

A One Year Community-based Study on the Incidence of Diarrhoea and Rotavirus Infection in Urban and Suburban Malaysian Children

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Summary

A 1 year longitudinal study of 156 Malaysian children from urban and suburban areas in the Klang Valley revealed that the incidence rate of diarrhoea was 23.6 per 100 person-year with abnormal faeces reported on 0.26% of the total days of observation. Diarrhoea cases were detected in children from all socio-economic classes. Rotavirus was isolated from 12% of the diarrheic children and asymptomatic rotavirus infection occurred in 3.2% of the children. All rotaviruses isolated were group A rotaviruses with long electrophoretic pattern.

Key words: Diarrhoea, symptomatic and asymptomatic rotavirus infection.

Introduction

Diarrheal diseases rank as a major group of illnesses in Malaysia^{1,2}. Several reports have shown that group A rotaviruses were associated with a significant proportion of diarrhoea cases in Malaysian children^{3,4,5,6}. However, these reports were cross-sectional hospital-based studies. Diarrheal illnesses necessitating the patients to be hospitalised are usually more severe than those in which hospitalisation is not required and hence more likely to be associated with some enteropathogens. Thus, the prevalence rate of rotavirus-associated diarrhoeas obtained from these hospital-based studies may not be reflective of the true rate in the community. A more accurate picture would be obtained from community-based longitudinal studies which cover a wider range of severity of illness. The high prevalence of rotavirus isolated from diarrheic children admitted to the Kuala Lumpur General Hospital^{5,6} had raised doubts concerning the real etiological role of the rotavirus in these cases as asymptomatic infection had been reported elsewhere⁷. The significance of the rotavirus isolate as the etiological agent can only be ascertained if the incidence of asymptomatic infection is known.

Thus far there has been no published longitudinal study on symptomatic and asymptomatic rotavirus infection in Malaysian children. The aims of this study were to ascertain the incidence of diarrhoea and its association with rotavirus infection in a cohort of urban and suburban children as well as to determine the incidence of asymptomatic rotavirus infection in these children.

Materials and Methods

Study area

The study population consisted of families from homes dispersed in the Klang Valley and 2 housing clusters located together at the fringe of the city centre.

Selection criteria

The selection criteria used were age of children 5 years old and below, consent of their parents to participate as well as the feasibility and practicability of the field-workers to visit and maintain regular contact with them.

Features of the study population

A total of 156 children from 116 households took part in this study which started on 1st July 1988 and ended on 30th June 1989. The age distribution of the participants and the number of days of observation are shown in Table I.

Table I
Age distribution of the participants and days of observation
in a cohort of 156 urban and suburban children

Age group (months)	No of children (%)	Days of observation
2 - 5	12 (7.7%)	3,843
6 - 11	21 (13.5%)	7,939
12 - 23	32 (20.5%)	6,622
24 - 35	32 (20.5%)	11,909
36 - 60	59 (37.8%)	18,082
ALL	156	48,395

Data collection and illness surveillance

The participating families were divided into 8 groups. A field-worker who was assigned to each group made 3 visits weekly to the families and enquired about any illness in the children on that or the preceding days. The parents and childminders were instructed to make daily observation of the children's bowel movements and to collect any semi-liquid or liquid faeces for analysis. An additional faecal specimen was regularly collected from each child towards the end of each month. A doctor, accompanied by the respective field-worker, also made monthly visits to the homes of the children. During the visits, the doctor examined the children, reviewed the information recorded by the field worker and validated it by interviewing the participants' spokespersons. Children in the dispersed families were visited and examined once during the duration of this study. At other times the doctor held monthly meetings with the parents to review and verify the information collected.

Laboratory investigations

Rotavirus was detected using an in-house enzyme-linked immunosorbent assay (ELISA) based on the WHO method for group A rotavirus detection⁸ and also by the technique of polyacrylamide gel electrophoresis (PAGE) with silver staining as previously described⁶. The sensitivity and specificity of the

in-house assay was found to be similar to the WHO ELISA and a commercial ELISA (Dakopatts, Denmark) for group A rotavirus detection (unpublished data).

