

**Study of Clinical Profile of Infective Aetiology of Jaundice****Gourav Jyoti Borah<sup>1</sup>, Ubedul Islam<sup>2</sup>, Mehzabin Haider Hazarika<sup>3</sup>, Dhiraj Das<sup>4</sup>**<sup>1</sup>Postgraduate Trainee, Department of General Medicine, Gauhati Medical College and Hospital, Guwahati, Assam, India<sup>2</sup>Associate Professor, Department of General Medicine, Gauhati Medical College and Hospital, Guwahati, Assam, India<sup>3</sup>Assistant Professor, Department of Community Medicine, Gauhati Medical College and Hospital, Guwahati, Assam, India<sup>4</sup>Professor, Department of General Medicine, Gauhati Medical College and Hospital, Guwahati, Assam, India

Received: 20-05-2023 / Revised: 21-06-2023 / Accepted: 18-07-2023

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Conflict of interest: Nil

**Abstract:****Background:** In this study we wanted to evaluate the clinical profile of patients with jaundice of infective aetiology, determine the aetiological agents and correlate the abnormal liver function tests among different infective aetiologies.**Methods:** This was a hospital-based observational study conducted among 125 patients having jaundice with or without fever at the Department of Medicine, Gauhati Medical College, over a period of one year from March 2019 to February 2020 after obtaining clearance from the institutional ethics committee and written informed consent from the study participants.**Results:** Viral hepatitis (52%) was the most common aetiology, followed by malaria (18.4%). Leptospirosis and scrub typhus accounted for 3.2% of patients. The majority of cases of malaria (82.6%) and viral hepatitis (67.7%) came from rural areas, while 70% of cases of enteric fever were from urban areas. Hepatitis A (61.5%) was the most common viral hepatitis. Anorexia was the most common presenting complaint among the study population besides jaundice and fever. Only 49.2% of viral hepatitis patients had fever at the time of examination whereas, all patients of other aetiologies presented with fever.**Conclusion:** In our study, viral hepatitis was the leading cause of jaundice due to an infectious cause, followed by malaria. They are found predominantly in male patients and in rural populations. Among viral hepatitis causes, hepatitis A is the most common infection and is found more commonly in younger age groups. Severe liver dysfunction is seen in patients with viral hepatitis compared to other aetiologies. Complications like renal failure, shock, hypoglycaemia and ARDS are also observed in a few patients.**Keywords:** Clinical, Profile, Infective, Aetiology, Jaundice.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

The word "Jaundice" is derived from the French word "Jaune" which means yellow. It is one of the most common presentations in the inpatient department worldwide, presenting as yellowish discoloration of the sclera and body tissues resulting from the deposition of bilirubin (Jameson, J. et al., 2018).[1] There is no reliable data on the incidence of jaundice in the general adult population worldwide. However, in a community study in Alwar, Rajasthan, the annual incidence of jaundice was found to be 2.76 (95 % CI: 2.37- 3.15) per 10,000 populations (Singh J. et al., 1997).[2] Jaundice may be caused by many different diseases with severity ranging from benign to life-threatening conditions.

Infective aetiologies play a major part in it and they are mostly viral and bacterial infections and parasitic infestations (Le Huong N. T. and An N. T. T., 2015).[3] In a study done in Cho Ray Hospital, Vietnam, infective origin of jaundice among admitted patients was 13.3% (Ahmad, J. et al., 2014).[4] In the South-East Asia Region, infective causes are hepatitis A, B, C, and E, malaria, dengue, leptospirosis, sepsis, HIV etc. (Anand, A. C. and Garg, H. K., 2015).[5] According to Patel, N. D., 2006 from Mumbai, viral hepatitis is the most common, followed by malaria and leptospirosis. In a study from Assam, hepatitis A (39.02 %) was the leading cause, followed by malaria (23.39%), hepatitis E (18.29%), hepatitis B (4.88%) and hepatitis C

