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Original Research Article

Role of APRI Score in Determining Severity of Disease in Patients with Different Serotypes of Dengue: A Hospital Record-Based Study in Tertiary Care Hospital in Western India

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Abstract:

Introduction: Dengue is the most prevalent and rapidly spreading arbovirus causing risk for 4 billion people in the world. The number of cases reported worldwide increased from 2.4 million in 2010 to 5.2 million in 2019.

Objective Utilizing APRI score or Aspartate Aminotransferase to Platelet Ratio Index, a non-invasive tool used to assess the likelihood of liver fibrosis or cirrhosis.

Methods: A hospital based cross sectional study was conducted in a tertiary care hospital at western part of India during September 29, 2023 and December 29, 2023. Classification of patients into dengue fever, dengue fever with warning signs and severe dengue was done as per latest WHO recommendation. APRI score was calculated and statistical analysis correlating APRI score with dengue severity was done using AI.

Results: A total of 334 participants were included; out of (62.5%) males and (37.5%) females. The peak admission rate was seen in October 2023 (59%), followed by November 2023 (33%). When stratified by severity, mean APRI rises from 7.93 in DF to 9.29 in DWS and peaks at 13.67 in SDC, with corresponding medians of 6.13, 6.91, and 9.39, respectively. This graded increase suggests that higher APRI values—which reflect both hepatocellular injury (elevated AST) and thrombocytopenia—are associated with more severe clinical phenotypes.

Conclusion: APRI should be integrated with other warning signs, laboratory markers, and patient factors to improve prognostic accuracy. In practice, APRI could serve as one component of a multiparametric risk score, rather than a sole predictor, to guide triage and monitoring intensity.

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Introduction

Dengue is the most prevalent and rapidly spreading arbovirus causing risk for 4 billion people in the world. The number of cases reported worldwide increased from 2.4 million in 2010 to 5.2 million in 2019[1]. India is among the 30 most highly endemic countries in the world. India recorded about 94198 cases of dengue till Sept 2023 [2]. Being a tropical region, a similar trend is observed in the Union territory of Western India reporting 478 cases in 2023 among the resident of the study district [3]. The number of cases show a rise around the monsoon and the post monsoon season [4]. Dengue in India is mainly transmitted by the Aedes aegypti and Ae. albopictus mosquito. [5]

Dengue is caused by any of the 4 serotypes of dengue virus (DEN-1 to DEN- 4). Recently, a fifth serotype (DEN-5) was discovered in 2013 from Bangkok [6]. All 4 serotypes have been recorded in western India. Each of the four serotypes is likely to produce an infection that can present with different clinical signs and symptoms, but neither can induce cross-protection against the other serotypes in infected individuals [7].

Dengue fever (DF) occurs abruptly after approximately 3 to 10 days of incubation with the onset of a high fever [8], often accompanied by headache, nausea, vomiting, joint and muscle pain, and a rash resembling measles [9].[10].

Platelet count is used to monitor the prognosis of the disease and predict the severity of the disease. Some studies have found correlation between APRI scores and prediction of severity of dengue illness. AST to platelet ratio index (APRI) includes AST and platelet count as variables. APRI score could serve as a parameter for determining the severity of the infection.

Operational Definitions:

Dengue is defined by a combination of ≥2 clinical findings in a febrile person who lives in or travelled to (in the last 14 days) a dengue-endemic area. Clinical findings include nausea, vomiting, rash, aches and pains, a positive tourniquet test, leukopenia, or any warning sign.

Dengue warning signs include abdominal pain or tenderness, persistent vomiting, clinical fluid accumulation, mucosal bleeding, lethargy, restlessness, and liver enlargement. Patients with warning signs should be monitored closely as they can be more likely to progress to severe disease.

Severe dengue is defined by dengue with any of the following clinical manifestations: severe plasma leakage leading to shock or fluid accumulation with respiratory distress; severe bleeding; or severe organ impairment such as hepatitis (elevated transaminases ≥ 1,000 IU/L), impaired consciousness, or heart impairment.

APRI score or Aspartate Aminotransferase to Platelet Ratio Index, is a non-invasive tool used to assess the likelihood of liver fibrosis or cirrhosis. It is calculated using a formula based on the levels of aspartate aminotransferase (AST) and platelets in the blood.

[(AST level ÷ AST-ULN) ÷ platelet count (10^9/L) × 100]

Methodology: This is a retrospective cross-sectional study done in medicine inpatient department at NAMO medical hospital. Ethical certificate was issued by the NAMO research committee. The study was done on patients admitted during the time period September 29, 2023 and December 29, 2023. Basic demographic details, clinical findings, and investigation reports at the time of presentation were collected from the medical records. Classification of patients into dengue fever, dengue fever with warning signs and severe dengue was done as per latest WHO recommendation. APRI score was calculated and statistical analysis correlating APRI score with dengue severity was done using AI (chatgpt4.o).

