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Serum SGPT in Early Dengue: A Predictive Marker for Severe Disease Progression in a Tertiary Hospital of Bangladesh

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Abstract

Background: Elevated serum SGPT (ALT) in early dengue fever may be a strong indicator of liver damage. Elevation of SGPT, in conjunction with other liver function tests, can be used to monitor for possible complications and gauge the severity of the disease, even though it is not a diagnostic marker for dengue.

Objective: The objective of our study was to determine the level of SGPT elevation in dengue patients in febrile phase (day 1-4) and to explore the relationship between the degree of SGPT elevation with the severity of dengue infection.

Methods: This prospective observational study was conducted at Dinajpur City's Dinjpur Medical College Hospital during the period of June 2023 to July2024.430 diagnosed cases of dengue fever, however, 210 patients with available clinical and lab records willing to participate in the study was included in the study.

Result: There was no statistically significant association between SGPT category and sex (Pearson Chi-square, p = 0.119). Most of our patients were male 78.57%. One-way ANOVA showed a significant difference in mean SGPT between groups (p < 0.01). Shock was significantly more frequent in patients with SGPT >135 U/L (p = 0.022). Majority (≈75–80 patients) are in the non-shock group in <45 SGPT Class.

Conclusion: To confirm these correlations and ascertain whether SGPT trends could function as an early predictor of development to shock, further extensive, multi-center research is necessary.

Keywords: Early, Dengue, Progression, Severe, SGPT

Introduction

Dengue is a mosquito-borne viral disease caused by the dengue virus (DENV), an arbovirus. The virus transmitted primarily by the Aedes aegypti mosquito [1]. Dengue is now considered the most significant arthropod-borne viral infection affecting humans globally [2]. It is endemic across tropical and subtropical regions of all continents and has emerged rapidly over the last few decades as a major public health concern. Contributing factors to the surge in dengue cases include rapid urbanization, changes in human behavior and lifestyle, poor water management, which provide breeding grounds for mosquito vectors [3]. In Bangladesh, dengue was first recognized as a serious health issue during the large-scale outbreak in 2019-2000 [4]. Since then, the disease has shown a recurrent seasonal pattern.

Dengue presents with a wide clinical spectrum, ranging from asymptomatic infection or mild febrile illness (classical dengue fever) to severe disease forms, including dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) [5]. The 2009 World Health Organization (WHO) classification stratifies dengue into three categories: dengue without warning signs, dengue with warning signs, and severe dengue [6]. Early recognition and management of severe dengue is curtail for reducing mortality and morbidity of patient. Early recognition improves patient follow up and management and thus reduces need for intensive care unit [7].

Disease symptoms caused by the dengue virus are generally difficult to diagnose, especially in the early stages of infection [8]. DHF patients may not experience shock symptoms and may not be diagnosed as patients with DSS. So there needs to be early markers in febrile phase to predict the dengue severity as haematological and clinical manifestations becomes evident in afebrile phase [9]. In low-resource settings, early identification of patients at risk for severe dengue is critical to optimize care and reduce mortality. Hepatic involvement is a well-documented in dengue [10]. Liver injury in dengue may result from direct viral cytopathic effects or immune-mediated mechanisms and it can range from mild to severe hepatic dysfunction [11]. Elevation of liver enzymes, particularly serum glutamic pyruvic transaminase (SGPT or ALT), is frequently observed and may correlate with disease severity. Biochemical markers such as SGPT could potentially serve as accessible and cost-effective indicators to predict disease progression [12]. However, there is a paucity of local data correlating liver enzyme levels with clinical severity based on the WHO 2009 classification, particularly in northern Bangladesh [13]. To address this gap, we conducted a study at Dinajpur Medical College Hospital, a tertiary care facility in northern Bangladesh equipped with a dedicated 30-beded dengue isolation ward. The objective of our study was to determine the level of SGPT elevation in dengue patients in febrile phase(day 1-4) and to explore the relationship between the degree of SGPT elevation with the severity of dengue infection.

Materials and Methods

Study Design

This prospective observational study was conducted at Dinajpur City's Dinjpur Medical College Hospital during the period of June 2023 to July2024.

Study Site

The inpatient departments of Dinajpur and 30 bedded dedicated dengue ward of Medical College hospital in Dinajpur City was used for this study.

