VOLUME - 11, ISSUE - 04, APRIL - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

General Medicine

UTILITY OF SERUM ALBUMIN AND C-REACTIVE PROTEIN FOR ASSESSING THE SEVERITY OF DENGUE INFECTION- A RECORD BASED CASE SERIES STUDY.

Dr Pavanakumar Kamagond — Assistant Professor, Department of General Medicine

Dr SUHAS S V* — 3rd Year Post Graduate, Department Of General Medicine *Corresponding Author

ABSTRACT

Background: Dengue is the most rapidly spreading mosquito borne viral disease in the world. Dengue viruses are flavivirus, which include four serotypes 1, 2, 3 and 4. Clinical expression of dengue virus infection vary from asymptomatic infection to severe dengue with shock. Incidence has increased 30- fold in the last 50 years with increasing geographic expansion to new countries and, in the present decade, from urban to rural settings. At present, dengue fever (DF) causes more illness and death than any other arboviral disease of humans. Aims and objectives: To determine the value of serum albumin and C-reactive protein (CRP) in the assessment of severity of dengue infection in patients admitted to SNMC and HSK hospital. **Materials and methods:** Record based study done on patients admitted to general medicine department of S Nijalingappa Medical College and HSK hospital, bagalkot, Karnataka. Patients with Dengue NS1 Ag or IgM positive are included in the study after meeting inclusion and exclusion criteria. Results: A total of 65 patients were studied according to the inclusion criteria. Majority of the patients were between 20-40years of age with 56.9% being male patients and 43.1% were females. 40% of the patients had dengue without warning signs, 52.3% had dengue with warning signs and 7.7% had severe dengue. Mean serum albumin of 2.66g/dl was seen in severe dengue group whereas a value of 3.65g/dl and 3.06g/dl was seen in dengue without warning signs and dengue with warning signs respectively. Mean CRP of severe dengue group was 98.84mg/L whereas it was 9.49mg/L and 53.60mg/L among dengue without warning signs and dengue with warning signs respectively. **Conclusion:** Serum albumin and C-reactive protein can be used as potential markers to predict severity of illness in dengue infection.

KEYWORDS :

Dengue is a disease of major concern throughout the world due to its ability to cause huge burden on public health system since it is rapidly transmitted by mosquitoes. Based on (WHO) World Health Organization reports, about 50 to 100 million new dengue infections are estimated to occur annually with a steady increase in the number of countries reporting the disease.[1] Dengue is a febrile illness caused by infection with one of four dengue viruses (DENVs) transmitted by Aedes aegypti or Aedes albopictus mosquitoes during the taking of blood meal.[2-4] Severe dengue is characterized by thrombocytopenia, spontaneous haemorrhages, and gradual plasma leakage that can lead to shock.[5,6] Dengue infection presents with variety of clinical manifestations ranging from asymptomatic infection or simple viral illness to dengue shock syndrome. Dengue causes severe bleeding, circulatory shock and even death. So early diagnosis and recognition of severe form of dengue infections like dengue haemorrhagic fever, dengue shock syndrome is cornerstone in management. Though dengue infections are common in paediatric age group, adult admissions has been increased in recent years especially in India. In India, particularly in Karnataka state in recent years dengue has been a major health issue contributing to significant mortality and morbidity. C-reactive protein is an acute phase reactant protein synthesized by the liver in response to inflammation and tissue injury within 6 hours.[7] Inflammation is the bodies way of protecting tissues in response to an infection. CRP is an annular pentameric protein found in blood plasma who circulating concentration rise in response to inflammation. Hence, CRP is considered as a biomarker for infection and inflammation. Albumin (molecular radius, 36Å), the major protein responsible for the colloidal properties of plasma, carries a strong negative charge and is filtered less readily than neutral proteins of similar size, such as transferrin.[8,9] Glycosaminoglycans (GAGs) are complex, negatively charged polysaccharides that are widely distributed on cell surfaces and are incorporated into the glycocalyx layer on the luminal surface of the vascular endothelium.[10,11] Disruption of the GAG components of the glycocalyx layer has been implicated in the increased clearance of proteins seen in animal models of capillary leak in dengue infection.[12,13] Although the clinical features of DHF suggest that vascular endothelial dysfunction is a prominent feature of the disease and alterations in microvascular permeability have been demonstrated using strain gauge plethysmography.[14]