(1.2%) (Loitongbam, R. et al., 2014).[6] The number of deaths associated with viral hepatitis in Southeast Asian Region (SEAR) like India, was 1.34 million in 2015. This number was comparable with the number of deaths from tuberculosis but higher than the number of deaths from HIV (Global Hepatitis Report, 2017). Infection may directly or indirectly injure the hepatocytes leading to swelling and poor functioning. This results in compression of the bile ducts and the swelling of its endothelium leading to further intra-hepatic cholestasis. (Damjanov, I., 2009).[7] The clinical spectrum of infectious causes of jaundice varies according to aetiology. Most of the patients present with infectious and constitutional symptoms like anorexia, nausea, vomiting, arthralgia, myalgia, fever, malaise, fatigue, headache, photophobia and coryza which often may precede the onset of jaundice by 1- 2 weeks. A variety of serological and molecular assays are available for the diagnosis of the different causes of jaundice (Marzinke M. A. et al., 2020).[8] Studies in India regarding the prevalence and clinico-aetiological profile of infective causes of jaundice are lacking. Hence, this study was conducted to evaluate different infective causes of jaundice and to assess the clinical and biochemical profiles of these cases.

#### Aims and Objectives

- To study the clinical profile of patients with jaundice of infective aetiology.
- To know the aetiological agent.
- To correlate the abnormal liver function tests among different infective aetiologies.

#### Materials & Methods

This was a hospital-based observational study conducted among 125 patients having jaundice with or without fever at the Department of Medicine, Gauhati Medical College, over a period of one year from March 2019 to February 2020 after obtaining clearance from the institutional ethics committee and written informed consent from the study participants.

#### Inclusion Criteria

- A willing consent given by the patient to participate in the study.
- Dengue IgM positive or NS1 antigen positive
- Age more than 16 years.
- Platelet count less than 1,50,000.

#### Exclusion Criteria

- Age less than 12 years.

- Jaundice due to toxin, drugs, haemolytic disease, non-infective biliary tract disease (choledocholithiasis, benign or malignant tumours), chronic liver disease, benign and malignant liver tumour, hereditary liver diseases and autoimmune hepatitis.
- Patients who are not willing to participate in the study.

#### Study Procedure

Data were collected and recorded using a preformed proforma according to the objectives of the study. After getting informed signed consent, detailed histories and examinations were done on the 125 patients included in the study. The aim and purpose of the study were informed to the patients, who thereby gave written consent for participating in the study.

Those patients who satisfied all the inclusion and exclusion criteria were selected for the study. Blood samples were collected for different investigations including haemoglobin, total leucocyte count, platelet count, peripheral blood smear, RFT and LFT. Also, viral markers such as HBsAg, anti HCV, IgM HAV, IgM HEV and ultrasound of the whole abdomen were done for all patients. Some special tests like IgM Leptospira, HIV, IgM scrub typhus etc. were done based on the history and clinical examination. Complete blood count was done in the laboratory of the Department of Pathology, GMCH, by an automated analyser available there (SYSMEX XS-800i). Liver function tests were also analysed using VITROS 4600 automated analyser.

#### Sample Size

125 (123 rounded off to 125)

Sample size was calculated using the formula (Daniel, W. W. and Cross, C. L., 2018)

$$\text{Sample size} = \{Z^2 \times p \times (1 - p)\} \div c^2$$

Where,

Z= Z value (1.96 for 95% confidence interval)

p= Prevalence of jaundice of infective aetiology (13.3%) (Ahmad, J. et al. 2014)

c= Allowable error 6% (Here, we took it as 0.06)

#### Statistical Methods

All the data were entered into a data collection sheet in Microsoft Excel format and analyzed using SPSS software. Numerical values were reported using the mean and standard deviation or median. Categorical values are reported using numbers and percentages.

