EFFICACY OF TOURNIQUET TEST IN DIAGNOSIS OF DENGUE FEVER

Shahzad Ahmad[1], Muhammad Sajjad Ali Khan[1], Muhammad Zaheer Ullah Babar[1], Muhammad Arif[3], Waheed Iqbal[2]

ABSTRACT

Objective: This study was conducted to measure the diagnostic accuracy of Tourniquet test by comparison with dengue IgG/IgM in patients suffering from undifferentiated fever.

Study Design: Cross sectional validation study.

Place and Duration of Study: The study was conductedin Northwest General Hospital and Research center from Jan, 2017 to December, 2018.

Material and Methods: 150 confirmed cases of undifferentiated fever were enrolled in this study by non-probability convenience sampling.The diagnostic accuracy of tourniquet test was determined. Patients who were known cases of chronic liver disease, chronic renal failure and those on anticoagulant /anti-platelet therapy were excluded. The tourniquet test was performed by a standardized procedure in the first 24 hours upon admission. A comparison was formed between the dengue antibodies (IgG/IgM) and tourniquet test.

Results: A comparison of the diagnostic accuracy between tourniquet test while keeping the dengue IgM/IgG as the gold standard showed 16%were true positive, 8.6% were false positive, 38% were true negative and 37.3% were false negative, whereas sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy was calculated as 30%, 81.42%, 64.86%, 50.44%, and 59.6% respectively. There is no statistically significant difference between dengue IgM/IgG gold standard and tourniquet test for the diagnosis of Dengue fever with p-value = 0.1, 95% CI 0.9682-1.769.

Conclusion: This study reveals that tourniquet test has lower sensitivity but higher specificity and an average diagnostic accuracy which indicates that it can used in clinical practice to diagnose acute dengue fever in poor resource endemic areas.

Keywords: Dengue fever, Diagnosis, Tourniquet test.

INTRODUCTION

Acute dengue fever (ADF) is a viral infection which is prevalent globally and significantly emerging in the tropical and subtropical countries, considered endemic by the WHO[1]. A total 36,173 cases were reported in Pakistan from 2012-2016 [2]. Almost 390 million people suffer from dengue fever every year, a quarter of which are symptomatic[1]. DF has become a public health concern in the last five decades due to its widespread expansion amounting to 30 fold rise in incidence[3]. The dengue virus is included in the genus flavivirus in the Flaviviridae family. The mosquito 'Aedesaegypti' is most often the vector for spread of the disease[1]. The virus has an incubation period of 3-7 days. This disease has 3 stages, 2-7 days of febrile phase, 1-3 days of critical phase and 3-5 days of recovery phase[4]. Myalgia, arthralgia, orbital pain, anorexia, nausea, vomiting, diarrhea and development of rash are the most common clinical features of the disease[5]. Mild hemorrhagic manifestations, fever, thrombocytopenia and leucopenia have been reported in the febrile phase of the illness[5]. Severe dengue infection has the features of hemorrhagic events called Dengue Hemorrhagic Fever(DHF) and hypovolemic shock (dengue shock syndrome)[4]. The common modalities for diagnosis of dengue is performed through the detection of specific IGM and IgG in serological ELISA tests. These diagnostic tests are quite expensive and cannot afforded by the lower socioeconomic class of the rural areas of our county. According to the WHO (1997) recommendations for dengue, Tourniquettest may be utilized to diagnose DHF and DSS but, not DF[1]. According to the 2001 WHO guidelines the TT can be to help in diagnosis of DF[6]. The objective of this study is to accurately measure the specificity and sensitivity of tourniquet test in patients of dengue fever.

