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REVIEW

Hepatitis A outbreaks—methods of intervention in South-East Asian countries

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Summary *Introduction:* In many Asian countries, improved hygiene standards and socio-economic conditions have led to a reduction in exposure to the hepatitis A virus (HAV) in childhood. However, the persistence of circulating HAV may lead to hepatitis A outbreaks, particularly in adolescents and adults. In other countries and specific areas, where socio-economic conditions have not improved as markedly, HAV endemicity remains medium-to-high. A systematic approach to outbreak control is therefore urgently needed.

Methods: The Steering Committee for Prevention and Control of Infectious Diseases reviewed reports on recent hepatitis A outbreaks in South-East Asian countries and determined that there is no systematic regional plan for the containment of such outbreaks. By contrast, on reviewing reports on outbreaks in several North American and European countries, it was found that the most important elements of successful outbreak control are a plan of action, rapid and widespread communication, public education and vaccination of household contacts to prevent secondary cases.

Results: This investigation proposes an outbreak control programme consisting of six key stages — initiation, planning, set-up, implementation, vaccination of at-risk populations and evaluation. Outbreak control requires the formation of an outbreak management team, plus a task force to implement intervention and educate the public. The vaccination of family members and close contacts is a central element of the programme.

Conclusion: This model programme for hepatitis A outbreak control provides a framework for action in countries and specific areas where the disease remains a problem.

Introduction

Almost 1.4 million cases of hepatitis A are reported worldwide each year, with approximately half occurring in the Asian region.[1] Hepatitis A is endemic throughout most of South-East Asia;

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however, with different countries experiencing different rates of socio-economic development, two distinct patterns of epidemiology have emerged in the region.

The first pattern is seen in countries such as Indonesia, the Philippines and Taiwan, where hepatitis A endemicity remains moderate-to-high (Table 1) and is linked to socio-economic differences that lead to different standards of hygiene and sanitation being found in close proximity.

The second pattern is seen in countries such as Malaysia, Singapore and Thailand, where the hepatitis A virus (HAV) remains in circulation, but where improvements in hygiene and socio-economic standards have led to a decline in its prevalence, and endemicity is low (Table 1). As a result there is less exposure to HAV in childhood and pockets develop of adults who are susceptible to HAV infection.[2,6,8,17,18]

The containment of hepatitis A outbreaks is particularly important in regions in which large numbers of adults are at risk of infection, because the incidence of severe complications resulting from HAV increases with the age of the affected

Table 1 HAV seroprevalence and hepatitis A outbreaks in selected South-East Asian countries/areas.

Country/ area	Seroprevalence of HAV in children and adolescents	Existing outbreak plan	Main types of outbreaks
Hong Kong	Declining[2–4]	No unique plan, but the health department recognises the possibility of outbreaks. It has published some general guidelines for managing suspected outbreaks of communicable diseases[5]	Usually as a result of contaminated food, particularly shellfish, and drink, from food vendors,[4*] Water-borne infections less common[*]
Indonesia	Marked regional variations[2,6]	No specific action plan	Outbreaks in schools in urban areas[*] Community outbreaks owing to poor sanitary practices in rural areas[*]
Malaysia	Declining overall, but regional variations[6,7]	Central action plan, in addition to regional action plans for dealing with food- and water-borne diseases	Outbreaks among some religious groups caused by unlicensed food handlers during festive seasons[*] Outbreaks among school children owing to contaminated food.[*] Outbreaks caused by travellers returning from endemic regions[*]
Philippines	Regional variations[8]	No structured outbreak plan. The media play a role in raising public awareness about particular diseases	Outbreaks in schools, attributable to contaminated food or drinking water[*]
Singapore	Declining[6]	None	Outbreaks often owing to contaminated seafood,[9*]
Taiwan	Declining in urban areas, but regional variations[10,11]	No specific plan; however, food-related outbreaks of disease are common and the media have been used to broadcast educational information.[10] Sentinel reporting systems have been set up to give advance warning of outbreaks[10]	Outbreaks among Taiwanese living in isolated areas[10] Outbreaks in schools owing to contaminated food and water[*]
Thailand	Declining[6]	Existing protocol for infectious diseases has been applied to HAV	Outbreaks in institutions such as colleges, hospitals, and schools[12–16] Outbreaks are food- and water-borne, or caused by poor sanitation,[12,13,15*]

[*] Reported by the Steering Committee for Prevention and Control of Infectious Diseases in Asia, 6—7 November 2001, Singapore.

individual.[2,19] As socio-economic developments are made within the South-East Asian region, an increasing number of countries are expected to experience the second pattern of epidemiology for HAV, placing greater numbers of adults at risk of infection and resultant complications.

