Prevalence of Diarrhoeal Diseases – An Indicator for Poor Environmental Sanitation

Grace A Chitra[a], V Mohanan Nair[b]

a. Department of Humanities and Social Sciences, Indian Institute of Technology (Madras), Chennai, Tamil Nadu, India;
b. Indian Institute of Diabetics, Trivandrum, Kerala, India; Kerala State Institute of Health & Family Welfare, Trivandrum, Kerala, India*

ABSTRACT

Published on 29th March 2010

Kerala (India) has a low prevalence of diarrhoeal diseases, but recently there has been an increase in water –related diseases. Prevalence of diarrhoea (in two rural communities of Kerala) among under-five children was selected as the indicator, to assess the factors leading to a resurgence of diarrhoeal diseases. Related factors studied were access to clean drinking water, sanitation facilities, and hygienic behaviour prevalent. Methodology involved a cross-sectional household survey, using a pretested interview schedule. Among the 1028 under-five children, the prevalence of diarrhoea was 8.7% in the two week period preceding the survey. Occurrence of diarrhoea was significantly associated with the socio-economic status of the household, age of the child, breast-feeding practises, hygiene behaviour, availability of drinking water, presence of sanitation facility etc. Washing hands was significantly associated with occurrence of diarrhoea in some instances. The need for a region specific health education and increased availability of water was realised.

Keywords: Diarrhoeal Diseases, Environmental Sanitation, Kerala

*See End Note for complete author details

INTRODUCTION

It is expected that a State like Kerala (in South India), with excellent social and health indicators in terms of low infant mortality rate, low maternal mortality rate, high literacy rate (Aravindan, 2000) would be having a good environmental sanitation system in place. But the inadequacies of the water supply and sanitation systems get expressed as disease outbreaks and with higher prevalence of water related diseases, at some point of time. The state of Kerala, has excellent health indicators, and is undergoing "epidemiologic transition" from infectious diseases to non-communicable diseases. But it is reported to have the highest rates of morbidity among the Indian states. The prevalence of water related diseases are affected by a plethora of factors like availability and access to water and sanitation facilities, prevailing hygienic practices in the community and many other physical, biological and social aspects etc. Though there has been a dramatic fall in the number of diarrhoeal cases over the years, diarrhoea is still reported to be one of the major causes of morbidity (Aravindan, 2000; Thankappan, 2002). A study conducted in rural Kerala shows a higher prevalence of diarrhoea in coastal areas, which was explained in the context of backwardness and poor health facilities (Aravindan, 2000). Some parts of Thiruvananthapuram district (capital city), particularly the area selected for the study had a cholera outbreak and there was an increase in the diarrhoea related hospital admissions during the month of October- November 2002 (The Hindu, 2002). Assessing the community's access to clean drinking water and sanitation services, hygienic practises and health seeking behaviour of the community, was needed to adopt proper intervention strategies. For this purpose, the prevalence of diarrhoeal diseases in the high-risk group of under-five year old children, (an effect indicator), was used in the present study.

METHODOLOGY

A community based cross-sectional survey was carried out in the study area. Two adjacent Gram panchayats of Thiruvananthapuram district, Vizhinjam and Venganoor were selected for the study. Vizhinjam is predominantly a coastal village with majority of the people undertaking fishing and related work and Venganoor is the adjacent gram panchayat. Both these panchayats have different cultural and social factors.

The study population consisted of children under-five years of age, in the study area. Sample size required for the study (with 95% confidence limits), was calculated to be 733 (N), with the assumed prevalence of diarrhoea as 12% (IIPS, 2001). Cluster sampling

Corresponding Author:
Dr. Chitra Grace A , PhD Research Scholar, Department of Humanities and Social Sciences, Indian Institute of Technology (Madras), Chennai, Tamil Nadu, India. Email: chitragrace@yahoo.co.uk

technique (Henderson & Sundaresan, 1982) was used as the sampling method. So 40% of N was added to the sample, so that the sample size was 1000 under- five children from the sampling area. A total of 35 clusters were selected, so that from each gram panchayat 500 children were selected to make up the total sample of 1000 under- five children.

