

## **Risk Factors for Diarrheal Diseases in Children under the Age of Five Years in Karbala**

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### **Abstract:**

To identify the possible risk factors for diarrheal problems , a prospective survey done for 202 children , under 5 years old , admitted to Karbala Hospital for Children in Karbala governorate in Iraq due to diarrheal problems .

Variable personal and demographic informations were taken from the mothers or caregivers.

Breastfeeding predominated significantly in both rural (71.4 %) and urban (63.44 %) areas (P.<0.0001)

Underweight children were mostly bottle feeded (68.4 %) . ( $X^2 =7.08$ , P. <0.029) Occurrence of diarrheal diseases was inversely proportional to maternal education level.

One-third of children in the study had prior recent diarrheal illness.

Ninety four percent of children received antibiotics for the diarrheal illness prior to admission to the hospital.

There was an overall negligence of the use of oral rehydration solution (ORS.)

The majority of bottle feeder mothers did not apply the proper method of bottle feeding preparation.

Eighty five percent of patients using pacifier represents all the bottle-fed infants, and (65.1 %) of urban breastfed infants and (90 %) of rural breastfed infants.

In conclusion, malnutrition, poor environmental feeding hygiene, lower maternal education, recent diarrheal illness increase the liability for diarrheal problems .It was also concluded that:

Underweight was less in breastfeeding babies.

ORT was underused, while antibiotics were overused in this sample of children.

### **Abbreviations:**

WHO: World Health Organization

ORS: Oral Rehydration Solution

ORT: Oral Rehydration Therapy

IVF: Intravenous Fluid

CDD: Control of Diarrheal Disease

الخلاصة :

لغرض تشخيص عوامل الخطورة المحتملة لأمراض الإسهال في الأطفال أجريت هذه الدراسة على (202) طفل تحت عمر (5) سنوات ادخلوا إلى مستشفى كربلاء للأطفال/ في محافظة كربلاء للفترة من 1 / 6 / 2000 ولغاية 1 / 12 / 2000 , بسبب أصابهم بأمراض الإسهال ومن مناطق مختلفة ريفية وحضرية. أخذت المعلومات ( فيما يخص العمر والوزن وحالة الطفل قبل دخول المستشفى ومدة الإسهال ونوعية التغذية - رضاعة طبيعية أو صناعية أو مختلطة ) من أمهات الأطفال أو مرافقاتهم وعززت بأجراء الفحوصات السريرية اللازمة.

وجد من خلال الدراسة أن الرضاعة الطبيعية هي الشائعة في الريف (71.4 % ) و المدينة (63.44 % ) ومع ذلك فإن حالات سوء التغذية والإسهالات لا تزال واضحة فيها كما هو الحال في التغذية الصناعية والمختلطة وذلك لوجود العوامل الأخرى المسببة خاصة قلة تعليم وثقافة الأم (حيث وجد أن عدد حالات الإسهال يتناسب عكسيا مع مستوى التعليم للام)، وسوء الظروف البيئية والمعيشية من قلة النظافة واحتمال تلوث الماء المستعمل للشرب وتحضير الغذاء، وجهل الأم بالطرق الصحيحة للتغذية في حالة الاضطراب لاستعمال الرضاعة الصناعية من ناحية عدد قناني الرضاعة و كثرة التلوث , كما أن اغلب الأطفال عرضوا لاستعمال الملهيات الملوثة (المصاصات). ووجد بشكل واضح كثرة استعمال المضادات الحيوية في معالجة الإسهال سواء قبل دخول المستشفى (94 %) ( وفي اغلب الأحيان بدون ضرورة طبية أو قبل استشارة الطبيب) أو بعد دخول المستشفى (86%). وبالمقابل وجد إهمال واضح وقلة استعمال محلول الارواء الفموي (37.6 %) في معالجة حالات الإسهال عند الأطفال قبل وبعد دخول المستشفى .

أكد البحث على ضرورة تفعيل برامج الوقاية من الإسهال، وتشجيع الرضاعة الطبيعية والاهتمام بتنظيف الأمهات حول النظافة الشخصية والكيفية الصحيحة لتغذية الطفل والاهتمام بتنقية وتعقيم مصادر الماء وأخيرا الاهتمام بتوعية الأمهات بالإضافة إلى الكوادر الطبية و الصحية حول الأهمية الكبيرة لمحلول الارواء الفموي في معالجة الإسهال عند الأطفال وضرورة الابتعاد عن الاستعمال غير المبرر للمضادات الحيوية .

