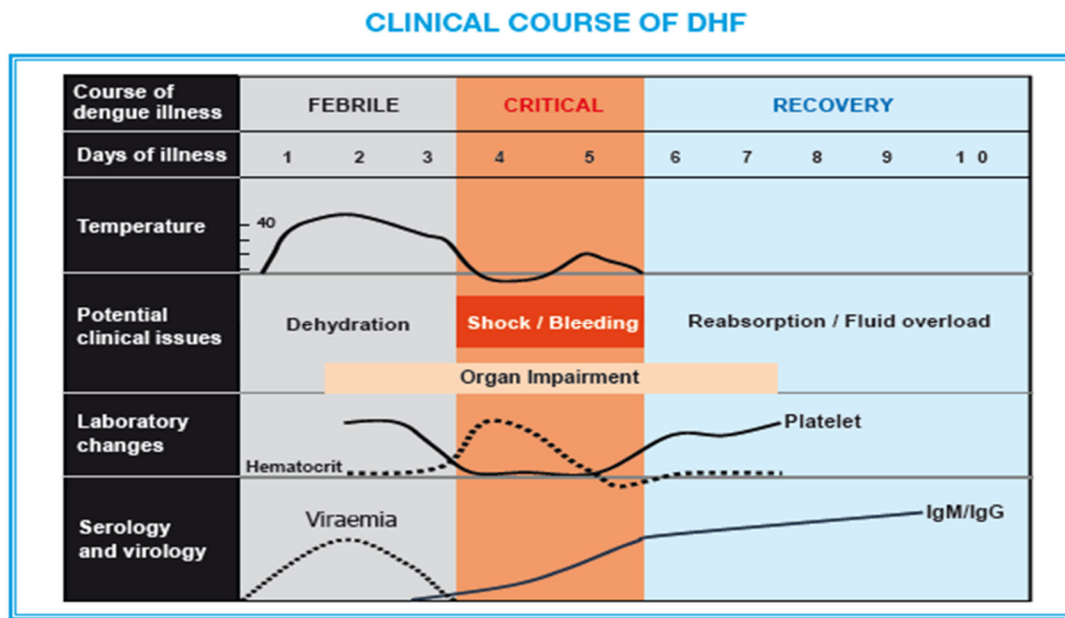
This was a prospective study, patients aged (0-16 years) were included in the study. Inclusion criteria were all admitted patients in 0-16 years age group with suspected Dengue fever and serologically confirmed Dengue fever. Patients with Enteric fever, Rickettsial Fever, malaria, Leptospirosis, Septicemia and viral hemorrhagic fever other than dengue were excluded from this study. Detailed clinical examination along with laboratory parameters like serial hemoglobin estimation, serial hematocrit, platelet counts, liver function tests, abdominal sonography, chest x-ray, serology tests for dengue NS1 Antigen, IgG and IgM antibody were done. Based on these parameters the patients were classified as dengue fever, dengue hemorrhagic fever grade I,II, III and IV; according to WHO traditional 1997 classification. According to WHO 2012 classification, they were classified as dengue, dengue fever with warning signs and severe dengue.

Symptomatic treatment was given for fever. Along with supportive care, fluid management was done according to WHO 2012 fluid management guidelines in the pediatric general wards. During the treatment period monitoring charts for vital parameters were used, initially one hourly monitoring was done till clinical improvement was seen.

Isotonic saline (0.9% NS) was used for initial management, IV fluid regulator (DOSIFLOW) was used to regulate the fluid volume in the management of all dengue patients in the pediatric general wards without shifting them to PICU, infusion pump was not used. IV fluids were discontinued after patients become hemodynamically stable.

Table-I: Age wise and Sex wise distribution of Pediatric Dengue Cases.

Age group	Male	Female
0-1 years	16	12
1-5 years	131	95
5-16years	922	361
Total	1069	468



Note : Onset of defervescence usually occurs between day 3 to day 5 of illness

Figure-1: Clinical course of Dengue fever

In our study majority of the patients were negative for Dengue NS1Ag, IgG and IgM, only 9 cases IgM positive, 14 cases IgG positive and 43 cases NS1Ag positive. Tourniquet test was found to be negative in majority of the patients. All febrile patients were treated with antipyretics (paracetamol) in appropriate doses. Patients who presented without warning signs and stable vital signs were initially encouraged to take oral fluids. Intravenous fluids were started according to national guidelines. All of the 100% cases needed intravenous fluids. All patients with warning signs, with hypovolemia, severe thrombocytopenia, bleeding manifestations were managed in the pediatric general ward with the help of fluid regulator (DOSIFLOW). Fluid could be adjusted and regulated as 10ml/kg, 7ml/kg, 5ml/kg, 3ml/kg very easily with the help of fluid regulator without the use of infusion pump.

Dopamine was required in 2% of cases; all of them were severe dengue cases. Platelet concentrate and Blood transfusion were not given to any of our admitted dengue cases. Case fatality rate was 0%, as all cases were discharged successfully after recovery with fluid management.

Discussion

Dengue infection causes a broad spectrum of clinical disease, which can range in severity from febrile illness to serious bleeding and shock.