At a recent workshop, the Steering Committee for Prevention and Control of Infectious Diseases in Asia (a working group comprising senior specialists in infectious diseases from across South-East Asia) reviewed published and unpublished information on past outbreaks in selected South-East Asian countries, with a view to identifying and assessing existing outbreak control measures. None of the countries covered in the review has a plan in place for dealing specifically with an hepatitis A outbreak (Table 1). However, some have implemented several of the key elements for the successful management of an hepatitis A outbreak in a community setting, including rapid identification of the source of infection, rapid identification of the at-risk population (e.g. secondary contacts), prompt vaccination of this population and comprehensive public education.

The success of outbreak control measures used in the past in South-East Asia may be used as a guide for developing a more comprehensive outbreak management plan in countries that continue to experience moderate-to-high endemicity of HAV. In countries of low endemicity in South-East Asia, disease control plans could be modelled on those used in North American and European countries. Using this approach, this paper aims to present a practical framework for outbreak control that can be adapted for use by South-East Asian countries experiencing both patterns of epidemiology.

Epidemiology of outbreaks

In South-East Asia the causes and epidemiology of hepatitis A outbreaks vary according to the country, and there are often regional variations within a country. Outbreaks originate mostly from contaminated food and water, and commonly occur in institutions (e.g. schools, kindergartens, day care centres, colleges and hospitals) and/or food outlets (e.g. restaurants, grocery stores and street stalls). Outbreaks also occur in isolated communities of indigenous people (Table 1).

The epidemiology of outbreaks in developed countries is different to that of those in the developing world. In North America, hepatitis A outbreaks occur most commonly in the community as a whole, mainly affecting young adults and children in lower socio-economic classes.[1] Outbreaks have also been reported among men who have sex with men and intravenous drug users, as well as in isolated communities.[20–22] In regions of Europe where there is a low local prevalence of HAV, secondary transmission from HAV-infected migrants has sometimes been reported as a source of outbreaks.[23]

Some cases of hepatitis A outbreaks in developed and South-East Asian countries are described below. The success of the outbreak control strategies adopted during these outbreaks is discussed.

Examples of outbreaks in developed countries

Outbreaks among men who have sex with men, and IDUs

A hepatitis A outbreak, primarily affecting men who have sex with men, occurred in Vancouver, Canada, from 1997 to 1998.[20] Outbreak control measures taken by Vancouver public health authorities included free vaccination, which was made available at community clinics and doctors' offices. Extensive media coverage of the outbreak control programme led to 10,000 doses of vaccine being administered, representing approximately 50% coverage (Meeting of the Steering Committee for Prevention and Control of Infectious Diseases in Asia, 6—7 November 2001, Singapore). Within three months the outbreak appeared to be over; however, in late 1999 new cases of hepatitis A began to appear among intravenous drug users.[21] The vaccination campaign was broadened in December 1999 to include this population, and the number of new cases of hepatitis A in the region subsequently began to decline.[21]

An evaluation of this vaccination campaign showed that although 92% of the affected community had heard about the programme, only 59% of the community was vaccinated (Meeting of the Steering Committee for Prevention and Control of Infectious Diseases in Asia, 6—7 November 2001, Singapore). Many men did not perceive themselves to be at risk from hepatitis A, and so offering free vaccination alone was not necessarily effective.

Community outbreak in children

An epidemic occurred in two adjoining villages in northern Slovakia from December 1991 to March 1993 in which 121 cases of hepatitis A were reported.[24] There had been no cases of hepatitis A infection in either village during the preceding 22 years. A vaccination programme was implemented in the local school in December 1992 and 73% of children were vaccinated, 404 with hepatitis A vaccine and 19 with immune globulin. The remaining

157 children were not vaccinated. A decrease in the incidence of new cases was subsequently seen. The number of new cases of hepatitis A was higher in the immune globulin-treated group (three out of 19) than in the group given hepatitis A vaccine (one out of 404).

