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# Rotavirus diarrhoea among children aged less than 5 years at Mahosot Hospital, Vientiane, Lao PDR☆,☆☆

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ABSTRACT

Rotavirus is one of the most common causes of severe life-threatening diarrhoea in children leading to hospitalization especially in developing countries. At Mahosot Hospital in Vientiane, Lao PDR, children with diarrhoea underwent standard clinical evaluation and faecal specimen collection to estimate the burden of rotavirus hospitalizations and to determine rotavirus strain patterns among children aged less than 5 years old. From March 2005 to February 2007, a total of 1158 stool specimens were collected from children aged less than 5 years old hospitalized with acute diarrhoea. Rotavirus was identified in 624 (54%) of these patients. The G1P[8] strain was the most common genotype (35%), followed by G9P[8] (25%). These surveillance data suggest that improved prevention and control programs for rotavirus as well as other causes of diarrhoea are needed in Lao PDR.



## 1. Introduction

Globally, rotavirus is the most common cause of severe life-threatening diarrhoea in children and it is responsible for an estimated 527,000 deaths each year among children aged less than 5 years old [1,2]. Rotavirus is also one of the main causes of all childhood hospitalizations and is the leading cause of childhood diarrhoeal hospitalizations [3,4]. In developing countries with limited access to health care, infants are particularly at risk for rapid body fluid losses associated with rotavirus infection [5].

The Lao People's Democratic Republic (Lao PDR) has a total population of 5,609,997 living within an area of 236,800 km$^2$ [6]. In Lao PDR, the national life expectancy is 61 years and the infant mortality rate (IMR) is 59 per 1000 live births while mortality rate of children aged less than 5 years old (U5MR) is as high as 75 per 1000 live births [7]. In Laotian children aged less than 5 years old, malaria accounts for 24% of major hospitalizations while diarrhoea, pneumonia and neonatal tetanus are responsible for 17%, 16% and 9%, respectively [8]. Despite the fact that diarrhoea is one of leading cause of admission to paediatric departments, there is little information available on causes of diarrhoea in the Lao PDR [9,10]. Currently, there are no systematic data available on rotavirus diarrhoea in Lao PDR and such data are critical to help guide health policy decisions regarding the use of new rotavirus vaccines in Laotian infants.

This study describes the prevalence of acute diarrhoea caused by rotavirus as well as the distribution of G and P genotypes of rotavirus strains among children aged less than 5 years old who were admitted to Mahosot Hospital, Vientiane, Lao PDR. This study also describes demographic, seasonal and clinical characteristics of rotavirus diarrhoea in these hospitalized patients.

## 2. Materials and methods

Mahosot Hospital is a major teaching and referral hospital located in Vientiane, Lao PDR. The majority (75%) of paediatric inpatient admissions (1824 of 2432 inpatients) to Mahosot Hospital in 2005 were children aged less than 5 years old [11]. This study was

*Abbreviations:* IMR, infant mortality rate; IVI, International Vaccine Institute; Lao PDR, Lao People's Democratic Republic; RT-PCR, reverse transcriptase-polymerase chain reaction; U5MR, mortality rate of children aged less than 5 years.

☆ Results reported in this manuscript were presented in part at the 6th Asian Rotavirus Surveillance Network Investigators' Meeting, Bangkok, Thailand, December 3–4, 2007.

☆☆ Human experimentation guidelines of the U.S. Department of Health and Human Services and those of the authors' institution(s) were followed in the conduct of clinical research.

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conducted from March 1, 2005 through February 28, 2007 among children aged less than 5 years old who were admitted for acute diarrhoea to the Department of Paediatrics in Mahosot Hospital. Acute diarrhoea was defined as three or more watery stools in a 24-h period with onset less than 7 days before presentation. Moreover, a symptom-free interval of not less than 5 days was observed to distinguish between successive episodes of diarrhoea [12,13]. Ethical clearance for this study was granted by the Ethical Review Committee of the Council of Medical Sciences and Technology as well as the Institutional Review Board of the International Vaccine Institute, Seoul, South Korea.

Children were screened in all paediatric inpatient units of Mahosot Hospital and physicians interviewed parents to record signs and symptoms of diarrhoea and relevant demographic and clinical information. Parents were provided with faecal specimen collection containers with plastic bags to collect diarrhoeal specimens. These containers were labelled by medical staff with the date of collection and a unique surveillance identification number to permit reporting of test results to clinical paediatric department staff.

Study investigators were provided with standardized forms for demographic and clinical data collection and data forms were reviewed for completeness and accuracy to ensure data quality. On a weekly basis, data were entered into surveillance database management software created by IVI staff using MS Visual FoxPro® (Microsoft Corp., Redmond, USA). We performed descriptive analysis of rotavirus diarrhoea epidemiologic patterns by age and sex as well as the seasonal distribution of diarrhoeal and rotavirus hospitalizations. Clinical characteristics, the severity of illness and family characteristics were compared between children with rotavirus-positive and rotavirus-negative diarrhoea using chi-square test or Fisher's exact test when the expected cell sizes were less than five.