[1] Department of Medicine, Northwest general hospital and Research Center Peshawar
[2] Department of Pharmacology, Khyber Medical College Peshawar
[3] Department of Peads Northwest General Hosptial Peshawar

Address for correspondence:
Dr Zaheer Ullah Baber
Department of Medicine, Northwest general hospital and Research Center Peshawar Pakistan
Email: drzaheerbabar123@gmail.com
Cell No:03339466525

MATERIALS AND METHODS

A study was conducted at Northwest General Hospital and Research Center, Hayatabad, Peshawar to validate the utility of tourniquet test in 150 patients (age > 14 years)suffering from undifferentiated fever for 2-7 days in 2017. Patients fulfilling the WHO criterion for dengue fever (DF) were diagnosed as dengue patients, which is fever and two or more of the following: myalgia, headache, orbital pain, arthralgia, leukopenia, rash and bleeding and who had a confirmed infection on laboratory test. DF patients were distinguished from DHF by the WHO criterion which is 1) fever for more than 2 days, (2) Hemorrhagic manifestation, (3) Platelet Count < 100,000 platelets/μL, (4) Plasma Leakage (5). Patientswere enrolled in the study through non probability convenience sampling. We did not witness any patients of dengue shock syndrome. Patients with other infections which overlap dengue symptoms, diagnosed patients of chronic liver disease, chronic renal failure and those on anticoagulant/antiplatelet therapy were excluded from the study.Tourniquet test was performed through a standardized method by inflating a blood pressure cuff mid-way in between the systolic and diastolic pressures for five minutes. The observation of 10 or more Petechiae per 2.5 cm2 was considered positive. The data were analyzed through SPSS 20. A comparison was carried out between dengue IgM/IgG and TT through a 2x2 table to calculate the diagnostic measures.

RESULTS

In 2017, 150 patients presented to our OPD with an undifferentiated fever history for 2-7 days. The median age was 31, lowest age of presentation is 14 and highest age is 70. Gender analysis showed 81 patients (54%) were male and 69 patients (46%) were female. Table 1 summarizes the demographics and the presentation of patients who were enrolled in the study.

Dengue antibodies testing showed that 7 patients (4.7%), 53 patients (35.3%), 20 patients (13.3%) patients werereactive for IgG, IgM and both respectively, while 70(46.7%) patients were found to be non-reactive and were not diagnosed as dengue patients.

The gold standard IgG/IgM upon comparison with TT shows that 16% were true positive, 38% were true negative, 8.6% were false positive while 37.3% were false negative. Similarly, specificity, positive predictive value, negative predictive value and diagnostic accuracy was calculated as 30%, 81.42%, 64.86%, 50.44%, and 59.6% respectively (table 2).

Figure 1 shows the Receiver operating characteristics (ROC) curve was constructed which highlighted that Area under curve is 0.485 (95% CI = 0.37-0.59).The chi-square test was determined to find any difference between the gold standardIgG/IgM vs. Tourniquet test.

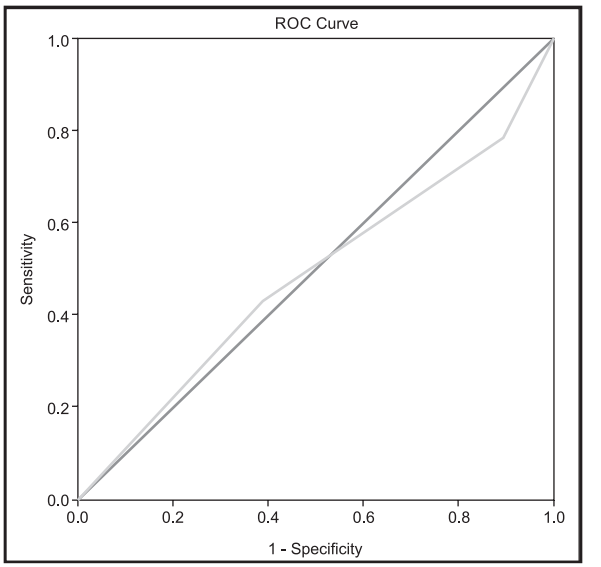

Fig 1: ROC Curve; Area under curve is 0.485 (95% CI = 0.37-0.59)

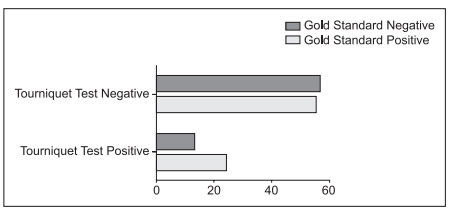

Fig 2: Difference between Gold standard Dengue Serology vs Tourniquet test

Table 1: Demographics and presentation of patients.

