

SOCIO-DEMOGRAPHIC DETERMINANTS OF THE FIRST ATTACK OF DIARRHEA IN INFANTS

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Abstract:

Background:

The importance of diarrhea in infants in Babylon Province in Central Iraq cannot be underestimated as it is a serious impediment to the health and development of children in this resource-strained region of the country. Locally diarrhea is a major cause of attendance at health facilities, remains at the forefront of causes of admission to many of the hospitals in the province, and a significant and often preventable cause of death. Local beliefs in the Middle East about causes of diarrhea in infants are different from country to country and from culture to culture and this no more true than in Babylon Province.

Aim of the study: 1-To analyze the socio-demographic factors related to the first attack of diarrhea in infant less than 1 year in Babylon Province.

2- To outline the main local beliefs of mothers and care givers about the possible causes of such an attack.

Patients and methods:

A cross sectional study was conducted in Babylon Province, Iraq. It was carried on 400 infants attending primary health care centers and pediatric clinics for vaccination or for routine follow up, during the period from first of May 2014 to the first of May 2015.

Results and conclusions:

In Babylon Province the first attack of diarrhea infants tends to occur early in life prior to 6 months of age despite the fact that close to three quarters of affected infants were in schedule with Rota Vaccine timetable. A staggering 94% of affected infants were not fed naturally, reflecting the declining rates of natural feeding in the Province. One third of the study population was born with a weight less than 2500g and over half were born via Caesarean section. Mothers of affected infants tend to be mostly rural, teenaged and poorly educated.

Key words: diarrhea, Rota vaccine, infants.

Introduction:

Two billion cases of diarrheal disease occur worldwide according to the World Health Organization (WHO) and UNICEF. 1.9 million children younger than 5 years of age perish from diarrhea each year, mostly in developing countries. This amounts to one fifth of all the deaths of children under the age of five and means that more than 5000 children are dying every day as a result of diarrheal diseases. Of all child deaths from diarrhea, three quarters occur in the African and South-East Asian regions (1). The importance of diarrhea in Babylon Province in Central Iraq cannot be underestimated as it is a major cause of attendance at health facilities, the forefront of causes of admission to many of the hospitals in the province, and a significant and often preventable cause of death.

Local beliefs about causes of diarrhea in infants are different from culture to culture. In general diarrhea can be caused by a number of factors, ranging from a change in the infants' diet to an intestinal infection. Any of the following can cause diarrhea in infants:

- 1-An infection (bacterial, viral etc.) due to contact with contaminated food or water, or by touching contaminated surfaces.
- 2-A food allergy or sensitivity to medicines
- 3-Excessive intake of fruit juice or inappropriate weaning foods.
- 4-Food poisoning (2).

Babylon Province; being part of Iraq, which in recent years has endured social and political strife and unrest, faces many challenges, and the burden of diarrheal disease, is a serious impediment to the health and development of children in this resource-strained region. An upsurge in the investment by charitable foundations and governmental entities in combating

infectious diseases and the emergence of new concepts in vaccination strategies collectively point to opportunities to develop new strategies against this very old disease(3).

Rotavirus gastroenteritis is the most common cause of severe gastroenteritis among children under 5 years of age, causing considerable morbidity and mortality worldwide [4]. In the developing countries, this disease afflicts mostly the children of the age 6-12 months (5).

The clinical manifestations of rotaviruses alter from asymptomatic infection to severe and serious, dehydrating diarrhea with vomiting that may be deadly (6, 7). Widdowson reported that rotavirus infections are the primary cause of serious gastroenteritis in infants around the globe (8).

Since the introduction of the rotavirus vaccine, hospitalizations and emergency visits for rotavirus have dropped dramatically.

Two brands of rotavirus vaccine are available. That the infant will get either two or three doses, depending on which vaccine is used (First Dose: 2 months of age, Second Dose: 4 months of age and third Dose: 6 months of age (if needed)

The child must get the first dose of rotavirus vaccine before 15 weeks of age, and the last by age 8 months. Rotavirus vaccine may safely be given at the same time as other vaccines. Almost all babies who get rotavirus vaccine will be protected from severe rotavirus diarrhea. And most of these babies will not get rotavirus diarrhea at all (9).

Study objectives: 1-To analyze the socio-demographic factors related to the first attack of diarrhea in infant less than 1 year in Babylon Province.

2- To outline the main local beliefs of mothers and care givers about the possible causes of such an attack.

