การสอบสวนทางระบาดวิทยา

# OUTBREAK OF GASTROENTERITIS IN PREY TUP VILLAGE, KAMPONG THOM PROVINCE

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## INTRODUCTION/BACKGROUND

On Friday 1st February 2008, Provincial and Village Red Cross Volunteers reported to Provincial Health Directorate that many villagers in Prey Tup village got sick after having meals at Ms. X's and presented with abdominal pain, vomiting and diarrhea. Some patients rushed to private clinics and others to health centre. There were no death reports.

Fifty five people had joined the event and food was served for the whole day (four times).

The village is located about 23 kilometers away from Kampong Thom provincial town and 1 kilometers from the national road # 67. The population is 1,127 and the total number of households is 176. Farming is the principal business.

On Saturday 2nd February, 2008 provincial and district RRT and health centre staff went to the village to control the outbreak and provided health education. On Tuesday 5th February 2008, officers of CDC Department, Kampong Thom Provincial Health Department, Kampong Thom Operational Health District jointly investigated the outbreak.

**The objectives of the investigation were:**

1. To confirm the outbreak and to verify the diagnosis
2. To describe the characteristics of the outbreak
3. To determine risk factors and source of infection
4. To give recommendations on control and prevention measures

## MATERIALS AND METHODS

*Descriptive epidemiological study*

The event's participants on 1st February 2008 were interviewed using pretested questionnaires to obtain information on socio-demographic data, symptoms, food items, and personal hygiene.

*Environmental survey*

Specimens from village's wells and other sources of water were collected and investigated at Pasteur Institute and NAMRU2 in Phnom Penh.

*Analytical epidemiology*

The study design was a retrospective cohort study. Statistical tests (Relative Risks [RR]) were performed computed using EpiData/Stata statistical packages.

*Case definition:*

Any persons who participated to the 1st February event in the village and who presented at least one of the following symptoms: abdominal pain, vomiting, diarrhea (at least 3 stools per day) between February 1st to February 4th, 2008.

*Laboratory study:*

Stool samples and water from 3 wells and one water filter were collected and sent to NAMRU2 Laboratory and Pasteur Institute for testing.

## RESULTS

*Descriptive epidemiology*

Fifty-five people participated in the event; 44 people got sick which gives an overall attack rate of 80%. The attack rates did not differ according to gender and age-groups (both with p-value >0.20). The attack rate among people who cooked and those who did not cooked were also not significantly different (*p-value>0.20)*.

**Table 1:** age-gender characteristics of cases and non-cases:

| Variables | Total | Cases (%) | *p-value* |
|---|---|---|---|
| **Gender:** | | | |
| - Male | 40 | 31 (77.5) | > 0.20 |
| - Female | 15 | 13 (86.7) | |
| **Age groups** (Yrs) | | | |
| - 0-5 | 3 | 3 (100) | > 0.20 |
| - 6-19 | 3 | 1 (33.3) | |
| - 20-29 | 18 | 15 (83.3) | |
| - 30-39 | 10 | 9 (90.0) | |
| - ≥ 40 | 21 | 16 (76.2) | |
| **History of Cooking** | 12 | 11 (91.7) | > 0.20 |
| - Yes | 43 | 33 (76.7) | |
| - No | | | |

Information about symptoms was available for 44 out of the 55 samples. Among those, diarrhea and abdominal pain were the predominant symptoms during the outbreak followed by vomiting, fever, headache and nausea (see figure 1).

75% of all cases developed symptoms on Feb 1st and 2nd, suggesting a point source with a short incubation period of the causative agent. The occurrence of cases declined sharply after Feb 2nd, and no more cases were reported after Feb 4th. (Figure 2)

