No evidence of transmission from an acute case of hepatitis A in a foodhandler: follow-up of almost 1,000 potentially exposed individuals, London, United Kingdom, April 2012

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Identification of acute hepatitis A virus (HAV) infection in a foodhandler in a London hotel led to a large incident response. We identified three potentially exposed groups: hotel staff who had regularly consumed food prepared by the case and shared toilet facilities with the case, patients who shared the same hospital ward as the case and hotel guests who consumed food prepared by the case. We arranged post-exposure HAV vaccination for all 83 potentially exposed hotel staff and all 17 patients. We emailed 887 guests advising them to seek medical care if symptomatic, but did not advise vaccination as it was too late to be effective for most guests. Through the International Health Regulations national focal points and the European Union Early warning and response system (EWRS), we communicated the details of the incident to public health agencies and potential risk of HAV transmission to international guests. Potentially exposed hotel staff and guests were asked to complete an online or telephone-administered questionnaire 50 days following possible exposure, to identify any secondary cases. Survey response was low, with 155 responses from guests and 33 from hotel staff. We identified no secondary cases of HAV infection through follow-up.

Introduction

On 10 April 2012, the local Health Protection Unit was alerted to a hospitalised patient with hepatitis A virus (HAV) IgM antibodies consistent with a recent HAV infection, who was a foodhandler at a busy London hotel in the United Kingdom (UK). The patient had returned from travel abroad four days before onset of symptoms (information obtained through a trawling questionnaire).

The patient was admitted to hospital with a seven-day history of fever, mild diarrhoea, vomiting and epigastric pain and developed jaundice on 4 April, which indicated a clinical suspicion of HAV infection. The patient was discharged home six days later once the clinical symptoms had resolved.

According to guidance from the Health Protection Agency (HPA) – now Public Health England since April 2013 – the case definition for a confirmed case of hepatitis A is a person who meets the clinical case definition (an acute illness with a discrete onset of symptoms AND jaundice or elevated serum aminotransferase levels) and is laboratory confirmed (IgM antibodies to HAV (anti-HAV) positive) [1]. The case was notified to the local Health Protection Unit when the infection was confirmed, although notification based on clinical suspicion would have increased the time for public health action and reduced the number of contacts for follow-up.

The infectious period is taken from two weeks before the onset of symptoms to one week after onset [1]. As the maximum incubation period is 50 days, a secondary case may not be symptomatic until 8 weeks after symptom onset of the first case [2]. In this incident, the case had worked for six days when they would have been infectious, preparing and handling uncooked food such as cold meats and bread rolls for the breakfast buffet and salads at the hotel's snack bar. Infectious foodhandlers with HAV, which is transmitted faeco-orally, are a recognised source of food-borne outbreaks [1,3]. The risk of transmission is increased if infectious foodhandlers prepare uncooked food or food that is handled after cooking [1-3]. In non-endemic countries such as the UK, where most of the population are susceptible

FIGURE

Timeline describing steps taken to identify individuals at risk following possible exposure to an acute case of hepatitis A, London, United Kingdom, April 2012

HAV: hepatitis A virus; HNIG: human normal immunoglobulin.

to HAV infection [4], outbreaks resulting from an infectious foodhandler have resulted in large numbers of secondary cases of HAV infection [5-7].

Secondary cases can be averted by timely administration of post-exposure HAV vaccination, up to two weeks after exposure, and human normal immunoglobulin (HNIG) can be given to those most vulnerable to infection (those aged over 50 years or with comorbidities) up to 28 days post exposure [1,8-10]. Given the infectiousness of HAV, and the opportunity to prevent secondary cases post exposure, the public health response to identification of an HAV-infected foodhandler can result in large-scale interventions [11,12].

Following the identification of the case in London in April 2012, we convened an incident response team, aiming to promptly identify individuals exposed to a potential infection risk in order to offer post-exposure vaccination and to inform hotel guests who were potentially at risk. We conducted a follow-up study aiming to identify any secondary cases of HAV infection among

those exposed and hence to estimate the transmission risk in this incident. This would also add to the evidence base on the transmissibility of hepatitis A from infected foodhandlers.