## Introduction:

Diarrheal diseases are global problem. They are main factors of the leading causes of morbidity and mortality for children worldwide (1-5). It has been estimated that each year between 700 – 1000 million episodes of diarrhea occur in developing countries in children under the age of 5 , that results in 3 – 5 million deaths annually (1,2,3,4) . The driving force behind these deaths is dehydration; however, malnutrition is a major side effect.

Factors that increase the incidence of diarrhea include failure to breast feed exclusively for the first 4-6 months of life, failure to continue breast feeding until the first year of age, using infant bottles and preparation of them under unhygienic conditions, malnutrition , ingestion of contaminated food or water, exposure to unsanitary conditions and low level of parental education (6,7,8,9) Hamilton mentioned in his study that malnutrition affect diarrhea and that the converse of equal relevant importance (10). Diarrhea is an important cause of malnutrition and the state may be called the malnutrition-infection syndrome (11)

Poor nutritional status, prior recent diarrheal illness and impaired immunocompetence are important risk factors for persistent diarrhea (12, 13) which is by itself carries a higher risk of mortality and has greater impact on nutritional status than acute diarrhea, simultaneous presence of malnutrition and infection result in an interaction more serious to the child than from the combined effect of the two working independently)14)

Diarrhea is globally responsible for many deaths than any other causes and represents an economic burden for the developing countries (frequent hospitalization and the use of expensive intravenous fluids and drugs(

The most effective treatment for the majority of children with acute diarrhea is oral rehydration. Antimicrobials are rarely needed in simple gastroenteritis since even bacterial infection (with some significant exceptions) recovers spontaneously within a short period (15)

### **Aim of The Study**

In this study we tried to evaluate:

- 1- Some of the important risk factors for developing diarrhea in under five years old children in Karbala governorate (which locating in the middle district of Iraq ,100 km. to the south of Baghdad).
- 2- The effect of the nutritional status.
- 3- The treatment modalities offered to such children

- 4- What preventive measures are suggested to decrease the incidence of diarrheal illness
- 5- The effect of the educational level and feeding modalities programs offered to the mothers.

### **Patients and Methods:**

A total number of 202 patients resembling a sample of children under the age of five, from different districts of Karbala governorate who had been admitted to Karbala Hospital for Children , due to diarrheal illnesses were studied.

Informations were obtained from each mother or caregiver regarding to the personals and demographic variables including age, sex, duration of diarrhea, and history of diarrhea in the last two weeks before admission, the family residence

and the education of the mother.

Informations were further obtained regarding to the type of feeding whether breastfeeding , bottle feeding , weaning diet or combination of any of them and the use of pacifier .

Nutritional status was assessed by using weight for age and weight for height modes and classified accordingly to normal, under/overweight using the Z-score chart .

Information was also sought on any treatment given at home prior to presentation in hospital including the use of oral rehydration solution, drugs and herbal preparations .

Statistical analysis was done whenever it was applicable.

## RESULTS:

The study showed that breast feeding was dominated in both urban and rural areas (Table 1). In the rural area the percentage of breast feeding was (71.4%) while Bottle feeding was (18.3%) & mixed feeding was (10.2 %);  $P < 0.00001$ . While in urban area breast feeding was (63.44%); bottle-feeding was (19.2%) & mixed feeding was (17.3%),  $P < 0.00001$ . Totally, breast feeding was 67.32 % (136 patients), bottle-feeding was 18.82 % (38 patients) and mixed feeding was 13.86 % (28 patients).

