



IMPORTANCE OF COMPLETE BLOOD COUNT AND PERIPHERAL SMEAR EXAMINATION IN EARLY DIAGNOSIS OF DENGUE PATIENTS

MEHTA R.C.^{1*}, GOSWAMI H.M.¹, KATARA R.K.², PATEL P.S.¹, PARIKH U.V.¹, VEGAD M.M.² AND JAIN P.Y.³

¹Department of Pathology, B.J. Medical College, Ahmedabad- 380016, Gujarat, India.

²Department of Microbiology, B.J. Medical College, Ahmedabad- 380016, Gujarat, India.

³Hospital for Mental Health, Ahmedabad- 380016, Gujarat, India.

*Corresponding Author: Email- drjainrashi@gmail.com

Received: October 18, 2013; Accepted: November 21, 2013

Abstract-

Introduction: Dengue fever is the most common arbovirus infection in the world. Clinical manifestation may range from undifferentiated fever to dengue shock syndrome (DSS). Clinical diagnosis can be difficult as its presenting signs and symptoms are easily confused with malaria, leptospirosis and typhoid. Early and effective assessment of the peripheral blood can be very helpful in patient management.

Aim: To emphasize on the importance of complete blood count and peripheral smear findings in suspected dengue patients, to make early diagnosis and prompt treatment cost effective for the patient.

Materials and Methods: A cross sectional study was carried on a series of patients attending a tertiary care centre for a period of one month. Patients presented with chief complain of fever and bodyache. Complete blood count (CBC) and Peripheral smear (PS) examination was first performed. Those suspected to be Dengue were further analysed by NS1 antigen test (ELISA) or Dengue IgM antibody test (ELISA) for confirmation.

Results: Of the 100 Dengue positive patients studied, 40% showed increased hematocrit, 63% had leucopenia with relative lymphocytosis and 81% had thrombocytopenia (platelet count <1,50,000/cmm) at the time of admission. Of these, 40% had platelet count (<50,000/ cu mm). On PS, atypical lymphocytes along with few plasmacytoid cells were seen in 72% patients.

Conclusion: Presence of raised hematocrit, leucopenia with relative lymphocytosis, thrombocytopenia, and atypical lymphocytes along with plasmacytoid lymphocytes provide an important diagnostic clue for Dengue.

Keywords- Confusion matrix, Data Mining, Decision tree, Neural Network, stacking ensemble, voted perceptron

Citation: Mehta R.C., et al. (2013) Importance of Complete Blood Count and Peripheral Smear Examination in Early Diagnosis of Dengue Patients. Journal of Infectious Diseases Letters, ISSN: 0976-8904 & E-ISSN: 0976-8912, Volume 2, Issue 1, pp.-22-24.

Copyright: Copyright©2013 Mehta R.C., et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Introduction

Dengue fever is one of the commonest Arboviral infections in tropical and subtropical countries. It is caused by four serotypes of dengue virus forming an antigenic subgroup of the Flavivirus (Group B Arbovirus). All serotypes are capable of infecting and replicating in numerous human cells, including dendritic cells, monocytes/ macrophages, B-cells, T-cells, endothelial cells, neuronal cells and hepatocytes in vivo [1].

The most common epidemic vector of dengue is female *Aedes aegypti* mosquito, easily identified by white bands or scale patterns on its legs and thorax. Clinical features include fever, headache, muscle and joint pain, nausea/ vomiting, rash and hemorrhagic manifestations. Other symptoms like itching and metallic taste have also been reported. There are actually four clinical syndromes:

- Undifferentiated fever
- Classic Dengue fever

- Dengue hemorrhagic fever
- Dengue shock syndrome.

Clinical diagnosis can be difficult as signs and symptoms are easily confused with malaria, leptospirosis, and typhoid fever [2].

There is no specific treatment or vaccine currently available to this infection. Therefore, early and rapid diagnosis is very important for patient management. Complete blood count and peripheral smear examination is an important part of diagnostic work up of patients. Thrombocytopenia and presence of atypical lymphocytes on smear is a diagnostic clue. Presence of atypical lymphocytes in flowcytometric analysis can be used as a presumptive diagnostic tool. Atypical lymphocytes can also be assessed by buffy coat preparation by automated white cell differential counter. Further changes in atypical lymphocyte count is a useful marker for disease activity.