Results

Incidence and frequency of diarrhoea

Sixty episodes of diarrhoea (the excretion of semiliquid and liquid faeces as defined by the participants' parents) were reported from 34 (21.8%) of the 156 children. The incidence rate of diarrhoea was 23.6 per 100 person-year. Diarrhoea was noted on 0.26% of all days of observation and was recorded in all months of surveillance. The average number of excretion of liquid and semiliquid faeces per 24 hours per diarrheal episode was: 1 to 1.9 times (10.3% of total diarrheal episodes), 2 to 2.9 times (19.0%), 3 to 3.9 times (29.3%), 4 to 4.9 times (25.9%), 5 to 8 times (15.5%). The duration of the diarrheal episodes were 1 day (46.7% of the total diarrheal episodes), 2 to 3 days (43.3%) and 4 to 6 days (10.0%).

Prevalence of rotavirus in diarrheic children

Although diarrhoea was reported in 34 children, 1 or more faecal samples were collected from only 25 children. Rotavirus was detected in the faeces of 3 (12%) of the 25 children.

Proportion of diarrheic children seeking medical attention

Six (17.6%) of the 34 diarrheic children sought medical attention and 1 rotavirus-positive child who presented with fever and vomiting was hospitalised.

Asymptomatic rotavirus infection

Single normal faecal samples (total: 1,526 samples, 92% of expected total samples) collected monthly were analysed to determine the incidence of asymptomatic rotavirus infection. Rotavirus was detected in 5 (3.2%) children. All the 5 rotaviruses, and also the 3 detected from symptomatic cases, were long-pattern electrophoretotypes when analysed by PAGE.

Distribution of diarrheal cases and rotavirus infection in children based on socioeconomic indicators

The distribution of diarrheal cases and rotavirus infection in children based on rankings of the occupational class of the head of the family, the highest level of formal education attained by either parent and the total monthly family income is shown in Table II. Diarrhoea was detected in children from all ranks (groups) of the 3 indicators. The percentages of children with diarrhoea in the lower 2 groups of all the 3 indicators were similar and both were higher than those of the upper 2 groups but the differences were not significant.

No rotavirus infection was detected from the occupational class III, less than 7 years of formal education and total income of less than 500 ringgit per month groups. In the 3 occupational classes (I,II,III) where rotavirus infections were detected, infection was highest in children from the class II group and it was significantly different from children of class I group. The percentage of children with rotavirus infection in the group where parents had 7 to 11 years of formal education was 2 times lower than the group where parents had 13 years or more of education. However, the difference was not significant. The percentage of children with rotavirus infection was relatively similar in the various family income groups.

Discussion

The occurrence of diarrhoea in 0.24% of the total days of observation was 50 times lower than a previous report on Bangladeshi children⁹. Most episodes of diarrhoea reported in this study were mild: 29.3% had an average of less than 3 abnormal faecal excretions per day and about half of the diarrhoea episodes were

Table II
Distribution of diarrhoea and rotavirus infection in 156 urban and suburban children based on occupation, education and family income of the parents

Epidemiological parameter	in each group	Number of participants	
		with diarrhoea	with rotavirus infection
Occupational class of family head ^a			
I	14 (9.0%) ^b	5 (35.7%) ^d	1 (7.1%) ^{d,e}
II	56 (35.8%)	13 (23.2%)	6 (46.2%) ^e
III	26 (16.7%)	4 (15.4%)	
IV	60 (38.5%)	11 (18.3%)	1 (9.1%)
Educational level (year) ^c			
nil	7 (4.5%)	1 (14.3%)	
primary (>7yrs)	28 (17.8%)	4 (14.3%)	
secondary (7–11yrs)	97 (62.3%)	22 (22.7%)	5 (5.2%)
higher secondary to tertiary (≥13yrs)	24 (15.4%)	6 (25.0%)	3 (12.5%)
Family income (ringgit)			
<499	43 (27.5%)	6 (16.3%)	
500–999	48 (30.8%)	9 (18.8%)	3 (6.3%)
1,000–1,999	46 (29.5%)	11 (23.9%)	4 (8.7%)
≥2,000	19 (12.2%)	6 (31.6%)	1 (5.3%)

