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Diarrhoeal Disease Morbidity, Risk Factors and Treatments in a Low Socioeconomic Area of Ilorin, Kwara State, Nigeria

Gbolahan A Oni, Debra A Schumann[1], and Ezekiel A Oke[2]

Department of Community Health, University of Ilorin, Ilorin, Nigeria; [1]Department of Anthropology, Case Western Reserve University, Cleveland, Ohio; [2]Department of Sociology, University of Ibadan, Ibadan, Nigeria.

Abstract

A 12 - month diarrhoeal disease surveillance was carried out in a sample of 351 children under 3 years of age in a low - income traditional area of Ilorin, Nigeria to determine whether sociodemographic characteristics, including age of the child, sex, parity, mother's education, occupation, mother's age and household kitchen, were associated with the incidence of acute diarrhoea. Bivariate and multivariate analyses were used to determine association. Results indicated that only the age of the child and the type of kitchen used by the household had a significant association with diarrhoea. Diarrhoeal incidence decreases with the child's age while households with a private kitchen had a significantly lower incidence rate than those without a kitchen. This finding emphasises the importance of good hygiene in reducing the risk of having diarrhoea. Three common treatments applied by mothers are ORS (used in 14.8% of diarrhoea days), antibiotics (54.5%) and local herbs (27.7%). The younger a child is the more likely that ORS and antibiotics will be administered during diarrhoea. About 53% of the antibiotic use was by self medication while 40% were prescribed by the clinics. The need for educational campaigns to discourage the inappropriate use of antibiotics was emphasised.

Key words: Diarrhoea, Infantile; Risk factors; Diarrhoea morbidity; Diarrhoea mortality; Socioeconomic factors.

Introduction

Diarrhoeal diseases are a leading cause of childhood morbidity and mortality in developing countries(1 - 3). It has been estimated that about 1.3 billion episodes of diarrhoea occur each year in children under 5 years of age in developing countries (excluding China) and about 4 million children in this age group die annually from diarrhoea(4). While much is known of the relationship of such socioeconomic factors as education, occupation and income to child mortality(5 - 7), comparatively little is known about the relationship of socioeconomic status to child morbidity. For example, we do not know whether the low mortality that is often reported for children of educated mothers is due to the fact that those children are getting sick less often compared with children of mothers without education or because of the better treatment practices that are adopted by educated mothers or a combination of both of these factors.

In this paper, we examine the relationship between socio - demograhic characteristics and incidence of diarrhoea in a low - income area of Ilorin, the capital of Kwara State, Nigeria. We also examine the different types of treatment that the mothers use in treating their children's diarrhoea and the determinants of use of such treatment.

Materials and methods

The study area was Balogun Alanamu ward, one of the traditional wards of Ilorin. The estimated population of Ilorin is about 700,000 inhabitants while that of the Balogun Alanamu ward is about 50,000 people. The study area is inhabited mostly by people who are of low socioeconomic status having little or no formal education. They are engaged primarily in

Correspondence and reprint requests should be addressed to: Dr. GA Oni.

traditional occupations such as weaving, pottery, farming, embroidery and small trading. Most of the houses in the area are built with mud and have poor ventilation. The drainage and waste disposal systems are also very poor. Only 17% of the households have indoor pipe-borne water while the rest mostly rely on water supplied from municipal sources, distributed through pipes. The majority (85%) use pit latrines while most of the other households dispose their wastes in open spaces at the back of their houses.

The study was carried out in three stages. The first stage involved a survey of households in the area to identify children who were less than 3 years of age. Because of the long breastfeeding and post-partum abstinence practices that are common in the area(8) which, invariably, lead to long interbirth intervals, most households had only one child in the required age group. However, polygamy is commonly practised, so that in households where there was more than one child in the required age group, a child was randomly selected. Information on the socioeconomic characteristics of the households was collected during the survey. The survey was carried out between October 1988 and December 1988. A total of 1,713 children were identified during the survey.