Patients and Methods:

A cross sectional study was conducted in Al-Hilla city, Babylon Province, Iraq, of 400 infants attending primary health care centers and pediatric clinics for vaccination or for routine follow up during the period from 1st of May 2014 to 1st of May, 2015. 17 infants who met the inclusion criteria were excluded because of incomplete or uncertain data. The inclusion criteria of this convenient study for all the participants were:

- 1) Infants less than one year of age.
- 2) Residents of Babylon province.

All participants were informed of the purpose, requirements and procedures of the study. They were also informed that their participation in the study was voluntary. A self-structured questionnaire sheet was designed by the authors and it included:

Infant related variables: (age , gender, current and birth weight ,care giver of the baby , birth order) mother related variables : (maternal age , employment and educational level of parents , history of living in extended families ,residence, mode of delivery, number of children in the house).It also included the current Rota vaccine status.

Results:

Diarrhea - attack variables included (age of infant at the first attack , season , duration of attack , any history of hospitalization at the time of attack ,type of feeding ,beliefs about the causes of diarrhea,. how quickly medical attention was sought and if any extra liquids or food was given during and after the episode).

Ethical Approval:

Ethical issues of this study depend of the following

- 1- Approval of the Scientific Committee of Community Medicine-College of Medicine Babylon University.
- 2- The objective and methodology of this study were explained to all participants in the study to gain their verbal acceptance.

Data Analysis:

Recorded information was checked for missing values and data entry errors. Statistical analysis was performed using Statistical Package for Social Science software (SPSS, version 17). Variables were described using frequency distribution and percentage for the patients according to their characteristics. Chi square test was used for the assessment of the association between the variables studied. A p-value of less than 0.05 was significant statistically.

Table1: Medical and demographic factors of infants included in the study(n=400).

Variables	Number	Percentage (%)
Age at first attack of diarrhea (months)	348	
<6	52	87.0
≥6		13.0
Birth weight(gram)		
<2500	156	39.0
≥2500	244	61.0

Type of delivery		
Normal vaginal delivery	184	46.0
C-section	216	54.0
Care giver		
Biological mother	320	80.0
Sister in-law	4	1.0
Sister	12	3.0
Aunt or other	64	16
Birth order		
First	280	70.0
Second	64	16.0
Third or more	56	14.0
Past medical history		
Present	148	37.0
Absent	252	63.0
Past surgical history		
Present	48	12.0
Absent	352	88.0
Rota vaccine status		
With schedule	296	74.0
Not with schedule	104	26.0
Nursery day care		
Present	44	11.0
Absent	356	89.0
Source of milk		
Natural feeding(exclusive)	24	6
Artificial feeding	376	94

Table 1 shows that the first attack of diarrhea occurred early in life prior to 6 months of age despite the fact that close to three quarters were in schedule with Rota Vaccine timetable. A staggering 94% of

infants were not fed naturally, reflecting the declining rates of natural feeding in the Province. One third of the study population was born with a weight less than 2500g and over half were born via Caesarean section.

Table 2: Demographic Characteristics of Parents Included in the Study (n=400).

Variables	Number	Percentage(%)
Current maternal/care giver age(year)		
<18	156	39.0
≥18	244	61.0
Maternal education		
Illiterate	56	14.0
Primary education	224	56.0
Secondary education	80	20.0
Higher education	40	10.0
Maternal employment		
Employed	128	32.0
Unemployed	272	68.0
Marital status		
Married	324	81.0
*Others	76	19.0
Current paternal age(year)		
<18	116	29.0
≥18	284	71.0
Paternal education		
Illiterate	52	13.0
Primary	160	40.0
Secondary	128	32.0
Higher education	60	15.0
Paternal attitude toward breast feeding		
Positive	184	46.0
Negative	216	54.0
History of death from diarrhea in the offspring		
Present	32	8.0
Absent	368	92.0

*Widows, divorced and separated mothers.

Table 2 shows that over one third of mothers were teenagers who were poorly educated. This reflects the worrying rise in underage marriages in the study population. More

worrying is that the fathers of infants who had the first attack of diarrhea had a negative attitude towards natural feeding.

Table 3: Beliefs and Attitudes of Mothers/Care Givers Regarding Causes of Diarrhea in General (n=400).

