A study of seroprevalence and the associated risk factors of hepatitis C at a tertiary care hospital in Mumbai

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ABSTRACT

Background: Hepatitis C is a hepatotropic virus and shows varied presentation of signs and symptoms in positive cases. The estimated global prevalence of hepatitis C is around 1%. There is lack of data in general population in India on prevalence of hepatitis C, except in targeted population like blood banks.

Aims & objectives: The study was conducted at a tertiary care hospital to estimate seroprevalence of hepatitis C in both sexes & different age groups, association of hepatitis C with signs and symptoms, possible risk factors for the transmission and co morbidities.

Method: A prospective, cross-sectional study was conducted for a period of one year (2018–2019) at a tertiary care hospital and included 600 subjects at a tertiary care hospital. A detailed history of patient was recorded. Five milliliter of blood was collected for testing Hepatitis C by ELISA test. Results were analyzed statistically.

Result: Hepatitis C seroprevalence of 1.8% was observed in present study. It was predominantly seen in age group 0–10yrs (7%). Significant risk factors for hepatitis C were multiple blood transfusions (38.5%). Thalassemia was a statistically significant comorbidity (1.5%) associated with hepatitis C.

Conclusion: Hepatitis C was found more prevalent in 0–10year thalassemic age group. So, a continuous periodic screening of Hepatitis C especially in high-risk groups, like cases of Thalassemia and also in blood transfusion recipients is essential for an early diagnosis. An early diagnosis can improve clinical outcome in the patient, as appropriate therapy and management can be initiated at the earliest, thus, decreasing mortality and morbidity seen in hepatitis C cases.

1. Introduction

Hepatitis C is a hepatotropic virus and shows varied presentation of signs and symptoms in positive cases. About 20% cases develop acute hepatitis and 75–85% of exposed individuals develop chronic disease, further leading to fulminant hepatitis and hepatocellular carcinoma 1 . Unlike Hepatitis B, vaccine for prevention of Hepatitis C is not available yet. Research is going on for the same. The estimated global prevalence of hepatitis C is around 1% 2 . Seroprevalence of Hepatitis C infection in general population is not being carried out in many countries/regions, so the estimated global prevalence is based on weighted averages of regions rather than individual countries 3 . Seroprevalence of hepatitis C infection is mostly done in targeted population groups usually thalassemia or blood donors. There is a scarcity of population-based study for hepatitis C.

1.1. Aims and objectives

The study was conducted at a tertiary care hospital to estimate seroprevalence of hepatitis C in both sexes & different age groups and also study co relation of hepatitis C with associated signs and symptoms, risk factors and co morbidities.

2. Materials and methods

The present study was a prospective, cross-sectional study. Study location: It was conducted at the Department of Microbiology of a tertiary care hospital for a period of one year period from 2018 to 2019.

Study patients: Included 600 patients. The selection of patients was done by systematic sampling method in which every Nth patient was
selected. Randomly selected clinically suspected cases of hepatitis. The study was carried out after permission from the Institutional ethics committee.

2.1. Inclusion criteria

The patients of all age groups & both sexes, from wards & outpatient departments, and who were advised Hepatitis C screening were included in the study. Clinically suspected patients of hepatitis in all age groups and both sexes who were registered at the outpatient department (OPD) & patients admitted in wards were randomly selected and tested for hepatitis C infections.

2.2. Exclusion criteria

Patients who had previously tested positive for hepatitis C & patients who refused to give consent were excluded from the study.

3. Methodology

All patients satisfying the inclusion criteria were included in the study. Written consent from patient was taken. A detailed clinical history was taken & patients were explained about the test procedure. Patients were asked for:

1) complaints of Jaundice, loss of appetite, fever, weight loss
2) History of co morbidities (Thalassemia, Diabetes, HIV status)
3) Patients were assessed for presence of risk factors (Blood transfusion, sharp injury, previous surgery, tattooing, alcohol abuse, IV drug use, renal dialysis)

and the findings were noted down.

Five milliliter of fasting blood sample from each patient was collected aseptically in a plain vacutainer. The serum was separated in sterile vials and then tested by ELISA test as per kit literature. The ELISA kit used was HCV MERILISA kit of Meriline diagnostic Pvt. Ltd. (Gujarat, India). The ELISA is of third generation Sandwich immunoassay. Known serum specimens which had tested positive & negative were included as external positive & negative controls for quality control.

Results were statistically evaluated by applying a univariate analysis, Fischer’s exact test was used for calculating statistical significance.

