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# AN OUTBREAK OF SEVERE GASTROENTERITIS CAUSED BY ROTAVIRUS IN THE SOLOMON ISLANDS

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## Abstract

An outbreak of severe acute rotavirus gastroenteritis affected children and adults on Guadalcanal Island in the Solomon Islands during the two months from 2 September to 5 November 1995. A total of 858 patients presented to the Outpatient Department of Honiara Central Hospital, resulting in 169 admissions, predominantly of children under five years of age, two of whom died. The abrupt onset and cessation of this epidemic may prove to be characteristic of rotavirus epidemiology in small island populations.

## Introduction

Rotavirus is the single-most important cause of severe gastroenteritis in young children between six and 24 months of age worldwide<sup>1,2</sup>. There are only a limited number of published reports on rotavirus outbreaks occurring in isolated communities. The pathogen is clearly present in tropical island communities in the Pacific Ocean, but its epidemiology is not well understood. Reports include those from Papua New Guinea in 1979<sup>3</sup>, Truk in 1980<sup>4</sup> and New Caledonia in 1994<sup>5</sup>. The epidemic in islands comprising the Truk District during 1964 was particularly severe, involving 3,439 cases. That epidemic occurred from February to April 1964, involved residents on 14 islands, with attack rates ranging from 5.8 to 25/100 persons/island. At the time, the aetiological agent was not identified. Retrospective studies done fifteen years later demonstrated that the outbreak was caused by rotavirus<sup>4</sup>. In Papua New Guinea, 54 of 66 children studied with severe gastroenteritis were found by electron microscopy to be infected with rotavirus<sup>3</sup>. A survey carried out in New Caledonia involving 2,088 diarrhoea patients however showed that rotavirus was not a common enteric pathogen during the period of the survey<sup>5</sup>.

The Solomon Islands comprise several hundred islands located in the south-western Pacific Ocean scattered over 249,000 square nautical miles between Papua New Guinea to the north-west and Vanuatu to the south-east. The capital, Honiara, is located on Guadalcanal Island. The majority of the Solomon Islands population (370,000 in 1993) live on the narrow coastal plains. The climate is equatorial with a mean year-round temperature of 27°C, humidity 60-90%, and maximum (monsoonal) rainfall from November to April.

Diarrhoea is the third-most common cause of morbidity among children in the Solomon Islands, exceeded only by acute respiratory infections and malaria. The attack rate for all forms of diarrhoea in 1992 was 3.5 attacks per child per year, with mortality estimated to be 14%, equivalent to 1.7 deaths per 1,000 children per year<sup>6</sup>. The frequency of gastroenteritis cases presenting to the Outpatient Department of Honiara Central Hospital, the national referral hospital, routinely fluctuates between two and six per day. The number of admissions to the Children's Ward ranges from three to 24 per month. There appears to be no clear seasonal pattern, in common with epidemiological observations in other tropical countries<sup>7</sup>. In the past ten years there have been outbreaks of gastroenteritis, including one due to *Shigella* species in 1988. The presence of rotavirus had not been documented in the Solomon Islands prior to this outbreak, primarily because there are no laboratory facilities for the isolation and identification of viruses. Outbreaks of viral origin may have taken place, but the aetiological agents were never identified.

The epidemic described in this report began in the middle of September 1995, when there was a noted increase in the number of severe gastroenteritis cases presenting to the Outpatient Department of Honiara Central Hospital. The number of cases continued to rise during October, severely stretching the ability of existing facilities to manage the number of patients. When the unusual nature of the epidemic was realised, together with the inability of the hospital laboratory to identify an aetiological agent, faecal specimens collected during the latter part of the epidemic were flown on ice to Melbourne for viral analysis.

## Methods

All patients (adults and children) presenting to the Outpatient Department of Honiara Central Hospital with symptoms of acute gastroenteritis were registered. Data were collected and tabulated by date of presentation, age and gender. A case was defined as a person (usually a child) presenting with fever, vomiting and profuse watery diarrhoea. Data on patients admitted to the ward were collected and compiled from admission records and case notes.

Stool specimens obtained within 48 hours of admission to hospital were routinely examined for bacterial enteropathogens (including *Salmonella* species, *Shigella* species, *Campylobacter* species and *V. cholerae*) by the Honiara Central Hospital Clinical Laboratory. Stool speci-

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mens collected from thirty-two young children after admission to hospital with severe diarrhoea between 12 and 19 October 1995 were sent to the Gastroenterology and Clinical Nutrition Department of the Royal Children's Hospital in Melbourne, Australia where they were examined for rotavirus using an enzyme immunoassay developed to detect and serotype human rotavirus strains<sup>8</sup>. The genetic patterns (electropherotypes) of rotavirus strains were identified by gel electrophoresis of dsRNA extracted from faecal specimens.

## Results

An increase in gastroenteritis cases presenting to the Outpatient Department of Honiara Central Hospital was observed during early September 1995, rising to a peak for numbers of patients admitted during the first two weeks of October. The numbers admitted declined thereafter, returning to normal levels by early November (Figure).