By the assessment of nutritional status in relation to the type of feeding (Table 2 ), it was found that bottle feeding was associated with underweight (68.4 %) while breast feeding was also associated with underweight but to a less degree (51.47 %).

diarrhea (94.6%), antiprotozoal (41%) ,and anticholinergic drugs about (37.5%) (Table 7.(

The source of water used to prepare feeding bottles as showed in (Table 8), it was found that (27.27 %)of cases were used tap water comparing to ( 63.63 % ) used boiled water & (9 %) thermos water . It was found that (48.4%) of mothers practicing bottle feeding had only one feeding bottle , while (39.3%) having two bottle feeding & only about (3%) had proper number of bottles (4 or more) (Table 9). Only (22.7%) of mothers, who were practicing bottle feeding, used boiling of the bottles as a method of sterilization while (60.6%) used just simple washing and only (3%) were using chemical methods and (13.6%) used other methods, from total 66 patients on bottles for feeding (Table 10) . Also found that there was a significant overuse of pacifiers without proper sterilization (Table 11) , (85%) of the total of breast fed babies used pacifiers[(65.1% were urban and (90%) were rural breast fed babies] All of the bottle fed babies (100%) were used pacifier and all on mixed feeding (100%) used pacifier (urban & rural.)

The distribution of the patients according to the age & sex (Table 12), it is found that about one half of all children where aged 4-12 months, of the 202 children 98 (48.5 %) were from rural areas and 104 (51.5 %) were from urban areas, in both groups there was male predominance

(although there was no statistical significant association of acute diarrhea and male gender). Statistically, the age distribution shows most of the diarrheal cases are above the age of six months 138

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cases are above the age of six months 138 (68.3 %)

### **Discussion:**

The factors found to be associated with increasing risk of acute diarrhea in this study are.

Poor nutritional status: In our study, it was found that more than 50% of children presented with diarrhea were malnourished. Poor nutritional status was widely recognized as one of the major risk factors for diarrheal illnesses and had been reported from numbers of studies (7,8,13) . This may be explained by the state of what is called malnutrition-infection syndrome (11). Studies showed that some diarrheal pathogens like shigella affecting more the malnourished children and on improving the nutritional status the resistant to such infections may be improved (16) .Poor nutritional status was also widely recognized as one of the major risk factor for persistent diarrhea that had been reported from a number of studies (7,8,13(

The age distribution factor: The

present study doesn't differ significantly from those observed in other studies that represented young age to be a risk factor for the diarrheal illnesses (7,8,13).The author of this study found that infants after the age of four months were more exposed to a higher risk of diarrhea ,this association may be linked to feeding practices, particularly the interruption of breastfeeding at this age .

Type of Feeding : This study showed that in both rural and urban areas there was tendency for breastfeeding possibly reflecting the effect of the health education programs regarding the breast feeding support and the more understanding of the risks related to bottle feeding as water contamination .In this study statistically bottle feeding associated with more underweight cases than breast feeding owing to the bad practicing regarding the use of bottle feeding (from bad hygiene ,the use of untreated tap water and improper number of bottles). The more important factor is ignorance of the basic nutritional requirement of both bottle feeding and those with breast feeding infants, both might be due to bad weaning practice and most of the cases were from low socioeconomic status, and large number of the two modes of feeding are

associated with persistent diarrhea which is strongly associated with underweight which is also found in other studies<sup>(17)</sup>

Mother education: showed significant association of maternal education with the risk of developing diarrhea, as lower education associated with more diarrheal illnesses, this is expected because lower education level associated with less awareness of the proper personal and environmental hygiene, which were also mentioned in many researches<sup>(17,18)</sup>. Most studies detected the low maternal schooling as a risk factor for childhood diarrhea<sup>(19,20)</sup>, it is corresponded with our study while a study in Brazil did not detect this association with mother education<sup>(21)</sup>.

Prior history of diarrhea: About 27% of cases in this study had prior history of diarrhea within the last (1-4 weeks) before presentation, which support studies that prior diarrheal illness associated with long term morbidity illness<sup>(17)</sup>; the epidemiological studies indicated that 3-20% of episodes starting acute diarrhea in children in developing countries become persistent diarrhea and cause about one-third to one-half of all deaths from diarrhea<sup>(22-24)</sup>.

Oral rehydration therapy (ORT): The effectiveness of ORT has been

demonstrated in clinical trials and in wide spread use around the world<sup>(25)</sup>.

Countries that have adopted ORT have experienced a dramatic decline in the mortality rate from diarrhea illness<sup>(25)</sup>.

