International Journal of Contemporary Pediatrics
Rawat D et al. Int J Contemp Pediatr. 2019 Sep;6(5):2046-2052
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

Original Research Article

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20193722

Clinico-epidemiological study of dengue fever in Ajmer region

Dharmendra Rawat, Kanwar Singh*, Pukhraj Garg

Department of Pediatrics, JLN Medical College, Ajmer, Rajasthan, India

Received: 16 May 2019
Accepted: 29 July 2019

***Correspondence:**
Dr. Kanwar Singh,
E-mail: dr_kanwarsingh@rediffmail.com

ABSTRACT

Background: Dengue infection is a major challenge to public health, especially in South-East Asia. It present with a diverse clinical spectrum. Estimates suggest that annually over 50 million cases of dengue hemorrhagic fever (DHF) occur in Asian countries with a case fatality rate of less than 5%. Of those with DHF, at least 90% are children younger than 15 years old. In humans, dengue infection causes a spectrum of illness ranging from relatively mild, non-specific viral syndrome known as Dengue fever (DF) to severe hemorrhagic disease and death. Definitive early Dengue diagnosis requires laboratory tests and those suitable for use at this stage of illness are either costly, such as RT-PCR for Dengue; not sufficiently rapid, such as virus isolation. Currently test available are NS1 antigen detection and ELISA for dengue, IgM and IgG antibodies. Objective of this study is to study clinico-epidemiological and haematological features of Dengue infection.
Methods: Prospective observational study involving initial 100 registered cases who were serologically confirmed dengue infection for a period of one year.
Results: DF, DHF and DSS were found in 41%, 53% and 6% patients respectively. Most common presenting complaint and bleeding manifestation were fever and petechiae. Uncommonly altered sensorium and icterus were found in severe dengue infection. 6% patients had coagulopathy, 37 patients had hepatic involvement and 2 patients had deranged renal function who had DSS. Fever was present in (100%) cases of DF, DHF and DSS. 26% patients had their platelet count <50000/mm3.
Conclusions: Dengue is a common disease in the India with wide spectrum of clinical presentations, affecting 5-15 years age group children commonly. It is one of the dreaded fevers but early diagnosis and management according to recent WHO guidelines can decrease case fatality rate significantly.

Keywords: Dengue fever, DHF, DSS, N S antigen

INTRODUCTION

Dengue infection is a major challenge to public health, especially in South-East Asia. It present with a diverse clinical spectrum. Estimates suggest that annually over 50 million cases of dengue hemorrhagic fever occur in Asian countries with a case fatality rate of less than 5%. Those of with dengue hemorrhagic fever, at least 90% are children younger than 15 years old. Dengue fever is a benign syndrome caused by several arthropod-borne viruses and is characterized by biphasic fever, retroorbital pain, myalgia or arthralgia, rash, leucopoenia, and lymphadenopathy. There are at least 4 distinct types of dengue viruses (dengue 1,2,3 and 4), members of the family Flaviviridae. Dengue viruses are transmitted by mosquitoes of the Stegomyia family. Aedes aegypti, a daytime biting mosquito, is the principal vector.[1] The virus passes from the mosquito intestinal tract to the salivary glands after an extrinsic incubation period, a process that takes approximately 10 days and is most rapid at high ambient temperatures.[2]

In humans, dengue infection causes a spectrum of illness ranging from relatively mild, nonspecific viral syndrome known as Dengue fever (DF) to severe hemorrhagic disease and death. The severe hemorrhagic form of disease is called Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS), a leading cause of hospitalization and death among children in Asia. Humans are the main reservoirs for the dengue virus.[3] Classic dengue fever is marked by rapid onset of high fever, headache, retro-orbital pain, diffuse body pain (both muscle and bone), weakness, vomiting, abdominal pain, sore throat, altered taste sensation, and a centrifugal maculopapular rash, among other manifestations. The severity of the pain led to the term break bone fever to describe dengue.