#### Results

Table 1

Diseases	Malaria	Viral Hepatitis	Enteric Fever	Leptospirosis	Dengue	Scrub Typhus	Others	Total
No. of Cases (n=125)	23	65	10	4	2	4	17	125
Percentage of Cases	18.4%	52%	8%	3.2%	1.6%	3.2%	13.6%	100%
Aetiological Distribution of the Study Population								
Aetiology	Male (% of Patients)			Female (% of Patients)				
Malaria (N=23)	15 (65.2%)			8 (34.8%)				
Viral Hepatitis (N=65)	35 (53.8%)			30 (46.2%)				
Enteric Fever (N=10)	5 (50%)			5 (50%)				
Leptospirosis (N=4)	2 (50%)			2 (50%)				
Dengue (N=2)	2 (100%)			0				
Scrub Typhus (N=4)	2 (50%)			2 (50%)				
Others (N=17)	9 (52.9%)			8 (47.1%)				
Total (N=125)	70 (56%)			55 (44%)				
Sex Distribution of the Study Population in Different Aetiology								
Aetiology	Rural (%)			Urban (%)				
Malaria (N=23)	19 (82.6%)			4 (17.4%)				
Viral Hepatitis (N=65)	44 (67.7%)			21 (32.3%)				
Enteric Fever (N=10)	3 (30%)			7 (70%)				
Leptospirosis (N=4)	3 (75%)			1 (25%)				
Dengue (N=2)	0			2 (100%)				
Scrub Typhus (N=4)	2 (50%)			2 (50%)				
Others (N=17)	8 (47.1%)			9 (52.9%)				
Total (N=125)	79 (63.2%)			46 (36.8%)				
Aetiological Distribution of Rural and Urban Populations								

Viral hepatitis constituted more than half of the study population (52%) followed by malaria (18.4%). Leptospirosis and scrub typhus constituted 3.2% of the study population each. In the 'others' category which included 17 (13.6%) cases, 4 cases (23.5%) had urosepsis and another 4 (23.5%) cases had features suggestive of pneumonitis. In the remaining 9 cases, the aetiological agent could not be established. Among the 23 malaria patients, 15 (65.2%) were male and 8 (34.8%) were female.

Similarly, males predominated (53.8%) in the viral hepatitis group, whereas, an equal number of male and female patients were seen in the enteric fever, leptospirosis, and scrub typhus groups. 82.6% of malaria patients and 67.7% of viral hepatitis patients were from rural areas whereas, the majority of patients (70%) with enteric fever were from urban areas. All dengue patients were from urban areas.

Table 2:

Aetiology	HAV	HBV	HCV	HEV	Total
No. of Cases (n=65)	40	3	0	22	65
Percentage	61.5%	4.6%	0%	33.9%	100%
Types of Viral Hepatitis as Aetiology					
Age Group (%)	Hepatitis A (n=40) (% of Patients)	Hepatitis B (n=3) (% of Patients)	Hepatitis C (n=0) (% of Patients)	Hepatitis E (n=22) (% of Patients)	
13-22	13 (32.5%)	0	0	7 (31.8%)	
23-32	10 (25%)	0	0	7 (31.8%)	
33-42	7 (17.5%)	0	0	3 (13.6%)	
43-52	7 (17.5%)	3 (100%)	0	1 (4.6%)	
53-62	2 (5%)	0	0	3 (13.6%)	
63 or More	1 (2.5%)	0	0	1 (4.6%)	
Total	40 (100%)	3 (100%)	0	22 (100%)	
Age Distribution of Viral Hepatitis Patients					

Out of 65 patients with viral hepatitis, 40 (61.5%) had hepatitis A, 22 (33.9%) had hepatitis E and 3 (4.6%) had hepatitis B.

Hepatitis A was more prevalent (32.5%) in the 13-22 age group. Hepatitis E was equally distributed in the 13-22 and 23-32 age groups (7 each). All patients with hepatitis B belonged to the 43-52 age group.

Table 3:

Complaints	Malaria (N=23) (%)	Viral Hepatitis (N=65)(%)	Enteric Fever (N=10)(%)	Leptospirosis (N=4)(%)	Dengue (N=2)(%)	Scrub Typhus (N=4)(%)	Others (N=17)(%)
Fever	23 (100%)	32 (49.2%)	10 (100%)	4 (100%)	2 (100%)	4 (100%)	17 (100%)
Anorexia	15(65.2%)	58 (89.2%)	8 (80%)	3 (75%)	1 (50%)	4 (100%)	13 (76.5%)
Nausea/ Vomiting	11 (47.8%)	34 (52.3%)	4 (40%)	1 (25%)	1 (50%)	1 (25%)	6 (35.3%)
Headache	8 (34.8%)	3 (4.6%)	7(70%)	2 (50%)	1 (50%)	2 (50%)	5 (29.4%)
Abdominal Pain	8 (34.8%)	33 (50.7%)	5(50%)	3 (75%)	1 (50%)	2 (50%)	4 (23.5%)
Myalgia	7 (30.4%)	55 (84.6%)	6 (60%)	1 (25%)	2 (100%)	3 (75%)	0
Oliguria	3 (13%)	6 (9.2%)	0	0	0	0	6 (35.3%)
Altered Sensorium	3 (13%)	4 (6.2%)	0	0	0	0	0
Presenting Complaints							
Interval In Weeks	0-3 Days (% of Patients)		4- 7 Days (% of Patients)		>7 Days (% of Patients)		
Malaria (N=23)	14 (60.8%)		4 (17.4%)		5 (21.8%)		
Viral Hepatitis (N=32)	12(37.5%)		14 (43.8%)		6(18.7%)		
Enteric Fever (N=10)	1 (10%)		4 (40%)		5 (50%)		
Leptospirosis (N=4)	0		2 (50%)		2 (50%)		
Dengue (N=2)	0		2 (100%)		0		
Scrub Typhus (N=4)	1 (25%)		3 (75%)		0		
Others (N=17)	4 (23.5%)		3 (17.7%)		10 (58.8%)		
Interval from the Onset of Fever to the Development of Jaundice							
Aetiology	Pallor	Bleeding Manifestation (Petechiae/Purpura)		Encephalopathy	Abnormal Pulmonary Findings		
Malaria (N=23) (% of Patients)	5 (21.7%)	1 (4.3%)		3 (13.1%)	4 (17.4%)		
Viral Hepatitis (N=65) (% of Patients)	5 (7.7%)	2 (3.1%)		4 (6.2%)	2 (3.1%)		
Enteric Fever (N=10) (% of Patients)	0	0		0	0		
Leptospirosis (N=4) (% of Patients)	0	0		0	0		
Dengue (N=2) (% of Patients)	0	0		0	0		
Scrub Typhus (N=2) (% of Patients)	0	0		0	0		
Others (n=17) (% of Patients)	8 (47.1%)	0		0	6 (35.3%)		
Clinical Signs of the Study Population							

All non-viral hepatitis patients had fever while only 32 patients (49.2%) with viral hepatitis had fever at the time of presentation. In the viral hepatitis group, anorexia (89.2%) was the commonest symptom followed by myalgia (84.6%). Among non-viral hepatitis patients, anorexia was present in 65.2% of malaria patients and 80% of enteric fever patients. It was also observed that altered sensorium was present in 13% of malaria and 6.2% of viral hepatitis patients while 13% of malaria patients presented with oliguria. It was observed that it took 3 days or less from the onset of fever to the

development of jaundice in most cases (60.8%) of the malaria group. Similarly, 81.3% of cases in the viral hepatitis group took 7 days or less from the onset of fever while 50% of patients in the enteric fever group and leptospirosis group developed jaundice after 7 days of the onset of fever.

21.7% and 7.7% of malaria and viral hepatitis cases respectively had pallor on clinical examination while 47.1% of patients with others diagnoses had pallor. 13.1% of malaria cases had encephalopathy.

Table 4:

Organomegaly	Malaria (N=23) (%)	Viral Hepatitis (N=65) (%)	Enteric Fever (N=10) (%)	Leptospiro-sis (N=4) (%)	Dengue (N=2) (%)	Scrub Ty-phus (N=4) (%)	Others (N=17) (%)
Hepatomegaly	11 (47.8%)	59(90.7%)	6 (60%)	2 (50%)	0	1 (25%)	5 (29.4%)
Splenomegaly	14 (60.8%)	6 (9.2%)	4 (40%)	0	0	2 (50%)	1 (5.9%)
Hepatosplenomegaly	7 (30.4%)	6 (9.2%)	4 (40%)	0	0	1 (25%)	1 (5.9%)
Distribution of Cases According to Organomegaly							
Parameters	Malaria	Viral Hepa-titis	Enteric Fever	Leptospi-ro-sis	Den-gue	Scrub Ty-phus	Others
Total Bilirubin (mg/dl)	4.03±1.15	9.27±2.80	2.93±0.32	7.25±2.52	3.1±0.14	4.87±1.18	3.74±1.12
Serum Total Bilirubin Level in Different Aetiologies							
Parameters	Malaria	Viral Hepatitis	Enteric Fever	Leptospi-ro-sis	Dengue	Scrub Ty-phus	Others
AST (iu/l)	207.26±116.67	1204.09±709.10	312.7±123.21	144±40.75	253±86.27	376.50±114.73	235.88±100.64
ALT (iu/l)	205.91±106.82	1288.6±774.26	244.1±76.24	105.75±35.79	211.50±50.20	425.25±96.24	236.23±115.13
ALP (iu/l)	132.17±32.58	189.60±68.90	127.6±32.85	129.75±27.65	124±5.65	132.50±5.97	135.29±53.59
PT (sec)	14.26±2.12	14.4±2.59	14.2±1.87	12.75±0.5	13±1.41	14.75±2.50	16.58±4.75
Other Liver Function Tests							

