Outbreak of viral hepatitis B in a rural community in India linked to inadequately sterilized needles and syringes


In India, virtually all outbreaks of viral hepatitis are considered to be due to faeco-oryally transmitted hepatitis E virus. Recently, a cluster of 15 cases of viral hepatitis B was found in three villages in Gujarat State. The cases were epidemiologically linked to the use of inadequately sterilized needles and syringes by a local unqualified medical practitioner.

The outbreak evolved slowly over a period of 3 months and was marked by a high case fatality rate (46.7%), probably because of concurrent infection with hepatitis D virus (HDV) or sexually transmitted infections. But for the many fatalities within 2–3 weeks of the onset of illness, the outbreak would have gone unnoticed.

The findings emphasize the importance of inadequately sterilized needles and syringes in the transmission of viral hepatitis B in India, the need to strengthen the routine surveillance system, and to organize an education campaign targeting all health care workers including private practitioners, especially those working in rural areas, as well as the public at large, to take all possible measures to prevent this often fatal infection.

Introduction

In India, virtually all outbreaks of viral hepatitis are considered to be due to faeco-oryally transmitted hepatitis non-A, non-B virus (HEV) (I–3). Outbreaks of viral hepatitis A have also been reported occasionally (I). In contrast, although there has been a sudden increase in cases of viral hepatitis B admitted to hospitals (4, 5), no outbreaks have been reported in the community setting in India.

However, an unusual clustering of cases of viral hepatitis B was recently observed in rural areas of Mehasana district, Gujarat State, India. In this article, we describe the epidemiological importance of this outbreak.

The outbreak was centred in three villages (Khata-Amba, Parsa, and Charadu), especially in Khata-Amba. Most of the population in the affected villages is engaged in occupations related to agriculture. Many people from Khata-Amba, including some of the patients, worked in nearby towns such as Surat and Ahmedabad, but came to the village every year around the time of Diwali (which in 1996 was on 10 November) to celebrate this festival.

The district health authorities learned on 13 January 1997 that an adult male, who was a resident of Khata-Amba, had died from viral hepatitis on 7 January 1997. Many more cases were identified in a subsequent house-to-house survey in this village and in Parsa and Charadu. Since blood samples taken from patients were positive for hepatitis B surface antigen (HBsAg), the episode was investigated systematically.

Materials and methods

The age, sex, education level, occupation, place of work, date of onset of illness, signs and symptoms, and results of laboratory investigations were deter-
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minded for all the surviving patients. The patients, their family members, or doctors who had treated them were also interviewed in order to identify any of the following risk factors for viral hepatitis B that may have been present from 6 months up to 15 days before the onset of illness: intramuscular/intravenous injections; blood transfusion; dental treatment; surgical operation; hospital admission for any cause; any chronic illness requiring frequent treatment; tattooing; and contact with a case of jaundice within or outside the family.

It soon became apparent that a local unqualified medical practitioner had administered intramuscular injections for minor ailments to many patients around the time of the Diwali festival. All the local medical practitioners in the affected villages were therefore thoroughly interviewed to determine their qualifications and treatment practices, and two types of epidemiological studies were planned, as described below.

- House-to-house surveys were carried out on 4–6 March 1997 in the three affected villages (Khata-Amba, Parsa and Charadu) and in one nearby village (Boru) that was not covered by the implicated medical practitioner. Health workers went from house to house to collect any histories of jaundice since the Diwali festival (10 November 1996).
- At least 75 apparently healthy persons from Khata-Amba had been given injections by the implicated medical practitioner in October–November 1996 and blood samples were collected at random from 31 of these individuals. An equal number of age- and sex-matched control samples were also collected from individuals who had never been given injections by this practitioner.

Laboratory investigations

Blood samples were drawn from all cases in the study villages who were reported to have had jaundice since the Diwali festival, as well as from their healthy contacts. Sera were separated in Civil Hospital, Gandhinagar, and transported to the main laboratories of the National Institute of Communicable Diseases, Delhi, for testing for markers of viral hepatitis. The sera of cases were tested using a macro-ELISA kit (enzyme-linked immunosorbent assay) (bead ELISA) (Abbott Laboratories, North Chicago, IL, USA) for IgM anti-HAV (hepatitis A virus), IgM anti-HBc, HBsAg, anti-HCV (hepatitis C virus), and anti-HEV (hepatitis E virus). The samples were also tested for IgM anti-HEV using ELISA kits (Genelabs Diagnostics, Singapore). All samples found positive for HBsAg were tested for anti-HDV. Serum samples from apparently healthy persons were tested for HBsAg and anti-HBc using bead ELISA (Abbott Laboratories, North Chicago, IL, USA).