Oral rehydration solution (ORS) was applied in only (37.6%) of the cases prior to the admission into the hospital (offered by mother or following medical advice), while intravenous fluid (IVF) used in 62.4 % after admission. & nil given fluid by nasogastric tube, indicating under use of ORS & over reliance on IVF. & neglecting of the other methods of giving fluid in dehydrated patient. Similar results were found in a study in the United State, where they used ORS in 30% of cases<sup>(26,27)</sup>, Nigerian study<sup>(18)</sup> and Turkish study<sup>(28)</sup>, indicating global under use of ORT in different countries.

While in Calcutta in a diarrheal training treatments unit (DTTU) they used ORT to treat (84.7%) of their patients and IVF in only (15.3%) over a two-year practice in management of diarrhea<sup>(29)</sup>.

Certainly, ORT was underused compared to IVF therapy in preadmission and in admission to the hospital, this may be explained that intravenous fluid can be infused rapidly while ORT requires the caregiver to provide fluid on a regular frequent bases over four to six -hour

periods . In addition, some children don't like the taste of commercially available solutions , inadequate education regarding the importance of ORS in diarrhea ,this indicates that we are still need more insistence on the CDD program , more education for mothers and physicians for the use of ORS.

Antibiotics : the overuse of antibiotics was very evident in this study ,over 86% of the studied cases of diarrhea in the admitted patients to the hospital , which is an alarming situation The most serious one, more than 94% of cases use antibiotics for diarrhea before admission to the hospital offered by mothers themselves or according to medical advice. This practice significantly will increase the duration of diarrheal episodes when antibiotics used<sup>(30)</sup>, increasing the chance of resistant to the antimicrobials<sup>(31)</sup> & economical cost to the family & hospital. Similar situations in other studies also showed the same results<sup>(30,32)</sup>.

With some significant exceptions antibiotics are rarely indicated, and are rarely needed in simple gastroenteritis since even bacterial infections recover spontaneously within a short period<sup>(25)</sup>. This might be due to less awareness of physician regarding drug therapy in diarrheal diseases, less dependant or lack of accurate laboratory investigations for

the causative pathogen of diarrheal diseases, unwise response to insisting mothers or family on use of more drugs to the child .

Other drugs are used to a lesser degree, though the antiprotozoal drugs were used in 45.5% of cases mostly on clinical bases only in the studied samples.

Hygienic measures: are not well accepted and poorly maintained in bottle feeders , being bottle sterilization was done through simple washing in 60.6% and 13.6% using just tap water and salts ,while only 22.7% using boiling of the bottles in sterilization . Moreover, 27.2% of bottle feeders using directly tap water in preparing milk formula, while only 12% using proper number of bottle feeding in addition to the bad use of pacifier. Children in such substandard environment may have being subjected to greater microbial loads, therefore, presented more sever disease<sup>(33)</sup>. This situation also present in other countries<sup>(34)</sup> ,so it indicate, the need for more education in the proper preparation of bottle feeding for the unlucky mothers who are using this method of feeding

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### Conclusion:

-Breast feeding is predominant in this study samples in both urban & rural areas though other risk factors for diarrhea are still presented (e.g.: contamination of water supply & unhygienic bottle preparation)

-Malnutrition is a significant risk factor of diarrheal diseases in both bottle feeding & mixed feeding children .

-The patient is unnecessarily subjected to the risk of the side effect of antibiotics. The antimicrobials are overused and often prescribed at the expense of the more vital treatment (i.e. ORT).

-Low maternal education, poor hygienic conditions, improper bottle feeding preparation and contaminated water supply are significant risk factors in diarrheal illnesses.

-Patient having preceding diarrhea illness and lower age group were associated with high incidence of diarrhea.

### Recommenda ions:

-The most powerful tools for controlling & eventually conquering diarrheal illness are not therapy but prevention which include such simple interventions as:

-promoting breast feeding and improving nutritional status..

-encouraging general personal hygiene.

-Ensuring safe water supplies .

-The advantage of the use of ORT needs to be vigorously promoted & insisting that the most effective treatment for the vast majority children with diarrhea is oral rehydration.

-Parents as well as physicians need to be educated to use simple but highly effective means of therapy (namely ORS) & to avoid the use of antibiotics unless they are highly indicated.