60.8% of malaria patients had splenomegaly while hepatomegaly was found in 47.8% of patients. In the viral hepatitis group, hepatomegaly, splenomegaly, and hepatosplenomegaly were found in 59 (90.7%), 6 (9.2%), and 6 (9.2%) patients respectively. Only 40% of patients in the enteric fever group had splenomegaly. No organomegaly was found in dengue patients. Viral hepatitis cases (9.27 ± 2.80) had the highest rise in total bilirubin levels followed by leptospirosis (7.25 ± 2.52).

Viral hepatitis had the highest ALT with a mean value of 1288.6 ± 774.26 IU/L. Most cases had an ALT value greater than AST whereas, AST value was greater than

ALT in cases with enteric fever. The mean ALP level decreased from the viral hepatitis group to other aetiologies. PT was prolonged among patients with other diagnoses, with a mean value of 16.58 ± 4.75 sec.

Table 5:

Aetiology	Total leucocyte Count (/cmm)	Hb (g/dl)	Platelet Count (×10 <sup>3</sup> / cmm)	S. Creatinine (mg/dl)	
Malaria	7860.52±3364.78	11.8±3.11	202.78±61.2	1.93±1.84	
Viral Hepatitis	6485.42±2285.89	12.32±1.88	204.56±69.83	1.12±0.69	
Enteric Fever	4846.6±2050.65	13.4±0.84	181.6±66.34	0.98±0.23	
Leptospirosis	10498.25±5678.24	13.5±0.57	192.25±79.26	2.45±2.07	
Dengue	4221.5±1057.13	12.5±2.12	78.5±16.26	1.25±0.49	
Scrub Typhus	8056±2032.37	12.25±1.25	211.25±38.65	1.1±0.12	
Others	12232.94±6998.56	10.2±2.97	193.58±73.23	2.1±1.67	
Other Laboratory Investigations					
Complications	Renal Failure (% of Patients)	Hypoglycaemia (% of Patients)	Shock (% of Patients)	Severe Anaemia (% of Patients)	ARDS (% of Patients)
Malaria (N=23)	7 (30.4%)	3 (13%)	4 (17.4%)	3 (13%)	3 (13%)
Viral Hepatitis (N=65)	7 (10.8%)	4 (6.15%)	3 (4.6%)	1 (1.5%)	2 (3%)
Enteric Fever (N=10)	0	0	3 (30%)	0	0
Leptospirosis (N=4)	2 (50%)	0	0	0	0
Dengue (N=2)	1 (50%)	0	0	0	0
Scrub Typhus (N=4)	0	0	0	0	0
Others (N=17)	9 (52.9%)	2 (11.8%)	3 (17.6%)	2 (11.8%)	2 (11.8%)
Complications According to Aetiology					

Aetiology	Recovered (% of Patients)	Expired (% of Patients)	Unknown (% of Patients)
Malaria (N=23)	19 (82.6%)	3 (13%)	1 (4.4%)
Viral Hepatitis (N=65)	59 (90.7%)	2 (3.1%)	4 (6.2%)
Enteric Fever (N=10)	10 (100%)	0	0
Leptospirosis (N=4)	3 (75%)	0	1 (25%)
Dengue (N=2)	2 (100%)	0	0
Scrub Typhus (N=4)	3 (75%)	0	1 (25%)
Others (N=17)	10 (58.8%)	4 (23.5%)	3 (17.6%)
Total (N=125)	106 (84.8%)	9 (7.2%)	10 (8%)

