

RISK FACTORS FOR PERSISTENT DIARRHEA IN THE UNDER FIVE CHILDREN: A CASE CONTROL STUDY

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Abstract;A case control study was conducted over a period of 18 months to identify the risk factors for persistent diarrhea in the under fives. A total of 188 cases with persistent diarrhea and their controls matched by age and place of residence were included in the study. 85.6% of the cases were under 18 months of age and the peak age of occurrence of persistent diarrhea was between seven and 12 months. Statistically significant association of persistent diarrhea was found with maternal literacy (OR=4.13 CI 2.62,6.53), lack of breast feeding (OR= 0.25 CI 0.11,0.56), severe protein energy malnutrition (OR=2.11 CI 1.31,3.31), vitamin A deficiency (OR=3.01 CI 1.75,5.19), non availability of latrine (OR=2.77 CI 1.78,4.31) and use of unprotected water supply (OR=4.61 CI 2.60,8.23).

Intervention to improve educational level of women, installation of sanitary fly proof latrines, health education regarding appropriate childhood feeding practices, national efforts directed towards the support of breast feeding, vitamin A supplementation, and prevention of HIV/AIDS is suggested to reduce the prevalence of persistent diarrhea and its associated mortality.

INTRODUCTION

Diarrhea remains one of the commonest illnesses of children and one of the major causes of infant and childhood mortality in developing countries (1). World wide there are an estimated four million deaths per year due to diarrhea (2,3). In Ethiopia, diarrhea is the leading cause of death in children under three years of age. It accounts for

over 300,000 deaths per year, or nearly half of all deaths occurring in children under five years of age (4). However, child mortality due to diarrhea has been reducing worldwide over the last decade by the success achieved from proper case management and preventive measures. It is now appreciated that substantial proportions of diarrhea-associated

deaths in young children are with persistent diarrhea and not acute diarrhea (5).

Persistent diarrhea is defined as an episode of diarrhea that begins acutely and lasts for 14 or more days (6). It accounts for less than 10% of all diarrheal episodes but is associated with 30-50% of deaths due to diarrhea (6). A study from Addis Ababa had shown that 5% of all children with diarrhea was found to have persistent diarrhea and 83% of them were below 18 months of age (7).

Factors that increase the risk of acute diarrhea becoming persistent diarrhea includes antecedent malnutrition, micronutrient deficiency, and transient impairment in cellular mediated immunity and lack of exclusive breast feeding during the initial six months of life, particularly use of bovine milk (8-11, 14). But there is lack of information about risk factors in Ethiopia. Thus the objective of this study is to assess the risk factors associated with persistent diarrhea so that intervention measures can be taken.

SUBJECTS AND METHODS

The study was carried out in Gondar town, North West Ethiopia from November 1999 to April 2001. Cases were under-five children with persistent diarrhea, defined as diarrhea lasting for 14 or more days, visiting the Gondar College of Medical Sciences hospital or the Gondar Health Center. One control with no history of diarrhea in the previous 2 months was selected for each case, matched by age (± 5 months), and place of residence. The study was designed to have a sample size of 188 that would be sufficient to detect odds ratio of 2 with alpha 0.05 and 90% power given a prevalence of exposure in the range of 20% to 65% (12). Cases and controls were compared with respect to a variety of socio-demographic, environment, nutritional, reproductive and morbidity factors.

A standardized pre-coded questionnaire, which was filled by trained nurses for the study, was used to gather information on socio-demographic data, duration, type and frequency of diarrhea, on feeding practice and on environmental health. Clinical evaluation was done to assess for signs of

protein energy malnutrition, vitamin A deficiency, nutritional status, signs of dehydration, symptoms of pediatric HIV/AIDS. The weight of both the cases and controls was measured and Welcomes classification was used to classify subjects as normal weight, marasmus, marasmic-kwashiorkor, kwashiorkor or underweight. Severe protein energy malnutrition refers to those classified as having marasmus or marasmic-kwashiorkor or kwashiorkor.

Epi-Info 2000 software was used to process and analyze the data. Chi-square test was used to assess the strength and associations between the cases and the controls.

RESULTS

A total of 188 cases and their age, sex and residential area matched controls were enrolled. The duration of persistent diarrhea has ranged between 14-60 days with a mean of 24.521 ± 14.597 (mean \pm SD). The age distribution of the cases are shown in table 1. The majority (82%) were under 24 months of age and the peak occurrence was between the age of seven and 12 months. Watery diarrhea with no dehydration (61.2%) was the main clinical feature while thirty-five (18.6%) patients had dysentery. 45 (24%) and 18 (9.5%) of the cases had some and severe dehydration respectively. Fifty four (28.7%) of the cases were found to have symptomatic pediatric AIDS. There was a strong association between persistent diarrhea and lack of breast-feeding and poor weaning practice. Likewise severe malnutrition and vitamin A deficiency, were found to have a strong association with persistent diarrhea (Table 4). Multivariate analysis by using linear logistic regression showed lack of breast-feeding, presence of severe malnutrition and vitamin A deficiency to be significantly associated with persistent diarrhea. However there were no significant associations between persistent diarrhea and recent measles infection and history of immunization. Maternal occupation (being a housewife), maternal illiteracy and low annual family income were significantly associated with persistent diarrhea (table 2). Moreover poor housing, non-availability of latrine and use of unsafe water source for drinking and domestic use were found to have a strong association with persistent diarrhea (table 3). Most of the cases (87.2%) and controls (91.4%) were cared for by their mothers. There was no statistically significant difference

between the care giver of the cases and controls. Similarly there were no significant association with paternal education, paternal occupation, family size, birth order and presence of other under five children in the family. Children hospitalized in the previous one-year period were more likely to have persistent diarrhea than the control group ($P < 0.001$).