Patient Characteristics

- **Criteria:** All patients that presented to emergency ward with chief complaint of fever and NS1 dengue test report positive were included in this study. However, Patients with concomitant infections such as hepatitis B, hepatitis C, HIV, or active tuberculosis were excluded from the study. History of malignant disease and patients on immunosuppression therapy were also treated as exclusion criteria.
- A total of 334 participants were included: out of (62.5%) males and (37.5%) females. The peak admission rate was seen in October 2023 (59%), followed by November 2023 (33%). The age of population lies 7.7% (<15 years), 91.4% (16-45 years) and 0.89% (>46 years).
- The mean day of illness at the time of admission was 4.18 ± 1.95(2– 10) days. The most common presenting symptom was fever that was present in 97.9% (n =327) patients. The second common symptom was chills 63.7% (n = 213), followed by generalisedweakness 58% (n = 194), nausea and vomiting 46.1% (n = 154), body ache 45.8% (n = 153) and abdominal pain 36.8% (n = 123). Severe headache was seen in 20.3% (n = 68) of patients. About 9.8% (n = 33) patients presented with cough. Around 8.3% (n = 28) patients presented with giddiness.
- At the time of admission Mean pulse was 84.6 ±9.76 beats per minute and mean temperature was 98.37 ± 0.97° F.
- DF (dengue fever without warning signs), DWS (dengue with warning signs), and SDC (severe dengue with complications), DF accounts for 152 episodes (≈45 %), DWS for 120 (≈36 %), and SDC for 62(≈18 %).
- Table showing comparison of laboratory parameters between DF (dengue fever), DWS (dengue fever with warning signs) and SDC (severe dengue with complications).

Table 1:

Variables	DF	DWS	SDC
Hb (g/dl)	12.9 ± 2.1	13.0 ± 2.0	12.6 ± 2.9
PCV	36.5 ± 6.5	37.0 ± 6.6	36.6 ± 8.6
Platelet count	0.82 ± 0.7	0.88 ± 0.7	0.76 ± 0.7
TLC	4.54 ± 2.3	4.71 ± 2.75	5.96 ± 3.7
SGOT	109 ± 90	139.1± 105.2	169.1 ± 116.8
SGPT	88.9 ± 85.9	73.2 ± 47.8	76.1 ± 46.9
Albumin	3.4 ± 0.4	3.2 ± 0.2	3.02 ± 0.6
Creatinine	0.92± 0.23	0.93± 0.31	0.92± 0.3

APRI Score: The main aim of this study was to observe the role of calculated APRI at time of admission on the outcome (disease complication). The "APRI" index—a continuous metric calculated as

[(AST level ÷ AST-ULN) ÷ platelet count (10^9/L) × 100]

APRI score ranges from 0.02 to 103.5 in the dataset (n=334), with a right- skewed distribution (median = 6.55; IQR = 2.95–13.18) and a mean of 9.90 (SD = 11.24). The APRI score calculated at the time of admission was statistically significant among the three stages of dengue infection: Dengue fever 7.97 ± 7.70 vs Dengue with warning sign 9.29 ± 8.28 vs Severe Dengue with complications 13.66 ± 15.74. When stratified by severity, mean APRI rises from 7.93 in DF to 9.29 in DWS and peaks at 13.67 in SDC, with corresponding medians of 6.13, 6.91, and 9.39, respectively. This graded increase suggests that higher APRI values—which reflect both hepatocellular injury (elevated AST) and thrombocytopenia—are associated with more severe clinical phenotypes.

To quantify the association between APRI and clinical severity, data was encoded into three severity strata (DF=1, DWS=2, SDC=3) and calculated Spearman's rank correlation with each patient's APRI score. The resulting coefficient (ρ = 0.143, p = 0.0086) indicates a weak but statistically significant positive correlation: as the APRI index rises, there is a modest tendency for cases to fall into higher-severity categories. A parallel Pearson correlation ($r \approx 0.144$) yields essentially the same conclusion, underscoring that the relationship is roughly linear on the ordinal scale.

ROC Curve for APRI Score in Disease Complication: To assess the discriminatory power of the APRI as a readout for groups with and without signs of severe dengue a ROC (receiver operating characteristic) curve was graphed. The area under the ROC curve was analysed and its respective 95% confidence interval was calculated assuming a non-parametric distribution. For predicting severe dengue(SDC) versus non-severe, the maximum Youden index occurs at APRI ≥ 8.50(AUC=0.601), yielding 55.7 % sensitivity and 63.4 % specificity.