Risk assessment and identification of exposed contacts

Our first step was to conduct a risk assessment according to guidance of the Health Protection Agency (HPA) – now Public Health England since April 2013 – which required consideration of the following: the symptom onset date for the case; duties carried out by the case; whether the case had undertaken a food hygiene course; the hotel's food preparation area and hand-washing facilities; and the level of exposure of contacts and whether the possible exposure was single or continuous [1].

Symptom onset of the case was 28 March 2012, with appearance of jaundice on 4 April (Figure). The case was considered to be infectious from 14 March to 10 April. This corresponds to 14 days before the onset of

symptoms and 7 days after symptom onset. The case worked for six days while infectious, between 26 March and 4 April, and was symptomatic with diarrhoea and fever (temperature unknown) for three of those days (31 March, 1 and 4 April) (Figure). The case was hospitalised on 4 April, staying on an open ward from 5 April to 10 April, contrary to hospital infection control guidelines [1].

An inspection of the hotel kitchen and hygiene practices was conducted by an Environmental Health Officer and practices were assessed to be good, with adequate hand-washing facilities, appropriate staff food hygiene training and use of non-powdered latex gloves. The case was judged to have followed good hygiene practices, including appropriate hand-washing and wearing gloves when handling food, and had undertaken a food hygiene course.

Given their food preparation role, the number of contacts who had eaten food prepared by the foodhandler and the ongoing daily possible exposure of hotel staff, we considered that there were three groups of people at risk of infection: hotel staff, hotel guests and hospital patients (Figure). The foodhandler's close family members were vaccinated with HAV vaccine by a general practitioner (GP) on the day the case was notified.

The staff in the hospital ward in which the case stayed were deemed to be low risk as the case used toilet facilities independently, washing their hands after use, and there was no sharing of toilet facilities by the case and staff. Staff were assessed as using appropriate personal protective equipment, thus maintaining hospital infection control procedures where required by the hospital infection control team.

According to the HPA guidance, the time period for public health action is defined by the type of exposure. For continuous exposures, the definition of time since exposure is the number of days since onset of first symptoms, even if exposure actually started before this time during the pre-symptomatic infectious period. For single exposures, time since exposure should be calculated as either the number of days since onset of first symptoms in the index case or the number of days since exposure to the index case, whichever is the most recent. In the incident described here, the time since onset of first symptoms in the case was used, rather than the time since onset of jaundice, as the evidence for the post-exposure efficacy of HAV vaccine is based on its use within 14 days of first symptom onset in the index case [1].

Hotel staff were considered to have been exposed to an infection risk if they worked between 26 March and 5 April 2012, i.e. the period in which the case was infectious and at work, plus an additional day to include possible consumption of leftover food. These individuals were considered to have been potentially continuously exposed to the case, sharing bathroom

facilities and eating breakfast and lunch prepared by the case. Although the case was at work on 28 March, their symptoms did not start until after their shift had ended: therefore, following the HPA guidance, their possible exposure was considered to have 'started' on 31 March, the first day the case was symptomatic and at work, until 5 April when they could have eaten leftover food prepared by the case on 4 April (Figure). Therefore, the 14-day window for issuing post-exposure vaccination started on 31 March.

Guests staying at the hotel between 25 March and 5 April were considered to have potentially had a 'single-point' exposure, as they could have eaten food prepared by the case during the case's infectious period. All guests had breakfast included in their tariff so those that arrived on 25 March may well have eaten breakfast and/or eaten from the snack bar on 26 March.

Hospital patients staying on the open ward with the case from 5 to 10 April were considered potentially to have had continuous exposure (Figure). While the HPA guidelines define the infectious period as lasting one week after symptom onset, thus implying the last date for infectivity was 4 April, we assessed that given the case was symptomatic with diarrhoea and sharing common bathroom facilities and the vulnerability of the other patients, all patients sharing the ward from 5 April to 10 April were at risk. They were given a letter informing them of their possible exposure, recommending them to be vaccinated and to visit their GP if they developed symptoms suggestive of HAV infection within the next 50 days. As it was considered that GPs would inform the public health team if any patients developed symptoms, the hospital patients were not included in our follow-up.