DHF has also been termed dengue vasculopathy. Vascular leakage in these patients results in haemoconcentration and serous effusions and can lead to circulatory collapse. This in conjunction with severe hemorrhagic complications, can lead to dengue shock syndrome, which possess a greater fatality risk than bleeding per se.[4]

Atypical presentations are rare and include encephalitis, seizures, hepatocellular damage, cholecystitis, myocarditis, pericardial effusion, renal dysfunction, severe gastro-intestinal hemorrhage, Guillain-Barre syndrome and rhabdo-myolysis.[5,6]

Definitive early Dengue diagnosis requires laboratory tests and those suitable for use at this stage of illness are either costly, such as RT-PCR for Dengue; not sufficiently rapid, such as virus isolation; or undergoing field trials, such as ELISA for NS1 protein of Dengue virus. Hence there is a need for simple laboratory tests like hematological and biochemical tests for early diagnosis of Dengue viral illness which will be useful for case management and preventing mortality and morbidity.[7]

In present rapid test available are NS1 antigen detection and ELISA for dengue, IgM and IgG antibodies. NS1 antigen, a viral non-structural protein, is released by infected cells into the circulation and can be detected in acute-stage . The detection of NS1 is the basis of commercial tests, including rapid lateral flow tests. These tests offer reliable point of care and diagnosis of acute dengue infection. Dengue IgM and IgG ELISA are sensitive (83.9-98.4%) and specific (100%), less expensive, quick, and simple tests to perform. Dengue IgM antibodies appear in serum by the fifth day of infection and become undetectable by 30-60 days of illness. The conventional or capture ELISAs have been used to identify different dengue viral serotypes. A fourfold or greater rise in antibody titers in paired samples is better than single random sampling.

The ultrasound findings in early milder form of DF include GB wall thickening, pericholecystic fluid, minimal to moderate ascites, pleural effusion, pericardial effusion and hepatosplenomegaly. Severe forms of the disease are characterized by fluid collection in the perirenal and pararenal region, hepatic and splenic subcapsular fluid, pericardial effusion, pancreatic enlargement and hepatosplenomegaly. Also found abnormal liver parenchyma, which has been attributed to intraparenchymal and subcapsular haemorrhages. GB wall thickening in DF may be due to decrease in intravascular osmotic pressure.[8] There is no specific treatment for Dengue. Hydration therapy and early recognition and management of complication of the disease are the key component of reducing both mortality and morbidity in dengue patients.

METHODS

Prospective study involving initial 100 registered cases were taken, who were serologically confirmed (IgM positive alone or both IgM and IgG) or NS1 antigen positive for dengue in 1-15 year age group attending department of Pediatrics, Jawahar Lal Nehru Hospital attached to Medical College, Ajmer, Rajasthan, during a period from October 2016 to September 2017. IgM negative dengue like illnesses, cases of enteric fever, malaria and other infections were excluded from study by appropriate investigations. Informed consent from all the patients relative were taken before undergoing the study. Ethical clearance has been obtained from ethical committee of the institution before starting the study.

Serological tests for detection of IgM and IgG dengue antibodies was done by MAC ELISA and NS1 dengue antigen test by card method (*J. Mitra Day 1 Dengue Rapid card test*) was done in department of Microbiology. Other investigation was done in all cases are , complete hemogram, Liver function tests and Renal function tests, Chest X- ray, USG abdomen, PT/APTT and serum electrolytes. CT/MRI brain and CSF analysis was done whenever required.

Statistical analysis

Data collected was transferred into excel sheet and analyzed with the help of frequency tables, percentages and appropriate statistical ANOVA test i.e. p and f value wherever applicable.

RESULTS

The present study show maximum number of Dengue infection cases in age group of above 5 years of age (93%). Only 7% cases were below 5year of age. Male predominance over female with a ratio of 1.63:1. Majority of patients (54%) were came from upper lower socioeconomic status followed by 20% each from upper middle and lower middle while only 6% patients were came from lower socioeconomic status. Out of total 100 patients, 71% patients came from urban area while remaining 29% patients belonged to rural area.

In this study 53% patients had DHF, 41% patients had DF and 6% of patients had DSS (Table 1). Most of the patients were admitted in month of September followed by October and November. Majority of patients (70%) had their hospital stay <5 days while remaining 30% patients had their hospital stay >5 days. Mean hospital stay in DF patients was 4.78±1.15 days, in DHF fever 5.11±1.43 days and in DSS was 7.50±2.42 days. On applying ANOVA the difference was found statistically highly significant (p<0.005).