DATA COLLECTION

Period of data collection was from December 2002 to March 2003. A pre-tested schedule was administered to the person who was with the child at the time of the interview viz., the informant, preferably the mother. The start point of each cluster, the first household, was randomly selected using random number method. The direction to follow was decided by drawing of lots in front of the first household. Selection began in the first household and then continued to the next nearest household until the desired numbers of children were got. All children under five in any particular household was included in the study. In the last household, all the under five children were included in the study, even if it exceeded the required cluster size. Household of every tenth child was personally observed for its drinking water and sanitation facilities by the investigator. Data was entered in Excel (Version 4.0) and was analysed using SPSS (Version 11).

The schedule consisted of questions for eliciting information on the occurrence of diarrhoea, household and child characteristics, knowledge, attitude and practises about diarrhoea and its management, drinking water facility, sanitation facility for the household and the hygienic practises of the household.

The main outcome variable considered was the prevalence of diarrhoea (WHO, 1996) for children under five years of age in the 2- week period preceding the survey. Prevalence was calculated by taking the percentage of children with diarrhoea with that of the total number of children.

RESULTS AND DISCUSSION

A total of 1028 under-five children from 661 households were included in the study. The overall prevalence of diarrhoea was found to be 8.7% in the study area. Venganoor gram panchayat had a diarrhoea prevalence of 6.7%, while Vizhinjam gram panchayat had a prevalence of 10.6%. The mean number of children in the households was 1.9 children (range: 1-6) in a household. There were 48.2% and 51.8% female and male children respectively in the sample (Refer Table 1).

Age of the child was found to be a significant factor for the occurrence of diarrhoea (p value: 0.04). The majority of diarrhoeal cases were under two years of age (25.3%). This corroborates with the evidence from many other studies too (Lye, 1984; Sunoto, 1982). Weaning practises, which may start early or at about 5-6 months, might introduce food that may be contaminated with faecal bacteria. The occurrence of diarrhoea came down to 4.3% in the 48-59 months age group. Maternal education, education of the father and occupation of the father were found to have a significant association with the occurrence of diarrhoea. Since a majority of the mothers were housewives, no association could be tested between the occupation of the mother and the disease.

Characteristics of the children were important predicator variables in the study. Sex of the child was not a significant factor for the occurrence of diarrhoea with a p-value of 0.382. The characteristics of the usual caregiver, such as age, education, occupation and relation to the child were not significant for the occurrence of diarrhoea. The age of the mother (p-value:0.09) and father (p-value: 0.4) of the child were also statistically non- significant in the study. Breast-feeding was highly prevalent among the community and almost all children under four months of age were being breastfed. This practise is in accordance with the criteria as suggested by the WHO. Prevalence of diarrhoea was higher among those children who were exclusively breastfed for less than four months. Studies in Northern Brazil(Lima et al, 2000) have shown the importance of exclusive breastfeeding. There was an eight-fold higher rates of diarrhoea in children who have been weaned. The exact weaning time was not enquired about, in the study, but it could be seen that occurrence of diarrhoea was lower in the age group that was still being breast-fed (5.9%), when compared to the other group (20.4%).

Sex of the child was not significantly associated with the occurrence of diarrhoea, in the present study. But proportionately the disease was more seen in male children (9.4%). Many studies also suggest that, when sex was a significant factor, male children had more chance of experiencing diarrhoea than female children (Mock et al, 1993)

Many studies have shown that the contamination of drinking water and difficulty in access to water are significant contributing factors to the occurrence of

Table 1. Characteristics of children in the study

Characteristics of children	No. of children with diarrhoea (%) (N=1028)	p-value
Age of child		
Upto 11 m (n=197)	25 (12.7)	
12-23 m (n=183)	23 (12.6)	
24 –35 m (n=171)	19 (11.1)	
36 – 47 m (n=220)	15 (6.8)	
48 – 59 m (n=257)	7 (4.3)	**0.046***
Sex of child		
Female (n=496)	39 (7.9)	
Male (n=532)	50 (9.4)	**0.382**
Period (Exclusive breast feeding)		
> 4 months (n=196)	40 (20.4)	
4 months & above (n=832)	49 (5.9)	**<0.0001***
Period (breast feeding)		
Still continuing (n=345)	17 (4.9)	
>= 12 months (n=221)	51 (23.1)	
< 13 months (n=462)	21 (4.5)	**<0.0001***