a. Types of occupation in each occupational class

- I doctor, engineer, lecturer, manager, bank officer, big-capital businessman
- II police & health inspectors, clerk, teacher, small/medium-capital businessman, draftsman, hospital assistant, laboratory technician, government officer
- III storekeeper, file searcher, shop assistant, film assistant, X-ray film processor, money changer, contractor (small capital), car mechanic, petty trader, driver, policeman, soldier, carpenter
- IV office, lift, laboratory & hospital attendants, cleaning supervisor, security guard, labourer

b. Based on total number of participants

c. Based on the highest level of education of either parent

d. Based on number of participants in each group (rank)

e. Significantly different ($X^2=5.93$, Chi squared test with Yates' correction).

Comparison between other ranks of columns 3 and 4 did not reveal any significant differences.

of 1 day duration. Furthermore, the mildness of most of the diarrhoea cases was indicated by the small proportion of the diarrheic children who sought medical attention (17%), and the hospitalisation of 1 child.

Previous studies on rotavirus-associated diarrhoea in children admitted for diarrhoea to the Kuala Lumpur General Hospital reported a prevalence of 28% to 40%^{6,10}. The determination of the extent to which the prevalence of rotavirus-associated diarrhoea in hospitalised children differs from children in the community requires a concurrent longitudinal and hospital-based study under similar conditions. A comparison of the incidence of 12% rotavirus-associated diarrhoea observed in this study, with that of a hospital-based study covering the same area and conducted at almost the same time period using similar

rotavirus detection methods⁶, revealed that the incidence of rotavirus-associated diarrhoea in the community was 2.5-fold lower when compared to the hospital-based study.

In order to ascertain the incidence of asymptomatic rotavirus infection, faeces were collected monthly from each child for the whole duration of this study. As no diarrhoea was reported for at least 2 weeks before and after the collection it was likely that any rotavirus detected from these specimens was not associated with diarrhoea but with asymptomatic infection. The isolation of rotavirus from a very small proportion of then-diarrheal children in this study (3.2%) clearly demonstrated that asymptomatic rotavirus carriage did occur in the community, but was uncommon. Thus positive rotavirus detection in diarrhoea cases, including the high positive detection rate in hospitalised children reported^{5,6,10}, does indicate its likely role as the etiologic agent for the illness.

PAGE analysis of the rotaviral RNA migration pattern revealed that all the rotaviruses detected in this study have long electrophoretic patterns in which all 11 segments migrated separately. The electrophoretic pattern was similar to the dominant type isolated from hospitalised children⁶. No other electrophoretic type was isolated, most probably because the dominant electrophoretic type accounted for a very large proportion (71.1%) of the rotavirus detected during this period⁶.

Occupations, education and incomes of parents were used as socioeconomic status indicators of the children under study. The results revealed no significant association of diarrhoea with any particular socioeconomic class of the study population. The observation of a trend towards higher incidence in children from families with higher socioeconomic status was likely to be spurious due to small samples of some groups and also to the relatively small number of diarrheal cases. Analysis of the association of rotavirus infection with socioeconomic status was even more untenable and equivocal due to the extremely small number of cases detected. However, it is of interest to note that only 1 of the 8 rotavirus cases was in children from lower ranks of the 3 socioeconomic indicators.

Conclusion

Urban and suburban children in this study have a low incidence of diarrhoea. Diarrhoea was present in all socioeconomic groups and was not significantly higher in any particular group. A small proportion of the diarrhoea cases (12%) was associated with rotavirus infection. Asymptomatic rotaviral infection was uncommon. The very small number of rotavirus cases did not allow meaningful analysis of its distribution according to socioeconomic status.

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