An Outbreak of Echovirus 11 Amongst Neonates in a Confinement Home in Penang, Malaysia

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SUMMARY

Confinement homes are private institutions that provide full-time care for newborn babies and their respective postpartum mothers up to one month after delivery. An outbreak of fever and diarrhoea amongst newborns occurred in one such confinement home in Penang between the months of September to October 2004. An outbreak investigation was carried out including all babies, their respective mothers and workers in the home to determine the source of the outbreak and to institute control measures. Based on a working case definition of febrile illness with or without diarrhoea, 11 out of the 13 babies in the confinement home met the case definition. One hundred percent had symptoms of fever. 36.4% had symptoms of diarrhea and other respiratory conditions respectively. The attack rate of among babies in the confinement home was 90%. Echovirus 11 was isolated from 3 out of the 11 febrile cases. Echovirus 11 was isolated from the cerebrospinal fluid and stool of another baby at a private hospital that was epidemiologically linked to the first case. In conclusion, the outbreak of febrile illness amongst newborn babies in the affected confinement home was due to echovirus 11. The source was probably health-care associated with efficient transmission within the confinement home. The faecal-oral route was the most likely mode of transmission.

KEY WORDS:
Echovirus 11, Outbreak, Confinement home

INTRODUCTION

Echoviruses (Enteric Cytopathogenic Human Orphan Viruses) are RNA viruses belong to the family *Picornaviridae*, under the genus *Enterovirus*. There are 31 known serotypes[1,2]. They are responsible for many human febrile and cutaneous diseases including aseptic meningitis. Echovirus 11 has been known to be associated with encephalitis, paralysis, generalized disease of newborn and neonatal diarrhea. Transmission of enterovirus is generally regarded as faecal-oral and humans are the only known reservoir of human echoviruses. Young children are the usual reservoir. The main mode of spread appears to be by close contact, that is, faecal-oral via contamination of fingers, formites, utensils and food. The virus can also possibly be spread by the respiratory mode though this seems to be less important as faecal shedding persists for a longer period and the virus is shed in higher titres in the stool[1-3]. Outbreak transmission has occurred in families, nurseries and institutions[4-7]. We describe one such outbreak of neonatal febrile illness due to echovirus 11 in a confinement home in Penang, Malaysia.

Confinement homes are private institutions set up for the sole purpose of catering to the needs of a mother and her newborn baby during the first few weeks of her confinement. The usual practice is that after being discharged from hospitals or maternity homes following their deliveries, mothers and newborns will reside in confinement homes for their preferred period of time before going back to their own homes. The mother is provided with "appropriate" cultural food during her confinement period and the babies are taken care of during the night and also most of the day. It gives an opportunity for the mother to rest. However, she is encouraged to breastfeed her baby. If a child falls ill while in the confinement home, the child would be isolated in another room or may be referred to the hospital, depending on the nature and type of illness.

MATERIALS AND METHODS

Working Hypothesis

This was an outbreak of febrile illness among newborn babies which could have originated from one of the residents or workers in the confinement home.

Clinical Case Definition[8]

A case was defined as a person or child with fever who resided in the HB confinement home between the months of September to October, 2004, or any person or child at the confinement home in contact with an infant during that period, presenting with fever and / or diarrhoea. Fever was defined as body temperature of equal or greater than 38°C as recorded by the physician or as reported by the mother. Diarrhoea was defined as the presence of two or more watery stools within a period of 24 hours.

- Categories of Cases
  - *Confirmed case* - a case that fits the case definition and is either laboratory confirmed for Echovirus 11, or linked to a laboratory-confirmed case
  - *Probable case* - a case that fits the clinical case definition only. There is neither laboratory confirmation nor epidemiological link.
  - *Possible case* - a case that fits case definition but awaiting confirmation.

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- *Contact* – defined as resident infants or mothers, workers or caretakers at the confinement home between the months of September and October, 2004.

Case Review
A retrospective case series study was done by case review. All the babies who were residents of the confinement home over the months of September and October were listed. The mothers of the infants were interviewed using a standard questionnaire and the infants were re-examined. A chart review was also performed at the hospitals where the infants were delivered and the following data obtained: name, registration number, date of birth, sex, symptoms, date of onset of symptoms and temperature.

Active Case Finding
Active case finding was carried out in other confinement homes in the area to find out if there were more cases of fever. Active case finding was also carried out in all the hospitals where the infants in the affected confinement home were delivered. A telephone survey was carried out at other hospitals on the island to search for unusual events.

Contact Tracing
Contact tracing was carried out on all infants and their respective mothers who were admitted to the confinement home from August 2004 to October 2004. It was also carried out on all the other siblings in the family of the cases.

