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EVALUATION OF SERIAL ABG AND OTHER BIOCHEMICAL PARAMETER AS AN EARLY PREDICTOR OF MORTALITY IN SEVERELY ILL DENGUE PATIENTS

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ABSTRACT

Background – Dengue have become major public health issue all over the world. Increasing incidence of dengue cases over the last few decades has been lying parallel with increased death. Mortality prediction strategies of dengue in severely ill patients will be useful in the clinical treatment and management. The main aim of the study is to identify the correlation between serial ABG and other biochemical parameters as a predictor of mortality in severely ill patients with dengue.

Methods- The study of confirmed 126 severe dengue patients that were hospitalized in Index Hospital, Indore (M.P). They were classified into two group; survivors and non-survivors. Serial ABG and other parameter were estimated at the time of admission and after 24 hours to MICU. Compared between survivors and non- survivors groups of clinically patients with severe dengue to evaluated the mortality rate. The data analysis is expressed as mean and standard deviation (S.D). Statistical comparisons were performed by student's t-test using the SPSS 20.0 software. The P value <0.05 was considered to be statistically significant.

Results-Compared to survivor, the level of pH (<0.0001), PO_2 (<0.0001) and bicarbonate (<0.0001) were significantly lower in the non survivor group, while PCO_2 (<0.0001) were significantly higher in the non-survivor group after 24 hours observation in MICU. On addition, the level of SGOT (<0.0001), SGPT (<0.0001), ALP (<0.0001) and LDH (<0.0001) were significantly higher among the groups (non-survivor and survivor group), while other hand, the level of urea (<0.0243), creatinine (<0.734), glucose (<0.2254) and serum albumin (<0.718) was observed normal in the both groups.

Conclusion - ABG parameters, SGOT, SGPT, ALP and LDH is associated with severity of dengue. These parameters may used as a prognostic and predictor marker of mortality in severely ill patients with dengue**.** Further studies on it may helpful for treatment and management of dengue.

Keywords- Mortality, biochemical parameters, serial ABG, severe dengue

1. INTRODUCTION

In the most countries dengue virus infection is the serious cause of morbidity and mortality especially, in the tropical and subtropical regions. [1] Dengue virus, a positive-stranded RNA-containing virus, belongs to flavivirus species, genus flavivirus, and family flaviviridae. Clinical presentation of dengue fever may range from mild fever (classical dengue fever) to complicated syndromes (like dengue hemorrhagic fever, and dengue shock syndrome). [2] Dengue Clinical manifestation varies greatly from self limiting febrile illness to fatal outcomes without clear cut hallmarks to assist diagnosis. These life threatening complications

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occur relatively late during the disease course often day 4 of fever onset or around the critical phase [3] [4].

Dengue fever with unpredictable clinical course, which is a most important vector borne disease which leads to a policy of proper referral from peripheral centers to higher centers and it, is very difficult to predict which case will progress to severe dengue with the complications of dengue fever. Dengue fever patients have clinical symptoms such as headache, myalgia arthralgia manifestations and other features such as hepatic dysfunction, an elevation in serum aminotransferase levels, hepatomegaly, leucopenia, ascites and pleural effusion. The acute phase of dengue begins with fever that is in differentiable from the initial phase of other acute febrile infectious diseases. [5] [6] [7].

2. Material and Methods

The observational retrospective study was carried out from patients hospitalized from 11th January 2022 to 22nd June 2023 at Index Medical College, Hospital and Research Center, Indore (M.P). Study was approved by the ethical committee of the institute. Informed consent was obtained according to institutional guidelines. We included 126 patients age of 15 to 60 years, hospitalized with probable DF, DHF/DSS and having positive NSI antigen or dengue serology. Patients taking anti-platelet medications, having platelet disorder, hemolytic anemia or co morbidities (like IHD, hepatitis due to non-dengue cause, pancreatitis, and chronic renal or liver disease) and infections other than dengue were excluded. Informed consent was signed by each patient before enrolment in the study.

2.1 Blood sampling

5ml of blood sample was collected from each participant in SST or EDTA tube under aseptic conditions. The tube was centrifuged at 3000 to 4000 rpm for 15-20 minutes. Serum or plasma collected carefully and stored in sterile aliquots and freeze at -20^{0}C to -80^{0}C until ready for assay.

2.2 Assay Methods

Dengue patients was admitted (either directly from the emergency department or transferred from the other wards) to our medical intensive care unit (MICU) for various critical illnesses (presence of warning signs according to WHO criteria for dengue) were screened for their eligibility as study participant[8]. The analysis of serial ABG parameters (pH, PO2, PCO2 and bicarbonate) and other biochemical parameter (PCO2, SGPT, SGOT, LDH, Urea, Creatinine, RBS, ALP) of all patients included in the study was evaluate by the standard operating procedure on automated analyzer.

3. STATISTICAL ANALYSIS

Result can be expressed as Mean ± SD with 95% confidence interval. Statistical analysis is done by Student's t-test using SPSS 20.0 software. Significant value considered as P value <0.05.