Materials and Methods

A cross sectional observational study was carried out on a series of

patients' attending and admitted in a tertiary care centre, B.J. Medical College, Civil Hospital, Ahmedabad, for the duration of one month. Study included patients presenting with chief complaints of fever, headache, and joint pain at the time of admission. Complete Blood Count and peripheral smear examination was done on each patient's venous sample collected in EDTA vacutainer. After analyzing the sample with clinical correlation, samples showing leucopenia with relative lymphocytosis, thrombocytopenia and presence of atypical or plasmacytoid lymphocytes on peripheral smear were sorted out. These patients were then advised NS1 antigen test (0-5 days of fever/ illness) or IgM antibody test & titer (more than 5 days of illness) according to the duration of illness. 48 patients positive for NS1Ag and 52 patients positive for IgM antibody were then selected, making a total of 100 Dengue positive patients. The results were then compared and correlated with the CBC & peripheral smear findings.

Results

This study included 100 Dengue positive patients over a duration of one month. Of the 100 patients studied, 40 patients (40%) showed increased hematocrit on admission. 63 Patients (63%) had leucopenia with relative lymphocytosis and 81 patients (81%) had thrombocytopenia (platelet count <1,50,000/cu mm) at the time of admission. Of these, 40 Patients (40%) had platelet count (<50,000/ cu mm). On PS, atypical lymphocytes along with few plasmacytoid cells were seen in 72 patients (72%). Forty three Patients (43%) had elevated serum direct bilirubin (>0.2mg/dl). 49 Patients (49%) had elevated SGPT levels (>45U/L). 48 Patients (48%) were NS1 antigen positive and 52 patients (52%) were positive for serum IgM antibodies. The majority of patients were discharged without any adverse sequelae. The fatality rate was 4 patients (4%) and these patients died of Dengue Shock Syndrome, while 96 patients (96%) recovered completely.

Raised hematocrit, leucopenia with relative lymphocytosis and presence of atypical lymphocytes along with plasmacytoid cells proved to be a consistent finding in majority of dengue patients [Fig-1].

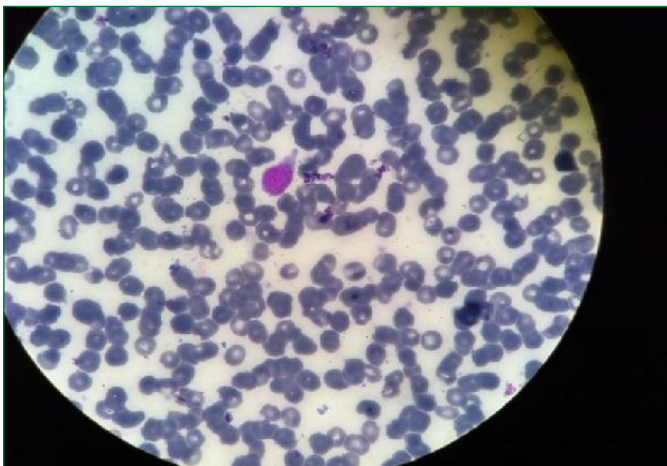


Fig. 1- Characteristic atypical lymphocyte

Discussion

Laboratory Investigations thus Help in Diagnosis

Complete Blood Count (CBC)

CBC Showing raised hematocrit, leucopenia (<4000/cmm) with relative lymphocytosis (>40%), thrombocytopenia. Raised hematocrit is because of plasma leakage due to cytokine release and leu-

copenia and thrombocytopenia is due to virus induced bone marrow suppression [3]. Some patients may show blood plasmacytosis [4,5].

Peripheral Smear Examination (PS)

Presence of atypical lymphocytes along with plasmacytoid cells. Atypical lymphocytes were one of the consistent finding in our study. These lymphocytes had increased cell size, increased amount of cytoplasm with characteristic tailing pattern of the cytoplasm along with increased cytoplasmic basophilia [Fig-2]. Nuclear chromatin was slightly open and few cells showed cleaved nucleus. Plasmacytoid cells were cells with basophilic cytoplasm, round to oval nucleus and slightly prominent golgi zone resembling a plasma cell.

