

Case-Control Study of acute diarrhea in Children

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Abstract

Background: To determine the risk factor for acute diarrhea disease in children.

Methods: In the survey, 220 cases and 220 controls were involved. Cases were children with loose watery feces, pathologically diagnosed as acute diarrhea by the physician, and enrolled from the Emergency Ward as the Incident Cases in Dr. Sheykh Hospital, Mashhad, northeast of Iran. Control group too, was enrolled from the same cases and the members were children whose risk factors disease were not the risk factor for acute diarrhea, and were enrolled from emergency ward of burn patients, accidents, acute respiratory diseases and eligible patients.

Results: By using univariate logistic regression models, variables consisting used milk up to 6 months age, antibiotic usage during the last 15 days, mother's employment, mother's acquaintance with ORS, occupancy, and water slack during the week before illness, were significantly related with acute diarrhea. In a multiple logistic regression, the relationship between the said factors as the independent variables and acute diarrhea was studied. Use of formulas before 6 month age with (95% CI 1.77-5.79) OR=3.21, and tenantry with (95% CI 1.24-2.71) OR=1.83, and mother's employment with (95% CI 1.2-5.06) OR= 2.48 were factors affecting acute diarrhea which remained in the multiple logistic model and had significant relationship with the disease.

Conclusion: During this study, important environmental risk factors were recognized. Endangered groups and mothers with children under 5 years old should be aware of these risk factors in order to prevent their children's diseases. Prevention of acute diarrhea in children can reduce massive detriments to health system.

Keywords: *Acute Diarrhea, Case Control study, Children*

Introduction

Several methodological issues may have an impact on the incidence rates of childhood acute diarrhea (A06.0) reported by community-based studies (1). In addition, it remains a major cause of childhood morbidity and mortality worldwide (2). In developing countries, acute infectious diarrhea remains one of the leading causes of death among young children, especially those under 1 yr of age. In contrast, in industrialized nations the death rate is very low, although the disease is an important cause of morbidity and consumes

substantial healthcare costs (3). According to Kowzak et al. from 60 researches during 1990 to 2000 it was determined that cause of 21% of mortalities of children < 5 yr old was acute diarrhea and about 2.5 million mortalities were occurred because of acute diarrhea annually and this showed the unchanged morbidity of this disease comparing last decades (4). In year, 2000 Mory et al. also estimated that 13% of mortalities < 5 yr old were because of diarrhea that causes 1.4 million deaths each year (5). In comparison between two above researches, the decreasing rate of mor-

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tality and morbidity can be observed but still the importance of this disease determines it as a priority in some communities. Probability of diarrhea infection in infants is 4.8 in average yearly. Generally, in developing countries the probability of diarrhea, infection is estimated that for each child would be at least 3.2 times a year. This statistics in some developing countries with a lower level of health condition is increases up to 9 cases (6). According to the importance of acute diarrhea in children health, different studies were conducted to identify the risk factors of this disease worldwide; by case-control study of Huffman et al. in Brazil, it is determined that the mortality caused by acute diarrhea among children who didn't use mother's milk are 25 times more than other children (7). Also in a case-control study for some factors of acute diarrhea in south Pakistan, females were recruited for the risk factors of acute diarrhea and the increase of mothers as well as children's age were identified as a conservational factor in diarrheal patients (8). By Huttly et al. study in Nigeria factors like: ingestion of contaminated water, disregarding health of residential environment, poor economical status and nourishing milk powder are determined as risk factors of acute diarrhea (9).

According to limited studies in the field of studying risk factors of acute diarrhea in our country it is considered to design a study for some factors which has not investigated the direct relation of risk factors with diarrhea disease till now so the aim of this study was to determine the relation of some demographic and environmental factors related to life circumstances with acute diarrhea disease in children of Mashhad. Maybe by identifying these factors we can truly decrease the access of this disease.