Table 2. Occurrence of diarrhoea and source of drinking water

Drinking water facility for the household	No. of children with diarrhoea(%)	p-value
Source of drinking water (N=1028)		
Piped into dwelling/yard & bottled water (n=200)	8 (4)	
Public tap (n=96)	11 (11.5)	
Tube well & protected dug well (n=448)	32 (7.1)	
Private well, given for public use (n=134)	15 (11.2)	
Tanker services & others (n=150)	23 (15.3)	
Total (N=1028)	89 (8.7)	**0.002**

diarrhoea. (Derslice & Briscoe, 1995; Cifuentes et al. 2002). In the present study, the source of drinking water, over which the household had no control over, for preventing contamination, were found to be contributing more towards the disease burden namely, private well, given for public use (11.2%) and tanker services (15.3%). The main source of drinking water for the households in the study area was protected dug wells (43.4%). Only about 28.8% of the children in households included in the study had access to piped drinking water, of which 9.3 % of was collecting water from a public tap. The source of drinking water and occurrence of diarrhoea were found to be significantly associated (p value: 0.002), in the present study (Refer Table 2).

About 131(12.7%) of children did not have toilet facility in their household. 11.6% of the household had flush toilet and majority had pit latrine connected to the septic tank (85.3%). In 54.4% of households only the adults used toilets. The presence of an own toilet facility for the household was found to be significantly associated with the occurrence of diarrhoea (p value: <0.001), as also seen in other studies (Aziz, 1990). In the absence of such private facility, the use of alternatives like defecating in the open or using public latrine was found to be significantly associated with the occurrence of diarrhoea.

There was a higher incidence of diarrhoea, where water purification was not practised (20.6%). But water purification by some method was highly prevalent (90.1%) in the study area. This may have due to the increased awareness of the population after the health education campaign that happened in the area. The most preferred way of purifying water was through boiling and the water was not usually stored for more than one day.

The storage of water and the method it was drawn and by whom in the household was all significantly associated with the occurrence of diarrhoea. Even though the practise of water purification was highly prevalent, the households were not following hygienic practises in drawing water. Dipping of a cup/vessel for drawing water (53.7%) seemed to be the preferred method, which increases the chance for contamination. The water purified may be contaminated by these conflicting practises, which increases the occurrence of diarrhoea in these households.

Hygiene should be maintained in the handling (storage, purification and drawing) of drinking water. It is also necessary that personal hygiene should be maintained to avoid contamination. Practice of washing hands after "critical times" is important in this context. The practice of washing hands (with or without soap) after post defecation and after handling/washing post child defecation was found to be significant, while the practice of washing hands before feeding, before preparing food, before eating food and after handling of animal, if present was not statistically significant. The frequency of washing hands during these was also not significant except for washing hands before feeding and preparing food for the child (Refer Table 3).

The prevalence of diarrhoea was higher in the instances where hands were never washed i.e., before preparing food and before feeding the child (41.2%). The practise of washing hands with soap after defecation and after handling or washing the child post defecation seemed to associate with lesser prevalence of diarrhoea.

In the cross sectional household survey, the occurrence of diarrhoea was significantly associated with the

socio-economic status of the household, age of the child, breast-feeding practises etc. Environmental sanitation factors like availability of drinking water, presence and usage of sanitation facility, was significantly associated with the occurrence of diarrhoea. Majority of households were purifying drinking water, but were adopting unhygienic practises to dispense the water. Practise of washing hands was significantly associated with the occurrence of diarrhoea in some instances. Studies have shown hand-washing interventions to achieve a median reduction in diarrhoea incidence of 35%, but it has also been found that only adequate water supply makes it possible (or at least more feasible) for people to adopt safe hygiene behaviours (Hill Z et al, 2001; Hutley et al, 1997; Esrey S, 1996). The reduced availability of water may be the impeding factor for adopting safe hygienic practises. Therefore, it is necessary to provide adequate water to the community, followed by education to improve key human behaviours. This would greatly reduce the risk of diarrhoeal diseases (including cholera epidemics) in the area.