Study Population

Within Dinajpur Medical College Hospital between June 2023 to July 2024 there was 430 diagnosed cases of dengue fever. 210 patients with available clinical and lab records willing to participate in the study was included in the study.

Inclusion and Exclusion Criteria

Fever with history of travel from dengue endemic area was initially recruited in the study. After recruitment, dengue infection was confirmed by a positive result for either NS1 dengue antigen or IgM antibody or both. Presumptive patients with dengue who were negative for both NS1 antigen or IgM antibody or developed another secondary infection were excluded from the study. aged 18 years and above as well as willing to give written informed consent for participation were included in the study whereas those with chronic liver disease, viral hepatitis (Hepatitis A, B and C), history of alcohol abuse and use of acute or chronic hepatotoxic drugs were excluded.

Laboratory test for Dengue Infection

All patients included in the study underwent serological testing for dengue using the enzyme-linked immunosorbent assay (ELISA) technique. Diagnosis was confirmed by detection of the NS1 antigen, and/or anti-dengue IgM and IgG antibodies. The DENV Detect™ NS1 ELISA and IgM/IgG ELISA kits (InBios International, USA) were used for antigen and antibody detection. The presence of NS1 antigen and anti-dengue IgM/IgG was reported as either positive or negative. An anti-dengue IgG antibody test was performed to identify evidence of previous infection.

A complete blood count (CBC) was done during the febrile phase (up to day 4) to establish a baseline hematological profile and identify early changes. CBC was repeated daily to monitor hematocrit and platelet counts until discharge or death. Serum alanine transaminase (ALT/SGPT) and aspartate aminotransferase (AST) levels were measured on day 3 and day 4 of the febrile phase, and repeated later as required to evaluate hepatic involvement. Additional investigations included serum creatinine, urine routine and microscopy, chest x-ray and abdominal ultrasonography to assess renal and systemic involvement. SGPT <45 was counted as normal, SGPT 45-135 was counted as mildly elevated and SGPT >135 was counts as high.

Dengue Severity

Disease severity was categorized at discharge or death in accordance with the 2009 WHO dengue classification criteria. The World Health Organization's 2009 classification as Group A, Group B, and Group C. Group A includes patients having dengue fever without warning signs, Group B includes dengue fever with warning signs, and Group C includes severe dengue fever (severe plasma leakage, severe bleeding, severe organ involvements). Groups A and B are combined into the non-severe (non-shock group), and Group C is labeled as (Shock group).

Data Collection

On a uniform case report form, vital clinical and laboratory information was meticulously documented consistently for every included patient.

Statistical Analyses

SPSS (SPS IBM Statistics 22.0) was used to do statistical analysis. Clinical and laboratory parameters among different groups were compared withthe chi-square or Fisher's exact tests, for numerical variables, and independent t test, as applicable for continuous variables. Multivariable logistic regression was done to detect the risk factors and early clinical and hematologic parameter change for developing severe dengue. All tests were interpreted as statistical significance with p <0.05.

Result

Table 1: Association between SGPT levels with gender of patients (n = 210)

SGPT	Male	Female	Total	
<45	34.5%9(57)	48.9%(22)	37.6%(79)	P=0.119
45-135	37.0% (61)	35.6%(16)	36.7%(77)	
>135	28.5%(47)	15.6%(7)	25.7%(54)	
Total	78.57%(165)	21.43%(45)	100%(210)	

Table 1 indicated association between SGPT levels and gender of the patients. Pearson Chi-Square was done. There was no statistically significant association between SGPT category and sex (Pearson Chi-square, p = 0.119). Most of our patients were male 78.57%.

Table 2: Association between SGPT levels and dengue severity groups (n = 210)

SGPT	Group-A	Group-B	Group-C	Total	
<45	42.5% (65)	26.3% (10)	21.1% (4)	37.6% (79)	P=0.022*
45-135	35.9% (55)	44.7% (17)	26.3% (5)	36.7% (77)	
>135	21.6% (33)	28.9% (11)	52.6% (10)	25.7% (54)	

Table 2 showed association between SGPT levels and dengue severity groups. Pearson Chi-square was done. SGPT levels were significantly associated with disease severity, with higher proportions of very high SGPT (>135 U/L) in Group-C patients (p = 0.022).