Materials and Methods

This case-control study investigated children < 5 yr old. After presenting child accompa-

nying parents or other person to emergency ward in Dr Sheykh Hospital, Mashhad, northeast of Iran this Hospital, children who had three loose and watery stools within 24-h period for last 3 days with determination of specialist as an acute diarrhea, were enrolled as cases. Children without acute diarrhea and their identified cause disease was not the risk factor of investigated disease, were enrolled as controls. Under 5 age and permanent resides in Mashhad were the matched variables in both groups. Matching method was a kind of frequency matching.

After under-5, second measure for controls and enrollment in study was not being diarrheal during last 6 months. Sampling for enrollment of controls was according to the measures of cases. Cases were enrolled from patients presented to emergency ward and controls were enrolled from emergency ward of burn patients, accidents, acute respiratory diseases, and eligible patients. Control children were investigated and acute diarrhea was rejected. Having enrolled the cases and controls, information needed were collected through a questionnaire involved investigated variables.

It is important to say that the opinion of professional professors was used for determining of validity of questionnaire and reliability were confirmed by means of test –pretest method among 10 selected individuals with 82% index Cronbach Alfa.

According to the type of study and one of primary aims of this study which was comparing the lack of nourishment rate of mother's milk till six months of age between controls and cases, volume of samples was determined according to this fact that if the nourishment rate of mother's milk in cases were 16% lesser than controls, to reject the hypothesis of ineffective nourishment of mother's milk till 6 months of age in diarrheal episode in a two range test with error level of ($\alpha= 0.05$) and power of ($1-\beta= 0.80$). According to this fact that there is not any

reliable information to examine the relation of mother's milk nourishment till 6 months of age on acute diarrhea and concerning some cultural differences of our country and developed countries and limitations of using their results, in a random process the rate of nourishment of mother's milk in cases were considered 50% and in controls 16% more and concerning 5% confidence level and power of 80%, 216 person were selected in each group. In order to use random methods these samples were selected by systematic method in which at odd days recruit cases enrolled with even file number and at even days recruit odd file number.

Parents' testimonial was taken before enrolling each child to take their agreements. All of the information about children was gathered without name and surname by the number of file and the executive of this project pledged morally in testimonial to keep the information confidential.

According to type of this study odds ratio was used to convey the power of relationship which was estimated by logistic regression single-model. For more precise analysis, identifying and separating the manipulators from logistic regression multi-model with backward method. Descriptive indexes and charts of frequency distributions were used to describe other information.

Results

Considering sample, 229(52%) cases were male at the age between 1 month to 60 months and their average age was 19.35 yr. In both sexes the chance of diarrhea infection, statistically was not significant. The average ages in case group and control group, respectively, were 18.58 yr (95%, CI=16.66-20.50) and 20.13 yr (with 95%, CI= 17.99-22.27) which the average age difference in both case and control groups statistically was not significant. After omission of sex impact, this relation turned to be

significant as the chance of diarrhea infection of boys is significantly decreased by increasing in age ($P<0.05$). Age distribution in both case and control groups according to sex presents in chart 1.

After evaluation of relation between independent variations and acute diarrheal disease with logistic regression models, these results were separately obtained; 16.8% of case group and 15.5% of control group had weight < 2500 gr at the commencement of the birth which the underweight difference this time in both groups was not statistically significant. Although there was not statistically significant difference in both case and control groups regarding consumption of refrigerated stale food during one week before affection but 11% of case group and 6.8% of control group consumed refrigerated stale food.