The second stage involved a 12 month diarrhoeal disease surveillance of a sample of children out of those identified during the first stage. Mothers were asked during the first stage of the study (i.e. the survey) to indicate whether or not their children had diarrhoea during the previous 24 hours. 12.3 percent of the children had diarrhoea during the previous 24 hours. Using this as an estimate of diarrhoea prevalence in the population, the sample size needed during the second stage for similar estimate (at the 95 percent confidence limit and within 5 percent of the true value) was calculated to be 166. However, since the diarrhoeal disease surveillance involved a long period of follow up (twice a week and for 12 months), we could not pre-determine what the drop out rate would be. We decided on a much larger sample of 360 children. Also in order to ensure that a sufficient number of children belong to mothers of different education and socioeconomic groups, we divided the 1,713 children into four strata as follows: (a) no education and low socioeconomic status (b) no education and high socioeconomic status (c) some education and low socio-economic status (d) some education and high socioeconomic status. The socioeconomic status was defined by eight selected indices of development. These are father's education, mother's occupation, water supply, kitchen, electricity, television, refrigerator and motor vehicle. Each of these variables was dichotomised (low/high). A household scoring low in four or more of these variables was considered to be of low socioeconomic status, otherwise it was classified as high socioecomic status. We attempted to sample 90 children from each stratum to give a total of 360 children, but there was difficulty in getting sufficient children in certain strata and also in getting some mothers to participate in the study. Only 351 mothers agreed to participate of which 278 (or 79.2%) remained in the study to the last month of surveillance.

The diarrhoeal disease surveillance was carried out between February 1989 and January 1990 by fourteen female high school graduates who received two weeks of organised training conducted by the authors. Two college graduates in sociology, recruited as supervisors, also participated in the training. Diarrhoea was defined as the passing of liquid or watery stools at least three times in a 24-hour period. A new episode must be separated by at least two days that are free of diarrhoea, otherwise, it was considered as a continuation of the previous attack. Each surveillance worker visited her assigned households twice in a week (Monday and Thursday or Tuesday and Friday). Information on stooling patterns and characteristics during the previous two or three days was obtained. Any treatment given to the child by the household during diarrhoea was also noted.

The third stage involved observational studies of behavioural risk factors associated with diarrhoeal disease. Each child who was followed up in the second stage of the study was categorised as low risk or high risk depending on his/her diarrhoea rate. After a preliminary ethnographic survey, structured observation forms were developed and these were used for each household. The aim was to identify diarrhoeal disease transmission behaviours which increase the risk of diarrhoeal disease incidence and which may be helpful in developing an intervention programme. Each child's home was visited by a trained observer who arrived early in the morning (about 6.30 a.m.) and remained in the household until 5 p.m., recording all the necessary observations on the standard forms.

The data presented in this paper concern only the second stage of the study. All the three stages of the study are described to achieve clarity.

Diarrhoeal Prevalence and Incidence rates were computed as follows:

$$\text{Prevalence Rate} = \frac{\text{No. of days with diarrhoea}}{\text{No. of observation days}} * 365$$

$$\text{Incidence Rate} = \frac{\text{No. of new attacks}}{\text{No. of observation days}} * 365$$

With the above definition, the prevalence rate can be considered as the number of days that a child is expected to be sick with diarrhoea during a period of one year (365 days). Similarly, the incidence rate represents the number of diarrhoeal episodes that a child would have during a one-year period. The rates as defined above are, therefore, density measures. We should note that when the denominator in estimating incidence rate was adjusted by subtracting the number of diarrhoea days from the observation days, no difference in the estimates was obtained. This was due to the fact that the former was very small when compared with the latter.

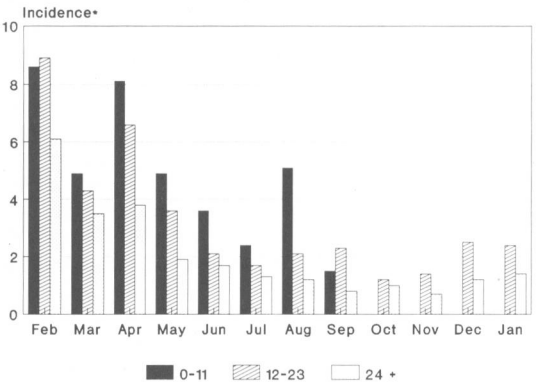
The bivariate and multivariate associations of diarrhoeal incidence with characteristics of the child and mother were examined. These characteristics include age and sex of the child, child's care-taker, mother's age, education, occupation, parity, type of kitchen and use of refrigerator by the household. We also examined the different treatments that were given to the children when they had diarrhoea and the determinants of the use of such treatments.