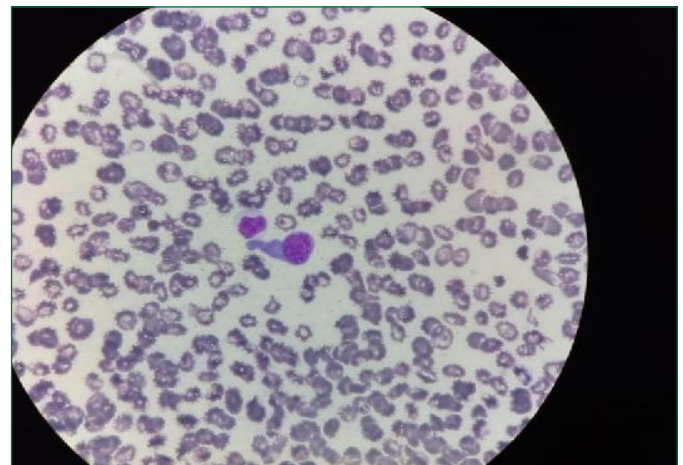


Fig. 2- Plasmacytoid appearance with tailing of cytoplasm

Serological Tests

NS1 antigen test by ELISA method- is done during the acute phase of illness (0-5 days following onset of symptoms or fever [6]. IgM detection test by ELISA method-Different pattern of antibody response is observed in primary and secondary infection. In primary infection, IgM is detected 5 or more days after onset of illness and IgG from 10-15 days. In secondary infection, IgM appears earlier or same time frame but at lower titer while IgG increase rapidly [7].

Dengue antigen detection test by Immunohistochemistry, Immunofluorescence, Isolation of Dengue virus and Viral RNA detection are other methods used for diagnosis.

Conclusion

Through the above study, it was concluded that hematological parameters (i.e. Increased hematocrit, leucopenia with relative lymphocytosis, thrombocytopenia, presence of atypical lymphocytes and plasmacytoid cells on smear) are an important diagnostic clue for early diagnosis of dengue fever. Further, raised SGPT and raised serum direct bilirubin were markers for deranged liver function test and presence of hemolysis respectively.

Early suspicious patients can be started on fluids as a part of treatment till the confirmatory test reports are awaited. This can also prevent unnecessary antimalarial exposure to the patient and can avoid development of antimalarial resistance. However, confirmation can be done by NS1 antigen detection and IgM antibody test. Flow cytometric analysis of atypical lymphocytes can be done in higher centers to assess disease progression.

Conflicts of Interest: None declared.

References

- [1] Jessie K., Fong M.Y., Devi S., Lam S.K., Wong K.T. (2004) *Journal of Infectious Diseases*, 189(8), 1411-1418.
- [2] World Health Organization and the Special Programme for Research and Training in Tropical Diseases (2009) *Dengue: guidelines for diagnosis, treatment, prevention and control*.
- [3] La Russa V.F., Innis B.L. (1995) *Bailliere's Clin. Haematol.*, 8 (1), 249-270.
- [4] Bibi-Triki T., Aras N., Braun T., Lautridou C., Boukari L., Morin A.S., Maquarre E., Stirnemann J., Brichler S., Laurian Y., Fain O. (2009) *Med. Interne.*, 30(3), 274-276.
- [5] Gawoski J.M., Ooi W.W. (2003) *Arch. Pathol. Lab. Med.*, 127 (8), 1026-1027.
- [6] Dussart P., Labeau B., Lagathu G., Louis P., Nunes M.R., Rodrigues S.G., Storck-Herrmann C., Cesaire R., Morvan J., Flamand M., Baril L. (2006) *Clinical and Vaccine Immunology*, 13(11), 1185-1189.
- [7] Vaughn D.W., Green S., Kalayanarooj S., Innis B.L., Nimmannitya S., Suntayakorn S., Endy T.P., Raengsakulrach B., Rothman A.L., Ennis F.A., Nisalak A. (2000) *Journal of Infectious Diseases*, 181(1), 2-9.