The relation of acute diarrhea with variations like parent's education, water pressure fall, traveling during two weeks before affection, family size, and having vendor's food 10 days before affection was reviewed which the relation of none of these variations with acute diarrhea was significant. The consumption of milk powder in case group before six months of age clearly was more than control group which had significant difference in both groups ($P<0.001$). Mother's employment was a factor of significantly increase in the chance of diarrhea infection ($P<0.013$). Indeed, after more precise survey it was defined that day nursery as a defacing factor demonstrate consequent relation of affection and mother's employee weak, for this reason that children who have operative mothers spend their time in day nursery more than other children. Role of mothers' lack of knowledge of ORS powder consumption in rising the chance of acute diarrhea infection was significantly higher in case group ($P<0.001$). Taking antibiotics, lodging and water stoppage one week before affection were the factors which were signifi-

cantly more in case group than control group ($P<0.05$). Table1 shows frequency distribution of case and control groups regarding effective cause of acute diarrhea. In one logistic regression multi-model the relation between mentioned factors as independent variations and acute diarrheal disease was

reviewed in which milk powder consumption before six months of age, residence status and mother's employment remained as effective cause in this model. Predominance rates Obtained by logistic regression multi and single-models present in Table 2 and 3.

Table 1: Distribution of case and control by risk factors

		Case		Control	
		n	%	n	%
Used milk up to 6 month age	Milk	171	77.7	202	91.8
	Powder Milk	49	22.3	18	8.2
Antibiotic usage during the last 15 days	Yes	80	36.4	59	27.2
	No	140	63.6	158	72.8
Mother's employment	Yes	26	11.8	13	5.9
	No	194	88.2	207	94.1
Mother's acquaintance with ORS	Yes	73	66.8	130	39.5
	No	147	33.2	85	60.5
Occupancy	Landlord	98	44.7	130	59.4
	Tenant	121	55.3	89	40.6
Water slack during the week	Yes	85	38.8	109	49.5
	No	134	61.2	111	50.5
Having vendors food	Yes	11	5	9	4.1
	No	209	95	210	95.9
Refrigerated stale food	Yes	22	10	15	6.8
	No	197	90	204	93.2
Water pressure fall	Yes	123	56.4	126	57.3
	No	95	43.6	94	42.7
Traveling during two weeks	Yes	78	35.5	73	33.2
	No	142	64.5	147	66.8

Table 2: Distribution of case and control by parent's education

		Case		Control	
		n	%	n	%
Elementary School	Father	67	30.6	53	24.3
	Mother	73	33.2	79	35.9
Guidance School	Father	58	26.5	55	25.2
	Mother	40	18.2	46	20.9
High School	Father	62	28.3	81	37.2
	Mother	78	15.5	75	34.2
University	Father	32	14.6	29	13.3
	Mother	29	13.2	20	9.1

Table 3: Association of acute diarrhea with risk factors by univariate logistic regression

Variable		OR*	95% CI [†]	P
Used milk up to 6 month age	Milk	1		<0.001
	Powder Milk	3.21	5.72-1.80	
Antibiotic usage during the last 15 days	Yes	1		0.040
	No	1.53	2.29-1.01	
Mother's employment	Yes	1		0.032
	No	2.13	4.27-1.06	
Mother's acquaintance with ORS	Yes	1		<0.001
	No	3.07	4.55-2.08	
Occupancy	Landlord	1		0.002
	Tenant	1.80	2.63-1.23	
Water slack during the week	Yes	1		0.024

* Adjusted odds ratio; † 95% Confidence Interval

Table 4: Association of acute diarrhea with risk factors by multivariate logistic regression

Variable		OR*	95% CI [†]	P
Used milk up to 6 month age	Milk	1		<0.001
	Powder Milk	3.21	5.79-1.77	
Mother's employment	No	1		0.013
	Yes	2.48	5.06-1.2	
Occupancy	Landlord	1		0.002
	Tenant	1.83	2.71-1.24	