**Figure 1:** Clinical manifestations of gastroenteritis cases (n=44)

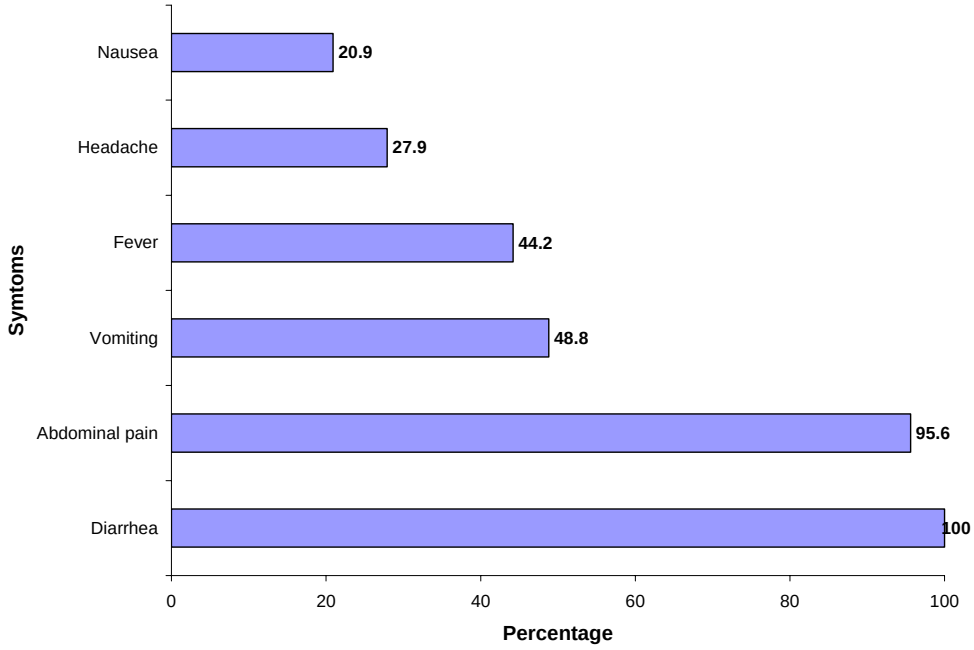
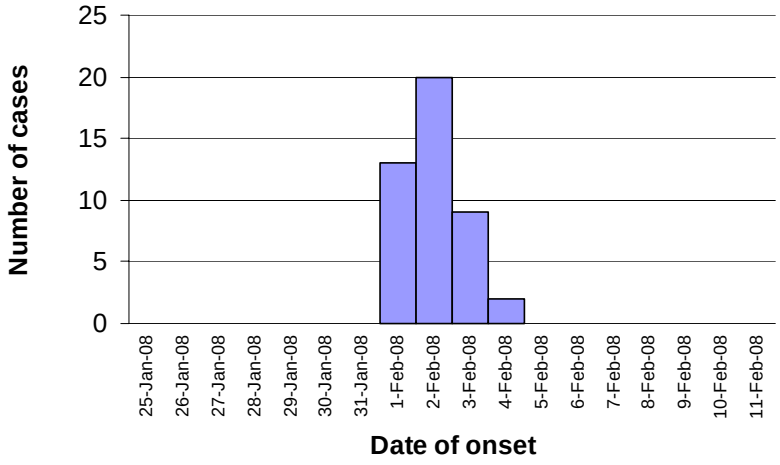



**Figure 2:** Distribution of cases by date of onset




**Analytic study: Hypothesis**

- The primary hypothesis is that contaminated food was the cause of the outbreak (COHORT STUDY).

- In addition, with the aim to exclude a contaminated water source process, we conducted an environmental survey and took water samples.

**Food Items:**

Food served on 1st February 2008 included bobor (boiled rice) in the morning, rice with machou kroeung at lunch time, rice with nhoam (papaya salad) in the afternoon and rice with curry in the evening.

(Table 2)

**Table 2:** Food items served on 1st February 2008

| Date | Breakfast | Lunch | Snacks | Dinner |
|---|---|---|---|---|
| 1st February 2008 | Boiled rice with pork and with (optional) bean sprout and/or sliced garbage and/or Chy Ronar (mint) | Rice with Machou Kroeung (sour soup with morning glory and beef) | Rice with Nhoam (pork, cucumber & garbage like papaya salad) | Rice with curry (beef, duck with egg plants and long green beans) |

Since food was served all day, most people ate more than one food item. It is therefore not possible to calculate food-specific attack rates.