END NOTE

Author Information

1. Dr. Chitra Grace A., PhD Research Scholar
   Department of Humanities and Social Sciences
   Indian Institute of Technology (Madras)
   Chennai, Tamil Nadu, India
   Email: chitragrace@yahoo.co.uk

2. Dr. Mohanan Nair. V, Director & CEO, Indian Institute of Diabetics, Trivandrum, Kerala, India
   Principal, Kerala State Institute of Health & Family Welfare, Trivandrum, Kerala, India
   Email: v.mohanannair@utoronto.ca

Conflict of Interest: None declared

Editors Notes:

1. The paper is based on the MPH dissertation work of the first author. At the time of study the authors were affiliated to Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute of Medical Sciences, Trivandrum, Kerala, India
2. I would like to acknowledge the support and guidance rendered to me during the study by Dr. Amar Jesani (Centre for Ethics & Rights, Mumbai, India) who was then a Faculty at Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute of Medical Sciences, Trivandrum, Kerala, India

Cite this article as: Grace A Chitra, V Mohanan Nair. Prevalence of Diarrhoeal Diseases – An Indicator for Poor Environmental Sanitation. Kerala Medical Journal. 2010 Mar 29;3(1):7-10

REFERENCES

1. Aravindan KP & Kunhikannan (2000) Health Transition in rural Kerala – 1987-996. The Kerala Sastra Sahithya Parishad. 23-25
2. Aziz KM, Hoque BA, Hasan KZ, Patwary MY, Huttly SR, Rahaman MM, Feachem RG. (1990) Reduction in diarrhoeal diseases in children in rural Bangladesh by environmental and behavioural modifications. Trop Med Hyg. 84(3): 433-8
3. Bhan MK, Bhandari N, Sazawal S, Clemens J, Raj P, Levine MM, et al. Descriptive epidemiology of persistent diarrhoea among young children in rural northern India. Bull World Health Organ. 1989;67(3):281–8. [Pubmed]: http://www.ncbi.nlm.nih.gov/pubmed/2670297
4. Cifuentes E, Suárez L, Solano M, Santos R. Diarrheal diseases in children from a water reclamation site in Mexico city. Environ Health Perspect. 2002 Oct;110(10):A619–24.
5. Esrey S. (1996) Water, Waste and Well-being: A Multi-Country Study. American Journal of Epidemiology.143 (6): 608–623
6. Gorter AC, Sandiford P, Smith GD, Pauw JP. Water supply, sanitation and diarrhoeal disease in Nicaragua: results from a case-control study. Int J Epidemiol. 1991 Jun;20(2):527–33.
7. Henderson RH, Sundaresan T. Cluster sampling to assess immunization coverage: a review of experience with a simplified sampling method. Bull World Health Organ. 1982;60(2):253–60. [Pubmed]: http://www.ncbi.nlm.nih.gov/pubmed/6980735
8. Hill Z, B Kirkwood, and K Edmond. (2001) Family and Community Practices that Promote Child Survival, Growth, and Development: A review of the Evidence", Public Health Intervention Research Unit, Department of Epidemiology & Population Health, London School of Hygiene and Tropical Medicine.
9. Huttly SR, Morris SS, Pisani V. Prevention of diarrhoea in young children in developing countries. Bull World Health Organ. 1997;75(2):163–74.
10. International Institute for Population Sciences (IIPS) and ORC Macro (2001) National Family Health Survey (NFHS-2), India, 1998-99: Kerala. Mumbai:IIPS.
11. Lima AA, Moore SR, Barboza MS, Soares AM, Schleupner MA, Newman RD, et al. Persistent diarrhea signals a critical period of increased diarrhea burdens and nutritional shortfalls: a prospective cohort study among children in northeastern Brazil. J Infect Dis. 2000 May;181(5):1643–51.
12. Lye MS. Diarrhoeal diseases in rural Malaysia: risk factors in young children. Ann Acad Med Singap. 1984 Apr;13(2):156–62.
13. Mock NB, Sellers TA, Abdoh AA, Franklin RR. Socioeconomic, environmental, demographic and behavioral factors associated with occurrence of diarrhea in young children in the Republic of Congo. Soc Sci Med. 1993 Mar;36(6):807–16.
14. Sunoto null. Diarrhoeal problems in Southeast Asia. Southeast Asian J Trop Med Public Health. 1982 Sep;13(3):306–18.
15. Thankappan, K.R. (2002) Diarrhoea morbidity among under-five children: a comparative study of two villages. Discussion paper No.39. Kerala Research Programme on Local Level Development
16. The Hindu (Newspaper) (2002) Thiruvananthapuram edition, October 26,
17. VanDerslice J, Briscoe J. Environmental interventions in developing countries: interactions and their implications. Am J Epidemiol. 1995 Jan 15;141(2):135–44.
18. WHO. (1996) Catalogue on Health Indicators: A selection of health indicators recommended by WHO programmes. World Health Organization, Geneva