Table 1: Distribution of cases according to severity of dengue fever.

Severity of Dengue Fever	No.	%
Dengue Fever	41	41.00
Dengue Haemorrhagic fever	53	53.00
Dengue Shock Syndrome	6	6.00

According to symptoms fever was present in (100%) cases of DF, DHF and DSS, followed by vomiting in (58.5%,62.2% and 66.7%), myalgia in (56.1%, 52.8% and 66.7%), headache in (61%, 52.8% and 16.7%), abdominal pain in (46.3%, 43.4% and 83.3%), rashes (4.9%, 50.9% and 0%), retro-orbital pain in (2.4%, 9.4% and 16.7%), pruritis in (19.5%, 18.9% and 33.3%) and respiratory difficulty in (2.4%, 5.7% and 83.3%) was present respectively in DF, DHF and DSS. On applying chi square test, the difference was found highly significant in jaundice, rash and respiratory difficulty (p<0.001) for DF, DHF and DSS (Table 2).

According to bleeding manifestation, petechiae was most common bleeding manifestation in 60.4% of DHF and 66.7% of DSS (Table 3).

Table 2: Distribution of cases according to Presenting Complaints.

Presenting Complaints	Dengue Fever						Total		χ^2	P
	Dengue Fever (n=41)		Dengue Haemorrhagic Fever (n=53)		Dengue Shock Syndrome (n=6)					
	No.	%	No.	%	No.	%	No.	%		
Fever	41	100	53	100	6	100	100	100	-	-
Abdominal Pain	19	46.3	23	43.4	5	83.3	47	47.0	3.463	0.177
Vomiting	24	58.5	34	64.2	4	66.7	62	62.0	0.368	0.832
Myalgia	23	56.1	28	52.8	4	66.7	55	55.0	0.451	0.798
Headache	25	61.0	28	52.8	1	16.7	54	54.0	4.199	0.123
Backache	8	19.5	7	13.2	2	33.3	17	17.0	1.858	0.395
Retroorbital Pain	1	2.4	5	9.4	1	16.7	7	7.0	2.654	0.265
Jaundice	0	-	0	-	2	33.3	2	2.0	31.973	<0.001
Pruritis	8	19.5	10	18.9	2	33.3	20	20.0	0.715	0.699
Rash	2	4.9	27	50.9	0	-	29	29.0	26.432	<0.001
Respiratory Difficulty	1	2.4	3	5.7	5	83.3	9	9.0	43.356	<0.001

Table 3: Distribution of cases according to Bleeding Manifestation.

Bleeding Manifestation	Dengue Fever						Total		χ^2	P
	Dengue Fever (n=41)		Dengue Haemorrhagic Fever (n=53)		Dengue Shock Syndrome (n=6)					
	No.	%	No.	%	No.	%	No.	%		
Petechiae	0	-	32	60.4	4	66.7	36	36.0	39.182	<0.001
Epistaxis	0	-	17	32.1	1	16.7	18	18.0	16.121	<0.001
Melena	0	-	9	17.0	1	16.7	10	10.0	7.722	0.021
Protracted Menstrual Bleeding	0	-	9	17.0	1	16.7	10	10.0	7.722	0.021

According to general physical examination, tourniquet test was positive in 57% patients and out of them 9, 44 and 4 patients had DF, DHF and DSS fever respectively, facial puffiness present in 13 patients and of them 2, 10 and 1 patient had DF, DHF and DSS respectively, lymphadenopathy in 6 patients and out of them 2, 3 and 1

patients had DF, DHF and DSS, pallor was present in 3 patients and out of them 1 each had all the three type of fever, Jaundice was present in 2 patients of DSS, ascites was present in 2 patients and they had DSS, 2 patients had altered sensorium who had DSS. Statistically highly significant ($p<0.001$) difference was found in altered sensorium, ascites and tourniquet test while significant difference was found in icterus ($p<0.05$) (Table 4).

Table 4: Distribution of cases according to General Physical Examination.