#### Hospital Outcome

The mean serum creatinine level was the highest in leptospirosis cases with a value of  $2.45 \pm 2.07$  mg/dl. Scrub typhus and leptospirosis cases had the highest haemoglobin (Hb) value while  $11.8 \pm 3.11$  g/dl was the mean Hb level of malaria cases. Both dengue patients had thrombocytopenia with a mean value of  $78.5 \pm 16.26 \times 10^3$  /cmm. Among malaria patients, complications like renal failure, severe anaemia, and ARDS were seen in 30.4%, 13%, and 13% respectively. Among 65 patients with viral hepatitis, 7 had renal failure, 4 had hypoglycaemia and 2 had ARDS. Three patients (30%) presented with shock in the enteric fever group. Two patients with leptospirosis presented with renal failure. No patients in the scrub typhus group presented with complications. Most of the cases recovered during hospital stay while only 3.1% of viral hepatitis patients and 13% of malaria patients expired. Hospital outcomes were not known for 6.2% of viral hepatitis patients.

## Discussion

### Age Distribution

Our study was conducted among 125 patients with an age of more than 12 years. The mean age of the study population was  $37.15 \pm 16.38$  years, with the maximum number of cases between 13-22 years (24%) followed by 23-32 years (23.2%). Gupta M. et al., 2011[9] studied 297 patients with jaundice of infective origin with age groups ranging from 1-60 years and above, where the mean age was found to be 25.3 years.

### Sex Distribution

In our study of 125 patients, 70 (56%) were male and 55 (44%) were female. The male-to-female ratio was 1.27:1. Gadia C. L. B. et al., 2017[10] published a retrospective study of fever and jaundice with 99 cases of males and 99 cases of females. The male-to-female ratio was 1:1. In the study by Syhavonga, B. et al., (2010), males were predominant, like in our study, with a male-to-female ratio of 1.94:1.

### Aetiological Distribution

Many studies have found that hepatitis A is one of the most common among all the hepatitis viral infections in India. In this study, 40 cases (32%) out of 125 cases of infective jaundice were diagnosed as hepatitis A. Similarly, Loitongbam, R. et al., (2014) reported hepatitis A as the commonest cause (32 out of 121 cases), followed by malaria (20 cases) and hepatitis E (15 cases). Das A. K. et al., (2014)[11] also suggested hepatitis A in 33% of cases and hepatitis E in 20% of cases out of 591 cases in a study of acute sporadic viral hepatitis done in North-East India.

### Clinical Presentation

#### a) Fever

All non-viral hepatitis patients had fever at the time of presentation whereas, only 32 (49.2%) out of 65 patients with viral hepatitis were febrile at the time of presentation. Gancheva G. I. et al., (2007)[12] studied 1705 cases of acute viral hepatitis and reported fever in 52% of patients at the time of presentation. Desai H. D. et al., (2020)[13] reported 70 cases of acute viral hepatitis and 37 (52.9%) presented with fever, which was consistent with our study.

#### b) Other Clinical Presentations

Besides fever and jaundice, anorexia was a common presenting complaint in this study, more common in patients with viral hepatitis (89.2%). Similarly, it was present as a presenting complaint in 87.5% of viral hepatitis patients in a study done by Pankhaniya R. N., Parikh Y. N. and Mohan D. S., (2018).[14] Nausea and vomiting were also common presenting complaints in patients with viral hepatitis (52.3%) and to a lesser extent in other aetiological groups. In a study done by Desai, H. D. et al., (2020), nausea or vomiting was present in 55.7% of patients and anorexia was present in 65.7% of patients with acute viral hepatitis.

#### Clinical Signs

In this study, pallor was seen in 21.7% of cases of malaria and 7.7% of cases of viral hepatitis. Bleeding manifestations were seen in 4.3% and 3.1% of malaria and viral hepatitis cases respectively. 33% of cases had pallor and 20.9% of cases had bleeding manifestations in a study of malarial hepatopathy reported by Kaeley, N. et al., (2017).[15] They concluded that bleeding manifestations were seen in more malarial hepatopathy cases compared to non-hepatopathy cases.