Interview
Interviews were carried out using a standard questionnaire on all workers in the confinement home. It was also carried out on the nurses and pediatricians who handled the babies at the hospital where the babies were delivered and also where they were referred to from the confinement home.

Laboratory Investigation
Cerebrospinal fluid (CSF), blood, stool and throat swabs were collected from sick babies admitted to hospital whereas only stool samples and throat swabs were collected from all infants in the confinement home as well as contacts and sent to the National Public Health Laboratory for virus isolation. The throat swabs in viral transport medium (VTM) was lightly vortexed and treated with crystalline penicillin (100,000 units/ml) and streptomycin (100 μg/ml). After an hour of treatment at room temperature, 100 μl of the fluid was inoculated in duplicate into JM tubes, each containing newly confluent monolayered of Vero cells (ATCC CCl-81) and RD cells (ATCC CCL-136) respectively. A suspension of stool sample was made by transferring a small "pea-size" amount of stool into 3 ml of VTM and lightly vortexed. The stool suspension was clarified by centrifugation at 1000 g for 10 minutes and the supernatant was filtered through a 0.22 micron filter. One hundred microlitre of the resultant filtrate was inoculated in duplicate into respective cells as for the throat swab specimen. The inoculated cells in JM tubes were incubated at 37°C in an ambient of 5% CO_2 and examined daily up to 10 days for evidence of virus replication by the presence of cytopathic effect (CPE) on the cultured cells. Viruses in infected cells showing CPE were harvested, fixed and typed by a panel of commercial typing monoclonal antibodies (Chemicon Int. Inc. USA).

Environmental Investigation
Inspection of the nursing home was carried out with special attention on cleaning practices, daily routine and washing facilities in the confinement home and information was recorded using a pre-prepared checklist. A visit to the hospital where the infants were born was carried out.

RESULTS

On 4th October, 2004, the Health Officer of the district of Timur Laut was notified of an infant with viral fever admitted to the Pediatric Department of Penang Hospital. The infant was cared for in a confinement home HB where all the other infants were also down with fever illness. On the very same day the Rapid Assessment Team was sent to verify the outbreak. On confirmation that more infants were affected, further investigation was initiated.

On-site Observation
The confinement home HB was located in Greenlane, Penang with a valid operating business license. Observation at the nursing home showed that it was generally clean. There were 10 baby cots placed randomly in a room 12 feet by 14 feet and was relatively congested. The maximum capacity of the nursery was 10 infants at any one time. A separate sick room could be created to accommodate one infant and the mother after moving out another adult bed in the room.

The infants were bottle fed one after another by caretakers (comprising both local and Indonesian workers). They wore aprons while feeding the infants but their aprons were not changed between babies. The infants were bathed one after the other in the bath area. The bath tub was not disinfected in between babies. All the infants used common linen diapers and these cotton diapers were washed together in a common washing machine. Disposable diapers were not used in the home. There was a common cooking area where meals for postpartum mothers were prepared.

Descriptive Findings
During the month of August 2004, five babies of Chinese origin with their mothers resided in this confinement home. All were well and did not experience any illness.

Between September to October of 2004, another batch of 10 male and 3 female infants of Chinese origin, together with their mothers, resided at the confinement home. All were well when they came in.

A male infant developed fever on 8th of September 2004, and met the clinical case definition. Further investigation at the confinement home found 32 contacts of whom 12 were resident infants, 13 were infants accompanying their mothers, four were workers and three caretakers. Ten out of those 12 contact infants were found to have febrile episodes and classified as cases. This made the total number of ill cases to be 11 and the attack rate at the confinement home was 84.6% (11/13). The remaining contacts, including two resident infants were free from any symptom of illness (Fig. 1).

The date of onset of illness for the first case (Case 1, index case) was on 8th September, 2004, which was four days after he was born (by vacuum extraction) at Hospital A and two

Table I: Clinical features of affected infants at the confinement home

Clinical Feature	Number Affected (N=11)	Percentage (%)
Fever	11	100
Diarrhoea	5	34.8
Runny Nose	3	27.3
Breathing difficulty	2	18.2
Jaundice	1	9.1