**Table 3:** Association between food items and illness

| Risk factors | Exposed | | | Non exposed | | | RR | 95% CI |
|---|---|---|---|---|---|---|---|---|
| | Sick | Not sick | Total* | Sick | Not sick | Total* | | |
| Bobor | 40 | 11 | 51 | 1 | 0 | 1 | 0.8 | 0.7-0.9 |
| Rice with Machou | 40 | 9 | 49 | 1 | 0 | 1 | 0.8 | 0.7-0.9 |
| Rice with Nhoam | 28 | 4 | 32 | 16 | 7 | 23 | 1.3 | 0.9-1.7 |
| Rice with curry | 43 | 9 | 52 | 1 | 0 | 1 | 0.8 | 0.7-0.9 |

*** missing data during the data collection resulted in the different denominators**

The risk to develop symptoms was not associated with the number of food items consumed (*p-value* > 0.20). Interestingly, among in the sub-group of those who consumed 3 food items, 12 out of 13 did not eat Nhoam (see Table 5).

**Table 4:** Cases stratified by the number of food items exposed

| Number of food items consumed | Number of observations | Cases (%) | *P-value* |
|---|---|---|---|
| 2 | 1 | 1 (100) | > 0.20 |
| 3 | 18 | 13 (72.2) | |
| 4 | 28 | 25 (89.3) | |

**Table 5:** Cases and number of food items exposed stratified by the Nhoam

| Number of food items consumed | Total observations | Nhoam | | | | | |
|---|---|---|---|---|---|---|---|
| | | Exposed | | | Not exposed | | |
| | | Total | Sick (%) | *P-value* | Total | Sick (%) | *P-value* |
| 2 | 1 | 0 | 0 | > 0.20 | 1 | 1 (100) | > 0.20 |
| 3 | 18 | 1 | 1 (100) | | 17 | 12 (70.6) | |
| 4 | 28 | 28 | 25 (89.3) | | 0 | 0 | |

**Hygiene practices:**

Participants were also interviewed about their personal hygiene. For children, we interviewed the care takers. The main findings are presented below in Table 6

**Table 6:** Practices of personal hygiene in the village (in general)

| Personal practices | Number (Percent) |
|---|---|
| Hand washing after defecation | 26/55 (47.3%) |
| Hand washing before cooking | 14/26 (45.8%) |
| Hand washing before eating | 36/55 (65.5%) |
| Cutting nails short | 13/55 (23.6%) |

We could not get the personal hygiene information among the cooks and the non-cooks as we did not ask their respected roles in the event of the house construction. We were therefore not able to stratify for the cooks and the non-cooks in the sample.

**Laboratory results:**

One stool sample was collected and tested negative for all common pathogens (Salmonella, Campylobacter, Shigella and Yersinia enterolitica).

**Water sources:**

The well in the house compound is a dig one and not covered, situated under the branches of a small tree, and only partly enclosed. Pigs and poultry were free ranging and accessed the well proximity. A second well is located across the street, also uncovered under a tree. The third water source is a covered pump well. Filtration water is consumed without treatment. All water sources were found contaminated (Table 7).

**Table 7:** Laboratory result of water analysis

| Sources | Use | Water analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **1 (N<10)** | **2 (N<100)** | **3 (N:0)** | **4 (N:0)** | **5 (N:0)** | **6 (N:0)** | **7 (N: absence)** |
| Well 1 | Wash | NA | NA | $7x10^5$ / 100ml | $6x10^5$ / 100ml | 700/100ml | 20/20ml | absence |
| Well 2 | Wash, cook, drink | NA | NA | 700/100ml | 500/100ml | 125/100ml | 60/20ml | absence |
| Well 3 | Wash, cook, drink | NA | NA | 420/100ml | 250/100ml | 300/100ml | 20/20ml | absence |
| Water filtered | Drink | 540/ml | Uncountable | 350/100ml | 30/100ml | 30/100ml | 0/20ml | absence |