Results

a) *Diarrhoeal Rates and Associations*

There was a total of 102,739 person-days of observation, 2677 person-days of diarrhoea and 745 diarrhoea episodes. These translate to an average of 2.6 episodes per child per year with each episode lasting for an average of 3.6 days.

Table I shows the estimated prevalence and incidence rates for each month of observation. The average duration of a diarrhoeal disease attack was also estimated for each month. The highest rates were observed during the first three months of surveillance with February leading with an average of 7.8 episodes per child per annum. The period between November and April represents the dry (hot) season in Nigeria. The period between May and October represents the rainy season. A general decline in incidence was observed with each additional month of surveillance until November, after which the incidence starts to rise again. Since the general decline in the incidence rates may be due to the fact that the children were getting older with each month of surveillance, we estimated the rates for the different age groups at each month (figure 1). In October 1989, less than 10 children in our sample were still under 6 months of age, hence we did not provide estimate of the incidence rate for that month and also for the subsequent months. In general, children under one year of age had the highest rates while those who were two years and older had the lowest rates. However, a pattern similar to that of Table I was also observed in all the age groups.



Monthly Diarrhoeal Rate by Age

*Episode/year based on monthly rate.

Table I. Prevalence, Incidence Rates and Duration of Diarrhoea by Months of Observation

Month	Prevalence*	Incidence*	Duration#
February	21.2	7.8	2.7
March	14.2	4.2	3.4
April	20.6	5.8	3.6
May	11.0	3.2	3.5
June	7.5	2.2	3.4
July	7.9	1.6	4.9
August	7.3	2.0	3.7
September	5.3	1.4	3.8
October	4.8	1.2	4.3
November	4.9	1.0	4.8
December	7.3	1.7	4.2
January	8.0	1.7	4.6

* These are prevalence and incidence in a year if the rates for each month apply (also see text).

\# Duration (in days) = $\frac{\text{Prevalence Rate}}{\text{Incidence Rate}}$

Table II. Prevalence, Incidence and Duration of Diarrhoea by Characteristics of the Child and Mother

Charac-teristics	No. of children	Pre-valence*	Incidence*	Duration
Total	351	10.3	2.9	3.5
Child's Age				
0-5	41	13.3	3.3	4.0
6-11	62	15.7	4.1	3.8
12-23	128	11.0	2.9	3.8
24 +	120	5.7	2.2	2.6
Sex of Child				
Male	182	10.9	3.1	3.5
Female	169	9.6	2.8	3.4
Parity				
1-2	162	10.9	3.0	3.6
3-4	136	9.3	2.8	3.3
5 +	53	10.9	3.1	3.5
Child's Care-taker				
Mother	323	10.0	2.9	3.5
Others	28	13.1	3.3	4.0
Mother's Education				
None	197	9.3	2.6	3.6
Primary	89	10.6	3.3	3.2
Secondary	65	12.9	3.4	3.7
Mother's Age				
< 25	113	10.3	3.1	3.3
25-34	152	11.7	3.2	3.6
35 +	86	7.8	2.3	3.4
Mother's Occupation				
None	16	8.8	3.5	2.5
Traditional	307	10.2	2.9	3.5
Modern	28	11.7	3.3	3.5
Type of Kitchen				
None	110	10.7	3.5	3.1
Shared	177	10.5	2.8	3.7
Private	64	8.8	2.3	3.8
Refrigerator in Household				
Yes	228	10.7	2.8	3.8
No	123	10.1	3.0	3.4

* Prevalence and Incidence were first computed for each child before averaging for the groups.

Table III. The Effects of the Various Characteristics on Diarrhoeal Incidence: Gross and Net Unstandardised Regression Coefficients

Characteristics	Gross effect	Net effect
Child's Age		
0-5	1.13*	1.08*
6-11	1.86#	1.86#
12-23	0.71	0.82*
24 + §	-	-
Child's Sex		
Male §	-	-
Female	-0.26	-0.08
Parity		
1-2 §	-	-
3-4	-0.27	0.33
5 +	0.07	0.72
Child's Care-taker		
Mother §	-	-
Others	0.37	0.38
Mother's Education		
None §	-	-
Primary	0.70	0.85
Secondary	0.86	0.83
Mother's Age		
< 25 §	-	-
25-34	0.07	0.15
35 +	-0.80	-0.57
Mother's Occupation		
None §	-	-
Traditional	-0.49	-0.31
Modern	-0.02	-0.10
Type of Kitchen		
None §	-	-
Shared	-0.64	-0.75
Private	-1.18*	-1.34*
Refrigerator in Household		
No §	-	-
Yes	-0.23	-0.51

Constant term for multiple regression = 2.73 ; Multiple R = 0.28

* Significant at the 5 % level.