Who Revised Criteria For Classification Of Severity Of Dengue

DENGUE WITHOUT WARNING SIGNS	DENGUE WITH WARNING SIGNS	SEVERE DENGUE
PLUS any TWO of the following: • Headache • Malaise • Myalgia • Arthralgia • Retro-orbital pain • Anorexia • Nausea, vomitingDiarrhoea • Flushed skin • Rash • Leukopenia with/without thrombocytopenia • Dengue NS1 antigen or IgM antibody positive	PLUS any ONE of the following: • Abdominal pain or tenderness • Persistent vomiting • Clinical signs of fluid accumulation • Mucosal bleeding • Lethargy/restlessness • Liver enlargement • Increase in haematocrit and/or decrease in platelet count <1,00,000/microlitre	Dengue with/without warning signs PLUS any one of the following: • Severe plasma leakage or shock leading to fluid accumulation with respiratory distress • Severe bleeding • Severe organ impairment like LIVER- AST or ALT>1000U/L. CNS- seizure, impaired consciousness. HEART- myocarditis. KIDNEY- renal failure.

AIMS AND OBJECTIVES:

To determine the value of serum albumin and C-reactive protein (CRP) in the assessment of severity of dengue infection in patients admitted to SNMC and HSK hospital.

METHODOLOGY:

Study design- Record based study

Source of study population- Record based study done on patients admitted to general medicine department of S Nijalingappa Medical College and HSK hospital, bagalkot, Karnataka.

Inclusion criteria-
- Patients above 18years of age
- Dengue NS1 or IgM positive

Exclusion criteria-
- Patients with pre-existing liver disease
- Patients with autoimmune disorders
- Patients with other bacterial infections

Sample size- 65
- Sample size estimation was done using openepi software version 2.3.1.
- At 95% confidence level,
- According to the study conducted by [0]
- Plasma leakage (Ascites and pleural effusion) with hypoalbuminemia (<3gm/dl) was found in 64%=p
- At 20%, relative precision,
-

Sample size estimated is 62, which is rounded off to 65.
- Formula used n= [DEFF*Np(1-p)]/ [(d²/Z²1- /2*(N-1)+p*(1-p)]
- Data collection- Record based study on patients admitted with dengue infection under department of general medicine. Data collected from medical record department, SNMC and HSK hospital.

RESULTS:

A total of 65 patients were studied according to the inclusion criteria. Majority of the patients were between 20-40years of age with 56.9% being male patients and 43.1% were females. 40% of the patients had dengue without warning signs, 52.3% had dengue with warning signs and 7.7% had severe dengue. Mean platelet count was 0.12 lakh/cumm among severe dengue group whereas it was 1.14lakh/cumm and 0.67lakh/cumm among cases of dengue without warning signs and dengue with warning signs respectively. Mean serum albumin of 2.66g/dl was seen in severe dengue group whereas a value of 3.65g/dl and 3.06g/dl was seen in dengue without warning signs and dengue with warning signs respectively. Mean CRP of severe dengue group was 98.84mg/L whereas it was 9.49mg/L and 53.60mg/L among dengue without warning signs and dengue with warning signs respectively.

Table No 1: Age Distribution In The Study

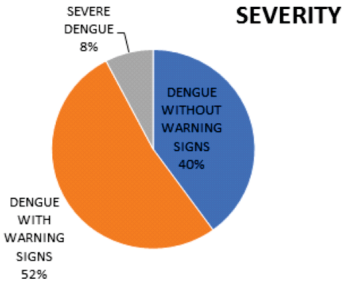
Age	No of cases	Percent
≤ 20	12	18.5
21-30	26	40.0
31-40	12	18.5
41-50	11	16.9
> 50	4	6.2
Total	65	100.0