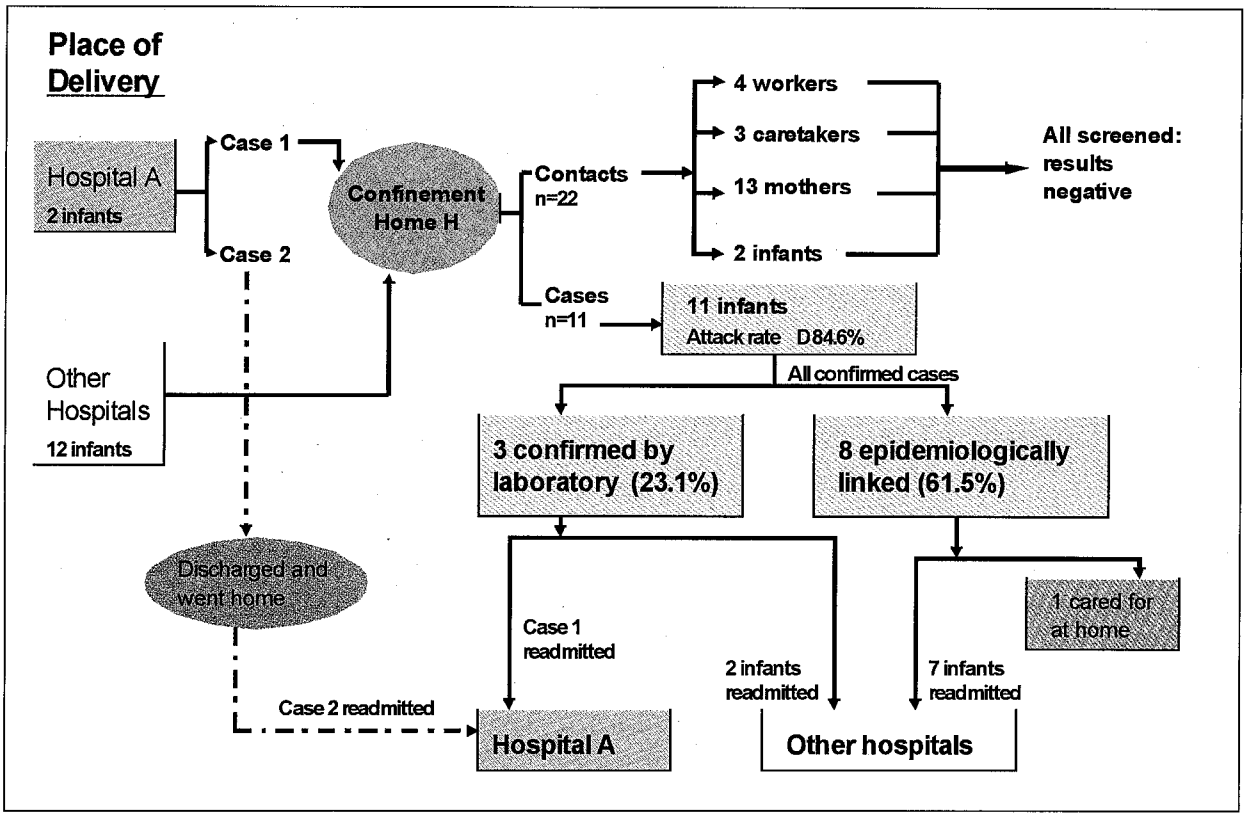

Fig. 1: Summary of Epidemiological Investigation

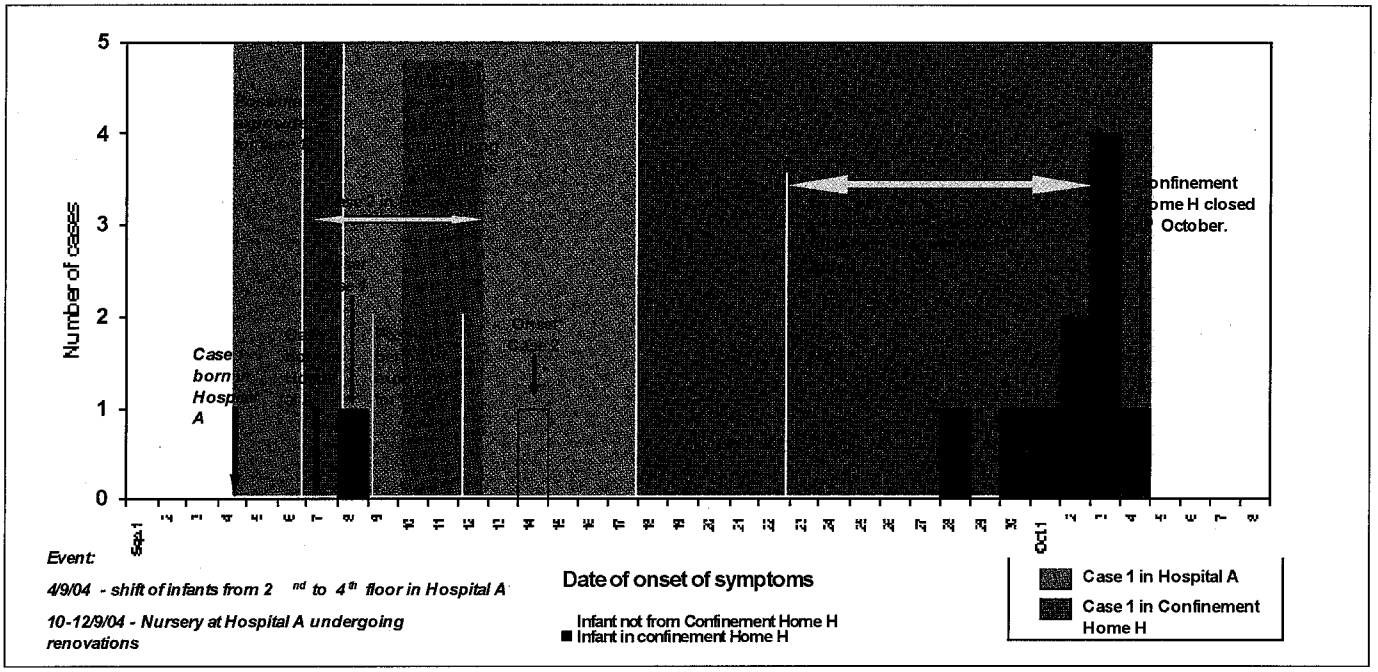

Fig. 2: Onset of illness for each of the cases from 1st September to 8th October, 2004

days after entering the confinement home. He was re-admitted to Hospital A on the same day of illness and remained in the Hospital A until 17th September 2004. Upon recovery, he returned to the confinement home and stayed there till 4th October, 2004. During his 1st stay at Confinement Home HB, from 6th to 8th September, 2004 there were no other infants in the confinement home.

The second case (Case 2) was also born in Hospital A on 7th September, 2004 and went home on the 12th September 2004. She developed fever on the 14th September, 2004 and was readmitted to the same Hospital A on the same day. Case 2 remained in Hospital A in the same ward as Case 1 and was discharged on the 19th September 2004.

Case 2 was a Malay infant and was never admitted to the confinement home. Case 1 and Case 2 were together in the nursery in Hospital A for two periods; 8th to 12th September 2004 and 14th to 17th September, 2004.

Subsequently no infants developed febrile illness until 27th September, 2004. From that date to October 4th 2004, nine infants developed symptoms, with a peak on 3rd October, 2004 (Fig. 2). All these cases were from the confinement home HB.

Out of 11 cases, 10 cases were later admitted to hospitals for further management and one was treated at home. The presenting clinical features of cases are shown in Table I. All infants survived. There were two other confinement homes in the area and none of them had babies with similar illness.

Laboratory findings
Echovirus 11 was isolated from the CSF and stool specimens of Case 1 and Case 2 that were admitted to Hospital A and from two stool samples belonging to two other symptomatic infants (cases) in the confinement home.

DISCUSSION

Echovirus can be spread by both symptomatic and healthy individuals. It is communicable over a long period of time as this virus can also be shed in stools for a long period of time.