We considered that hotel guests had a lower risk of infection than hotel staff and hospital patients, as they did not share toilet facilities and had no direct contact with the case and the case's food hygiene was judged to be exemplary.

Public health action

We obtained a list of potentially exposed hotel staff, name, date of birth, address details and contact numbers on 11 April. Given the requirement for post-exposure vaccination to be issued within 14 days of the onset of symptoms in an index case, vaccination had to be arranged within two days to confer protection (Figure). With cooperation of hotel management and the local Primary Care Trust, we organised a vaccination clinic at the hotel on 13 April. All potentially exposed staff were contacted by letter, translated as required as many staff did not use English as a first language, which was hand delivered to the hotel management team on 12 April for distribution to both day and night hotel staff the same day. The letter explained the nature of the potential exposure and the recommendation of HAV vaccine and information on hepatitis A.

On 13 April, we obtained the contact details for guests who had made direct reservations and for booking agencies (who had arranged block bookings with the hotel). Contact details for guests who made direct bookings were limited to email addresses and we did not have postal addresses or country of residence. From email addresses, it was presumed that many guests were from outside of the UK. By this time, the 14-day post-exposure limit for vaccination had been exceeded for most guests (Figure). But it was not clear where the guests lived nor was it known how many other people had occupied each room, and it was logistically unfeasible to offer vaccination for all guests. We prepared a standard letter for all guests, providing information on the possible exposure and information on HAV that listed symptoms and advised them to seek medical attention if they developed symptoms suggestive of HAV infection [1]. We asked them to inform the local Health Protection Unit if they developed symptoms or were diagnosed with HAV infection by a health professional. We sent the letter by email to guests for whom we had email addresses and requested booking agencies to send the letter to their guests on our behalf.

We contacted other national public health agencies on 16 April to inform them of the potential risk of HAV transmission through the International Health Regulations (IHR) [13] National Focal Points and European Union Early warning and response system (EWRS) [14]. A dedicated email address was set up for use during the incident so that all responses were managed by the dedicated incident response team. We received email correspondence from 15 countries requesting further information, to which we replied to individually. Further to the emails received, we also had telephone conversations with two international public health departments. The reason for informing the public health authorities through the IHR National Focal Points and EWRS was to identify any secondary cases related to this incident following countries' own risk assessments, in the knowledge that they would contact the local Health Protection Unit with details of cases identified as having stayed at the hotel during the investigative period through their own reporting mechanisms.

Hospital staff organised vaccination on 19 April for potentially exposed patients still in hospital. All patients who needed HNIG were invited to attend a clinic at the hospital on the 19th to receive this (Figure). Where potentially exposed patients had been discharged from hospital, we telephoned them and their GPs to inform them of the possible exposure. Vaccination clinic times were arranged at the time of the call with the GP's practice and we advised patients to obtain vaccination at the practice at the arranged time.

Follow-up survey

At the end of May 2012, after the maximum incubation period for HAV (50 days after symptom onset in the case) had elapsed, we again contacted hotel staff and guests, requesting them to complete a brief survey, in order to identify any secondary cases of hepatitis A. We set the following definitions for a secondary case of hepatitis A in this incident.

- Confirmed case: an individual who either worked in the same hotel as the infected foodhandler between 26 March and 5 April 2012 or stayed in the hotel between 25 March and 5 April or shared the hospital ward with the infected foodhandler between 5 April and 10 April and who reported having a blood test positive for HAV IgM, with the sample taken between 14 days after the first day of their exposure and 8 weeks after their first day of exposure.
- Probable case: an individual who either worked in the same hotel as the infected foodhandler between 26 March and 5 April 2012 or stayed in the hotel between 25 March and 5 April or shared the hospital ward with the infected foodhandler between 5 April and 10 April and who reported a clinical diagnosis of hepatitis A or jaundice, where the diagnosis was made between 14 days after the first day of their exposure and 8 weeks after their first day of exposure, and a blood test was not performed.
- For hotel guests, we created an online questionnaire using Select Survey [15]. In addition to questions on possible exposure (dates of stay, food eaten) and outcome (symptoms, clinical diagnosis, test results), we asked if they had previously received HAV vaccine, whether they took any action following our notification of their possible exposure and what their country of residence was, so we could check if there were any notifications from the country's public health authorities. Respondents were also asked to provide exposure and outcome information for guests sharing their room or for whom they booked rooms. We emailed a cover letter and hyperlink to the survey. For guests with missing email addresses we requested booking agencies to forward the email.