Adjusted odds ratio ; † 95% Confidence Interval

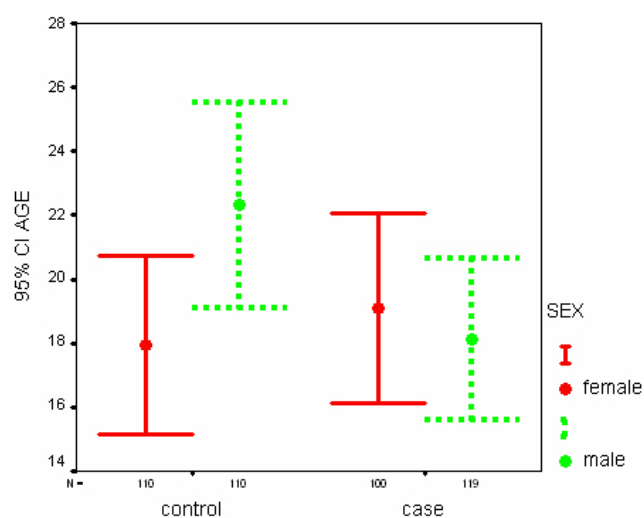


Fig. 1: Distribution of case and control by age

Discussion

The recent survey is a case-control study conducted to investigate factors which is effective in acute diarrhea of children <5 yr of age. Control group selection in case-control study always has been a sensitive and determinative part of this study and although control group is selected from presented patient which their risk factor had the least relation with acute diarrhea disease but concerning the limitation of patients selection, again, there is some selection inaccuracy. All comparisons must be carried out with great care because of this inaccuracy and for previous studies that did not investigate some of these variations.

According to findings of recent study no relation has been observed between sex and children's age in diarrheal episode, indeed after restrict analysis separately in two sexes it was defined that the chance of diarrhea infection in boys is decreased by increasing in age, which demonstrate the correlation of age and sex effects. The relation between sex - age and acute diarrhea reports in various studies, some shows female sex is more liable to the risk of diarrhea episode and some other contradicts to this. In many studies increasing in age mentioned as conservational factor (10) and some studies contradicted this. Age, compared to sex in general, has more significant effect on acute diarrheal episode (11-16).

Mother's milk ingestion until six months of age is one of the findings of recent study, which is verified by various studies. This finding can be reiterative on presence of iminoglobulin and anti-chores in mother's milk that inactively can prevent this disease (17-22).

Inappropriate environmental condition (23) and weak economical status are the important risk factors of acute diarrhea. Although this study did not measure economical and environmental status directly but concerning

that residence status can be indirect assessment of economical status, being possessor or lodger is investigated and determined that the chance of diarrhea infection in the individuals with lodging circumstances are more which is reiterative to previous findings, if residence status can be acceptable as one of the economical status factors. It is mentionable that investigations of economical status as an independent factor needs more accurate and wider study (3, 12, 24-28-26).

According to findings of this study, type of injective water had no relation with diarrhea disease, which contradicts to previous studies. Various studies, which were conducted in this field, all emphasis on impact of unsanitary and plumbing water on diarrhea and use of sanitary and packing water, can prevent this disease (13, 16, 29).

A disputable fact of this study is the relation of disease with mother's employment. Mother's employment rate of case group is nearly two with comparison to control group. Making reasonable decision concerning number of studies conducted in this field is slightly difficult. Indeed, after more precise investigation it was determined that this is because of operative mother's children who are going to day nursery, diarrhea in this cohort can happen because of the day nursery circumstances, and day nursery is a defacing factor.

Since Mothers were not informed from illness symptoms and did not know how to use ORS at home, then a better and more teaching of the family members is necessary in knowing acute diarrhea symptoms, how to use ORS, prescribed drugs and foods during diarrhea and preventing ways and referring system at times necessary by health centers (30).

Although this study purveys valuable information and outcomes to identify effective risk factor of acute diarrhea but there was a limitation concerning the hospital was

the case and control source. Thus in order to generalize the outcomes to whole society, wider study in the same field as population must be designed. Consider the importance of acute diarrhea's impact on children health with less than five years of age also more over studies in different part of country is recommended.

In conclusion, the necessity of educational and interventionist programs were determined to develop mothers knowledge about effective factors of acute diarrhea.

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