**Table 1**
Children with diarrhoea by age group, Vientiane, Lao PDR, March 2005–February 2007.

| Age group, months | Total enrolled, *n* (%)[a] | Specimens tested, *n* (%)[b] | RV-positive, *n* (%) |
|---|---|---|---|
| <6 | 136 (12) | 135 (99) | 56 (42) |
| 6–11 | 380 (32) | 376 (99) | 207 (55) |
| 12–23 | 439 (38) | 435 (99) | 250 (58) |
| 24–35 | 122 (10) | 121 (99) | 79 (65) |
| 36–59 | 95 (8) | 91 (96) | 32 (35) |
| Total | 1172 (100) | 1158 (99) | 624 (54) |

[a] Column percentage.
[b] Percentage of specimens tested among the total number of patients enrolled.

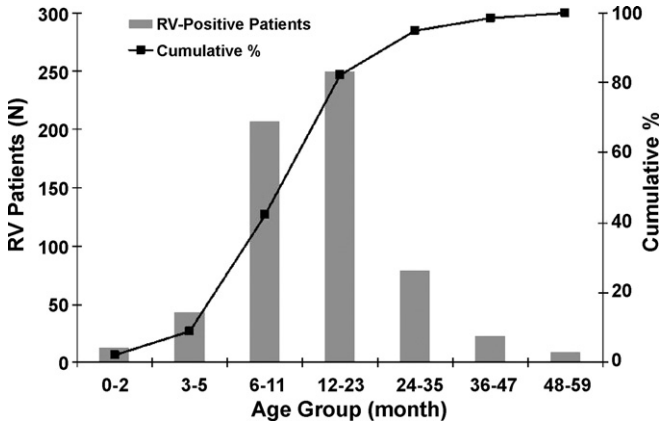


**Fig. 1.** Age distribution and cumulative percentage of rotavirus-positive diarrhoea admissions (*n* = 624), Mahosot Hospital, Vientiane, Lao PDR, March 2005–February 2007.

For each child, a faecal specimen was collected at the time of admission and frozen at −20 °C. Those stools samples were tested using a rotavirus antigen detection enzyme immunoassay (Oxoid Ltd, United Kingdom). A randomly selected group of 211 rotavirus-positive faecal specimens underwent further characterization to determine strain genotype by reverse transcriptase-polymerase chain reaction (RT-PCR) at Murdoch Childrens Research Institute, Melbourne, Australia [14,15].

## 3. Results

Of 1172 children aged less than 5 years old admitted for acute diarrhoea from March 2005 to February 2007, 1158 (99%) had a stool specimen available for rotavirus testing and of these 624 (54%)

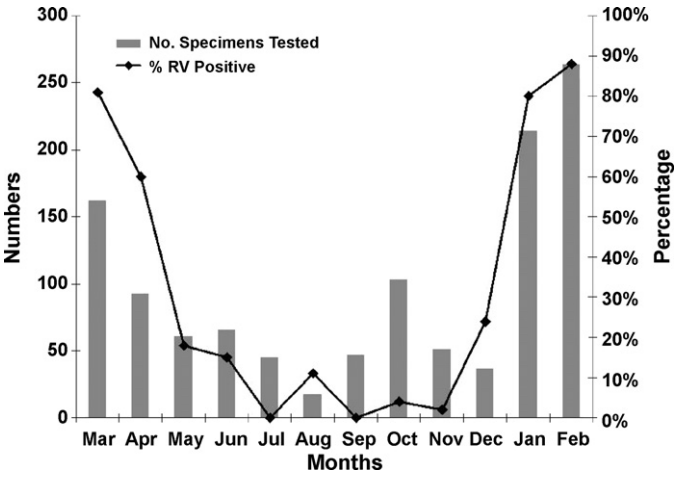


**Fig. 2.** Seasonal distribution of diarrhoea admissions (*n* = 1158) and rotavirus-positive diarrhoea (*n* = 624), Mahosot Hospital, Vientiane, Lao PDR, March 2005–February 2007.

**Table 2**
Clinical characteristics of children with diarrhoea, Vientiane, Lao PDR, March 2005–February 2007.

| Characteristics | Rotavirus-positive, *n* (%) | Rotavirus-negative, *n* (%) | *P*-value |
|---|---|---|---|
| Temperature (°C) | | | |
| ≤37.5 | 341 (55) | 286 (54) | |
| 37.6–38.6 | 184 (30) | 143 (26) | 0.20 |
| ≥38.7 | 99 (16) | 105 (20) | |
| Dehydration | | | |
| None | 22 (3.5) | 70 (13) | |
| Some | 587 (94) | 455 (85) | <0.0001 |
| Severe | 15 (2.4) | 9 (1.7) | |
| Length of stay (days) | | | |
| ≤2 | 473 (76) | 368 (69) | |
| 3–6 | 146 (23) | 143 (27) | <0.0001 |
| >6 | 5 (0.8) | 23 (4.3) | |
| Diarrhoea duration (days) | | | |
| ≤2 | 28 (4.5) | 31 (5.8) | |
| 3–5 | 226 (36) | 166 (31) | 0.15 |
| >5 | 370 (59) | 337 (63) | |
| Vomiting duration (days) | | | |
| No vomiting | 40 (6.4) | 151 (28) | |
| <3 | 428 (69) | 320 (60) | <0.0001 |
| ≥3 | 156 (25) | 63 (12) | |
| Treatment | | | |
| ORS + IVF | 554 (89) | 427 (80) | |
| ORS + IVF + ABX | 19 (3.0) | 48 (9) | <0.0001 |
| Others | 51 (8.2) | 59 (11) | |

*Note*. ORS, oral rehydration solution; IVF, intravenous fluid; ABX, antibiotics.