Outbreaks in isolated communities

McMahon et al. conducted a study of 25 rural Alaskan communities in which large hepatitis A outbreaks had been reported every eight to 12 years since the 1960s.[22] Epidemics usually lasted four to six years. Efforts to control these epidemics by widespread treatment of household contacts with immune globulin had previously failed.

During one such epidemic, McMahon et al. conducted a vaccination programme in which 4930 children and adults from these communities were each administered one dose of hepatitis A vaccine. It was found that in regions in which vaccination rates of less than 50% of susceptible people were achieved, the outbreak continued for a further 50 weeks following vaccination. In regions in which more than 80% of susceptible people were vaccinated, the outbreak ceased within four to eight weeks of vaccination.

Assessment of outbreak control strategies in developed countries

Some form of vaccination campaign was the cornerstone of each of the outbreak management programmes described above. Careful planning, rapid and widespread communication and public education were other important aspects of outbreak control. In cases in which vaccination programmes were implemented it was seen to be important to achieve a high (i.e. >80%) vaccination rate. The decision on whether to vaccinate individuals selectively after testing for HAV seropositivity depends on a number of factors, including the extent of the outbreak and the availability and cost of the vaccine. It is planned to discuss cost-benefit issues associated with mass vaccination against HAV in a future paper by the Steering Committee for Prevention and Control of Infectious Diseases.

The vaccination rate can be improved by using the media to encourage those people at greatest risk to seek vaccination; however, as evidenced by the Vancouver outbreak, this does not guarantee a high uptake. Public education is also very important for ensuring that people recognise that they are at risk of infection and understand the measures they can take to avoid it.

Hepatitis A vaccine has superior protective efficacy in an outbreak situation compared with immune globulin. In people who are administered immune globulin, antibody levels begin to decline after approximately three to five months and protection against HAV wanes.[25] This means that there is insufficient time for HAV to be eradicated from a community before people become at risk of infection again.

Vaccination of household contacts to prevent secondary transmission of HAV is another key clinical intervention during outbreaks. The use of hepatitis A vaccine in the prevention of secondary HAV infection was investigated by Sagliocca et al., who discovered that the efficacy of the vaccine was 79% (95% CI, 7—95) for this purpose.[26] They concluded that hepatitis A vaccine is the preferred option for post-exposure prevention of hepatitis A.

Examples of outbreaks in South-East Asian countries

Food-borne outbreak

A territory-wide outbreak of hepatitis A occurred in Hong Kong in 1988 (Meeting of the Steering Committee for Prevention and Control of Infectious Diseases in Asia, 6—7 November 2001, Singapore). At least 17 separate groups of people developed the disease after sharing common meals of shellfish. The outbreak, which occurred in winter, may have been related to the popular 'hot pot' method of cooking shellfish, in which cooking may be incomplete.

Although there is no formal protocol for the management of hepatitis A outbreaks in Hong Kong, the Department of Health applies the same principles as for an outbreak of any communicable disease. An outbreak is suspected if there is a clustering of cases, and then epidemiological investigations are conducted to find any common factors.

Water-borne outbreak

A water-borne hepatitis A outbreak occurred in southern Sumatra, Indonesia, from May to August 2000 (Meeting of the Steering Committee for Prevention and Control of Infectious Diseases in Asia, 6—7 November 2001, Singapore). The outbreak was reported to the Indonesian Ministry of Health by local health authorities in July 2000, and a full investigation was initiated the following month. The investigation was facilitated at the national, provincial and district levels by the relevant authorities.

A case-control study was carried out, encompassing four of the ten villages affected by the outbreak. An unaffected village nearby was used

as a control. It was ascertained that HAV infection occurred mostly among children aged less than ten years. In addition, it was found that infected individuals were more likely to have consumed water from a public well, and more likely to have used a dry pit outside their house for human waste disposal, compared with the control group.