General Physical Examination	Dengue Fever						Total		χ^2	P
	Dengue Fever (n=41)		Dengue Haemorrhagic Fever (n=53)		Dengue Shock Syndrome (n=6)					
	No.	%	No.	%	No.	%	No.	%		
Facial Puffiness	2	4.9	10	18.9	1	16.7	13	13.0	4.076	0.130
Tourniquet Test	9	21.9	44	83.0	4	66.7	57	57.0	35.416	<0.001
Ascites	0	-	0	-	2	33.3	2	2	31.973	<0.001
Lymphadenopathy	2	4.9	3	5.7	1	16.7	6	6.0	1.313	0.519
Pallor	1	2.4	1	1.9	1	16.7	3	3.0	4.121	0.127
Icterus	0	-	1	1.9	1	16.7	2	2.0	7.425	0.024

Table 5: Distribution of cases according to platelet count.

Platelet Count/mm^3	Dengue Fever						Total	
	Dengue Fever (n=41)		Dengue Haemorrhagic Fever (n=53)		Dengue Shock Syndrome (n=6)			
	No.	%	No.	%	No.	%	No.	%
<50000	6	14.6	16	30.2	4	66.7	26	26.0
50000-1Lac	19	46.3	29	54.7	2	33.3	50	50.0
1 Lac – 1.5 Lac	7	17.1	3	5.7	0	-	10	10.0
>1.5 Lac	9	22.0	5	9.4	0	-	14	14.0
Total	41	100	53	100	6	100	100	100

Table 6: Statistical Analysis of General Investigations Hematocrit (HCT).

Day of Illness	Dengue Fever						f	P
	Dengue Fever (n=41)		Dengue Haemorrhagic Fever (n=53)		Dengue Shock Syndrome (n=6)			
	Mean HCT %	SD	Mean HCT %	SD	Mean HCT %	SD		
Day 2	36.95	0.63	35.00	5.73	33.45	8.59	0.215	0.809
Day 3	35.49	4.55	36.25	4.59	34.98	8.21	0.261	0.771
Day 4	35.32	4.34	35.51	4.51	31.95	4.34	1.758	0.178
Day 5	34.67	4.53	34.79	4.82	32.61	4.86	0.580	0.562
Day 6	34.97	4.05	35.35	4.02	31.68	5.51	2.131	0.125
Day 7	33.99	3.66	34.51	3.69	31.53	4.60	1.685	0.192

Table 7: Distribution of cases according to TLC.

TLC/mm^3	Dengue Fever						Total	
	Dengue Fever (n=41)		Dengue Haemorrhagic Fever (n=53)		Dengue Shock Syndrome (n=6)			
	No.	%	No.	%	No.	%	No.	%
<4000	24	58.5	36	67.9	5	83.3	65	65.0
4000-11000	16	39.0	16	30.2	1	16.7	33	33.0
>11000	1	2.4	1	1.9	0	-	2	2.0
Total	41	100	53	100	6	100	100	100

In present study, total 26% patients had their platelet count <50000, 50% patients had their platelet count between 50000-100000, 10% patients had their platelet count 1 lac to 1.5 lac and 14 patients had their platelet count >150000 (Table 5).

Table 6 shows comparison of HCT with dengue fever on different days. Mean HCT at the time of admission for DF was 36.95±0.63, for DHF 35.00±5.73 and for DSS 33.45±8.59. The difference was found statistically insignificant (p >0.05) at all. 5 patients suffering from DF, DHF and DSS respectively. 33% patients had their TLC between 4000-11000 and out of them 16, 16 and 1 patients suffering from DF, DHF and DSS respectively while only 2% patients had their TLC >11000 and out of them 1 each suffering from DF and DHF (Table 7).

In this study Mean TLC at the time of admission for dengue fever was 7485±3273, for DHF 6622±2816 and for DSS 4975±1228. Mean TLC was lowest for DSS but statistically insignificant (p>0.05).

In this study, out of total 100 patients, 6% patients had coagulopathy (INR >1.5) and out of them 4 (66.66 %) and 2 (33.33%) patients suffering from DHF and DSS respectively. 37% patients had hepatic involvement (SGPT>40) and out of them 6 (16.21%), 25(67.56%) and 6(16.21%) patients suffering from DF, DHF and DSS. Out of 100 cases 3 patients had renal dysfunction who had DSS. 96% patient had their serum potassium level between 3.5-5.5 Meq /L. On chest X-ray examination of 88% cases did not find any abnormality, while 12% patients had pleural effusion in chest X-ray ,this difference was found statistically significant (p<0.001). According to abdominal ultra-sonography hepatomegaly (30%) was most common finding (Table no 8).