Results

Details of the 15 individuals for whom there was evidence of hepatitis B are shown in Table 1. None of these individuals was positive for markers of HAV, HCV, and HEV; of 11 samples tested, 3 were positive for anti-HDV (hepatitis D virus). All the cases of viral hepatitis B were adults aged ≥19 years and nine were male. Seven patients died within 2–3 weeks of the onset of their illness (case fatality ratio, 47% (7/15)). At least three patients who died had evidence of sexually transmitted disease (penile ulcers), one of whom had worked in Surat away from his family for the previous 5 years.

None of 15 patients with viral hepatitis B had a history of hospital admission, blood transfusion, intravenous injections, tattooing, or dental treatment between 6 months and 15 days before the onset of illness. Two cases were related to each other (uncle-nephew) but in no other instances was there a history of contact with a case of jaundice within or outside family. One patient had bronchial asthma and another, hypertension.

At least 10 of the 15 patients with viral hepatitis B were definitely/probably treated for minor illnesses by the implicated local practitioner (K.K.P.) and had received injectable drugs around Diwali. The remaining five patients or their relatives were not available or did not cooperate to elicit this information.

K.K.P. claimed to have qualifications from the Gujarat Board in Ayurvedic and Unani medicine. However, he frequently treated patients with injectable drugs, e.g. gentamicin, ampicillin, chloramphenicol, or Deriphyllin; usually, he administered only one injection of antibiotic and then prescribed other drugs. He had a clinic at Parsa, where a boiler (for syringe and needles) was connected to an electric power point. In Khata-Amba village he went from house to house to treat patients, and claimed to carry one syringe and many needles to give injections, asking for hot water to rinse the syringe before giving an injection. The villagers, however, claimed that he carried only one syringe and one needle on his visits to Khata-Amba and rinsed these in hot water before giving injections. From time to time, he also went to Charadu village to treat patients.

Another local practitioner (M.S.P.) who claimed to have received a medical degree in April
1995, had been practising in Khata-Amba for 7 months when the study was carried out. He treated patients in his clinic only, he also prescribed injections, but reportedly used only disposable syringes and needles. Nevertheless, he was aware of the importance of boiling syringes and needles before giving injections.

As shown in Table 2, house-to-house surveys by paramedics revealed 14, 3, and 2 cases of jaundice, respectively, in Khata-Amba, Parsa, and Charadu. Of these cases, two in Khata-Amba were considered not to have clinical jaundice by a medical officer and two additional cases had no laboratory evidence of viral hepatitis B. No case of jaundice was discovered in Boru village. The attack rate of jaundice in Khata-Amba (5.1 per 1000 population) was significantly higher than that in Parsa (1 per 1000), Charadu (0.5 per 1000), or Boru (0 cases).

As shown in Table 3, the prevalence of HBsAg or anti-HBc among apparently healthy persons in Khata-Amba was about 42% (13/31) for individuals who had received injections from K.K.P. in October–November 1996. In contrast in the control group (those who never had injections from K.K.P.) none of the samples was positive for HBsAg and 13% (4/31) were positive for anti-HBc. This difference was statistically significant irrespective of whether HBsAg alone or both markers were considered.

