International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Assessment of Abnormal Liver Chemistry in Malaria & Dengue Infections

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Abstract: ***Background: Malaria and dengue are the two most common mosquito-borne diseases in tropical region including India. Although the routine diagnostic procedure does not involve assessing liver chemistry in above diseases, morbidity and mortality are mostly due to complications arising from long standing liver dysfunctions. Liver function tests (LFT) are designed to assess if there is any hepatic dysfunction or not. Hence using LFT as screening test will help the physician to prevent mortality from liver diseases. Hence, we have conducted this study to demonstrate liver is affected in malaria & dengue infections & analyze the biochemical pattern of liver function in patients diagnosed with malaria and dengue infections. Materials and methods: It is a prospective study carried out in the Department of Pathology, S.C.B. Medical College, Cuttack. Blood samples were collected from patients advised for LFT. The reports were compiled and analyzed using SPSS 21.0 software and then correlated with clinical diagnosis. Results: LFT was done in 533 blood samples out of which non-hepatic infections constituted 154 cases including 64 cases of dengue, 54 cases of tuberculosis & 36 cases of malaria with 98.4% , 57.4% & 77.7% of abnormal LFT results respectively. On comparing the results of dengue and malaria cases with the control, a significant difference ($p < 0.005$) was obtained for different parameters of LFT. Conclusion: Liver is affected in non-hepatic infections like dengue and malaria; therefore LFT should be performed as a screening test to know the functional status of liver for better management of patients.***

Keywords: Dengue, Liver function test (LFT), Malaria

1. Introduction

Malaria and dengue are the two most common vector-borne diseases prevalent in tropics and subtropics. Being major public health problem malaria is responsible for presenting 300 to 500 million cases of clinical disease per year with 1.5-2.7 million deaths annually according to WHO, 2000[1]. On the other hand dengue infections affect approximately 100 million people across the tropical world.[2] Despite improvement in diagnostic procedures and WHO eradication programmes, 40% of world's population still lives in malaria endemic areas.[1] Recently, dengue has emerged as a major recurring health problem with a frequency of 2-3 epidemics per annum occurring mostly around monsoon periods.[2,3]

Liver is a vital organ in humans which can function normally in presence of only 25% of liver parenchyma. Therefore liver dysfunction is usually masked unless clinical manifestations appear. Liver function tests (LFT) are a group of serological and biochemical assay designed to screen symptomatic and asymptomatic liver dysfunction.[4] Though LFT are said to be less sensitive and less specific for a particular disease but taken as a panel including patient's history and clinical examination, both sensitivity and specificity increase.[4] LFT includes assessing several serum parameters like bilirubin, aminotransferases (AST & ALT), alkaline phosphatase (ALP).

Malaria is caused by a species of Plasmodium of which infection by P. falciparum appears to be most fatal.[5] The exoerythrocytic sporozoites invade the hepatocytes where they multiply and then release out by killing the hepatocytes to invade other hepatocytes and erythrocytes.[1,6,7] The rise in serum liver enzymes may be due to direct release of enzymes from hepatocytes after parasitic killing or due to leakage from hepatocytes as a result of compromise in membrane integrity due to autoimmune progress or abnormal activation of cells induced by parasites.[1,6] Hyperbilirubinemia is a common feature of falciparum malaria caused by hemolysis of RBCs and partly due to liver damage.[7]

Although liver is not a major target organ in dengue as in case of malaria, hepatic dysfunction is a well-recognized feature of dengue infection and changes like centrilobular necrosis, Kupffer cell hyperplasia, monocytic infiltration have been reported.[2,8] Abnormal liver functions with dengue infections might be due to various pathways. Some studies state it might be due to direct attack by virus on hepatocytes,[3, 9] while others impart an immunological pathophysiology. The replication of virus in hepatocytes can be detected by presence of immunoreactive NS3 antigens and upregulations of TRAIL, a type-II transmembrane protein responsible for apoptosis of hepatocytes.[10]

Hence analysis of LFT will provide a clue whether liver is affected in malaria and dengue infections and also can indicate the degree of damage to liver thereby helping physicians in proper management of such cases.

2. Materials and Methods

This research project was conducted in the Department of Pathology, S.C.B Medical College, Cuttack. Blood samples were collected from patients coming from different wards for investigations of LFT. All the parameters of liver function test were assessed by using an auto-analyzer machine and the reports were collected. Detail clinical history and clinical findings of all the patients were collected. These findings were correlated with that of liver functions tests.

3. Statistical Analysis

The data obtained were analyzed using Mann-Whitney test and level of significance was set at $p < 0.005$. SPSS software package version 21.0 was used. Results were expressed in median with interquartile range.