In present study 7 patients required platelet transfusion and out of them 4(7.45%) and 3(50%) patients suffering from DHF and DSS respectively, 4 patients required packed RBCs and out of them 1(1.88%) and 2(33.33%) patients suffering from DHF and DSS respectively, 3 patients required fresh frozen plasma and out of them 2(3.77%) and 2(33.33%) patients suffering from DHF and DSS respectively. Requirement of all three blood component was significantly associated with DSS (p<0.001). Out of total 100 patients, no mortality was recorded while 95% patients were cured from their disease and 5% patients were discharge on request. (Table No 9).

Table 8: Distribution of Cases according to USG Abdomen.

USG Abdomen	Dengue Fever						Total	
	Dengue Fever (n=41)		Dengue Haemorrhagic Fever (n=53)		Dengue Shock Syndrome (n=6)			
	No.	%	No.	%	No.	%	No.	%
Hepatomegaly	9	21.9	18	33.96	3	50.0	30	30.0
Splenomegaly	3	7.31	3	5.66	1	16.67	7	7.0
Gall bladder wall thickening	3	7.31	5	9.43	0	-	8	8.0
Ascites	6	14.63	9	16.98	6	100.0	21	21.0
Pleural effusion	2	4.87	5	9.43	5	79.36	12	12.0

Table 9: Distribution of Cases according to Outcome.

Outcome	Dengue Fever						Total	
	Dengue Fever (n=41)		Dengue Haemorrhagic Fever (n=53)		Dengue Shock Syndrome (n=6)			
	No.	%	No.	%	No.	%	No.	%
Cured	37	90.2	52	98.1	6	100.0	95	95.0
Discharge on Request	4	9.8	1	1.9	0	-	5	5.0
Total	41	100	53	100	6	100	100	100
χ^2	3.350							
P	0.187							

DISCUSSION

Dengue disease has been ranked by the WHO as the fastest spreading vector-borne viral disease. The possible reason for the outbreak of dengue may be due to stored drinking water in large containers to overcome the water crisis and stagnant rainwater have led to an outburst in mosquito growth in the state. As per the WHO TDR 2009

dengue guidelines, dengue cases were analyzed. In present study, the total number of cases analysed were 100, out of which 53% had DHF, 41% patients had DF and 6% of patients had DSS. The maximum numbers of cases were seen in the age group of >5-15 years and the least affected age group was infants. In a study conducted by Nishikant et al, on dengue fever in a tertiary care hospital the highest number of cases were found in age group of 6-12 years (61%), followed by 35% cases in age group of 1 to <6 years and lastly 4% cases fell in <1 year age group.[9]

Male and female ratio in present study was 1.6:1. In study of Hema Mittal et al, and Chandrakanta et al, also found M:F ratio 1.32:1 and 1.6:1 respectively.[10,11] This was probably due to covered dress used by females. This similar pattern of age and sex predilection was also seen in the retrospective analysis of the 2006 North Indian Dengue outbreak. Duration of hospitalization was more in case of DSS patients. According to presenting complaints, all the patients had fever, vomiting was present in 62 patients, myalgia was present in 55 patients, headache in 54 patients, abdominal pain was present in 47 patients. Rash, pruritis, backache, respiratory difficulty, retroorbital pain and jaundice 29, 20, 17, 9, 7 and 2 patients respectively. In a study by Batra et al, fever was present in 100% cases, vomiting in 72%, abdominal pain in 52%, rash in 24% and bodyache in 8% patients.[12] Bleeding in dengue is multi-factorial. The most common bleeding manifestations in both severe and non-severe dengue were petechiae (36%) and epitaxis in 18%. Gastrointestinal bleeding was seen only in 9% of children. This could be due to early in recognition of disease and seeking medical attention at the beginning stage itself. Torniquet test was positive in 57% cases out of them 9, 44 and 4 patients had DF, DHF and DSS respectively.