\# Significant at the 1 % level.

§ Reference category in the dummy variable regression.

The diarrhoeal prevalence and incidence rates were computed for each category of the various characteristics. Results (Table II) show that diarrhoea tends to decrease with child's age, except that highest rates were observed among children aged between 6 months and one year. Males have slightly higher rates than female. Children who were often looked after by people other than their mothers had higher rates than those whose primary care-taker was their mothers. Diarrhoeal disease rates tend to increase with mothers education. Children in households with private kitchens had the least diarrhoeal rates while those in households without a kitchen had the highest rates. Tests of significance were carried out using bivariate and multivariate (on dummy variables) analysis. Results are shown in Table III. Only the age of the child and the type of kitchen of the household had significant effects on diarrhoeal incidence. Children who were two years and older had significantly lower diarrhoeal incidence rate than those who were younger. Similarly, children who lived in households with a private kitchen had significantly lower rates than those whose households had no kitchen($p < 0.05$). Differences in the mothers education, sex of child, parity, care-taker, mothers age, mothers occupation or use of refrigerator in the household had no significant effect on diarrhoeal disease incidence.

b) *Symptoms and Treatments*

For each of the days that a child had diarrhoea, the surveillance worker asked the mother or caretaker if blood or mucus was present in the stool and also if the diarrhoea was accompanied by vomiting or fever. The mother/caretaker was also asked to indicate if any treatment was given and who recommended the treatment. Only in 2.3% of the diarrhoeal days was blood present in the stool, mucus was present in 20.7% of diarrhoeal days. Vomit and fever occurred in 7.7% and 26.6% of diarrhoeal days, respectively.

There are three main types of treatment that were applied by mothers/caretakers in response to children's diarrhoea. These are oral rehydration solution (ORS), antibiotics and local herbs. For each child that had diarrhoea during the study period, we estimated the percentage of the total diarrhoea days when each of the three treatments was administered. Table IV shows the results for five characteristics of the child and mother. These characteristics are child's age and sex, mother's education and age. The fifth variable, "diarrhoeal risk", was derived by comparing the diarrhoeal incidence of each child with the average for his/her age. Children with a ratio of less than half were classified as "low risk', those with a ratio of between half and one and a half were classified as `medium risk' and those with a ratio of one and a half or greater were classified as `high risk'.

Results in Table IV show that in our sample and among those children who had at least one diarrhoeal disease episode, antibiotic was the commonest treatment, given in 54.5% of diarrhoea days. Local herbs were, on average, given in 27.7% of diarrhoea days while ORS was given only in 14.8% of diarrhoea days. Table IV also shows that the very young children (less than a year old) and those who had several episodes of diarrhoea (classified as high risk) were more likely than the others to have received ORS and antibiotics.

Table IV. Percentage of Diarrhoea Days When Certain Treatments were Given, by Selected Characteristics of the Child and Mother

Characteristics	No. of children*	Total Diarr Days	% diarr days of treatmt with ORS	Antibiotic	Herb
Total	254	2638	14.8	54.5	27.7
Child's Age					
0-11	85	1112	25.1	67.5	24.1
12-23	98	1082	13.1	57.3	36.6
24 +	71	444	4.8	35.0	19.8
Child's Sex					
Male	137	1454	14.3	50.5	22.6
Female	117	1184	15.3	59.2	33.7
Mother's Education					
None	138	1431	14.7	57.8	31.1
Primary	65	591	14.9	58.2	30.0
Secondary	51	616	14.7	40.7	15.7
Mother's Age					
< 25	83	679	16.1	53.1	35.1
25-34	115	1393	14.3	53.4	20.5
35 +	56	566	13.8	58.7	31.7
Diarrhoeal Risk					
Low	55	200	6.6	42.7	24.2
Medium	127	1120	17.4	52.9	27.5
High	72	1318	16.4	66.3	30.8

* These are the children who had at least one episode of diarrhoea during the study period.
Note: Percentages may add up to more than 100 due to multiple treatments.