4. Results

Out of 533 cases, abnormal LFT was found in 407 cases. A total of 100 cases comprise malaria and dengue infections with 77.7% and 98.4% of abnormal LFT features respectively. Both the diseases showed a male preponderance with a male to female ratio of 2:1 for malaria and 5:1 for dengue. Control was selected as the number of cases with normal LFT. An epidemiologic data on LFT advised for various diseases along with percentage of abnormal results is summarized in Table-1. Comparison analysis of data was done between the patients with malaria infections and the control; the values are expressed in median with interquartile range (Table-2). A p value of less than of 0.005 was obtained for all the parameters of LFT except for ALP. Comparison analysis of data was done between patients with dengue infection and the control. (Table-3) A significant difference in the parameters of LFT was obtained with $p < 0.005$, except for bilirubin where p value obtained was 0.67.

5. Discussion

Liver receives highest amount of blood supply which account for 25% of the total cardiac output. Encounter of any foreign substance entering our body with hepatocytes is earlier than any other cells. Therefore liver dysfunction is common in hepatic as well as non-hepatic injuries. Since liver is involved in the life cycle of malarial parasite and isolation of dengue specific antigens from the liver parenchyma after postmortem of dengue infected patients[11], puts a light that liver might be affected in such infections. Therefore, early screening of hepatic dysfunction with the help of LFT will prevent complications and mortality arising out of liver dysfunction.

Analysis of Table-1 shows malaria infection constitute 36 cases with 77.7% of abnormal LFT and dengue infection comprise 64 cases out of 387 non-hepatic diseases accounting 98.4% of abnormal LFT.(Table-1) In our study, a male biased dengue infection is observed with a male to female ratio of 5:1. This is in accordance with the study of Ukey et.al.[11] The greater risk for males might be due to greater exposure to the day biting vector aedes mosquito at their work places. In malaria infection also, a male preponderance is seen and this is supported by the study conducted by Sulabha et.al & Jimmy et.al, [12,13] but the reason for such has not been established.

Analysis of table 2 shows liver is affected in malaria infection as significant difference in p value was obtained for different parameter of LFT. Several theories state increase in all serum liver enzymes in malaria[1,6] but the present study is in consistence with the above fact and this is supported by a study published by Korean J. Parasitol, 2006 which states ALP levels are increased in Plasmodium vivax but decreased in P. falciparum infection.[14]Since our study does not differentiate between species of plasmodium , a mixed result is obtained i.e- ALP levels are elevated against the control but not significantly raised.(Table-2)

Analysis of table-3 also shows liver is affected in dengue infection and p value obtained was less than 0.005 for all parameters of LFT except bilirubin.(Table-3) Luis José de Souza et.al and Wahid SF et.al also observed in their studies that hyperbilirubinemia was seen in less than 10% of cases.[15,16] Another study states bilirubin is not usually raised whatever the transferase levels are, which is very peculiar in dengue.[17] The reason for normal bilirubin level might be due to the fact that dengue virus typically attacks the platelets and neither hepatocytes nor erythrocytes are the primary targets of the virus.
Therefore, it cannot be ruled out that complications will not arise out of hepatic dysfunction in malaria and dengue infection and serology remains the mainstay for preventing such complications.

6. Conclusion

Liver is affected in non-hepatic infections like dengue and malaria. Liver function tests are sensitive methods for diagnosing hepatic insufficiency in symptomatic as well as asymptomatic patients. Assessment of serum AST and ALT levels can significantly suggest hepatic involvement in malaria and dengue.

References

[1] Uzuegbu UE, Emeka CB. Changes in Liver Function Biomarkers among Malaria Infected Patients in Ikeja Lagos State, Nigeria; Current Research Journal of Biological Sciences 2011;3(3): 172-74.
[2] Ahmed A, Alvi AH, Butt A, Nawaz AA, Hanif A. Assessment of Dengue Fever Severity Through Liver Function Tests; Journal of the College of Physicians & Surgeons Pakistan 2014;24 (9): 640-44.
[3] Karoli R, Fatima J, Siddiqi Z, Kazmi KI, Sultania AR. Clinical profile of dengue infection at a teaching hospital in North India J Infect Dev Ctries 2012; 6(7): 551-54.
[4] Hasan FAM, Owyed S. Interpretation of Liver chemistry tests; Bulletin of Kuwait Institute for Medical Specialization 2003;2:27-31.
[5] Elbadawi NEE, Mohamed MI, Elzaki H, Mohamed AA, Ounsa GE, Mohamed EY, Ibrahim EK. The Effect of Malaria on Biochemical Liver Function Parameters in Sudanese Pregnant Women; J Physiobiochem Metab 2012;1:2.
[6] Onyesom I. Activities of some liver enzymes in serum of *P. falciparum* malarial infected humans receiving artemisinin and non-artemisinin-based combination therapy; Annals of Biological Research 2012;3 (7):3097-100.
[7] Kausar MW, Moeed K, Asif N, Rizwi F, Raza S. Correlation of Bilirubin with Liver Enzymes in Patients of Falciparum Malaria; International Journal of Pathology 2010;8(2):63-67.