In present study thrombocytopenia was seen to be more in those with DHF and DSS. Mean platelet count at the time of admission for dengue fever was 137000±31000, for dengue hemorrhagic fever 136000±59000 and for dengue shock syndrome 90000±54000. Liver involvement in the form of hepatomegaly and increased SGPT was observed in this study. These data were similar to the results described by Mohan et al.[13] Laboratory parameter packed cell volume (PCV) was used regularly to evaluate plasma leakage in dengue infection. Mean PCV at the time of admission for dengue fever was 36.95±0.63, for dengue hemorrhagic fever 35.00±5.73 and for dengue shock syndrome 33.45±8.59. Ratageri et al,[13] in their study at Karnataka found Hct value for Dengue fever, DHF and DSS were 31.5%, 30.75% and 30.4% respectively at the time of admission. In present study, total 65 patients had their TLC <4000 and out of them 24, 36 and 5 patients suffering from DF, DHF and DSS respectively. 33 patients had their TLC between 4000-11000 and out of them 16, 16 and 1 patients suffering from DF, DHF and DSS respectively while only 2 (2.4%) patients had their TLC >11000 and out of them 1 (1.9%) each suffering from DF and DHF. In a study by prathyusha CV et al, was also found leucopenia(66.2%).[14]

In present stydy 3% patients had renal dysfunction, who had highly significant association with dengue shock syndrome ($p<0.001$). A similar observation is found in study by Dhooria et al, they found renal dysfunction in 3.7% patients while Mehra et al, found renal dysfunction in 10.8% patients.[15,16]

Pleural effusion was present on right side in chest X-ray of 12 cases of DSS. According to abdominal ultrasonography hepatomegaly was most common finding present in 30 patients, ascites present in 21 patients, 8 patients had gall bladder wall thickening and 7 patients had splenomegaly (Table no 8). Srinivasa et al, in their study found hepatomegaly in 42% patients, splenomegaly in 16.5% patients, gall bladder wall thickening in 30.5% patients, ascites in 37% patients and pleural effusion in 46.5% patients.[17] There was highly significant associated of dengue shock syndrome with ascites and pleural effusion ($p<0.001$. On applying chi square test, the difference was found statistically highly significant ($p<0.001$).

In present study, out of total 100 patients, 37 patients had elevated hepatic enzymes (SGPT>40) and out of them 6, 25 and 6 patients suffering from DF, DHF and DSS. Studies conducted in past had reports 36.4%-96% elevated hepatic enzymes.[18-22]

In this study most of the patients (96 %) had normal serum potassium level while 4% patients had hypokalemia this is much lower than that obtained by Lumpaopong et al.[23] they found hypokalemia in 15.7% patients. On applying chi square test, the difference was found statistically insignificant ($p>0.05$).

CONCLUSION

Thus, we concluded that dengue is a common disease in this part of the India . It is one of the dreaded fevers for the paediatric age group. Children of age group 10-15 years were commonly affected by dengue. The disease has various presentations and features, but early diagnosis and management can decrease case fatality rate significantly. In this study we have enlisted all the typical and atypical presentations. Severe dengue is very dangerous for children. Laboratory parameter like raised SGPT and INR are very significant for distinguishing severe disease from non-severe variety. Pleural effusion is a dominant feature of severe disease. This study will elaborate knowledge about the disease and will improve the outcome.