**1** = Total aerobic plate count at 37OC-72h **2** = Total aerobic plate count at 22OC-72h **3** = Total Coliforms
**4** = Thermotolerant Cliforms **5** = *Enterococcus Faecalis* **6** = Sulfiteb reducing anaerobes **7** = *Vibrio cholearae*

**DISCUSSION**

The outbreak occurred among people who consumed food at one event in Prey Tup village, Kampong Thom province. Epidemic curve suggested a common source outbreak. No association was found between food items and the disease. However, Nhoam (papaya salad) had a relative risk of 1.34 and a 95% confidence interval of 0.97-1.86 and but not associated with the outbreak even it was prepared with untreated vegetables, and maybe contaminated due to unsafe water from the wells.

Even though the culprit microorganism was not identified from the stool specimen, and despite the fact that food samples could not be collected (no left over food), *salmonella species* could be incriminated as the possible source. The first reason is that lower gastrointestinal tract symptoms (diarrhea and abdominal pain) were the most frequent clinical findings being reported. The second reason is the shortness of the incubation period (most cases developed symptoms within two days). It was noticed that there were no cases presenting bloody stools. No allergic or neurological symptoms were present, and hence allow discarding a potential toxin poisoning.

Outbreak detection process is still not optimum at the community level since cases were reported by the Red Cross network. In order to strengthen outbreak detection at village level, the training of both provincial RRT and village health volunteers should be boosted.

Both control and active case finding interventions were successful. A mobile clinic was set up in the village to manage the patients, and local health education campaign was launched. Surveillance was put set up through telephone.

Collection of samples remains an important challenge. Only one stool sample was collected, and community implication was quite limited. Transport media was not available for provincial RRT in the province. Specimen transportation procedures were not optimum and need then to be improved.

**CONCLUSION**

It is concluded that the outbreak in Prey Tup village, Kampong Thom province was a common source outbreak and the attack rate was high (77.2%). Contaminated water was the possible cause of the outbreak in Prey Tup village. Nhoam (raw papaya salad) might have been the vehicle because it might have been contaminated by the water used for cooking and cleaning. *Salmonella species* could be one possible cause of the outbreak.

It is believed that filtered water is safe to drink, but it was found contaminated as well.

Provincial and district RRT worked very effectively and efficiently in the control of the outbreak by setting up surveillance and a mobile clinic to control the outbreak.

**RECOMMENDATION**

*For the community (villagers):*

To prevent outbreaks, food should be well cooked and raw vegetables must be cleaned at least two times with running safe water (treated), or with a permanganate solution. the availability of safe water remain an important challenge in Cambodian rural communities while chlorine and permanganate solution are not affordable for the villagers.

Drinking water should be treated before consumption (even after filtration) Filters need to be cleaned regularly and eventually changed when found unsafe. Drinking water can be boiled or treated with chlorine.

Sanitation also needs to be improved. Water wells should be enclosed and covered. In the long run, supply of safe water should be considered. Toilet facilities are also needed to avoid the abundance of human excreta that might contaminate the wells, especially during the raining seasons. Animals should be raised in a compartment and away from the water wells.

Health education should be promoted in the communities with emphasis on the importance of the personal hygiene (with simple messages such as hand washing before and after cooking, after defecation, and eating). Cutting nails short also remove reservoirs of germs.

In order reach such achievements, a multi-sectorial approach is required, which includes human health, animal health, rural development, environment, and agriculture.

*Provincial and District Rapid Response Team (RRT) and Central CDC*

Both provincial/district RRT and central CDC team should be trained in applied epidemiology and biostatistics, with active involvement in field activities and outbreak investigation. Guidelines for sample collection and SOPs for outbreak investigations and response should be available. Specimen collection equipment should be available at the provincial level.

Human sampling (rectal or throat swabs) and collection of food and water samples should be more systematically collected in order to identify the causative agents.

Village health volunteers should be trained for the quick detection and the reporting of abnormal public health events.

**LIMITATIONS**

The collection of specimens was very limited. Only one stool sample was sent for laboratory analysis and was tested negative. No causal agents were identified.

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