Results of the regression analysis to examine which of the five variables are important determinants of use of the different methods are shown in Table V. Only the age of the child had a significant effect on the use of ORS after adjustment had been made for the other variables. Children who were 2 years and older used ORS about 20% less often than children who were under one year of age. Both the age of the child and the 'risk' of diarrhoea had significant effect on the use of antibiotics. Children, two years and older used antibiotics about 37% less often than children who were under a year of age. Also children in the high risk group used antibiotics for about 22% more often than the low risk children. As for the use of local herbs, only the mother's age had a significant effect ($p < 0.05$). Mothers who were between the ages of 25 and 35 years used local herbs about 16% less often than younger mothers. Although mothers who were older than 35 years used herbs slightly less often than mothers under 25 years of age (7.4% less), this difference was not significant. There was no significant association between mother's education and the use of any of the three treatments even – though, mothers with at least, a secondary education gave their children antibiotics about 17% less often than mothers without education did. Similarly, they gave local herbs about 16% less often.

We analysed the data for the month of February (the first month of surveillance) to identify who prescribed the different treatments to the mothers/caretaker. The findings are shown in Table VI. Seventy percent of those who gave ORS were told to do so at the clinic, while 20% gave ORS without been instructed to do so by anyone. The other 10% were told to do so by family members including their husbands. Among those mothers who gave antibiotics, 52.5% were "self medications" while 40% received prescriptions from a clinic. The majority of those who gave local herbs (74.1%) did so without been instructed to do so by anyone. The rest 25.9% were instructed to give local herbs by a family member.

Discussion

We have followed a stratified sample of children under the age of 3 years in a poor income area of urban Ilorin for a period of one year to examine the relationship between socio – demographic factors and diarrhoeal disease incidence in that population. Our findings suggest that there may be a seasonal variation in the incidence of diarrhoea with the highest incidence occurring during the peak of the dry season (February – April), and lowest incidence occurring during the rainy season (May – October). Lower rates in the rainy season may be due to an increase in water availability during this period, since pipe – borne water through the municipal sources is rationed to the different areas of the city (municipal water supply to most areas of Ilorin occurs in two or three days per week). The reduced incidence in the rainy season could also be due to the fact that children spend most of the time indoors during this period under close supervision of their mothers and other adult members of the household, whereas during the dry season they may be left alone to play with the other children in the open compound and frontyards. Given the poor environmental sanitation of the area, the very young are at risk of ingesting materials that may be harmful to their health while playing outside the house.

Of the nine variables that we examined, only two (age of the child and type of kitchen) were found to be significantly associated with diarrhoeal disease incidence, and this association was not confounded by other variables. Diarrhoeal disease incidence peaks at ages 6 – 11 months, then decreases with age. The high incidence in infancy can not be due to reduced breastfeeding practice since 99 percent of the children under one year in our sample were still receiving breastmilk at the commencement of the surveillance. However, it is known that children in the area start receiving semi – solid and solid foods between 6 and 11 months of age (9). This is also the age group when crawling begins and the risk of ingesting harmful materials is high, especially in an unhygienic environment such as the one in which the study was carried out. Higher incidence in this age group may be related to both feeding and hygienic practices. The fact that diarrhoea is lower in households with a private kitchen compared to households without a kitchen or where a kitchen was shared with different households further underscores the above point, since risk of food contamination will be expected to be lowest in the former. Households with a private kitchen are more likely to be of medium socioeconomic status with moderate family sizes. Households without a kitchen or where a kitchen is shared are often found in large family compounds with several members of the extended family also living in the compound. In households where there are no kitchens, cooking often takes place in the compound passages and also in the open courtyards and frontyards.