[8] Wiwanitkit V. Liver dysfunction in dengue infection, an analysis of the previously published Thai cases; J Ayub Med Coll Abbottabad 2007; 19(1).
[9] Parkash O, Almas A, Jafri SMW, Hamid S, Akhtar J, Alishah H. Severity of acute hepatitis and its outcome in patients with dengue fever in a tertiary care hospital Karachi, Pakistan (South Asia); BMC Gastroenterology 2010;10:43.
[10] Duncan R. Smith and Atefeh Khakpoor; Involvement of the liver in dengue infections; Dengue Bulletin – Volume 33, 2009.
[11] Ukey PM, Bondade SA, Paunipagar PV, Powar RM, Akulwar SL. Study of Seroprevalence of Dengue Fever in Central India; Indian J Community Med. 2010;35(4): 517-19.
[12] Pathak S, Rege M, Gogtay NJ, Aigal U, Sharma SK, Valecha N, Bhanot G, Kshirsagar NA, Sharma S. Age-Dependent Sex Bias in Clinical Malarial Disease in Hypoendemic Regions; PLoS One. 2012;7(4):e35592.
[13] Antony J, Celine TM, Chacko M. Staging back of Malaria in Kerela, India: A Retrospective study; International Research Journal of Social Sciences 2013;2(12):42-46.
[14] Mohammad Ali Pir, Bikha Ram Devrajani, Saira Baloch and Marya Baloch; Serum Enzyme Activities in Patients with *vivax* Malaria and *falciparum* Malaria; International Journal Of Multidisciplinary Sciences And Engineering, Vol. 3, No. 11, November 2012.
[15] Souza LJ, Nogueira RMR, Soares LC et al. The Impact of Dengue on Liver Function as Evaluated by Aminotransferase Levels; The Brazilian Journal of Infectious Diseases 2007;11(4):407-10.
[16] Wahid SF, Sanusi S, Zawawi MM, Ali RA; A comparison of the pattern of liver involvement in dengue hemorrhagic fever with classic dengue fever; Southeast Asian J Trop Med Public Health. 2000;31(2):259-63.
[17] Uddin KN, Musa AKM, Wasim Md. Haque M, Sarker RSC, Ahmed AKMS. A Follow Up On Biochemical Parameters In Dengue Patients Attending Birdem Hospital; Ibrahim Med. Coll. J. 2008;2(1):25-27.

Tables

Table 1: Distribution of Cases Undergoing LFT (n=533)

Category Diseases	*Incidence*			*Abnormal LFT (Frequency)*	*Abnormal LFT (%)*
	Male	Female	Total		
Liver Diseases	83	17	100	89	89
GB DISEASES (Excluding CA GB)	18	28	46	42	91.3
Dengue	54	10	64	63	98.4
Malaria	25	11	36	28	77.7
Lung Diseases	38	16	54	31	57.4
Bleeding Diseases	26	15	41	26	63.4
Cardio-Vascular	8	4	12	8	66.6
Malignancy	9	12	21	15	71.4
Autoimmune Diseases	18	16	34	22	64.7
Poisoning	9	11	20	17	85.0
Neurological Diseases	17	5	22	13	59
Others	60	23	83	53	63.8
	Grand Total		533	407	

Table 2: Analysis of LFT between Malaria Patients & Control Group

LFT Parameters	*Malaria*	*Control*	*P Value*
BILIRUBIN	1.1 (0.9-3.8)	0.7 (0.6-0.8)	<0.001
AST	33.5 (27-47.7)	24 (20-27)	<0.001
ALT	31 (23.2-43.7)	25 (21-28.2)	<0.001
ALP	180 (127.2-	165.5 (136.5-	0.3

Table 3: Analysis of LFT between Dengue Patients & Control Group

LFT Parameters	*Dengue*	*Control*	*P Value*
BILIRUBIN	0.7 (0.5-1.0)	0.7 (0.6-0.8)	0.67
AST	103 (70.6-197.5)	24 (20-27.5)	<0.001
ALT	67.5 (38.7-	25 (21-28.5)	<0.001
ALP	191.5 (160.5-	162 (134-	0.001

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