The reported data on viral hepatitis from Itadara primary health care centre, Mehasana district, and Gujarat State over the period 1991–96 are shown in Table 4. Since the immunological markers of viral hepatitis are not easily available, the data can not be stratified according to type of viral hepatitis. Nevertheless, the case fatality rate has never been more than 4% during this period. Interestingly, Itadara primary health centre reported only one case, in 1995.
Table 3: HBsAg seropositivity among apparently healthy persons in the study villages

<table>
<thead>
<tr>
<th>Village</th>
<th>No. tested</th>
<th>No. positive for:</th>
<th>HBsAg</th>
<th>Anti-HBc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons given injection by K.K.P.</td>
<td>Khata-Amba</td>
<td>31*</td>
<td>7 (23)*</td>
<td>6 (25)*</td>
</tr>
<tr>
<td>Persons never given injection by K.K.P.</td>
<td>Khata-Amba</td>
<td>31</td>
<td>0</td>
<td>4 (13)</td>
</tr>
<tr>
<td>Unaffected village</td>
<td>Boru</td>
<td>10</td>
<td>0 (0)</td>
<td>Not tested</td>
</tr>
<tr>
<td>Contacts of cases</td>
<td>Charadu, Khate-Amba, and Parsa</td>
<td>24</td>
<td>1 (4)</td>
<td>Not tested</td>
</tr>
<tr>
<td>Health workers c</td>
<td>Khata-Amba</td>
<td>3</td>
<td>0 (0)</td>
<td>Not tested</td>
</tr>
</tbody>
</table>

* Only 24 samples (negative for HBsAg) were tested for anti-HBc.
  Figures in parentheses are percentages.
  c Includes the two private practitioners (K.K.P. and M.S.P.) and one other health worker.

Table 4: Reported cases and deaths from viral hepatitis in Itadara primary health centre (PHC), Mehasana district, and Gujarat State, 1991–96

<table>
<thead>
<tr>
<th>Year</th>
<th>PHC Itadara:</th>
<th>Mehasana district:</th>
<th>Gujarat State:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases</td>
<td>Deaths</td>
<td>CFRa</td>
</tr>
<tr>
<td>1991</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1992</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td>1993</td>
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<td>1994</td>
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<td>0</td>
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<td>1995</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1996</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

a CFR = case fatality rate.

Discussion

Our epidemiological and laboratory findings confirm the outbreak of viral hepatitis B, which centred mainly in Khata-Amba village. The outbreak was epidemiologically linked to the use of inadequately sterilized needles and syringes by an unqualified medical practitioner.

At least 10 of 15 patients with viral hepatitis B were definitely/probably treated for minor illnesses by a local unqualified medical practitioner and administered injectable drugs around the time of the Diwali festival (10 November 1996). The remaining patients or their relatives were either not available for interview or did not cooperate to enable us to elicit this information. A total of 13 of 31 (42%) blood samples collected from apparently healthy persons who had also received injections from K.K.P. were also positive for HBsAg or anti-HBc. In contrast, only 4 of 31 (13%) samples collected from those who had never received injections from K.K.P. were positive for anti-HBc; none of these was positive for HBsAg. Similarly, a house-to-house survey did not reveal any case of hepatitis in Boru village, which had similar demographic characteristics but which was not visited by K.K.P.

The outbreak was marked by a high case fatality rate (46.7%). A total of 3 of 11 samples from viral hepatitis B cases were positive for anti-HDV: two of three fatal cases whose serum samples were available for testing by NICD were positive for anti-HDV. Co-infection with hepatitis B and D viruses (IgM-HBc positive) as well as superinfections (IgM-HBc negative) have been reported to cause both
fulminant hepatitis and high mortality rates (5, 6). Therefore, concurrent infections with hepatitis B and D viruses may, at least partly, explain the high case fatality rates observed in this outbreak (5). However, at least three additional patients who died had evidence of sexually transmitted diseases, and reportedly had penile ulcers that were being treated by K.K.P.

Had it not been for the high mortality rate, the outbreak would have gone unnoticed, and reinforced the impression that community outbreaks of viral hepatitis B do not occur in India. Many cases had already occurred by the time the health authorities identified the first death in Khata-Amba village. In fact, while carrying out this study we found another cluster of viral hepatitis B cases centred in Dholasan, a village about 40 km from Khata-Amba, which had not been identified and reported through the routine surveillance system; this outbreak was also later confirmed as viral hepatitis B. The data on viral hepatitis (Table 4) also indicate the low sensitivity of the routine surveillance system. On average, about 200 cases of viral hepatitis are reported every year from Mehasana district (population >3 million), whereas community-based studies estimate that its incidence is around 1 per 1000 population (7).

