Rotavirus gastroenteritis in the Northern Territory, 1995–2004

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ABSTRACT

Objective: To present data on rotavirus notifications in the Northern Territory to provide knowledge about the local epidemiology of rotavirus gastroenteritis that can be used to inform the use and funding of rotavirus vaccines.

Design: Retrospective analysis of data from the Northern Territory Notifiable Diseases Database.

Participants and setting: Patients with cases of rotavirus infection notified to the NT Centre for Disease Control from 1 January 1995 to 31 December 2004.

Main outcome measures: Patterns of rotavirus notifications over time; infection rates in Indigenous versus non-Indigenous children aged 0–5 years; age groups infected with rotavirus.

Results: Numbers of rotavirus notifications over the period 1995–2004 show annual, monthly and regional variability. The rotavirus notification rate for Indigenous children aged 0–5 years was 2.75 per 100 per year, compared with 0.98 for non-Indigenous children, with a relative risk for Indigenous children of 2.17 (95% CI, 1.97–2.39) over the 10 years. Indigenous children infected with rotavirus were younger than non-Indigenous children, with median ages of 11 months and 16 months, respectively. Rotavirus gastroenteritis occurred in outbreaks, transmitted over months throughout the NT.

Conclusion: Large numbers of cases of rotavirus gastroenteritis affecting Indigenous and non-Indigenous children in the NT are notified every year. The rate in Indigenous children may be decreasing relative to non-Indigenous children. An effective rotavirus vaccine could prevent significant morbidity.

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Rotavirus gastroenteritis is an important public health problem throughout the world, causing around 500 000 deaths every year.[1] In Australia, death is a rare outcome, but rotavirus infections lead to 10 000 hospitalisations annually.[2] In Australia's Northern Territory, hundreds of children have rotavirus gastroenteritis each year, and many are evacuated from remote communities to regional hospitals at significant social and financial cost.[3] A rotavirus outbreak in 2001 was a huge burden on Alice Springs Hospital, with, at one time, over 45% of hospital beds occupied by children with gastroenteritis.[3,4]

Rotavirus has been notifiable to public health authorities in the NT since 1994, and a report on rotavirus epidemiology based on notification data was published in 2001.[5]

Vaccines to protect against rotavirus gastroenteritis are now available. Decisions about funding of vaccines require information on the local epidemiology of the disease. In this article, I describe the epidemiology of rotavirus gastroenteritis in the NT from 1995 to 2004, based on notification data.

METHODS

Laboratories have been required to notify rotavirus detection on faecal specimens to the Centre for Disease Control in the NT since 1994, and there has been reliable reporting since 1995.[5] Notification data include date of birth, Indigenous status, sex, community of residence, specimen date and type, collection and notification dates, laboratory and diagnostic method. Indigenous status is self-defined by patients or caregivers, and reported to clinical or administrative staff in clinics and hospitals. Notification data are held in the NT Notifiable Diseases System at the Centre for Disease Control.

Data in the notifiable diseases database were cleaned, and completed, where possible, from the NT Department of Health and Community Services patient identification database (Caresys). Identification by name and date of birth in each notification was established from Caresys. For notifications that did not include Indigenous status, this was transferred from Caresys to the notification database. Repeat notifications within 8 weeks were deleted. This process of collecting further information about clients with notifiable diseases is allowed under the *Notifiable Diseases Act 1999* (NT). Population data were based on estimates from the Australian Bureau of Statistics (Epidemiology Branch, NT Department of Health and Community Services, unpublished data).

The NT has two distinct regions — the Top End in the north, and Central Australia — which differ climatically, and in the ethnic, socioeconomic and demographic characteristics of their populations. Notification rates among Indigenous and non-Indigenous children in urban and rural areas in each region were calculated and compared. Cumulative incidence of rotavirus notification was calculated by applying the Indigenous-status-specific notification rates for 5 years to the cumulative proportion of notifications in each age group.