During the period covering the two months of the outbreak, from 2 September to 5 November 1995, 858 patients presenting with severe gastroenteritis were recorded by the Outpatient Department. Seventy per cent were children under three years of age with a mean age of 18 months, and ten per cent were aged from three to five years. Adults, and children over five years of age, accounted for 20 per cent of the cases. No gender bias was observed among the patients. The overall attack rates for children younger than three years of age presenting to the Outpatient Department and admitted to hospital were 100 per 1,000, and 28 per 1,000 respectively (calculated on the basis of a total population at risk of approximately 6,000 children up to three years old).

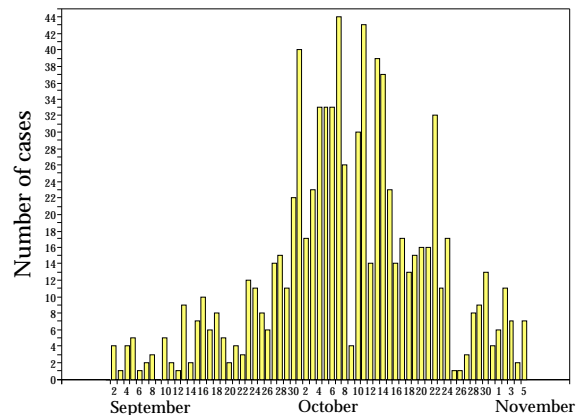
There were 169 admissions for severe gastroenteritis recorded during October. All were children under five years of age, with the majority between one and three years of age. All were moderately to severely dehydrated (10%-15%) on admission and required intravenous rehydration. The average length of intravenous therapy was two days, with an average length of stay of three days. The patients were discharged as soon as they were well hydrated and able to retain orally administered fluids. Follow-up of ten patients showed that the illness lasted an average of seven days. There were two known deaths: one died within six hours of admission and the other died before arrival at hospital.

Cultures sent to the Central Hospital Clinical Laboratory were all negative for bacterial enteropathogens. All thirty-two specimens from gastroenteritis patients tested at the Royal Children's Hospital in Melbourne were positive for rotavirus. A serotype could be assigned to 14/32 rotavirus positive specimens. All fourteen typeable specimens were G1 serotype. Genetic patterns (electropherotypes) of specimens tested were identical.

## Discussion

This was a major epidemic for a small country like the Solomon Islands, involving symptomatic illness in both

**Figure. Patients presenting to the outpatients department of Honiara Central Hospital with severe acute diarrhoea between 2 September and 5 November 1995**



adults and children. Rotavirus was identified for the first time as the causative agent of severe gastroenteritis in the Solomon Islands. No other outbreaks of gastroenteritis of the same magnitude and severity have been recorded, even though diarrhoeal disease is the third-most common cause of morbidity in these islands.

The epidemic began and ceased abruptly and was of short duration, lasting approximately six weeks, with a high attack rate in children aged less than three years of age. The pattern of the epidemic suggests a faecal-oral route of transmission since no patients presented with respiratory symptoms. It is unlikely that transmission involved the public water supply system on Honiara, since cases also occurred in rural villages on Gaudalcanal Island with separate water supplies. Detailed epidemiological investigations were not carried out.

Aside from the clinical aspects of this epidemic, the patient load that it created placed a heavy burden on the limited treatment resources available. The already short-staffed and overcrowded Honiara Central Hospital had to move patients to create a new ward at the height of the epidemic. Resources for the management of those patients, such as intravenous sets and drip stands, were also stretched to the limit.

The long-term effects of this gastroenteritis epidemic have not been assessed, but it is worth noting that rotavirus has been associated with post-enteritis weight loss in instances where there is a high rate of malnutrition<sup>9</sup>. In Honiara Central Hospital, 35% of patients admitted to the Children's Ward are less than 80% weight for age at discharge (Rodgers, unpublished observation). As a result of the epidemic, that percentage may increase.

The epidemiology of rotavirus transmission in Pacific island countries is still not well understood. A few reports published in the literature, together with observations of this epidemic, suggest that rotavirus infection may not be

endemic and that transmission may not be sustained in these small isolated communities. Instead of endemic year-round infection characteristic of tropical countries, there may be a pattern of periodic epidemics (involving adults and children) when rotavirus strains are reintroduced from time to time. The G1 rotavirus serotype involved in this epidemic has been shown to be the most common serotype causing diarrhoea in young children throughout the world<sup>1,2</sup>. The source of the strain responsible for this epidemic has not been identified, but could have been external to the Solomon Islands. Preliminary results indicate that it is genetically similar to a rotavirus strain causing severe diarrhoea on the Australian mainland during the same period (unpublished observations). It is unrealistic to expect that public health measures could prevent introduction of rotavirus strains into island communities from time to time, particularly via asymptomatic travellers. It is important to monitor rotavirus infection in the Solomon Islands on a continuing basis to understand the epidemiology of this important enteric pathogen. Eventually, control of rotavirus disease may be achieved by oral vaccines to prevent disease in young children<sup>10</sup>.

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