Our results also document the indiscriminate use of drugs, especially antibiotics by unqualified practitioners, who are a common feature of country areas in India. Pathogens, e.g. Salmonella typhi, rapidly develop resistance to low doses of antimicrobials (8). This is another area for serious concern, which requires continuous monitoring and appropriate use of antimicrobials in clinical practice.

In conclusion, our findings emphasize the following: the importance of inadequately sterilized needles and syringes in the transmission of viral hepatitis B in India; the need to strengthen the routine surveillance system; and the need to organize a health education campaign targeting all health care workers, including private practitioners, especially those in rural areas, and the public at large, to take all possible measures to prevent the spread of this often fatal infection.

Résumé

Flambée de cas d'hépatite B liée à une stérilisation insuffisante des aiguilles et des seringues dans une communauté rurale de l'Inde, 1997

La quasi-totalité des flambées d'hépatite virale survenant en Inde sont considérées comme dues à une transmission féco-orale du virus de l'hépatite E. Le virus de l'hépatite B n'a jamais été mis en cause dans des flambées observées dans la communauté. Ce rapport décrit un groupement inhabituel de 15 cas d'hépatite B dans trois villages adjacents du district de Mehsana, dans l'Etat du Gujerat.

La flambée s'est développée lentement, sur une période de trois mois. Les 15 cas concernaient des adultes de plus de 19 ans, dont neuf de sexe masculin. Sept malades sont décédés dans les 2 à 3 semaines suivant le début de la maladie, ce qui représente un taux de létalité de 47% (7/15). Aucun des cas n'était positif pour les marqueurs de l'hépatite A, C ou E. Trois prélèvements sur 11 étaient positifs pour l'anticorps anti-hépatite D (HDV); deux des trois cas mortels pour lesquels on disposait d'échantillons sérologiques étaient positifs pour l'anti-HDV.

Aucun des malades n'avait d'antécédents d'hospitalisation, de transfusion sanguine, d'injections intraveineuses, de tatouage ou de soins dentaires dans les six mois précédant le début de la maladie, à l'exception des 15 derniers jours. Deux cas présentaient un lien de parenté (oncle et neveu); les autres cas n'étaient eu aucun contact avec un cas d'ictère que ce soit au sein ou en dehors de la famille. En revanche, au moins 10 des 15 malades avaient été traités ou probablement traités pour des affections mineures par un praticien local non qualifié (K.K.P.) et avaient reçu des injections de médicaments au moyen d'aiguilles et de seringues insuffisamment stérilisées. Les autres malades (ou membres de leur famille) n'ont pu être interrogés ou ont refusé de donner ce type d'information. De plus, 13 échantillons de sang sur les 31 (42%) prélevés chez des sujets apparentement en bonne santé mais ayant également reçu des injections pratiquées par K.K.P. ont été trouvés positifs pour l'HBsAg ou l'anti-HBc, alors que seulement 13% d'un nombre égal d'échantillons prélevés chez des sujets n'ayant jamais reçu d'injections par K.K.P. étaient positifs pour l'anti-HBc, et aucun d'entre eux n'était positif pour l'HBsAg. La différence entre les deux groupes était statistiquement significative, que l'on considère seulement l'HBsAg ou les deux marqueurs.

Sans cette forte mortalité, la flambée serait passée inaperçue et aurait renforcé l'idée selon laquelle il n'existe pas de flambées d'hépatite B en Inde. De nombreux cas étaient déjà survenus lorsque les autorités sanitaires ont eu connaissance du premier décès associé à cette flambée. En effet, lors de l'enquête, les auteurs ont rencontré un autre groupe de cas d'hépatite B centré sur un village éloigné; cette flambée, non encore identifiée et

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rapportée par le système de surveillance de routine, a par la suite été identifiée comme étant due à l'hépatite B.

Cette étude souligne le rôle des aiguilles et seringues insuffisamment stérilisées dans la transmission de l'hépatite B en Inde, la nécessité de renforcer le système de surveillance de routine et la nécessité d'organiser une campagne d'éducation sanitaire destinée à tous les agents de soins de santé y compris les praticiens indépendants, en particulier dans les régions rurales, ainsi qu'au grand public, afin que toutes les mesures soient prises pour éviter cette infection mortelle.

References