Table No 2: Gender Distribution In The Study

Gender	No of cases	Percent
Male	37	56.9
Female	28	43.1
Total	65	100.0

Table No 3: Number Of Cases Based On Severity

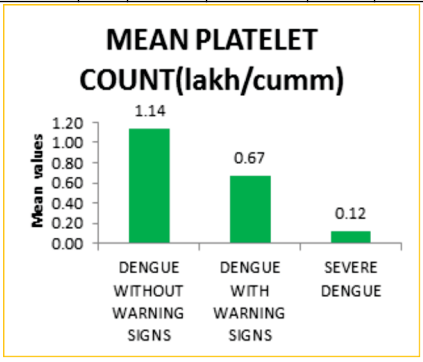
Severity of Dengue	No of cases	Percent
DENGUE WITHOUT WARNING SIGNS	26	40.0
DENGUE WITH WARNING SIGNS	34	52.3
SEVERE DENGUE	5	7.7
Total	65	100.0



Graph No 1: Number Of Cases Based On Severity

Table No 4: Platelet Count In The Study

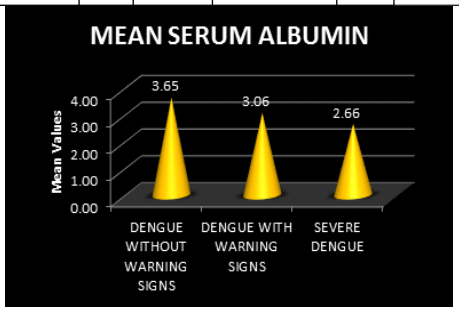
Severity of Dengue	N	PLATELET COUNT (lakh/cumm)		ANOVA	
		Mean	Std. Deviation	F Value	Significance
DENGUE WITHOUT WARNING SIGNS	26	1.14	0.18	89.52	P<0.001, Highly Sig
DENGUE WITH WARNING SIGNS	34	0.67	0.19		
SEVERE DENGUE	5	0.12	0.03		



Graph No 2: Platelet Count In The Study

Table No 5: Mean Serum Albumin In The Study

Severity of Dengue	N	SERUM ALBUMIN		ANOVA	
		Mean	Std. Deviation	F Value	Significance
DENGUE WITHOUT WARNING SIGNS	26	3.65	0.24	97.77	P<0.001, Highly Sig
DENGUE WITH WARNING SIGNS	34	3.06	0.15		
SEVERE DENGUE	5	2.66	0.09		

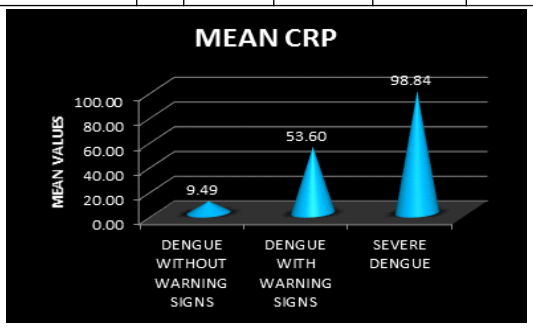


Graph No 3: Mean Serum Albumin In The Study

The above graph demonstrates that serum albumin is significantly lower in cases of severe dengue compared those patients with dengue fever with/without warning signs.

Table No 6: Mean Crp In The Study

Severity of Dengue	N	CRP		ANOVA	
		Mean	Std. Deviation	F Value	Significance
DENGUE WITHOUT WARNING SIGNS	26	9.49	6.61	213.32	P<0.001, Highly Sig
DENGUE WITH WARNING SIGNS	34	53.60	12.94		
SEVERE DENGUE	5	98.84	8.97		



Graph No 4: Mean Crp In The Study

The above graph demonstrates a significantly higher mean serum CRP value in cases of severe dengue compared to those cases of dengue with/without warning signs.