In response to this study, the local health authority implemented several preventative measures, including public education about hepatitis A transmission and good sanitary practice, and the distribution of antiseptic solution to affected families. Unfortunately, vaccinations could not be provided for financial reasons.

Outbreaks in schools

A recent outbreak in a Malaysian boarding school affected students aged 13—21 years (Meeting of the Steering Committee for Prevention and Control of Infectious Diseases in Asia, 6—7 November 2001, Singapore). Of the 129 contacts of these students who were tested, nine (7%) were found to be seropositive.

An investigation was carried out to ascertain the source of the outbreak, and contacts were screened and questioned. Following this, a number of extensive public education campaigns were launched, dealing with public health, sanitation and hygiene, the spread of HAV, and vaccination and viral exposure. Environmental issues, such as the chlorination of water and the improvement of personal hygiene standards of food handlers working in the school, were also addressed.

In September 2000, a regional surveillance unit in the Philippines contacted the National Epidemiology Center in Manila to report a potential hepatitis A outbreak in a large private school. A team was immediately sent out to investigate (Meeting of the Steering Committee for Prevention and Control of Infectious Diseases in Asia, 6—7 November 2001, Singapore). Three days prior to the surveillance unit's report, students had been tested for HAV and 11 of 3994 were found to be infected. A number of measures were then taken—drinking fountains were shut off in case the water was the source of the outbreak, the local health department carried out an inspection of the school canteen, blood testing of the school's food handlers was conducted, and water sampling was undertaken from all the taps and the main reservoir. The source of infection was found to be an infected well, water from which was used to mix drinks in the canteen.

A number of recommendations were made as a result of the investigation into this outbreak. These included continued surveillance for disease, the provision of health education, and better sanitation practices in the canteen, as well as encouraging students to bring their own food and drink to school.

Outbreak in an isolated community

In 1982, the Department of Health in Taiwan convened a committee of experts on hepatitis control.[11] The control plan they developed includes public education on hepatitis A, B and C, and free vaccination of pre-school children aged 15 months and above in some townships in Taiwan.[11] The Taiwanese government also provides indigenous people with free vaccination, which has resulted in a marked drop in the incidence of hepatitis A over the past two years. A vaccination rate of more than 60% has been achieved in mountainous areas (Meeting of the Steering Committee for Prevention and Control of Infectious Diseases in Asia, 6—7 November 2001, Singapore).

The government recognises that there will be an increased risk of hepatitis A infection as more Taiwanese travel to mainland China and other destinations in South-East Asia. But although vaccination is advised for Taiwanese who plan to travel, uptake of the vaccine remains low among this group of people, at about 5% (Meeting of the Steering Committee for Prevention and Control of Infectious Diseases in Asia, 6—7 November 2001, Singapore).

An intensified surveillance system has also been implemented in which jaundice of unknown aetiology is monitored, under the auspices of the Centers for Disease Control in Taiwan.

Assessment of outbreak control strategies in South-East Asia

Hepatitis A outbreak management in many parts of South-East Asia currently lacks coordination. Improved monitoring and follow-up of outbreaks that are not officially reported are needed. The most effective way to achieve this is by introducing surveillance 'sentinels' throughout all the different socio-economic areas. Effective communication with policy makers is also essential.

The successful handling of the outbreak in the Philippines can be attributed to a combination of the following factors:

- The surveillance system (National Epidemic Sentinel Surveillance System)
- Epidemiological networking
- Inter-/intra-agency collaboration
- Media and public involvement

- Support from local government and school authorities
- Reporting and investigation schemes
- Dissemination of reports to stakeholders.

Vaccination currently plays a less significant role in hepatitis A outbreak control in South-East Asia than in developed countries. The decision on whether to implement mass vaccination against HAV or to vaccinate selectively during outbreaks needs to be made on a country-by-country basis using cost-benefit analyses.

A plan for managing and containing outbreaks

The Steering Committee for Prevention and Control of Infectious Diseases in Asia has developed a six-step programme for outbreak management in South-East Asian countries (Figure 1). The programme can be adapted for implementation at local or national level. For effective control of hepatitis A outbreaks, the various aspects described below must be integrated to give a cohesive approach with multi-sectoral coordination.