Table 2:

APRI score	AUC	Cut-off value	Sensitivity (95% CI)	Specificity (95% CI)	+LR	–LR	P value
APRI	0.601	≥ 8.50	54.1 % (41.7–66.0 %)	63.4 % (57.5–68.9 %)	1.48	0.72	0.038

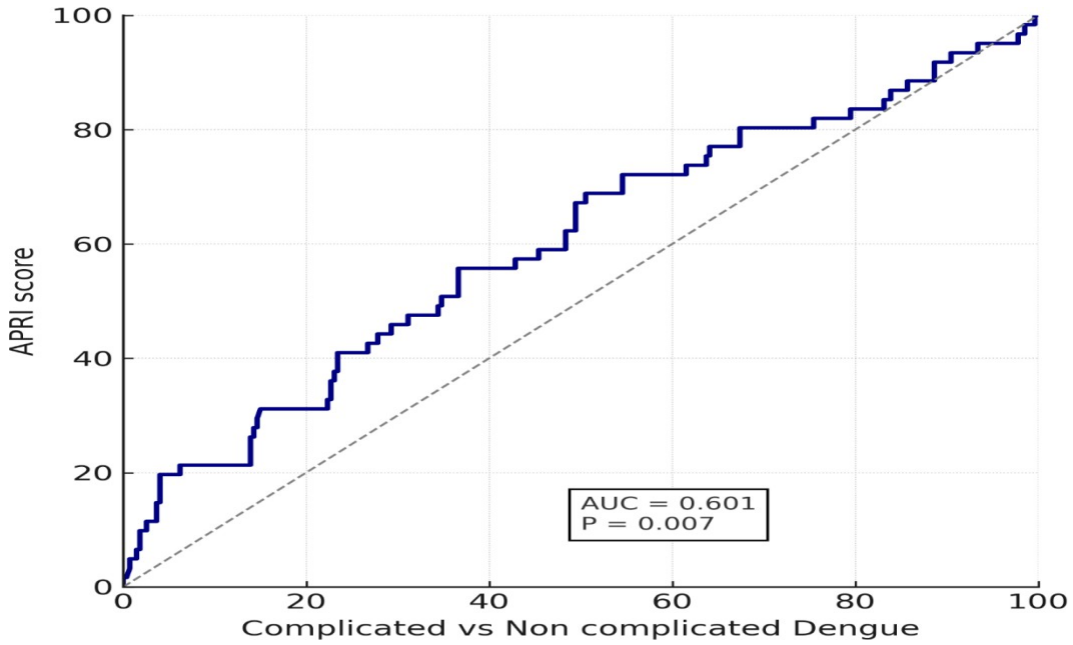

Figure 1:

Chi-Square Test: Contingency table of APRI group (High/Low) by complicated dengue (SDC=1 vs non-SDC=0):

Table 3:

APRI Group	Non- SDC	SDC	Total
Low (<8.5)	190	30	220
High (≥8.5)	117	41	158

Chi-square statistic: $\chi^2 = 4.32$, df = 1, p = 0.038

(indicating a statistically significant association between higher APRI and severe dengue at the 5% level). In univariate regression, APRI alone did not reach significance, likely due to limited sample size in the high-APRI/SDC cell.

Discussion

Comparison of disease stages and in-hospital survival by APRI group.

Table 4:

Variables	APRI < 8.50(n = 201)	APRI ≥ 8.50(n = 133)	P value
DF	49.3 % (99/201)	39.8 % (53/133)	0.115
DWS	36.8 % (74/201)	35.3 % (47/133)	0.874
SDC	13.9 % (28/201)	24.8 % (33/133)	0.018
Survived	100.0 % (201/201)	99.2 % (132/133)	0.398
Non-survived	0.0 % (0/201)	0.8 % (1/133)	0.398

[DF = dengue fever; DWS = dengue with warning signs; SDC = severe dengue with complications. Survived includes all discharges; non-survived = in-hospital death values by chi-square test (Fisher's exact for survival).]

Predictors of Severe Dengue (SDC vs DF + DWS):

Table 5:

Variable	OR (95 % CI)	P value
Age (per year)	0.95 (0.91–0.98)	0.004
Platelet count (×10³ cells/L)	0.95 (0.77–1.16)	0.594
SGOT (IU/L)	1.00 (1.00–1.01)	0.004
SGPT (IU/L)	1.00 (1.00–1.01)	0.108
APRI ≥ 8.5	2.04 (1.16–3.57)	0.013

Conclusion

APRI should be integrated with other warning signs, laboratory markers, and patient factors to improve prognostic accuracy. In practice, APRI could serve as one component of a multiparametric risk score, rather than a sole predictor, to guide triage and monitoring intensity.

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