Beliefs	Number	Percentage (%)
Teething	156	39.0
Untimely introduction of solid food (<6 months age)	56	14.0
Breast milk	108	27.0
Bottle feeding	36	9.0
Wrong weaning foods	12	3.0
Pacifier	12	3.0
Medication	8	2.0
Hospital acquired	8	2.0
Contagion from another child	4	1.0

Table 3 reflects the poor attitude of mothers towards natural feeding as one third of respondents were misguided that breast milk causes diarrhea in infants. These mothers

introduced the wrong type of weaning foods at the wrong time. The myth that teething causes diarrhea is widespread in Babylon Province.

Table4: Domestic and Household Factors Related to the Attack of Diarrhea in Infants Included in the Study (n=400).

Variables	Number	Percentage (%)
Residence		
Urban	152	38.0
Rural	248	62.0
Disposal of feces at home		
Proper	92	23.0
Improper	308	77.0
Mother hand washing habit		
Regular	152	38.0
irregular	248	62.0
House hold access to clean tap water		
Yes	252	63.0
No	148	37.0
Garbage collection		
Present	76	19.0
Absent	324	81.0
Waste water disposal		
Present	8	2.0
Absent	392	98.0

*Storage/source of water at home		
Proper	92	23
Improper	308	77
**Number of children in the house		
One	52	13.0
Two	120	30.0
Three	132	33.0
Four	16	4.0
Five and more	80	20.0

*Source of water includes boiled or non-boiled water.

**Some of the study population lives in extended families.

Table 4 reflects the nature of households in which the first attack of diarrhea occurred. The families tended to be large mostly rural, sometimes extended families, with poor

access to proper waste water and fecal disposal. Three quarters did not store water properly at home.

Table 5: The Association between the Age of the Infant at First Attack of Diarrhea and Maternal Demographic Factors.

Variables	Age of infant at first attack of diarrhea(months)		Total	Chi square	df	P value
	<6	≥6				
Current maternal/care giver age(year)						
<18	144(36.0%)	12(3.0%)	156(39.0%)	6.370	1	*0.012
≥18	204(51.0%)	40(10.0%)	244(61.0%)			
Maternal education				10.837	3	*0.013
Illiterate	56(14.0%)	0(0.0%)	56(14.0%)			
Primary Secondary	188(47%)	36(9.0%)	242(56.0%)			
Higher education	68(17%)	12(3.0%)	80(20.0%)			
	36(9.0%)	4(1.0%)	40(10.0%)			
Maternal employment				5.503	1	*0.019
Employed	104(26.0%)	24(6.0%)	128(32.0%)			
Unemployed	244(61%)	28(7.0%)	272(68.0%)			
Type of delivery				5.810	1	*0.016
NVD	152(38.0%)	32(8.0%)	184(46.0%)			
C-section	196(49.0%)	20(5.0%)	216(54.0%)			
Residence				24.744	1	*0.0001
Urban	116(29.0%)	36(9.0%)	152(38.0%)			
Rural	232(58.0%)	16(4.0%)	248(62.0%)			

*p value ≤ 0.05 was significant.

Table 5 shows that there is a significant association between the first attack of diarrhea and young maternal age, with a

primitive level of education, with the type of delivery being Caesarean section among others.

Table 6: Association between Source of milk of the infant and current maternal/care giver age, maternal education, maternal employment, Type of delivery and birth weight of the infants.

Variables	Source of milk		Total	Chi square	df	P value
	Natural feeding (exclusive)	Artificial feeding				
Current maternal/care giver age(year)						
<18	4(1.0%)	152(38.0%)	156(39.0%)	5.353	1	*0.021
≥18	20(5.0%)	224(56.0%)	244(61.0%)			
Maternal education						
Illiterate	4(1.0%)	52(13.0%)	56(14.0%)	21.201	3	*0.0001
Primary	4(1.0%)	220(55.0%)	224 (56.0%)			
Secondary	8(2.0%)	72(18.0%)	80(20.0%)			
Higher education	8(2.0%)	32(8.0%)	40(10.0%)			
Maternal employment						
Employed	4(1.0%)	124(31.0%)	128(32.0%)	2.759	1	0.097
Unemployed	20(5.0)	252(63.0%)	272(68.0%)			
Type of delivery						
NVD	4(1.0%)	180(45.0%)	184(46.0%)	8.844	1	*0.003
C-section	20(5.0%)	196(49.0%)	216(54.0%)			
Residence						
Urban	12(3.0%)	140(35.0%)	152(38.0%)	1.561	1	0.212
Rural	12(3.0%)	236(59.0%)	248(62.0%)			
Birth weight(gram)						
<2500	4(1.0%)	152(38.0%)	156(39.0%)	5.353	1	*0.021
≥2500	20(5.0%)	224(56.0%)	244(61.0%)			

***p value ≤ 0.05 was significant.**

Table 6 shows that rural teenage mothers who have a primitive level of education opt for artificial feeding.