Initiation

Upon a community reporting cases of a disease, it is important to determine firstly whether those cases represent endemic disease or if they constitute an outbreak. Outbreaks of hepatitis A can occur against a background of HAV endemicity or zero prevalence. To determine if an outbreak is occurring, it is necessary to know the background level of endemicity in a particular area. Outbreaks that occur in areas of high endemicity are often overlooked because of the existing prevalence of the disease. Good surveillance is therefore essential and baseline seroprevalence data are important.

It must also be ascertained whether a single disease is responsible for the outbreak of illness. Common-source outbreaks (e.g. oyster-related, salad-related or food-handler-related outbreaks) are usually caused by a single disease. However, in areas of poor hygiene, where there is the potential for water-borne or other infectious contaminants, there are likely to be other diseases present. It is therefore important to collect serological data to determine the percentage of individuals affected by HAV compared with other diseases. The greater the percentage of people affected by HAV, the more likely the outbreak is to be attributable to hepatitis A.

Once an outbreak has been confirmed, the source and the affected region must be identified. Molecular characterisation and phylogenetic analysis of HAV strains may be necessary to determine whether the HAV infections have originated

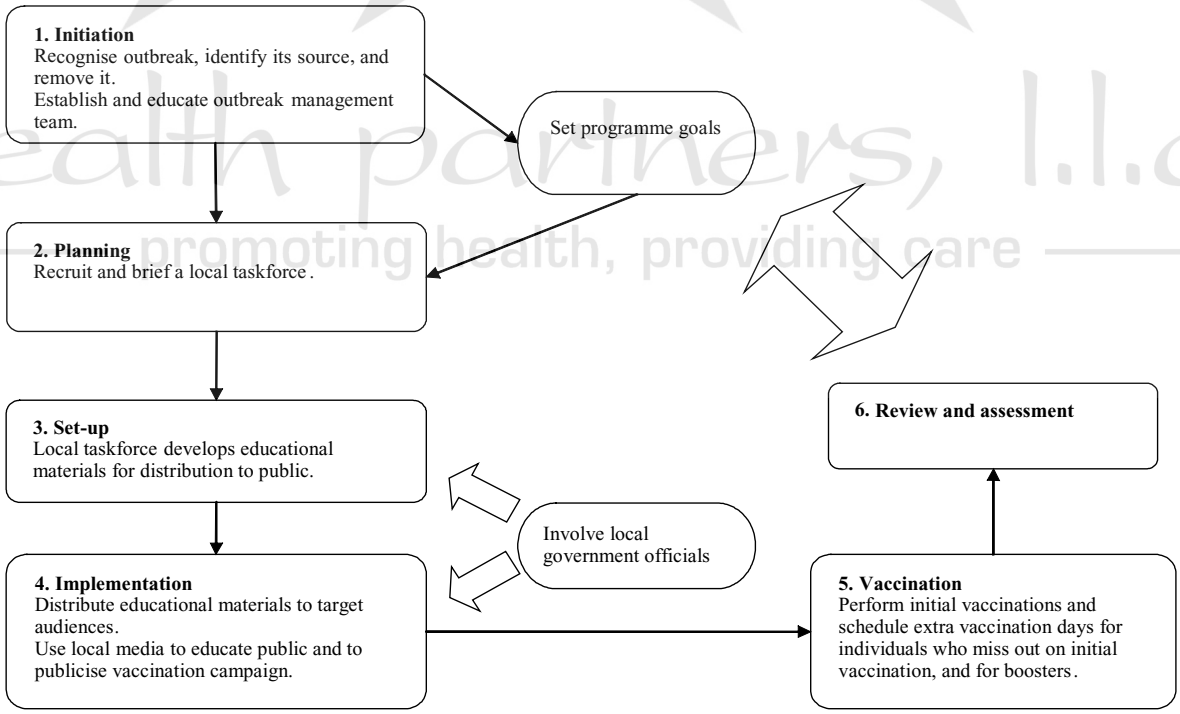

Figure 1 A proposed programme for hepatitis A outbreak management.

from a common source.[16,27,28] Infected food sources should be removed from sale and access to infected water sources should be halted. Infected water supplies should be disinfected using chlorination.