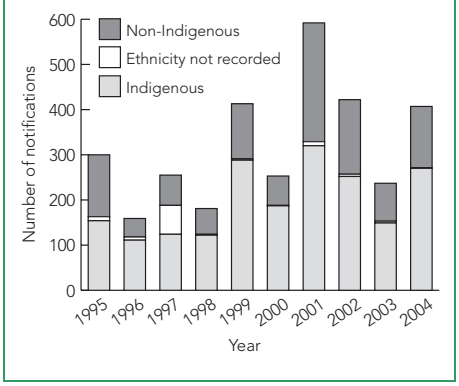
RESULTS

Annual and monthly rotavirus notifications

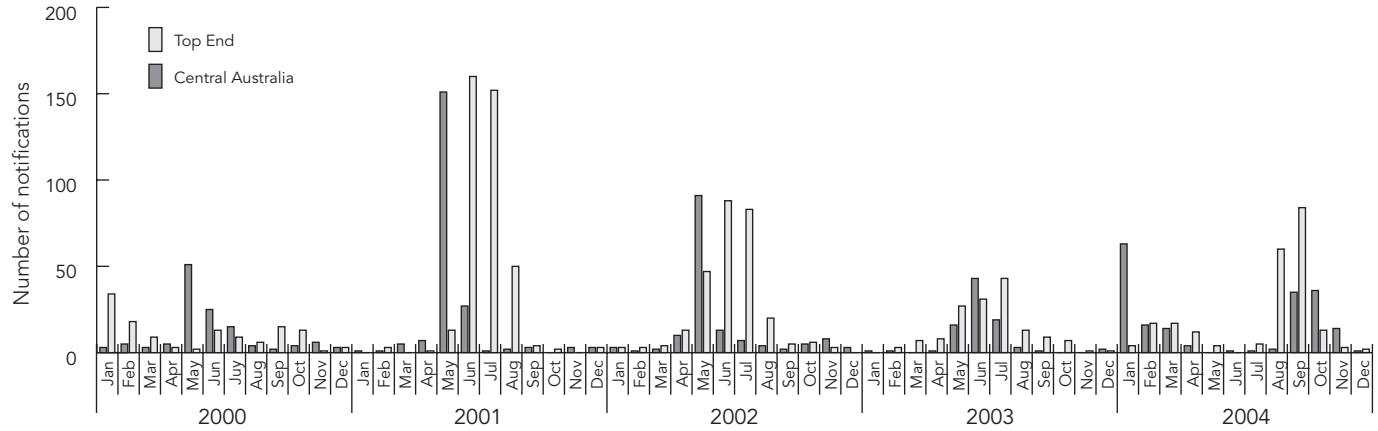
Rotavirus notifications are periodic, and total numbers are quite variable from year to year, as shown in Box 1. A second-yearly pattern was suggested by increases in rotavirus notifications in 1997, 1999 and 2001, but did not continue in 2003. The total number of notifications in 2004 is the sum of two separate peaks.

Further breakdown of notifications by month and region for 2000 to 2004 is shown in Box 2. There was no consistent seasonal or regional pattern over 5 years. In

1 Total number of rotavirus notifications in the Northern Territory by year, 1995–2004



2 Rotavirus notifications in the Northern Territory by month and region, 2000–2004



3 Rotavirus notification rate per 100 children aged 0–5 years per year in the Northern Territory, 1995–2004

Region	Indigenous	Non-Indigenous	Relative risk (95% CI)
Top End			
Rural	2.61	1.21	2.13 (1.81–2.49)
Urban*	0.70	0.85	0.82 (0.65–1.03)
Central Australia			
Rural	3.89	1.19	3.17 (2.31–4.37)
Urban	4.91	1.25	3.80 (3.19–4.53)
All Northern Territory*	2.75	0.98	2.17 (1.97–2.39)

* 1997 data excluded from calculations of "Top End urban" and "all Northern Territory" rates because Indigenous status of the patient was unknown in 43 of 177 notifications in 1997. ◆

most years, peaks of notifications occur in the cooler months of May to August and progress northwards through the NT, from Central Australia to the Top End.

The outbreak in May 2001 resulted in the largest number of notifications in one year — 592. However, characteristics were different in the two regions. In Central Australia, there were large numbers of cases over less than a month; while in the Top End, there were continuing high levels of transmission for 3 months.

In 2004, there were two smaller peaks, in January and September. This pattern was also seen in 1996 and 1998 (data not shown). Thus, over the 10-year period examined, no consistent pattern of rotavirus notifications was apparent.

Indigenous status

Over 1995–2004, 61.4% (1977/3219) of notifications were of cases in Indigenous people and 35.3% (1137/3219) were of cases in non-Indigenous people (Indigenous status could not be determined for 3.3% of notifications [105]). In the NT, about 30% of the population is Indigenous.

Box 3 shows notification rates per 100 children aged under 5 years per year by Indigenous status, region, and urban or rural place of residence for 1995–2004.

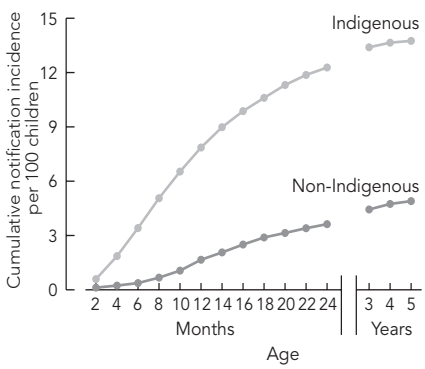
Indigenous status of Top End urban children was not reported in 65 of 751 notifications, 43 of which were in 1997. Assumptions about the Indigenous status of these children determined whether the notification rate of Indigenous or non-Indigenous Top End urban children was higher (if they were all non-Indigenous, the relative risk [RR] for Indigenous children was 0.79 [95% CI, 0.64–0.98]; if they were all Indigenous, the RR for Indigenous children was 1.46 [95% CI, 1.23–1.73]). When 1997 data were excluded from the calculation for Top End urban children, the notification rate was 0.70 per 100 Indigenous children and 0.85 per 100 non-Indigenous children per year, and the RR for Indigenous children was 0.82, but there was no statistical difference between Indigenous and non-Indigenous Top End urban children (95% CI, 0.65–1.03; Mantel–Haenszel χ^2, 2.95; P = 0.086).