Table7: Association between how quickly medical advice is sought and Current maternal/care giver age and age of infants at first attack of diarrhea.

Variables	Seek medical advice(hour)		Total	Chi Square	df	P value
	<24	≥24				
Current maternal/care giver age(year)						
<18	24(6.0%)	132(33.0%)	156(39.0%)	17.506	1	*0.0001
≥18	84(21.0%)	160(40.0%)	244(61.0%)			
Age at first attack of diarrhea (month)						
<6	88(22.0%)	260(65.0%)	348(87.0%)	3.984	1	*0.046
≥6	20(5.0%)	32(8.0%)	52(13.0%)			

*p value ≤ 0.05 was significant.

Table 7 shows that the younger the mother for her infant urgently even though their the less likely she seeks medical attention infants are less than 6 months old.

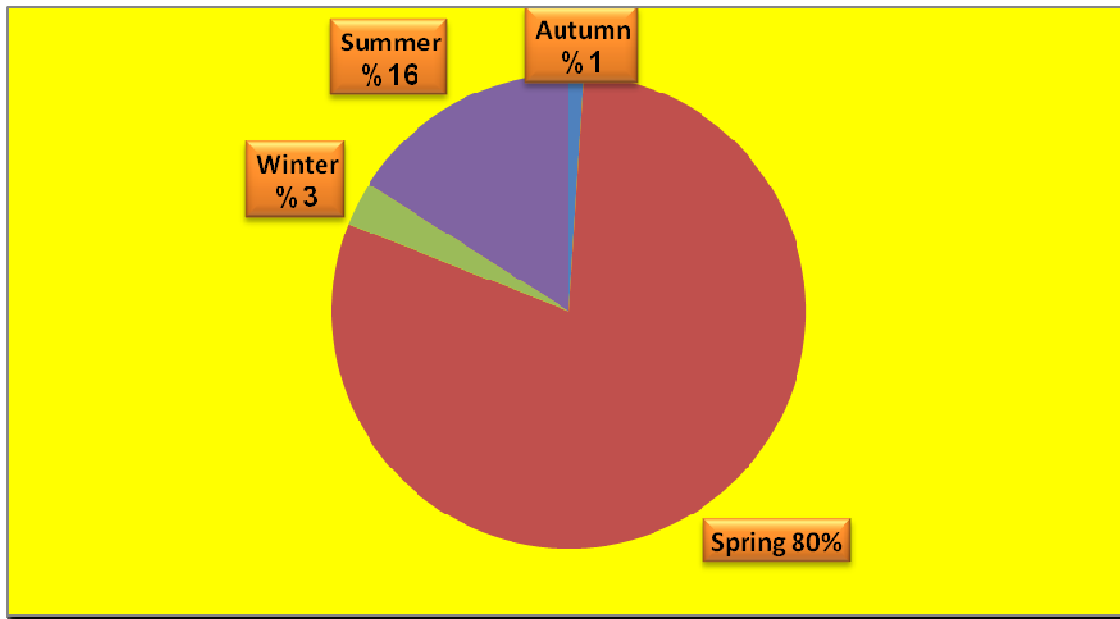


Figure 1: Distribution of diarrheal attack in infants included in the study according to seasons. The majority of the first attacks occurred in spring.

Discussion:

Diarrhea remains a major public health scourge in Babylon Province in central Iraq. It often lasts for a few days and can result in dehydration due to fluid loss. Signs of dehydration often begin with loss of the

normal stretchiness of the skin and changes in personality. This can progress to decreased urination, loss of skin color, a fast heart rate, and a decrease in responsiveness as it becomes more severe (10). Delaying or better still avoiding the first episode of

diarrhea in infants in Babylon Provinces should be based not only on early and appropriate treatment, but also on preventive strategies. These include breastfeeding ensuring good host defense by good nutrition, immunization and early treatment of childhood illness, and ensuring satisfactory sanitation and hygiene.