4. Results

- In the present study, a total of 600 samples were tested for hepatitis C, of which 11 were found to be positive. Thus, seroprevalence of hepatitis C in the present study was found to be 1.8%. Seroprevalence in the pediatric and adult subjects was found to be 1.5% and 0.33% respectively.
- Out of the total 11 positive cases, 9 were male and 2 were female. The male: female ratio was found to be 4.5:1. No statistical significance between gender and Hepatitis C was observed.
- Mean age of hepatitis C positive cases in the present study was found to be 14.18yr.
- Hepatitis C cases were seen predominantly in 0–10yr (7%) age group, followed by 11–20yr (1.9%).
- A total of 26 patients had jaundice, amongst which, ten patients (38.5%) tested positive for hepatitis C (p value < 0.001). A total 28 patients had loss of appetite out of which 11 (39.3%) tested positive (p value < 0.001) and 13 had weight loss of which 11 (84.6%) tested positive (p value < 0.001). These signs and symptoms were found to be statistically significant.
- The Liver function test panel which included SGOT, SGPT, Serum bilirubin, Alkaline phosphatase, Serum albumin, Serum protein were compared in hepatitis C positive and negative cases. It was observed that mean liver function test in hepatitis C positive patients were significantly increased as compared to hepatitis C negative cases (Fig. 1).
- In the present study, blood transfusion was found to be a statistically significant associated risk factor for hepatitis C (Table 1). Twenty-six cases had received blood transfusion, of which, ten (38.5%) cases tested positive for Hepatitis C (p value < 0.001) and odds ratio (358.125).
- Out of the 10 patients, nine patients had thalassemia and 1 patient (age >51 year) had history of past surgery along with blood transfusion (Fig. 2).
- One patient (age 21–30 year) who tested positive for hepatitis C gave a history of tattooing.
- In the present study, a significant statistical association of thalassemia and Hepatitis C was observed. Out of 26 thalassemia patients, nine (34.6%) tested positive for hepatitis C infection (p value < 0.001) and (odds ratio 151.412).

5. Discussion

In the present study, seroprevalence of hepatitis C was observed to be 1.8%. As per Hepatitis C fact sheet by World Health Organization (WHO), prevalence of hepatitis C is high in Eastern Mediterranean and European regions, with a prevalence of 2.3% and 1.5% respectively. Prevalence of HCV infection in other regions varies from 0.5% to 1.0%. In India the prevalence is estimated to be around 1%.

Different regions/countries have different prevalence of hepatitis C as seen in Table 2. The probable reason for the varied prevalence could be because of different cultural practices, socio economic status and human behaviour.

In the present study, males were observed to be affected more than females. Prasad A. 2017 & Laifangbam S. 2014 and Chakraborty A. 2015 found similar male preponderance. In all the above studies, there was no significance of gender with respect to hepatitis C infection.

In the present study, patients of all age groups were included but 0–10year age group was found to be predominantly affected. There was no attempt to include targeted population with any of the age or risk factors associated with hepatitis C. The selection of patients in the study was systematic random as every Nth sample was selected as per the statistical calculation. Of the 11 cases of hepatitis C, nine (1.5%) were observed in pediatric age group. Chakraborty A. 2015 found age group of less than 15year to be the most affected. Another study by Agrawal S. 2015 found maximum positive cases of hepatitis C in 12–18year age group followed by 9–12 year age group and these were predominantly seen in thalassemia patients who had multiple blood transfusions. Contrarily Laifangbam S. 2014 in their study, conducted at Manipur observed maximum hepatitis C cases in 41–50year age group in males and 31–40year age group in females. In their study, intravenous drug use was found to be a major risk factor for transmission of hepatitis C. The reason for higher age preponderance in the above study could probably be because of increased rate/clustering of patients of substance abuse in Manipur.

Jaundice, loss of appetite and weight loss were observed to be significantly associated with Hepatitis C in the present study. A study by Owusu M. 2012 found hepatitis C (3.2%) as the third major cause of jaundice preceded by HEV (7.1%) & HBV (31%).

Mean Liver function test was significantly increased in Hepatitis C positive patients in the present study (Fig – 1). A study conducted by Singh K. 2012 had similar findings of increased liver function test in hepatitis C patients. They also found that in most of the liver dysfunction cases, hepatitis B followed by hepatitis C are the major causative agents. Hepatitis C is a hepatotropic virus. It affects hepatocytes & causes liver injury. Hepatic dysfunction leads to loss of ability of Liver to conjugate bilirubin. In acute infection, symptoms are usually mild. But in chronic infections, inflammatory cells infiltrate the liver parenchyma ultimately leading to cirrhosis which leads to compression of the intra hepatic biliary tree further leading to increase in bilirubin and other liver
enzymes.

Blood transfusion was observed to be a significant risk factor for Hepatitis C in the present study (Table 1). Similar findings were observed by Mukherjee K.\(^5\), Hossain B\(^14\) and Ghafourian Boroujerdnia M\(^15\) at Iran in 2007. Qureshi H\(^16\) in their study, observed reuse of syringes as an important risk factor to be associated with Hepatitis C infection. Another study by Malhotra P.\(^17\) conducted at Haryana in 2015 observed previous surgery & tattooing as major risk factors for hepatitis C infection.