In all other regions, notification rates in Indigenous children were significantly higher than those in non-Indigenous children.

The highest notification rate (Box 3) was among Central Australian urban Indigenous children, and this was significantly higher than the rate among Central Australian rural Indigenous children. The RR for Central Australian urban Indigenous children compared with Central Australian rural Indigenous children was 1.25 (95% CI, 1.09–1.43).

For all of the NT in 1995–2004 (excluding 1997 because of the significant number of notifications involving patients with unknown Indigenous status), the notification rate for Indigenous children was nearly three times that for non-Indigenous children

4 Cumulative incidence of rotavirus notifications to age 5 years per 100 Northern Territory children, 1995–2004



(Box 3). The RR for Indigenous children compared with non-Indigenous children was 2.17 (Box 3).

Age of children with rotavirus

NT-wide data on the cumulative incidence of rotavirus notification to age 5 years in 1995–2004 are shown in Box 4. Infants aged less than 1 year accounted for 56% of notifications (1106/1977; 95% CI, 0.54–0.58) of Indigenous children, and infants aged less than 6 months accounted for 24% (480/1977; 95% CI, 0.22–0.26). The median age of Indigenous people with notified cases of rotavirus was 11 months. Among non-Indigenous people with notified cases of rotavirus, 31% (348/1137; 95% CI, 0.28–0.33) were aged less than a year, and only 7% (78/1137; 95% CI, 0.05–0.08) were aged less than 6 months. The median age for non-Indigenous people with notified cases of rotavirus was 16 months.

DISCUSSION

Rotavirus gastroenteritis is common in the NT in both Indigenous and non-Indigenous children. The rate of rotavirus gastroenteritis notification among non-Indigenous children was 0.98 per 100 per year compared with 2.75 per 100 per year among Indigenous children.

As the NT is the only Australian jurisdiction where rotavirus gastroenteritis was notifiable during the study period, comparative data are available only from another NT study for 1995 to mid 2001.[6] The RR for rotavirus notification of Indigenous compared with non-Indigenous children over 1995–2004 was 2.17. This is less than the RR of 5–8 reported in 2001 in the other NT study.[5] The marked decrease may reflect a true decrease, or be a result of the data cleaning and improved ascertainment of Indigenous status.

Central Australian Indigenous children, both urban and rural, had very high rates of rotavirus notification — around 4% per year — and Top End rural Indigenous children also had high rates, at 2.6% per year. Urban Indigenous and non-Indigenous children in the Top End have lower rates. Available data suggest that the rate may be as high in non-Indigenous as in Indigenous Top End urban children. If funding for rotavirus immunisation is to be limited to particular groups, these rates suggest that Indigenous children should be prioritised, except in the Top End urban region.

The young age of Indigenous children with notified cases of rotavirus in the NT is important because of the greater severity of disease and greater likelihood of hospitalisation of younger children.[1] To have greatest impact on reducing infection rates in these children, a vaccine should be effective from before 6 months of age.

Disease notification is limited to cases where the illness is presented to health care facilities, a specimen is collected, the test has adequate sensitivity to detect the infection, the result is positive, and the positive result is forwarded to the public health unit. Collection of stool specimens in primary health care services is not in the standard NT patient management protocol,[7] so rotavirus infection may be underrecognised, especially outside hospitals, and notification rates may not be a true indication of disease incidence rates.

The Notifiable Diseases Act requires collection of data on notifiable diseases, but the information collected is limited. Manual data entry has the potential for introducing further error. However, within these limitations, notification data provide ongoing, contemporaneous and local information on disease epidemiology.

Further research is needed to interpret the pattern and rates of notification of rotavirus gastroenteritis in the NT. Since 2005, rotavirus detection by laboratories has been notifiable in Queensland,[8] and future work will be able to compare rates in Queensland with those in the NT.

Ongoing rotavirus surveillance will enable us to better understand the seasonal pattern of outbreaks and transmission of infection. Quality data collection, including Indigenous status of the patient in every case, would assist in understanding the differential notification rates in Indigenous and non-Indigenous children. Enhanced data collection could determine any protective effect from breastfeeding.

Future rotavirus notification patterns and rates are difficult to project from data available. If a rotavirus immunisation program is to be introduced, its effectiveness should be actively monitored. Nonetheless, the notification data presented in this study show that an effective rotavirus vaccine could prevent considerable morbidity in both Indigenous and non-Indigenous children in the NT.

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COMPETING INTERESTS

None identified.

AUTHOR DETAILS

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