Globally, prevention of infectious diarrhea is by improved sanitation, clean drinking water, and hand washing with soap. Breastfeeding for at least six months is also recommended as is vaccination against rotavirus. Oral rehydration solution (ORS), which is clean water with modest amounts of salts and sugar, is the treatment of choice. Zinc tablets are also recommended (11). These treatments have been estimated to have saved 50 million children in the past 25 years (12). The current study shows that the first episode of diarrhea occurred in early in life prior to 6 months of age (87%) despite the fact that close to three quarters were in schedule with Rota Vaccine timetable. One third of the study population was born with a weight less than 2500g and over half (54%) were born via Caesarean section.

Breast feeding needs special mention, as it is cost effective and beneficial to young infants. Unfortunately the rates of breastfeeding are declining in Babylon province (13). Negative attitudes towards natural feeding are common not only among mothers but even fathers in the local community. A staggering 94% of infants were not fed naturally reflecting the declining rates of natural feeding in the Province.

Breast-feeding has declined in the recent decades throughout much of the developing world, including Pakistan(14) the failure to breast-feed, early cessation and less than optimal breast-feeding practices all have a negative impact on child and family health and well-being. A Latin American study done recently in Guatemalat gathered

information derived from different anthropological studies as part of the activities of the maternal and child health and nutrition project. It found that, according to popular beliefs, maternal milk plays a definite role in the etiology of diarrheal diseases in the lactating child (15). Despite these negative beliefs, breastfeeding practices have been shown to have a dramatic effect on the incidence of diarrheal disease in poor populations. Studies across a number of developing nations have shown that those who receive exclusive breastfeeding during their first 6 months of life are better protected against infection with diarrheal diseases. Exclusive breastfeeding is currently recommended during, at least, the first six months of an infant's life by the WHO (16).

The current study analyzed the nature of households in which the first attack of diarrhea occurred. The families tended to be large and mostly rural (62%). Sometimes there were over 5 children in the same household (20%) and some were living in extended families, with no proper waste water (98%) and fecal disposal. Three quarters (77%) did not store water properly at home. A disappointing 37% did not have access to clean tap water.(81%) did not have regular garbage collection by the local municipality.

(38%) of respondents admitted to implement proper handwashing.

Basic sanitation techniques can have a profound effect on the transmission of diarrheal disease (17). The implementation of hand washing using soap and water, for example, has been experimentally shown to reduce the incidence of disease by approximately 42–48%(18). Hand washing in developing countries, however, is compromised by poverty as acknowledged by the CDC: "Hand washing is integral to disease prevention in all parts of the world; however, access to soap and water is limited

in a number of less developed countries. This lack of access is one of many challenges to proper hygiene in less developed countries." Solutions to this barrier require the implementation of educational programs that encourage sanitary behaviors (19).

The sociodemographic variables that contribute to the first attack of diarrhea cannot be underestimated, but the impact of general environmental sanitation has been disputed as in a Nigerian study which was carried out among mothers of children aged less than five years in two markets in Ibadan, one with poor environmental sanitation and the other clean and well maintained. Thirty-seven percent of the children in the cleaner market (Gbagi) were said to have had diarrhea within the last 3 months compared to 33% of the children in the unhygienic Bodija market ($p > 0.05$). These results suggest that environmental sanitation may not be a major determinant of diarrhea among children of the two groups of market women (20). Surprisingly, emphasis on personal household hygiene rather than environmental sanitation has a more positive effect in delaying the first episode of diarrhea. In India a study was conducted to find out the pattern of food and fluid practices during diarrhea among 2,160 children under five. Mothers were educated to give homemade fluids during diarrhea. Their personal hygiene was studied and a positive correlation between diarrhea and poor personal hygiene was found (21).

This study shows that there is a significant association between the first attack of diarrhea and young maternal age, with a primitive level of education, with the type of delivery being Caesarean section among others. This study is in harmony with a study carried out in India that concluded that the risk of diarrhea and malnutrition is higher in young children born to mothers married as minors than in those born to

women married at a majority age. The same study found significant associations between maternal child marriage and infant and child diarrhea, malnutrition (stunted, wasted, underweight), low birth weight, and mortality (22).

A similar study in Pakistan found out that the first episode of diarrhea occurred more in infants of young teenage mothers. These mothers tend to have a poor level of education if not illiterate. The study found that child marriage (<18 years) which is prevalent in Pakistan is associated with negative health outcomes for their infants. The majority tends to be uneducated, poor and was working as housemaids. The majority participants were unaware of the negative health outcomes of child marriages. They appeared satisfied by the decision of their parents of marrying them before 18 years (23).