For hotel staff, we provided the hotel with paper questionnaires for self-completion by staff. A list of 74 staff with contact details was provided to us and non-responders were contacted by telephone. In addition to questions on outcome (symptoms, clinical diagnosis, test results), we asked if they had previously received HAV vaccine and what their country of birth was, as a proxy measure for likelihood of previous HAV infection.

Online survey responses were exported into Excel, as were the staff survey responses. Data cleaning and analysis was conducted in STATA v.12.

Results

Population exposed

We assessed that 83 hotel staff, 17 hospital patients and at least 887 hotel guests had possibly been exposed to HAV.

Public health action

All 83 potentially exposed hotel staff were vaccinated on 13 April 2012, within the 14-day time limit for the earliest possible exposure date, and seven also received HNIG. All 17 potentially exposed hospital patients were vaccinated within the 14-day time limit, and six also received HNIG. We sent emails about the incident to 642 individual guest email accounts and 11 block booking companies for onward distribution to around 245 guests (and received confirmation from the booking agencies that they had done so). The hotel guests resided in at least 31 countries.

Survey response

We sent the online survey directly to 642 guests and indirectly to 46 guests through their booking agencies. We were unable to send the survey to the rest ($n=199$) as their booking agencies were unwilling to participate. We received 137 responses, of which 125 were valid, including 27 who provided information for a total of 30 other guests who shared their rooms or bookings. The survey response was therefore considered to be 155/642 (24%). Three non-responders provided information on their exposure and outcome by email, so we had information on HAV status from 158 of the 887 guests potentially exposed. Of these 158 guests, 18 did not eat any food from the hotel during their stay and five did not stay overnight in the hotel during the exposure period. Therefore, 135 of the respondents were considered to have been exposed to food prepared by the case.

Staff surveys were self-completed by 19 staff. We contacted 55 non-responders for whom we received contact details and completed a further 14 telephone-administered questionnaires for non-responders (some of whom were no longer employed at the hotel); thus in total, 33 questionnaires were received.

Transmission of HAV to those exposed

No secondary cases of HAV were identified among those who were potentially exposed in this incident and responded to our follow-up survey. Given that potentially exposed hotel staff were immunised in time, the lack of transmission to these staff members was not very surprising.

Susceptibility to infection

Of the 135 hotel guests who responded to the survey and were considered to have been exposed, 65 (48%) may not have been susceptible to HAV infection as they either reported prior HAV vaccination or commented that they had previously been infected. Of

the remaining 70, 32 reported that they were not vaccinated, and 38 did not know or did not answer this question.

Among the 33 hotel staff who responded, seven reported having previous HAV vaccination; nine were born in countries considered to be of high endemicity and 13 in intermediate-endemicity countries (using the World Health Organization categorisation of global HAV prevalence [16]). Therefore, at least 29 of the 83 potentially exposed staff may not have been susceptible to HAV infection.

Hotel guest response to the email alert about the incident

Of the 135 potentially exposed respondents, 35 (26%) visited a doctor following receipt of the letter. Five of the 35 were vaccinated in response to the alert, two additionally received HNIG and 21 were tested for HAV infection. Five did not see a doctor but checked their vaccination records. Of the 135 exposed respondents, 59 (44%) reported that they did not take any action on receipt of the letter; 36/135 (27%) potentially exposed respondents did not answer the question regarding their response to the alert.

