



A STUDY OF PREDICTABILITY OF BLEEDING RISK IN PEDIATRIC DENGUE INFECTION WITH SIMPLE HAEMATOLOGICAL TESTS

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ABSTRACT

Background and aim: Predicting of bleeding risk in dengue infection with feasible means continues to be important concern. This study evaluates usefulness of basic hematological tests in this respect. **Method:** This is cross sectional study in pediatric dengue patients categorized as not bleeding; having petechial bleeds and having mucosal bleeds. At the highest measured packed cell volume (PCV) in the patients during hospitalization, bleeding status was noted, simultaneously with platelet and leukocyte counts. Patients were segregated around medians of these parameters to assess relation to bleeding status. Odds ratios were calculated to indicate bleeding risk. **Results:** Of duely investigated 95 cases, 68 had bleeds, 40 with petechie and 28 with mucosal spots. Median highest PCV was 37.1%, and median platelet and leukocyte counts were respectively 52000/micro litre and 3400/micro litre. Odds ratio of bleeding risk above median PCV values was 2.16 times, that for petechie 2.07 and for mucosal bleeds 2.27 times. Below median platelet counts yielded bleeding risk odds ratios 2.19 times overall, 1.9 for petechie and 3.06 for mucosal bleeds. Leukocyte counts did not appear to be consequential. **Conclusion:** Basic laboratory evaluations of PCV and platelet count are found useful to predicting bleeding risk in pediatric dengue infection.

Keywords: Dengue; PCV; Platelet count; bleeding risk; haematological test.

INTRODUCTION

Dengue is major arbo-virus disease that afflicts as subclinical or manifest forms as dengue fever (DF) or dengue hemorrhagic fever (DHF). The latest WHO criteria [1], suggest mucosal bleeding as warning signal of possibility of disease progressing to severe bleeding. Early diagnosis of DHF is difficult as clinical and laboratory indicators may manifest late in the acute illness [2]. DHF is a syndrome with 3-7 days of fever, headache, malaria and rash accompanied by leucopenia and varying degrees of thrombocytopenia [3]. The pathogenesis of bleeding in dengue involves vasculopathy, thrombopathy and coagulopathy. Complement activation cascades interconnect between these three entities [4]. Routine follow up of the dengue infection patients includes a simple complete hemogram, specially in post febrile critical period. The present study aimed at determining predictive value of simple investigations of bleeding tendency, viz. packed cell volume (PCV), leukocyte count and platelet count in the pediatric patients of dengue infection.

Patients and method

It was a cross sectional study of children admitted with diagnosis of dengue at Department of Pediatrics, BRD Medical College Gorakhpur, Northern India, between January 2012 to December 2012. WHO criteria were employed for clinical diagnosis with serological confirmatory tests for diagnosis. Haematological evaluations in patients were carried out daily as per patient condition. These included PCV, platelet and leukocyte counts. The highest of detected PCV was assumed to represent critical

vascular leakage period, and such highest PCV of patients were used to find out median value. Concurrent with the highest PCV test median values of platelet counts and leukocyte counts were also found out. All laboratory investigations were done at central pathological facility of college hospital. The guardians of patients (aged between 3 to 15 years) were explained that the routine management information of the patients will be used for research without revelation of identities. Their verbal consent was taken to include the patient in study. Patients with bleeds were defined as those with only cutaneous petechial bleeds and those with mucosal bleeding spots as forerunners of probably severe disease, as per WHO suggestion. Such state of patients was considered at the highest detected PCV level, for incorporation in study. Odds ratios (OR) of the PCV, leukocyte count and platelet count relationships to non bleeding; petechial bleeding and mucosal bleeding groups were calculated as predictors of heightened bleeding risk in those with worse measures around median levels of the parameters.

Observations and results

95 patients had due investigations over hospitalization and hence appropriate for study. Among these 27 was not bleeding while 68 had either petechial or mucosal bleed. Median highest PCV was 37.1%, median platelet count 52000/ μ l and median leukocyte count 3400/ μ l. Observed characteristics of the patients are presented in Table.1.