In this outbreak, 11 newborn babies in the confinement home met the clinical case definition, of which three were laboratory-confirmed. Case 2 at Hospital A was also found to be positive for Echovirus 11. A review of annual reports and outbreak documents at the library of the State Health Office from 1995 to 2004 in Penang showed no documented evidence of Echovirus 11 infection in Penang before this incident. The clinical presentation of the cases seen was that of generalized disease of the newborn, i.e. fever, diarrhea and running nose, which is typical for echovirus 11. Based on an incubation period of 3 to 5 days, it is most likely that Case 1 acquired infection in the period between 4th and 5th of September, 2004. His infection was mostly nosocomial, probably from healthcare worker in the hospital where was born. He was re-admitted for his illness and on returning to the confinement home he could have spread the infection within the confinement home. Exposure to a group of 10 infants could have possibly occurred between 23rd September 2004 to 2nd October 2004 and epidemiological investigation suggestive of faecal-oral route as the mode of transmission. Although the route of transmission was not established, specific measures to stop transmission at the nursing home was carried out.

Case 2 may have acquired the infection from Case 1 when they were placed together in the same nursery in Hospital A or nosocomial from healthcare worker as in the case of Case 1. The home was ordered to close by the Health Officer of the District on October 4th 2004. Disinfection of the nursing home with chlorinate compound was also done with focus on the kitchen and utensils used. Health education was given to all the workers on personal hygiene and on proper procedures to be used in handling the infants. They were advised to separate the babies in the nursery and to have a walking space between the cots. They were also advised to bathe all babies individually and to disinfect the bath tub after each bath. Napkins were to be thoroughly disinfected. Instructions were also given for sick infants to be isolated from the healthy ones and disposable diapers were recommended to be used.

At present confinement homes do not come under the purview of the Private Healthcare Facilities and Services Act 1998. Confinement Homes should be spelled out in Part II Section 3 of this Act so that they may be regulated. In conclusion, this was an outbreak of echovirus 11 amongst newborn babies in a confinement home in which the index case could have acquired nosocomial infection from Hospital A where he was born.

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