Two major pathophysiological responses are associated with severe dengue infection – plasma leakage leading to hypovolaemic shock and /or abnormal hemostasis leading to hemorrhage [9,10].

The clinical course of dengue includes febrile, critical and recovery phases (Fig 1), and there are different challenges for fluid management at each stage [9]. In the initial febrile stage, the aim is to treat dehydration. The majority (70%) of non-shocked dengue patients can be treated as outpatients with oral rehydration regimens; however, the remaining 30% of these patients and all DSS patients require intravenous (IV) fluid therapy[11].

During the critical stage, there is an increase in capillary permeability and shock can result if a large volume of plasma is lost through leakage. The recommended regimen for the treatment of DSS is : immediate and rapid replacement of the plasma loss with isotonic crystalloid solutions or, in the case of profound shock, colloid solutions; continued replacement of further plasma losses to maintain effective circulation for 24-48 hours; correction of metabolic and electrolyte disturbances; and blood transfusion in cases with severe bleeding. If large amounts of fluid are required, these should be reduced gradually as plasma leakage decreases in order to prevent hypervolaemia, an excess in plasma volume which can cause oedema, respiratory distress or congestive heart failure, during the recovery stage [9,10].

In the present study, male to female ratio was 2.3:1, males 1069 (69.5%) and females 468 (30.4%), in a study by M.J. Kulkarni in 2010 found two third patients to be males [12]. In a study reported by CV Prathyusa et al from Andhra Pradesh state showed almost equal distribution of male and female ratio in 2012 [13]. Equal sex distributions was reported by study of Jonathan G. Lin et al from Malaysia [14]. Majority of patients (92.03%) were found to be males and females constituted 7.96% by a study done by Hemanth kumar et al [15].

In this study youngest child was 2 months old, the youngest patient reported by Jonathan G. Lin et al in a study done in 2000-04 was 4 months old [14]. Youngest age reported by C.V.Prathyusha et al was 6 months [13]. M. J. Kulkarni et al reported 6 cases of newborn admitted for dengue [12].

The maximum number of cases 1283(83.4%) was seen in the age group of 5-15 years. Jonathan G. Lin et al reported majority of cases from age group of 6-12 years which accounted for 64% of the cases [14]. M.J.Kulkarni et al reported similar finding of almost half of the patients in the age group of 6-12 years [12]. In our study, fever was present in all cases (100%). O.Norlijah found that vomiting topped the list after fever which was present in half of the cases [16]. In a study by V.H.Ratageri who reported the clinical features in order of frequency a fever (100%), vomiting (82%), pain abdomen (61%), restlessness (65%) and headache (22%)[17]. M. J. Kulkarni et al reported bleeding manifestation (44.5%) followed by vomiting (35.2%), pain abdomen (22.1%) and myalgia(10%)[12].

In our study Thrombocytopenia was present in 100% of cases both in severe and non-severe dengue cases. Raised hematocrit was seen in 50% of cases. In a study by Jonathan G.Lin et al platelet count was 129000+53000 (range of 38000 to 418000) [14]. Kulkarni et al found thrombocytopenia in 84% cases [12].

No mortality was found in this study because of successful fluid therapy with the use of fluid regulator. M.J. Kulkarni et al reported a case fatality rate of 1.1% [12]. 0.13% cases resulted in fatality in a study by Hemanth Kumar et al [15]. C.V. Prathyusha et al reported a mortality of 6.25%[13].

There was no mortality in the present study group, whereas mortality rate was high in earlier previous studies due to delay in recognition of epidemic in past or delay in diagnosis and management. In India, Indonesia, Bhutan, and Nepal still have case fatality rates above 1% while in other SEAR countries it was lesser than 1% [18]. Early diagnosis and proper management of dengue fever are required to bring down CFR. In endemic areas, cost-effective, safe and efficacious dengue vaccine can be a supportive factor in dengue prevention and control programme. Vaccination of target groups like migratory population and travelers to endemic areas can be an appropriate measure to prevent the spread of dengue to other regions [19].

In our study fluid management with the use of fluid regulator (DOSIFLOW) was the mainstay of treatment, along with supportive care. The parenteral fluids used was 0.9% normal saline. Ionotropes like dopamine was used in some cases. All cases received 0.9% normal saline (100%). Other studies have also observed that replacement with intravenous fluids was the treatment of choice and had a favorable outcome [20,21].

Conclusion

Fluid therapy is very important in the management of Dengue fever which requires a fluid regulator for effective administration of intravenous fluids. All patients with Dengue fever with thrombocytopenia cannot be admitted in PICU, because of the cost factor involved in the admission to PICU, limited availability of Infusion pumps. We recommend to use Fluid regulator (DOSIFLOW) for fluid management of all Dengue Cases and also routinely in all paediatric cases for fluid administration, as it is very easy to use and regulate fluid volume without causing fluid overload.

Abbreviations

DHF -Dengue Hemorrhagic Fever, DSS -Dengue Shock Syndrome, WHO- World Health Organization, PICU - Pediatric Intensive Care Unit, NS 1Ag- Non specific Antigen, IgM antibody- Immunoglobulin M antibody, IgG antibody- Immunoglobulin G antibody, SEAR - South East Asian Region, CFR- Case fatality rate, IV fluids -Intravenous fluids.

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