Globally, infectious diarrhea is often acquired from contaminated food or water and is a major cause of death. It may be divided into three types: short duration watery diarrhea, short duration bloody diarrhea, and if it lasts for more than two weeks, persistent diarrhea (24). In this study, in order of percentages the local beliefs and attitudes that are regarded as determinants of the first episode of diarrhea in Babylon Province are, teething (39%), breast milk (27%), untimely introduction of solid foods (14%), wrong weaning foods (3%), bottle feeding (9%), pacifier (3%), medication (2%), acquired hospital infections (2%) and contagion (2%). In comparison the local beliefs in India are somewhat different. In a study of knowledge and practices of 108 rural Indian mothers about childhood diarrhea, the common causes of diarrhea reported were eruption of teeth (67.59%), eating of mud (51.85%), worm infestation (47.22%), and change of climate (35.18%), poor personal hygiene (34.25%) and changes in diet (25.92%) (25).

A large number of mothers in this study believed that teething is determinant factor behind the first episode of diarrhea. An international study found out that almost 75% of the participants incorrectly attributed diarrhea to teething. The study shows a common lack of knowledge about teething among parents. Parents should be better educated about the teething process and the proper management of teething troubles by the dental health care providers (26).

Some mothers in our study (3%) regarded using a pacifier was a determinant factor behind the cause of the first attack of diarrhea. Nonnutritive suckling has been always used by mothers for calming and comforting infants and young children. A study to this regard recommended postponing pacifier use after the first month of life not to interfere with the duration of breastfeeding which may have also the effect to reduce the risk of episodes of diarrhea in the first three years of life (27).

This study found that a large number of mothers did not seek medical attention within the first 24 hours of the attack of diarrhea. Instead they turned for advice to their grandparents and depended on local home remedies. This reflected by the fact that the mothers in the study were minors being teenaged poorly educated mothers. In an international study

It was found that most caregivers of children with diarrhea give some form of treatment at home in all research sites and that treatment choice is influenced by the severity of the episode. The results suggest that the perception of mothers and caregivers of the severity of episodes of diarrhea is an important factor in their choice of treatment, and thus could be used in messages promoting improved treatment of diarrheal disorders (28).

Our study found that there was a positive association between early onsets of diarrhea with those infants whose caregivers did not

comply with the national Rotavirus vaccine schedule. Globally, immunization against the pathogens that cause diarrheal disease is a viable prevention strategy; however it does require targeting certain pathogens for vaccination. In the case of Rotavirus which was responsible for around 6% of diarrheal episodes and 20% of diarrheal disease deaths in the children of developing countries, use of a Rotavirus vaccine in trials in 1985 yielded a slight (2-3%) decrease in total diarrheal disease incidence, while reducing overall mortality by 6-10% (29).

Knowing the sociodemographic determinants of the first episode of diarrhea in infants in Babylon Province has the potential to save many of lives in this developing community, while reducing the overall cost of treatment, and the costs to society.

Recommendation:

1-Promotion of a health information campaign by the local health directorate to counter the falling rates of natural feeding in Babylon Province.

2-Raising the awareness that formula milk is not an alternative to natural feeding, that it is not as hygienic and that this form of infant feeding is a major contributor to diarrhea in infants.

3-Targeting underage and teenage mothers as they have a poor level of education and they tend more to give birth via Caesarean section. The latter seems to be a determinant factor for an earlier onset of diarrhea in the first year of life.

4-Education about proper hand washing and improving personal hygiene. Household and environmental sanitation should also be monitored by the local municipalities in Babylon Province.

5- Removing age-old myths such as teething being a very common cause of diarrhea in Babylon province helps mother to seek medical attention earlier fir their infants and

thus receive a correct plan of management for the first episode of diarrhea.

Conclusion:

The study concludes that the outstanding sociodemographic factors that determine the first attack of diarrhea in infants less than one year of age in Babylon Province include mostly young, teenaged poorly educated rural mothers with a poor personal level of hygiene. Episodes of diarrhea occurred more in those born via Caesarean section as they tend to be born with a low birth weight and fed artificially. Household variables including lack of access to clean tap water and proper waste water and fecal disposal facilities correlated positively with an earlier onset of the first episode of diarrhea.

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