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4. RESULTS

Table No.1: The demographic clinical characteristics of sever dengue in the survivors and non-survivors group:

Clinical characteristics	Total patients (n=126)	Survivors (n=112)	Non-Survivors (n=14)	P Value <0.05
Age (years)	35.6±9.42	28.6±7.16	38.7±11.2	<0.0001
Gender				
Male	85 (67.4%)	74 (66.0%)	11 (78.5%)	
Female	41 (32.5%)	38 (33.9%)	03 (21.4%)	
NS-1	96 (76.1%)	84 (75%)	12 (85.6%)	
IgG	45 (35.7%)	37 (33.8%)	08 (57.2%)	
IgM	84 (66.6%)	74 (66.0 %)	10 (71.4%)	
Type of dengue infection				
Dengue fever (DF)	103 (81.7%)	97 (86.6%)	06 (42.8%)	
Dengue hemorrhagic fever (DHF) / dengue shock syndrome (DSS)	23 (18.2%)	15 (13.3%)	08 (57.1%)	

The demographic representation in table no.1 shows the clinical characteristics of patients with severe dengue in both group (survivors and non-survivors). This results show significant difference of age in survivors group (28.6±7.16) as compare to non-survivors group (38.7±11.2) in severe dengue patients (P <0.0001). We found that males (67.4%) are more likely to develop severe form of disease compare to female (32.5%) in both groups (survivor and non-survivors). Patients with DHF/DSS were relatively affects with high mortality.

Table no.2 Comparison of serial ABG of severe dengue in the survivors and non survivors group

ABG PARAMETERS	SUVIVORS		NON-SURVIVORS		P Value (P <0.05)
	On Admission (0-hours)	After 24-hours	On Admission (0-hours)	After 24-hours	
PH (7.35 – 7.45)	7.35±0.19	7.36±0.10	7.32±0.21	7.28±0.16	**<0.0001**
PCO_2 (35-45 mmHg)	36.8±6.7	38.7±9.4	44.6±5.8	48.6±12.2	**<0.0001**
PO_2 (80-100 mmHg)	95.4±22.4	97.8±19.6	86.5±28.2	84.6±32.4	**<0.0001**
HCO_3^-(22-26 mEq/L)	24.5±4.42	23.4±5.52	20.1±7.64	17.2±6.33	**<0.0001**

The demographic data in table no.2 shows the comparison of serial ABG of dengue patients in the survivors and non survivors group on the basis of two (0 hours and 24 hours) intervals after admitted to the MICU wards. Comparison between survivor and non- survivor groups, pH (<0.0001), PO_2 (<0.0001) and bicarbonate (<0.0001) were significantly lower in the non survivor group, while PCO_2 (<0.0001) were significantly higher in the non-survivor group after 24 hours of admission in MICU.

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Table no.3 Biochemical Parameter of severe dengue in the survivors & non- survivors:

Biochemical Parameters	Survivors (n=112)	Non-survivors (n=14)	P value (<0.05)
SGOT (5-45 U/L)	136.7 ± 42.8	252.8 ± 84.6	**<0.0001**
SGPT (5-40 U/L)	95.4 ± 34.6	236.5 ± 96.4	**<0.0001**
ALP (29-135 IU/L)	126.2 ± 25.8	181.4 ± 38.2	**<0.0001**
Urea (15 - 40 mg/dl)	25.9 ± 8.6	28.4 ± 7.7	0.3021
Creatinine (0.6 -1.4 mg/dl)	1.2 ± 0.4	1.0 ± 0.3	0.734
Glucose(RBS 90 - 140mg/dl)	108.6 ± 22.4	116.4 ± 24.1	0.2254
Albumin (3.5 - 5.0g/dl)	4.4 ± 2.8	3.5 ± 1.9	0.718
LDH (160 - 450U/L)	230.6 ± 112.8	682.4 ± 225.7	**<0.0001**

In the above, the analysis shows that the level of SGOT (<0.0001), SGPT (<0.0001), ALP (<0.0001) and LDH (<0.0001) were significantly higher among the groups (non-survivor and survivor group), while other hand, the level of urea (<0.0243), creatinine (<0.734), glucose (<0.2254) and serum albumin (<0.718) was observed normal in the both groups.

5. DISCUSSION

We observed statistically significant differences in pH, PO_2, PCO_2 and bicarbonate levels between the survivor and non-survivor groups. Lower pH, PO_2 and bicarbonate, with high PCO_2 were found to be associated with mortality in severe dengue. Some few studies shown the similar results associated with basic ABG in patients with severe dengue. [9][10][11]

According to **Uddin KN et al (2008)** the liver enzyme are correlated with grading of dengue but higher value of these enzyme to be associated with a higher morbidity. The study focused on the biochemical indices of severity. Serum transaminase (SGOT and SGPT) was found significantly high in the survivors group as compare to non-survivors group. Alkaline phosphatase was also significantly increased in the survivors group as compare to non-survivors group. [12] In our study we found that the level of serum LDH were significantly higher in the survivors group as compare to non-survivors group. Similar results are reported in previous by **Sirikut P et al (2014)** and **Hagadorn JE et al (1971).** [13][14]

6. CONCLUSION

We concluded that the biochemical parameters such as SGOT, SGPT and ALP associated with severity of dengue and correlate with mortality. ABG parameters and LDH is important predictor of mortality in severely ill dengue patients. These parameters may be used as prognostic and predictor marker in severely ill dengue patients.

7. CONFLICTS OF INTEREST

The authors have no conflict of interest.

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