Table 3: Mean SGPT levels by dengue severity group (ANOVA)(n=210)

SGPT	Mean	Std. Deviation	
Group-A	104.21	98.55286	(ANOVA) P = **<0.01***
Group-B	250.53	147.57752	
Group-C	123.22	229.24886	

Table 3 illustrated mean SGPT levels by dengue severity group. One-way ANOVA showed a significant difference in mean SGPT between groups (p < 0.01), with Group-B having the highest average SGPT.

Table 4: Association between SGPT levels and presence of shock (n = 210)

SGPT	Non-hock	Shock	Total	
<45	38.9%(74)	25.0%(5)	37.6%(79)	P= **0.033***
45-135	37.9%(72)	25.0%(5)	36.7%(77)	
>135	23.2%(44)	50.0%(10)	25.7%(54)	

Table 4 showed association between SGPT levels and presence of shock. Pearson Chi-Square was done. Shock was significantly more frequent in patients with SGPT >135 U/L (p = 0.033).

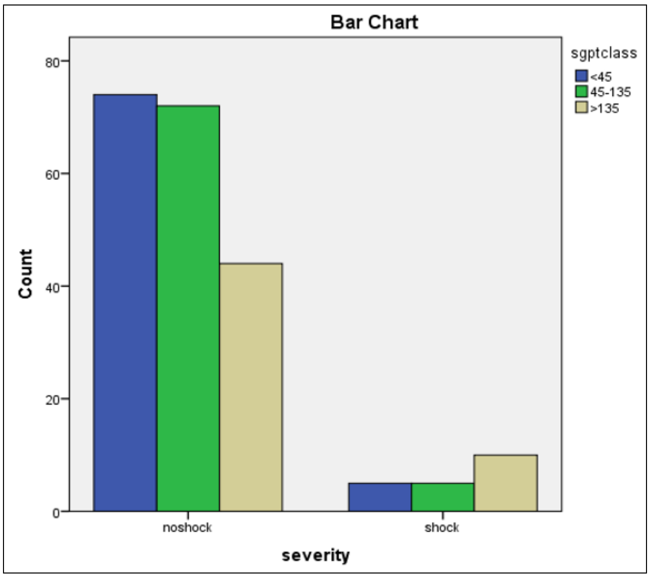

Fig 1: SGPT levels in Shock and non-shock group

Fig 1 The bar chart shows the frequency of patients in each SGPT class (<45 IU/L, 45–135 IU/L, and >135 IU/L). Most of the patients are in non-shock group. A higher proportion of patients in the shock group had markedly elevated SGPT levels (>135 IU/L) compared to the non-shock group.

Discussion

In our study, SGPT levels showed notable variations across demographic and clinical categories of dengue patients. Although males comprised the majority of participants, there was no statistically significant association between SGPT levels and sex (p = 0.119). This is consistent with some prior observations where liver enzyme elevation did not show a strong sex-based difference in dengue infection [13]. However, other studies have reported differing trends, suggesting possible variations due to sample size, study setting, or population-specific factors [14, 15].

When analyzed by disease severity, SGPT levels demonstrated a significant association (p = 0.022), with the highest proportion of markedly elevated SGPT (>135 U/L) seen in Group-C (severe dengue) patients. This supports previous evidence that hepatic involvement intensifies with disease severity and is more pronounced in severe dengue [13, 15]. Notably, our mean SGPT values were significantly higher in Group-B patients compared to both Group-A and Group-C (p < 0.01). This pattern might indicate a distinct biochemical profile in patients with warning signs, possibly due to acute hepatocellular injury before progression to shock or organ failure.

We also found that patients with shock had significantly higher proportions of SGPT >135 U/L (p = 0.033), suggesting a potential link between severe hepatic injury and hemodynamic compromise. Elevated liver enzymes, particularly transaminases, have been documented as markers of disease severity in dengue, possibly reflecting direct viral hepatocyte injury, immune-mediated damage, or hypoxic hepatitis due to shock [16, 17].

Conclusion

Overall, our findings align with existing literature indicating that SGPT elevation is a relevant biochemical marker for identifying patients at risk of severe dengue. Further large-scale, multi-center studies are warranted to validate these associations and to determine whether SGPT trends could serve as an early predictor for progression to shock.

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