Table.1: Characteristics of the patients.

Characteristic	Not Bleeding (n=27)	Petechial Bleeding (n=40)	Mucosal Bleeding (n=28)	Total
Males	15	21	14	50
Females	12	19	14	45
Median PCV %				37.1
Patients with PCV \geq 37.1%	10	22	16	48
Patients with PCV \leq 37.1%	17	18	12	47
Median Leucocyte Count / μ l				3400
Patients with L.count \leq 3400	15	18	14	47
Patients with L count \geq 3400	12	22	14	48
Median Platelet Count/ μ l				52000
Patients with Pl.count \leq 52000	10	21	18	49
Patients with Pl count \geq 52000	17	19	10	46

The Table 2 depicts odds ratios predicting bleeding risk in subjects relative to their haematological profile. Subjects with PCV >37.1% had 2.16 times higher risk of bleeding compared to those with PCV under that median. The risk for petechie was 2.07 times

and for mucosal bleed 2.27 times. Subjects with platelet counts 52000 and lower had overall 2.19 times raised risk of bleeding compared to those above the median 52000. Risk of petechie was 1.88 times and of mucosal bleed 3.06 times increased. The leukocyte counts did not appear consequential.

Table.2: Odds ratios of association of bleeding risk to parameters: PCV, leukocyte and platelet count.

Parameters	Non Bleeders (n)	Bleeders(n)	Odds ratio	Petechial Bleeders (n)	Odds ratio	Mucosal Bleeders (n)	Odds ratio
PCV ≤37.1%	10	38	2.155	22	2.07	16	2.27
PVC ≥37.1%	17	30		18		12	
Platelet ct ≤52000	10	39	2.19	21	1.88	18	3.06
Platelet ct ≥52000	17	29		19		10	

DISCUSSION

Dengue has wide spectrum of clinical presentation with spontaneous recovery in majority of patients. However, a small fraction of patients progress to severe disease characterized by plasma leakage with or without hemorrhage [1]. Broadly three categories of disease may be undifferentiated fever; dengue fever (DF) and dengue hemorrhagic fever (DHF). DHF is further classified in four grades of severity [5]. Simple elementary hematologic tests are available at most centres to aid to classification of probable dengue cases with or without warning signals. The haematological examination includes haemoglobin level, PCV, leukocyte and platelet count. Patients need be hospitalized for monitoring any bleeding.

As shown in table 2, our patients with PCV above median level of 37.1% exhibited 2.16 odds for risk of bleeding in contrast to those with lower PCV. At highest PCV values dengue patients are believed to be in critical phase characterized by decline in platelet count. Increased PCV represents hemoconcentration resulting on account of vascular fluid leak following increased platelet activating factor profile in dengue [6]. Thrombocytopenia and plasma leakage characterise severe dengue disease. The antibodies to virus cross react with platelets and endothelial cells causing their dysfunction and damage; coagulation defects and macrophage activation [7,8]. Consumption of platelets for sealing vascular leaks and decline in platelet count cause risk of bleeding [9].

In this study, subjects with platelet counts below the observed median level of 52000/ µl had increased risk of mucosal bleeding by 3 times but petechial bleeding less than 2 times over those with higher platelet counts. The observation indicates petechial bleeding as milder bleeding tendency as opposed to mucosal bleeds. Hemorrhage in dengue involves both reduction of count and dysfunction of platelets and hence count alone is no adequate indicator of bleeding risk. Auto-antiplatelet antibodies in dengue infection induce complement mediated platelet destruction [10]. High virus load may independently be responsible for severe thrombocytopenia [11]. Occurrence of leukocytopenia is reported in dengue infection [12, 13]. In children leukopenia is linked to increased risk of dengue associated shock [14]. In present study, leukocyte counts do not appear to correlate increased bleeding risk.

The study supports value of basic hematological investigations as PCV, platelet count can aid to predict risk of bleeding in pediatric dengue infection.

Conflict of interest statement

There is no conflict of interest.

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