ACKNOWLEDGEMENTS

Thanks to all patients and the relatives who participate in this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Scott B. Halstead In: Kliegman, Stanton, St. Geme and Schor Nelson Textbook of Pediatrics 20th ed. Philadelphia, Elsevier; 2016:1629-1631.
2. Watts DM, Burke DS, Harrison BA, Whitmire RE, Nisalak A. Effect of temperature on the vector efficiency of Aedes aegypti for dengue 2 virus. Am J Trop Med Hyg. 1987 Jan 1;36(1):143-52.
3. Shah GS, Islam S, Das DK. Clinical and Laboratory Profile of Dengue in Children. Kathmandu Uni Med J. 2006;4(1):40-43.
4. Statler J, Mammen M, Lyons A, Sun W. Sonographic findings of healthy volunteers infected with dengue virus. J Clin Ultrasound. 2008;36(7):413-7.
5. Brian KP G, Tan SG. Case of dengue virus infection presenting with acute acalculous cholecystitis. J Gastroenterol Hepatol. 2006 May;21(5):923-4.
6. Ahmed S, Ali N, Tariq W. Neurological manifestations as presenting feature in dengue fever. J Coll Physicians Surg Pak. 2007;17(4):236-7.
7. Tanner L, Schreiber M, Low JGH, Ong A, Tolfvenstam T, Cameroon P et al. Decision Tree Algorithms Predict the Diagnosis and Outcome of Dengue Fever in the Early Phase of Illness. J Trop Dis. 2008 March;2(3):196-201.
8. Venkata Sai PM, Dev B, Krishnan R. Role of ultrasound in dengue fever. Br J Radiol. 2005 May;78(929):416-8.
9. Nishikant T, Kisan P, More SS. Dengue fever in a tertiary care hospital. International Journal of Recent Trends in Science and Technology. September. 2015;16(2):358-62.
10. Mittal H, Faridi MMA, Arora SK, Patil R. Clinico hematological profie and palatelet trends in children with dengue during 2010 epidemic in North India. Indian J Pediatric. 2011;79(4):467-71.
11. Chandrakanta, Kumar R, Garima, Agrawal J, Jain A, Nagar R. Changing clinical manifestations of dengue infection in North India. Dengue Bull. 2008;32:118-25.
12. Batra P, Saha A, Chaturvedi P, Vilhekar KY, Mendiratta DK. Outbreak of dengue infection in rural Maharashtra. Indian journal of pediatrics. 2007 Aug 1;74(8):794-5.
13. Ratageri VH, Shepur TA, Wari PK, Chavan SC, Mujahid IB, Yergolkar PN. Clinical profile and outcome of dengue fever cases. The Indian Journal of Pediatrics. 2005 Aug 1;72(8):705-6.
14. Prathyusha CV, Rao MS, Sudarsini P, Rao KUM. Clinico-haematological profile and outcome of dengue fever in children. Int J Curr Microbiol App Sci. 2013;2(10):338-46.
15. Dhooria GS, Bhat D, Bains HS. Clinical Profile and Outcome in Children of Dengue Hemorrhagic Fever in North India. Iran J Pediatr. 2000; 18(3):222-8.
16. Mehra N, Patel A, Abraham G, Reddy YN, Reddy YN. Acute kidney injury in dengue fever using Acute Kidney Injury Network criteria: incidence and risk factors. Trop doctor. 2012 Jul;42(3):160-2.
17. Srinivasa S, Nawab T, Nair CC. Clinical profile and ultasonogaphic findings in children with dengue fever. Curr Pediatr Res. 2014;18(2):87-90.
18. Petdachai W. Hepatic dysfunction in children with dengue shock syndrome. Dengue Bulletin. 2005;29:112-7.
19. Mohan B, Patwari AK, Anand VK. Hepatic dysfunction in childhood dengue infections. J Trop Pediatric. 2000;46(1):40-3.
20. Wahid SF, Sanusi S, Zawawi MM, Ali RA. A comparison of the pattern of liver involvement in dengue hemorrhagic fever with classic dengue fever. Southeast Asian J Trop Med Pub Health. 2000;31(2):259-63.
21. Itha S, Kashyap R, Krishnani N. Profile of liver involvement in dengue virus infection. Natl Med J India. 2005;18(3):127-30.
22. Mehra N, Patel A, Abraham G et al. Acute kidney injury in dengue fever using acute kidney injury network criteria: incidence and risk factors. Tropical doctor. 2012;42:160-2.
23. Lumpaopong A, Kaewplang P, Watanaveeradej V, Thirakhupt P, Chamnanvanakij S, Srisuwan K, et al. Electrolyte disturbances and abnormal urine analysis in children with dengue infection. Southeast Asian Journal of Tropical Medicine and Public Health. 2010 Jan 1;41(1):72.

Cite this article as: Rawat D, Singh K, Garg P, Clinico-epidemiological study of dengue fever in Ajmer region. Int J Contemp Pediatr 2019;6:2046-52.