A significant statistical association of hepatitis C infection with thalassemia was observed in the present study (Table 1). Of the 11/600 (1.8%) cases of hepatitis C observed in the present study, 9 out of 11 cases were patients with thalassemia, thus giving a seroprevalence of 1.5% in this study group. The higher percentage of positivity of hepatitis C in patients with thalassemia is probably because these patients require multiple blood transfusion which increases the chance of blood acquired infections. The present place of study also has a thalassemia OPD, so investigations for blood borne infections are routinely requested for these patients. This may probably be the reason for the higher percentage of hepatitis C positivity in patients with thalassemia. The

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### Table 1

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Hepatitis C (N = 600)</th>
<th>Total</th>
<th>Chi square value</th>
<th>P value</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P(N = 11)</td>
<td>N(N = 589)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Blood transfusion</td>
<td>Y 10 (38.5%)</td>
<td>16 (61.5%)</td>
<td>26 (100%)</td>
<td>202.600</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td>N 1 (0.2%)</td>
<td>573 (99.8%)</td>
<td>574 (100%)</td>
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</tr>
<tr>
<td>Sharp injury</td>
<td>Y 0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>N 11 (1.8%)</td>
<td>589 (98.2%)</td>
<td>600 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past Surgery</td>
<td>Y 1 (2.8%)</td>
<td>35 (97.2%)</td>
<td>36 (100%)</td>
<td>0.190</td>
<td>0.663</td>
</tr>
<tr>
<td></td>
<td>N 10 (1.8%)</td>
<td>554 (98.2%)</td>
<td>564 (100%)</td>
<td></td>
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</tr>
<tr>
<td>Tattooing</td>
<td>Y 1 (3.3%)</td>
<td>29 (96.7%)</td>
<td>30 (0%)</td>
<td>0.395</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td>N 10 (1.8%)</td>
<td>560 (98.2%)</td>
<td>570 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol history</td>
<td>Y 2 (4.7%)</td>
<td>41 (95.3%)</td>
<td>43 (100%)</td>
<td>2.044</td>
<td>0.153</td>
</tr>
<tr>
<td></td>
<td>N 9 (1.6%)</td>
<td>548 (98.4%)</td>
<td>557 (100%)</td>
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</tr>
<tr>
<td>IV Drug abuse</td>
<td>Y 0 (0%)</td>
<td>2 (100%)</td>
<td>2 (100%)</td>
<td>0.037</td>
<td>0.846</td>
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<tr>
<td></td>
<td>N 11 (1.8%)</td>
<td>587 (98.2%)</td>
<td>598 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renal dialysis</td>
<td>Y 0 (0%)</td>
<td>1 (100%)</td>
<td>1 (100%)</td>
<td>0.019</td>
<td>0.891</td>
</tr>
<tr>
<td></td>
<td>N 11 (1.8%)</td>
<td>588 (98.2%)</td>
<td>599 (100%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Place</th>
<th>Seroprevalence of Hepatitis C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sood S. et al.(^4)</td>
<td>2008</td>
<td>Rajasthan</td>
<td>0.28%</td>
</tr>
<tr>
<td>Mukherjee K. et al.(^5)</td>
<td>2011</td>
<td>West Bengal</td>
<td>24.6%</td>
</tr>
<tr>
<td>Din G et al.(^6)</td>
<td>2013</td>
<td>Pakistan</td>
<td>49%</td>
</tr>
<tr>
<td>Chakraborty A. et al.(^7)</td>
<td>2014</td>
<td>Kolkata</td>
<td>1.5%</td>
</tr>
<tr>
<td>Yousefi M. et al.(^8)</td>
<td>2017</td>
<td>Iran</td>
<td>8.5%</td>
</tr>
<tr>
<td>Present study</td>
<td>2018</td>
<td>Mumbai</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

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Fig. 1. Mean of Liver function tests in Hepatitis C
Fig. 1 shows the comparison of mean liver function tests in hepatitis C positive and negative cases (Y axis-absolute numbers).

Fig. 2. Co morbidities associated with Hepatitis C
HCV positivity by ELISA test was assessed in patients with different co-morbid conditions (Fig. 2). (Y axis-absolute numbers).
following authors have done studies in targeted population like in thalassemic study groups and have found varied seroprevalence of Hepatitis C. Mukherjee K. has reported a seroprevalence of 2% and Yousefi M. found a seroprevalence of 8.5% of Hepatitis C whereas a higher seroprevalence of 24% and 49% of Hepatitis C was observed by Agrawal S. and Din G. respectively in thalassemia study groups.

6. Conclusion

Lack of an effective vaccine and the increased risk of serious complications have made prevention and early detection of HCV extremely important. Hence, a continuous periodic screening of Hepatitis C especially in high-risk groups like in thalassemia patients and also in blood transfusion recipients is essential for an early diagnosis.

Scaling up the screening for an early diagnosis can improve clinical outcome in the patient, as appropriate therapy and management can be initiated at the earliest, thus, decreasing mortality and morbidity seen in hepatitis C infection.

Author contribution

Ingle R; Writing original draft, Methodology, Chaya A K; Conceptualization, Supervision, Validation, Chavan S; Data curation, Taklikar S; Formal analysis, Baveja S; Project Administration, Supervision.

Consent from patients

Taken.

Ethics approval

Institutional ethics committee approval taken. (Ref. ID: D020160137 dt: 23/12/2016)

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Declaration of competing interest

None.

Acknowledgement

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