DISCUSSION

Breast feeding less than 6 months appeared to be significantly associated with an increased risk of persistent diarrhea in this study. The proportion of persistent diarrhea was significantly high among those breast-fed less than 6 months than the age matched breast-feed counterparts ($P < 0.01$). The protective effect of breast feeding against severe diarrheal morbidity and mortality has been well documented (10, 11, 19). Promotion of proper breast feeding is therefore a crucial step in reducing morbidity and mortality from diarrheal diseases. The association between severe malnutrition and persistent diarrhea in our study population was impressive ($p < 0.01$). Our finding was in harmony with other studies done elsewhere that has suggested a strong association between persistent diarrhea and malnutrition (9, 13, and 15). Persistent diarrhea in children may lead to protein energy malnutrition through diminished food intake, impaired absorption and utilization of nutrients, increased catabolic losses and subtle losses of protein in stools. Furthermore persistent diarrhea also often changes marginal malnutrition to a more severe form (18, 24). Prospective studies have also demonstrated a remarkable relationship between malnutrition and persistent diarrhea (14, 17). Therefore, the data from the present study add support to the hypothesis that a reduction in the prevalence of PEM would have a substantial impact in the reduction of diarrheal morbidity and mortality.

A significant association was also found between maternal illiteracy and persistent diarrhea ($p < 0.05$). Similar result had been reported by Kin-Maung and his colleagues in the study conducted in Myanmar children (16). Like wise Esrey, S.A. and Habicht, have reported literate mothers protect their children much better in unhygienic circumstances than do illiterate mothers, and

they use water more effectively for better hygiene than do illiterate mothers (18). Thus improving the education level of the mother would be of public health importance. The greatest concern, in agreement with previous reports (20) was the proportion of vitamin A deficiency that is significantly high in the cases than the control group ($p < 0.05$). Vitamin A deficiency has a broader consequence in developing countries in terms of child mortality and morbidity. Hence the control of vitamin A deficiency could enhance child health and survival (21).

Nearly 29% of the cases with persistent diarrhea were found to have symptomatic HIV/AIDS. Infants and young children with HIV commonly suffer from gastrointestinal manifestation of their disease. Many of them have evidence of persistent diarrhea, malabsorption, malnutrition or growth failure (22, 23).

This study suggests that intervention to improve educational levels of women, health education for proper childhood feeding practices and environmental hygiene will have large public health impact by reducing the prevalence of persistent diarrhea. Further more national efforts directed towards **the support of breast feeding, vitamin A supplementation should be intensified.**

Table 1: Age distribution of the cases and controls

Age group (months)	Cases (%)	Controls (%)	Odds ratio (95%CI)	P-value
0-12	72 (38.3)	51 (27.1)	1.67 (1.05,2.64)	0.03
13-24	82 (43.5)	91 (48.4)	0.82 (0.54,1.26)	0.4
25-36	23 (12.2)	35 (18.7)	0.61 (0.33,1.12)	0.12
37-48	8 (4.5)	7 (3.7)	1.15 (0.37,3.6)	1
49-59	3(1.5)	4(2.1)	0.75 (0.13,4.00)	1
Total	188 (100)	188 (100)		

Table 2: Socio-demographic determinants

Factors	Cases	Controls	OR (95%CI)	P-value
Maternal Occupation				
House wife	146	122	1.88	0.01
Others	42	68	(1.16,3.04)	
Maternal education				
Illiterate	127	63	4.13	<0.05
Literate	61	125	(2.62,6.53)	
Number of children				
< 3 yrs	91	43	0.32	<0.01
> 3 yrs	97	145	(0.21,0.51)	
Annual family income				
<300 Birr	69	45	1.84	0.01
>300 Birr	119	143	(1.15,2.96)	

Table 3: Environmental health determinants

Factors	Cases	Controls	OR (95%CI)	P-value
Number of rooms				
<2	176	161		
>2	12	27	2.46 (1.14,5.38)	0.02
Latrine				
Not available	105	59		
Available	83	129	2.77 (1.78,4.31)	<0.01
Water source				
Unsafe	69	21		
Safe	119	167	4.61 (2.60,8.23)	<0.01

Table 4: Nutritional determinants

Factors	Cases	Controls	OR (95%CI)	P-value
Breast feeding for at least 6 months				
Yes	154	178	0.25 (0.11,0.56)	<0.01
No	34	10		
Age supplement started				
≤ 6 months	75	125	0.33 (0.21,0.51)	<0.01
≥ 7 months	56	41		
Severe malnutrition				
Yes	75	45	2.11 (1.31,3.39)	<0.01
No	113	143		
Signs of vitamin A deficiency				
Yes	63	27	3.01 (1.75,5.19)	<0.01
No	125	161		

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