A core outbreak management team should be established to oversee outbreak control, track the incidence of disease, measure the progress of the programme and establish vaccination goals. The team should comprise, ideally, an epidemiologist or infection control expert, an immunisation coordinator, a public health official and a public information/education officer.

Planning

The core outbreak management team should recruit and brief a multi-sectoral outbreak control taskforce comprising key stakeholders within the local community. These stakeholders include healthcare professionals, school administrators and staff, day care centre staff, restaurant managers, corporate chief executive officers, government representatives, parents and the media. An outbreak control coordinator should also be appointed (usually from the local public health department) to take responsibility for the day-to-day running of the programme.

The health professionals on the task force should undertake the education of other task force members. They should emphasise the importance of public education and vaccination.

Set-up

Once the responsibilities of each taskforce member have been finalised, the appropriate local government officials should be contacted to request their support during the set-up and implementation of the outbreak control programme.

The taskforce will then be responsible for producing educational materials on personal hygiene, environmental sanitation and vaccination. Materials may include:

- Booklets, posters and fact sheets
- Letters to schools and day care centres, and letters to parents of children attending schools and day care centres
- Posters announcing vaccination clinics
- Flyers emphasising the importance of thorough hand washing, particularly for food handlers
- Booster reminder cards.

Implementation

During the implementation phase the information and educational materials should be distributed to the target audiences. If possible, a telephone hotline should be set up to answer people's questions. While stand-alone information campaigns can be expensive, integrating information about hepatitis A prevention through improved food safety and hygiene, into existing programmes for health promotion can be cost-effective. For example, countries that are implementing the 'Healthy Settings' programmes from the World Health Organization's Western Pacific Regional Office can incorporate educational campaigns on hepatitis A prevention into their 'Healthy Schools', 'Healthy Marketplaces', 'Healthy Workplaces', 'Healthy Cities' and 'Healthy Tourism' projects.

If possible, a press conference should be held to announce the launch of an outbreak control programme, involving local and/or national media as appropriate, healthcare professionals, local government officials and representatives of any institutions involved in the outbreak. A local expert should be employed to respond to media questions.

Also at this stage the vaccination procedure should be reviewed with medical personnel. Vaccine dosages and regimens for children, adolescents and adults should be checked against manufacturers' product information.

Vaccination

Vaccination against HAV is recommended for all family members and close contacts of suspected hepatitis A cases. Healthcare professionals and volunteers should be recruited to run vaccination days. Once the initial vaccination days have been held, booster days should be organised, and extra vaccination days scheduled for people who missed the first round of vaccinations.

Review and assessment

Long-term goals of the outbreak control programme should include improving sanitation and personal hygiene practices, and achieving immunity in most of the population to prevent future outbreaks. The local task force should review the practical aspects of the programme, while the management team should track the incidence of disease following vaccination.

Discussion and conclusions

The HAV epidemics described in this paper illustrate the importance of having an evidence-based, strategic approach to outbreak control. In countries in which the epidemiology of hepatitis A is undergoing a transition from high-to-moderate to low

endemicity, health professionals need a framework for action to tackle potential outbreaks among susceptible population subgroups.

Experience gained from outbreaks around the world demonstrates the utility of an outbreak control programme comprising the aforementioned six key stages. This comprehensive approach integrates public information, health advocacy and clinical strategies such as vaccination to address the multiple aspects of hepatitis A outbreaks. In regions in which resources are scarce, the comprehensive outbreak management programme for hepatitis A described above can be adapted for communities in different circumstances, according to the extent and severity of the outbreak.

Ultimately, improved sanitation will lead to more success in controlling the spread of HAV. However, vaccination of individuals most susceptible to HAV infection is the cornerstone of outbreak control. Long-term prevention of outbreaks will be achieved through a high vaccination rate in schools and day care centres, and the ongoing support of hepatitis A vaccination programmes.

Lessons learned from the experiences of other countries, if applied appropriately, can assist national health departments within the Asia-Pacific region in minimising morbidity and mortality from hepatitis A while the region completes the transition in epidemiology to low endemicity.

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