### Distribution of Cases with Organomegaly

Out of 23 cases of malaria in our study, 11 cases (47.8%) had hepatomegaly, while 14 cases (60.8%) had splenomegaly on clinical examination. 90.7% of cases of viral hepatitis had hepatomegaly, and 6 cases (9.2%) were found to have splenomegaly. In 10 cases of enteric fever, 6 (60%) cases and 4 (40%) cases had hepatomegaly and splenomegaly respectively. Similarly, Kochar, D. K. et al., (2003)[16] reported 56% and 48% of splenomegaly and hepatomegaly in all malaria cases studied respectively. Daseda, S. and Runwal, G., (2020), studied 50 cases of malaria and found hepatomegaly and splenomegaly in 40% and 64% respectively. Splenomegaly was found in 146 cases (76%) out of 192 malaria cases in the study done by Kakkad, K. et al., (2020).

### Liver Function Derangements:

In the present study, viral hepatitis cases ( $9.27 \pm 2.80$  mg/dl) had the highest rise in total bilirubin levels, followed by leptospirosis ( $7.25 \pm 2.52$  mg/dl). Malaria cases had a mean total bilirubin level of  $4.03 \pm 1.15$  mg/dl. Similarly, Desai, H. D. et al., (2020) reported a mean total bilirubin of 7.99 mg/dl in a study of 70 viral hepatitis cases while Kaeley, N. et al., (2017) reported a mean total bilirubin of  $8.4 \pm 7.3$  mg/dl in their study of malarial hepatopathy cases. They concluded that complications and mortality were significantly high in those with higher bilirubin levels, which was consistent with our study results.

### Other Laboratory Investigations

Thrombocytopenia was seen in dengue patients with a mean platelet count of  $78.5 \pm 16.26 \times 10^3/\text{cmm}$  in this study. Similarly, Devarbhabi, H. et al., (2020) reported thrombocytopenia in their study of dengue hepatitis with a mean of  $38.94 \pm 32.27 \times 10^3/\text{cmm}$ .

### Incidence of Complications

In this study, 7 cases (10.8%) of viral hepatitis had renal failure, while 3 cases (4.6%) developed shock. Renal failure had been reported only in severe cases of acute liver failure (Gancheva, G. I. et al., 2007). 22.2% of patients with acute viral hepatitis A developed acute kidney injury, but patients with acute viral hepatitis B.

### Comparison of Hospital Outcome

Out of 23 malaria cases, 82.6% (19) of the cases had been recovered, while 13% of the cases had succumbed to the disease. In viral hepatitis, the mortality rate was 3.1% of the total 65 cases, and in 6.2% of cases, the outcome was not known. All patients with dengue and enteric fever recovered. Similarly, Desai, H. D. et al., 2020 reported a mortality rate of 7.2% for viral hepatitis and most of

the patients expired due to fulminant hepatic failure. Kaeley N. et al., (2017) reported 11.1% of deaths among the total 215 cases of malarial hepatopathy studied. Ochiai R. L. et al., (2008), [17] in a study of enteric fever in five Asian countries reported that of a total of 42 cases of hospitalization, all cases were recovered and there were no deaths due to enteric fever, which was consistent to our study.

### Conclusion

In our study, viral hepatitis was the leading cause of jaundice due to an infectious cause, followed by malaria. They are found predominantly in male patients and in rural populations. Among the viral hepatitis causes, hepatitis A is the most common infection and is found more commonly in younger age groups. Severe liver dysfunction is seen in patients with viral hepatitis compared to other aetiologies. Complications like renal failure, shock, hypoglycaemia and ARDS are also observed in a few patients.

### Limitations of the Study

The present study has a small sample size and was an observational, institutional study, carried out over a short period of time. Also, investigations for some rare viral aetiologies like CMV, EBV, Parvo virus, etc. are not done. Hence, it is difficult to draw a definite inference. For a more definite picture of the infective aetiologies of jaundice in the community, a more elaborate RCT with a larger sample size will be required.

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