Table V. The Determinants of Use of the Different Types of Treatment: Gross and Net Unstandardised Regression Coefficients

Characteristics	ORS		Antibiotic		Herb	
	Gross	Net	Gross	Net	Gross	Net
Child's Age						
0 – 11 §	–	–	–	–	–	–
12 – 23	– 11.95#	– 12.18#	– 10.16	– 13.14	12.51	12.22
24 +	– 20.29#	– 19.73#	– 32.46#	– 37.30#	– 4.26	– 4.22
Child's Sex						
Male §	–	–	–	–	–	–
Female	1.08	1.09	8.68	8.29	11.12	10.35
Mother's Education						
None §	–	–	–	–	–	–
Primary	0.22	1.43	0.43	3.73	– 1.16	– 1.57
Secondary	– 0.04	– 1.42	– 17.05	– 16.46	– 15.42	– 15.77
Mother's Age						
25 §	–	–	–	–	–	–
25 – 34	– 1.75	0.08	0.25	1.70	– 14.53	– 16.51*
35 +	– 2.29	2.12	5.52	10.03	– 3.37	– 7.44
Diarrhoeal Risk						
Low §	–	–	–	–	–	–
Medium	10.81*	6.88	10.20	3.11	3.34	1.76
High	9.78	8.67	23.59*	22.28*	6.58	7.09
Constant		18.00#		57.65#		29.24*
Multiple R		0.30		0.31		0.23

* Significant at the 5% level.
\# Significant at the 1% level.
§ Reference category in the dummy variable regression.

Maternal education was not found to be a significant risk factor in the analysis. A similar finding has been reported for a study carried out in Burma (10). One would have expected to find lower rates for those children who belonged to the educated mothers. We do know, however, (through our knowledge of the tradition and custom of the area and also through ethnographic interviews) that it is the grandmother and other older women in the household and not the mother (irrespective of her education) who may have greater say regarding the rearing of a child. As one study mother confirmed, every child who is born is owned by the extended family and not just the couple. Educated couples who resent this age – long tradition would rather live outside the traditional area of the city and away from the extended family than confront it. The lack of strong association of education (and most of the other socioeconomic factors considered in this analysis) with child diarrhoea suggests that other aspects of human behaviour and practices (especially, hygienic practices) may be more important in explaining variation in diarrhoeal disease incidence in the study population.

Table VI. Percentage Distribution of Prescribers of the Different Treatments (February 1989)

Recommender	Type of treatment		
	ORS	Antibiotics	Herbs
Self	20	52.5	74.1
Family Member	10	7.5	25.9
Clinic	70	40.0	–

Our study also revealed that the incidence of dysentery as a diarrhoeal disease is low among the children studied, since visible blood in the stool was reported in only 2.3% of the diarrhoea

days. However, more than a quarter of the diarrhoea days were accompanied by fever.

The use of oral rehydration salt (ORS) solution in the study group is low (14.8%), while use of antibiotics is high (54.5%). The age of the child is significantly associated with the use of ORS and also with the use of antibiotics. The younger the child, the more likely that ORS and antibiotics would be given during diarrhoea. Children who had several diarrhoeal disease episodes were more likely to have used antibiotics than those children who had only a few episodes.

The Federal Ministry of Health and the Kwara State Ministry of Health have been promoting the use of sugar-salt-solution (SSS) rather than ORS packets for home management of diarrhoea. Mothers are often taught at the clinics how to prepare the solution, using locally available measuring tools. However, one of the disadvantages of adopting SSS as a home fluid for the management of acute diarrhoeal disease is that recipes are not just difficult to teach and learn but also to remember (11). Also since ORS does not stop diarrhoea, it is likely that the mothers are more interested in a treatment that will quickly stop the diarrhoea and hence their adoption of antibiotics as a treatment of choice. There is no doubt that the mothers have concern for their children, especially the infants, when they have diarrhoea but, while certain antibiotics are appropriate and are recommended for the treatment of dysentery, the routine use of antibiotics or antiparasitic therapy, especially by infants, has been discouraged by the WHO (4). They have been found to be mostly ineffective and dangerous, and their use may also delay appropriate treatment with fluids and food. Use of antibiotics has also been found to be a risk factor for diarrhoea (12). The fact that the incidence of dysentery is low in the study population and that the majority of antibiotic use occurred in infants without a doctor's prescription, underscores the urgent need to take steps that will discourage its use by the mothers and other caretakers. Welcome, one of the world's leading pharmaceutical companies, recently suspended sales of its anti-diarrhoeal mixture and ordered the withdrawal of the product worldwide following questions raised after a U.K television programme on inappropriate drug use (13). This is a significant step that other such companies may need to follow if more harm is not to be inflicted on the children in the developing countries where such drugs are often marketed. There is also the need for an educational campaign to discourage inappropriate use of these drugs. Such a campaign must be directed not only to the mothers but also to the health workers.

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