TABLE 1. Assessment of Type of Feeding in Relation to Residence

Residence	Type Of Feeding						Total No. of cases	
	Breast		Bottle		mixed			
	No	%	No	%	No	%	No	%
Rural	70	71.4	18	18.3	10	10.2	98	100%
Urban	66	63.4	20	19.2	18	17.3	104	100%
Total	136	67.32	38	18.82	28	13.86	202	100%



TABLE 2 . Assessment of Nutritional Status in Relation to the type of Feeding

FEEDING	UNDER WT.		NORMAL		OVER WT.		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%
BREAST	70	51.47	58	42.64	8	5.89	136	100
BOTTLE	26	68.4	12	31.6	0	0	38	100
MIXED	10	35.7	18	64.3	0	0	28	100
TOTAL	106	52.5	88	43.6	8	3.9	202	100

TABLE 3. Relation between Mothers, education &amp; No. of cases of Diarrhea .

No. of cases	Education Level													
	Illiterate		Read		Read + Write		Primary		Intermed.		Second.		high	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
202	38	18.81	8	3.96	44	21.80	74	36.63	18	8.90	16	7.92	4	1.98

TABLE 4 Duration of Diarrhea at time of Presentation

No. of cases	Duration of Diarrhea							
	1 Wk.		2 Wks		3 Wks		4 Wks +	
	No.	%	No.	%	No.	%	No.	%
56	30	53.6	14	25	9	16	3	5.4

TABLE 5 Methods of Rehydration

No. of Cases	Method of Rehydration					
	ORS		I.V Solution		N.G Tube	
	No.	%	No.	%	No.	%
202	76	37.6	126	62.4	0	0

TABLE 6. Medications used in the treatment of Children with Diarrhea in Hospital

No. of cases	Drugs											
	Anti-Biotics.		Anti-emetics.		Anti-cholinergic.		Adsorbent.		Anti-Protozoal		Others*	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
202	174	86	26	12.8	88	43.5	-	-	92	45.5	42	20.8

**TABLE 7.** Children Having Previous History of Diarrhea in the last 2 Weeks & type of Medications given Prior to Hospitalization

N o. of cases	Type of Medication													
	ORS		Antibiotics		Anti-emetic		Anti-cholinergic		Adsorbents		Anti-Protozoal		Other Medications	
56	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
		30	53.5	53	94.6	4	7	21	37.5	-	-	23	41	4

**TABLE 8** Source of Water for Feeding Bottles

Source of water	Tap water		Boiled water		Thermos		River	
No. of Cases	No.	%	No.	%	No.	%	No.	%
66	18	27.27	42	63.63	6	9.1	0	0

**TABLE 9 .** Number of Feeding Bottles

No. of bottles	1		2		3		4		4+	
No. of cases	No.	%	No.	%	No.	%	No.	%	No.	%
66	32	48.48	26	39.39	6	9.1	2	3.03	-	-

**TABLE 10** Methods of Sterilization of Feeding Bottles

Methods	Just washing		Boiling		Chemicals		Others (salts...etc.)	
No. of cases	No.	%	No.	%	No.	%	No.	%
66	40	60.61	15	22.73	2	3.03	9	13.63

**TABLE 11** Assessment of Pacifier Use in Relation to Residence & Type of Feeding

TYPE OF FEEDINGS	RESIDENCE					
	RURAL			URBAN		
	Total No.	Pacifier No.	%	Total No.	Pacifier No.	%
BREAST	70	63	90	66	43	65.1
BOTTLE	18	18	100	20	20	100
MIXED	10	10	100	18	18	100

**TABLE 12** No. of cases of Diarrhea in Relation to the Age ,Sex, and Residence

Sex & Resi		Age (month)														Total	
		0-3		4-6		7-12		13-24		25-36		37-48		49-60			
Rural		Z	%	Z	%	Z	%	Z	%	Z	%	Z	%	Z	%	Z	%
		♂	6	10.3	14	24	24	41.3	14	24	-	-	-	-	-	-	58
	♀	2	5	8	20	12	30	12	30	-	-	4	10	2	5	40	100
Urban	♂	12	19.3	4	6.4	24	38.7	16	25.8	2	3.2	4	6.4	-	-	62	100
	♀	8	19	10	23.8	18	42.8	6	14.2	-	-	-	-	-	-	42	100
Total		28	13.8	36	17.8	78	38.6	48	23.7	2	1.9	8	3.9	2	1.9	202	100

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