DISCUSSION:

Dengue is an acute infection with majority of the cases either asymptomatic or have diverse clinical signs and symptoms.16In our study, majority of the population belongs to age group of 20-50 years with a male preponderance. 7.7% of patients had severe dengue with a mean low platelet count of 0.12lakh/cumm was seen in the same group. Hypoalbuminemia has been described with dengue infections and is an indicator of severity.17In our study, mean serum albumin was significantly lower in severe dengue group compared to those patients having dengue fever with/without warning signs and similarly, a higher CRP value was observed in severe dengue group compared to those patients having dengue fever with/without warning signs which was similar to the study done by Chen et al., where mean CRP level was found to be significantly higher in DSS (median CRP>100 mg/L) and severe dengue compared to non-severe DF (median CRP>30 mg/L).18

CONCLUSION:

The study concludes that serum albumin and C - reactive protein is a useful prognostication factor in assessing severity of dengue infection. An early diagnosis and recognition of severe dengue infection with these parameters helps in preventing future mortality and helps in the proper management of the disease.

REFERENCES:

1. World Health Organization and Tropical Diseases Research. Dengue: Guidelines for diagnosis, treatment, prevention and control. Geneva: World Health Organization; 2009: new edition.
2. Simmons CP, Farrar JJ, Nguyen VV, Wills B. Dengue. N Engl J Med 2012;366:1423.
3. Guzman MG, Harris E. Dengue. Lancet 2015;385:453.
4. Kularatne SA. Dengue fever. BMJ 2015;351:h4661
5. Perez JGR, Clark GG, Gubler DJ, Reiter P, Sanders EJ. Dengue and Dengue hemorrhagic fever. Lancet 1998;352:971-77.
6. Kuhn RJ, Zhang W, Rossmann MG, Pletnev SV, Corver J, Lenches E, et al. Structure of dengue virus: implications for flavivirus organization, maturation, and fusion. Cell. 2002 Mar 8;108(5):717-25.
7. Eppy E, Suhendro S, Nainggolan L, Rumende CM. The differences between interleukin-6 and C-reactive protein levels among adult patients of dengue infection with and without plasma leakage. Acta Med Indones 2016;48:3-9
8. Brenner BM, Hostetter TH, Humes HD. Molecular basis of proteinuria of glomerular origin. New England Journal of Medicine. 1978 Apr 13;298(15):826-33.
9. Guasch A, Deen WM, Myers BD. Charge selectivity of the glomerular filtration barrier in healthy and nephrotic humans. The Journal of clinical investigation. 1993 Nov 1;92(5):2274-82.
10. Lindahl U, Hook M. Glycosaminoglycans and their binding to biological macromolecules. Annual review of biochemistry. 1978 Jul;47(1):385-417.
11. Kjellén L, Lindahl U. Proteoglycans: structures and interactions. Annual review of biochemistry. 1991 Jul;60(1):443-75.
12. Rosenzweig LJ, Kanwar YS. Removal of sulfated (heparan sulfate) or nonsulfated (hyaluronic acid) glycosaminoglycans results in increased permeability of the glomerular basement membrane to 125I-bovine serum albumin. Laboratory investigation. 1982 Jan 1;47(2):177-84.
13. Vehaskari VM, Chang CT, Stevens JK, Robson AM. The effects of polycations on vascular permeability in the rat. A proposed role for charge sites. The Journal of clinical investigation. 1984 Apr 1;73(4):1053-61.
14. Bethell DB, Gamble J, Loc PP, Dung NM, Chau TT, Loan HT, Thuy TT, Tam DT, Gartside IB, White NJ, Day NP. Noninvasive measurement of microvascular leakage in patients with dengue hemorrhagic fever. Clinical infectious diseases. 2001 Jan 15;32(2):243-53.
15. World Health Organization. Dengue. [Online] Available at: www.who.int/tdr/publications/documents/dengue-diagnosis.pdf. [Accessed on 18 September 2018]
16. Atakuri SR, Nayak P. Correlation of C-reactive protein and neutrophil counts as early indicators of severe dengue in children. Int J Contemp Pediatric 2017; 4: 450-454
17. Parkash O, Almas A, Jafri SW, Hamid S, Akhtar J, Alishah H. Severity of acute hepatitis and its outcome in patients with dengue fever in a tertiary care hospital Karachi, Pakistan (South Asia). BMC Gastroenterol 2010;10:43.
18. Chen CC, Lee IK, Liu JW, Huang SY, Wang L. Utility of C-reactive protein levels for early prediction of dengue severity in adults. BioMed Res Int 2015; 2015: 936062