Discussion

This large incident response required the commitment of considerable HPA resources, raised reputational concerns for the hotel and may have distressed the individuals contacted. Given the observed absence of secondary cases, it could be argued that such a response was not justified. We believe, however, that it was. Uncooked food prepared by an infected foodhandler with HAV is an established source of food-borne outbreaks [1,3,17]. The risk of transmission depends on foodhandler hygiene practices and the type of food they prepare [1,3,17]. It is difficult to accurately assess the hygiene standards of a foodhandler after exposure: in the incident reported here, the risk assessment was precautionary. Outbreaks where public health teams did not initiate post-exposure vaccination on the basis of satisfactory hygiene assessments have resulted in a failure to prevent secondary cases [5,7,18]. Public health professionals may overestimate the risk of transmission by foodhandlers since we assume that outbreaks due to infected foodhandlers are more likely to be published than the (probably frequent) incidents involving infected foodhandlers in which there are no secondary cases.

In this incident, the foodhandler demonstrated exemplary food hygiene and the food may have not been contaminated. However, given the potential risk, however small, we still needed to arrange post-exposure vaccinations. Additionally, the number of susceptible individuals who were potentially exposed in this incident may have been relatively low, as 68 of 158 guests and 29 of 33 hotel staff who responded were likely not to have been susceptible following prior vaccination or exposure.

The HPA guidance stated that HAV vaccination is required within a 14-day period from exposure, but due to delays in notification from the hospital and in obtaining information about guests from the hotel management team and the logistics of sending information through booking agencies, the 14-day window for vaccination (if exposed on the first possible date) would have been exceeded for most hotel guests. Although the hotel and most booking agencies were cooperative, there were delays and practical difficulties, with incomplete contact details and a room-booking system that did not capture the number of guests per room, so it is possible we have still underestimated the number potentially exposed.

Even if there had been no delays, would it have been justified to contact 887 guests and advise vaccination based on the risk assessment, given that we adjudged the risk to the guests as lower than that to the hotel staff? Would it have been still appropriate to take the action we did, i.e. advising guests to seek healthcare advice corresponding to their country of residence? Although the 14-day limit for vaccination had been exceeded for many guests when we informed them about the incident, we still advised them about their possible exposure. We believe it is important to be open with individuals about health hazards to which they may have been exposed. Furthermore, we considered that the letter might prompt earlier seeking of healthcare, diagnosis and management if individuals became symptomatic, thus potentially reducing the risk of tertiary cases.

Limitations of study

The main limitation was the low response rate to our survey and lack of follow-up of hospital patients in seeking to identify secondary cases of HAV infection. This, as with the logistic challenge of contacting guests, reflects the challenges of health protection responses and field epidemiology.

We did not manage to send the survey to all the individuals initially informed of their possible exposure, as some booking agencies declined to be involved and some hotel staff had left employment and changed their contact details. For hotel guests to whom we did manage to email the survey, the fact that it could only be sent 50 days after symptom onset (the maximum incubation period) may have affected their response. The low response rate may also reflect a lack of interest in the outcome and lack of collective concern as the hotel guests were not a connected group and may have no future contact with the hotel. Hotel staff had already been vaccinated so they may have not felt the need to respond to the survey. However, although the survey response rate was low, we also made use of other methods of identifying cases – by asking individuals in the first email communication to inform us if they became ill and by alerting other countries of the incident through the IHR National Focal Points and

EWRS, through which we expected to be informed if they received a notification of a case of HAV infection linked to this incident. Despite this, we identified no secondary cases and therefore we found no evidence of transmission of HAV in this incident.

Conflict of interest

None declared.

Authors' contributions

Victoria Hall – joint first author planned, conducted and analysed the follow-up study; wrote and edited the manuscript. Asha Abrahams – joint first author; incident response; wrote first draft. Deborah Turbitt – incident response; advice on manuscript. Simon Cathcart – advice on follow-up study; Helen Maguire – supervision and advice on concept of study. Sooria Balasegaram – supervision of follow-up study; incident response. All authors revised the manuscript, approved the final version and agreed to be accountable for the work.

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