Variable	Frequency	Percent (%)
Gender (M/F)	81/69	54/46
Myalgia (Yes/No)	136/14	90.7/9.3
Anorexia (Yes/No)	69/81	46/54
Vomiting (Yes/No)	59/91	39.3/60.7
Diarrhea (Yes/No)	30/120	20/80
Rash (Yes/No)	14/136	9.3/90.7
Bleed (Yes/No)	34/116	22.7/77.3
HCT (High/Normal)	13/137	8.7/91.3

Table 3 reveals that there is no statistically significant difference between Gold standard Dengue serology and Tourniquet test with p-value 0.1 (95% CI: 0.9682 - 1.769). The results are graphically shown in figure 2.

DISCUSSION

Multiple studies have been conducted so far in this aspect indicating variability in results, but due the massive increase in the incidence of dengue fever around the globe signifies the fact that many areas which has suffered from dengue epidemics comprises

Table 2: Tourniquet Test results vs dengue antibodies IgG/IgM.

Tourniquet Test	Dengue serology IgG/IgM		Total
	Positive	Negative	
Positive	True Positive (a) 24 (16%)	False Positive (b) 13 (8.6%)	a + b 37 (24.6%)
Negative	False Negative (c) 56 (37.3%)	True Negative (d) 57 (38%)	c + d 113 (75.3%)
Total	a + c 80 (53.3%)	b+ d 70 (46.6%)	150 (100%)
Sensitivity	30%		
Specificity	81.42%		
Positive Predictive value	64.86%		
Negative Predictive value	50.44%		
Accuracy rate	59.6%		

Table 3: Test for association.

	Dengue serology IgG/IgM			x2 Value	P-value	95% CI
Data analyzed	Positive	Negative	**Total**			
Tourniquet Test Positive	24	13	37	**2.62**	**0.1**	**0.9682-1.769**
Tourniquet Test Negative	56	57	113			
Total	80	70	150			

of people belonging to lower socioeconomic class and are unable the bear the burden of the diagnostic modalities. As indicated by the WHO recommendation 2011 for diagnosis of Dengue fever, tournequet's test is the most affordable modality for diagnosis of dengue fever. A meta analysis which comprised of 28,739 showing pooled sensitivity for dengue diagnosis by TT was 58% (95% Confidence Interval (CI), 43%-71%) and the specificity was 71% (95% CI, 60%-80%). This study concluded that in in poor resource setting area, TT demonstrates a marginal benefit in the diagnosis of dengue fever. Comparable to our results which shows a lesser sensitivity can be contributed to a lower number of cases being compiled. However the meta analysis concludes that TT is still of greater clinical importance in endemic areas[7].

A study conducted in Brazilian city which analyzed 28,000 trails with 119,589 suspected dengue cases showed 30,670 positive for dengue fever with a low sensitivity, low positive predictive value, high specificity and a high negative predictive value for diagnosis of dengue fever via TT. This shows that it has been agreed upon that the negative predictive and specificity as found by our study is higher for TT in diagnosing dengue fever. TT is mor effective in detecting cases which are true negative than are true positive. TT should not be used as the only modality for confirmation of dengue fever, however if necessary it should be used to screen suspected cases of dengue fever in resource poor areas,though the PPV and diagnostic accuracy of tourniquet test needs further evaluation but it cannot be negated that in rural areas where the pateints can not afford the cost of Dengue IgG/IgM, tourniquet test should be employed as an aid tool in the clinical diagnosis of the acute dengue fever. However, it should be just for screening and not as a tool for confirmation of diagnosis[7,8]. This study emphasizes that the treating physicians should make the clinical use of TT more promptly in diagnosing suspected cases of dengue fever. Our study findings are in agreement with most of the studies carried out in this aspect[4,9,10].

CONCLUSION

Since this study showed a high specificity and negative predictive vaule, hence TT should be used as a bedside test in detecting true negatives in suspected cases of dengue fever and especially in areas where the patient cannot afford Dengue IgG/IgM.

Conflict of interest

The authors declares no conflict of interest.

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