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The Relationship between Diarrhea and Feeding Indicators among Children in the Capital Sana'a, Yemen

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Abstract

Background: Lack of appropriate breastfeeding and complementary feeding practices in the first two years of life are the main cause of malnutrition and common childhood illnesses. In Yemen, the top three causes of disability-adjusted life years in 2010 were lower respiratory infections, diarrheal diseases, and congenital anomalies.

Objectives: To investigate impact of feeding practices on the prevalence of diarrhea in Sana'a city (the capital), Yemen.

Method: A standard comprehensive structured questionnaire was designed and administered on 601 randomly selected mothers of children aged 0-24 months who were visiting primary health, care centers and hospitals of Sana'a city during the period from April-June 2014.

Results: The exclusive breastfeeding, complementary food, bottle with breast milk, only bottle and introducing at least 4 food group from 7 rates were found to be 96%, 85%, 63%, 55% and 28% respectively. A statistically significant was found association between the prevalence of diarrhea and those children who were fed by bottle with or without breast milk and also with children who had 4 groups than others. The risk of diarrhea among of children practiced bottle with breast milk was 1.95, the risk of diarrhea among children who practice only bottle was 2.12, and the risk of diarrhea among children who practiced at least 4 food groups per day was 1.77 times than others.

Conclusion: Efforts must be intensified to educate prospective mothers on the need and benefits of breastfeeding, to equip mothers with knowledge and skills on hygiene, prevention of diarrhea and water treatment with the aim of lowering diarrhea cases.

Keywords: *Exclusive breastfeed; Complementary feed; Bottle feeding; Minimum dietary diversity; Diarrhea*

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Introduction

Infant and young child feeding practices directly affect the nutritional status of children under two years of age and, ultimately, impact child survival. Improving infant and young child feeding practices in children 0-24 months of age is therefore critical to improve nutrition, health and development of children. In this period, infants and children are particularly vulnerable to growth retardation, micro-nutrient deficiencies, and common childhood illnesses [1].

Human milk is considered an ideal nutrition and provides advantages regarding general health, growth and development, and psychological and social benefits [2]. Being readily available and economic, breast milk makes breastfeeding an effective preventive measure against allergic diseases [3]. In 2003, the World Health Organization (WHO) issued a revised global recommendation that mothers should breastfeed exclusively for six months [2]. This recommendation is likely to influence national policies on the recommended age for the first introduction of solids, so it is important that pediatricians are aware of the issues and the evidence on which the WHO recommendation is based [2]. In developing countries, breastfeeding reduces the incidence and severity of diarrhea in infants [2-4]. According to WHO, the complementary feeding should be introduced in addition to breast milk from 6 months of infant age. It has been suggested that in addition to disease prevention strategies, complementary feeding interventions targeting this "critical window" are most efficient in reducing malnutrition and promoting adequate growth and development [5,6]. The associated effects of inadequate breastfeeding and complementary feeding practices often lead to illness, growth faltering, nutrient deficiencies, and death, particularly during the first two years of life [1].

In Yemen, the top three causes of disability-adjusted life years in 2010 were lower respiratory infections, diarrheal diseases, and congenital anomalies. Overall, the three risk factors that account for the most disease burden in Yemen are suboptimal breastfeeding, childhood underweight, and dietary risks [7].

The Yemen National Health and Demographic Survey (YNHDS) 2013 reported that only 10% of infants aged less than 6 months have been breastfed, 40% of children aged 0-24 months have been fed using bottle, 65% of children aged 6-9 months received complementary feeding, 31% of children under age 5 years had diarrhea [8]. In addition, in Sana'a City for children under age 5 years, the YNHDS 2013 revealed that treatment was sought from health facility for 31% of children with diarrhea, 19.4% of children with diarrhea were given oral rehydration salt (ORS), 22% of children with diarrhea received were given any oral rehydration therapy (ORT) [8].

The present study is focusing on the feeding practices indicators such as exclusive breastfeeding, complementary feeding, bottle with breast milk, only bottle, and minimum dietary diversity and its influence on the prevalence of diarrhea during the first two years of life in Sana'a City, Capital of Yemen.

The aims of study were:

1. To estimate the feeding indicators among infants and children in age group 0-24 months according to WHO definitions in Sana'a City, Capital of Yemen
2. To estimate the prevalence of diarrhea among infants and children
3. To examine the relationship between feeding indicators and the prevalence of diarrhea

Methods

Definitions [WHO, 9,10]:

Diarrhea: As three or more loose stools in the past two weeks previous the survey [9]. The two-week period of diarrhea occurrence used as a criterion in our study is comparable with studies conducted in Egypt [11], India [12], and Western Ethiopia [13,14].

Exclusive Breastfeeding (0-6) months: Breast milk from mother or expressed breast milk, no other liquids or solids except vitamin drops or syrups, mineral supplements, or prescribed medicines,

Complementary Feeding (6-9) Months: Breast milk and solid or semi-solid foods: any food or liquid like eggs, cheese, rice, cereals, fruits, vegetables,

Bottle with Breastfeed (0-24) months: Any liquid (including breast milk) or semi-solid food from a bottle with nipple/teat, anything else: any food or liquid including non-human milk and formula,

Only Bottle feeding (0-24) months: Any liquid or semi-solid food from a bottle with nipple/teat, anything else: any food or liquid including non-human milk and formula,

Minimum dietary diversity (6-24) months: Receive foods from 4 or more food groups from 7 food groups, the 7 foods groups used are: 1) rice, potato, grains, 2) legumes and nuts, 3) dairy products (milk, yogurt, cheese), 4) flesh foods (meat, fish, poultry, liver), 5) eggs, 6) rich fruits and vegetables, 7) juices.

Variables of the Study: The target or dependent variable was prevalence of diarrhea and the independent variables were feeding indicators; namely, exclusive breastfeeding, complementary feeding, only bottle feeding, bottle feeding with mother's milk, and the minimum dietary diversity. All these variables were of binary form (yes or no).

Materials: The survey was carried out from April-July 2014 in Sana'a the Capital City, Yemen. The data collection tool was a structured questionnaire that covered socio-economic and educational attainments, vital statistics, and maternal characteristics. It also covered breast and bottle feeding and the normal feeding practices. Data collection process took place after getting consents of the management of targeted health care centers and hospitals. Only mothers who agreed to participate in the study were included. Mothers were interviewed face-to-face by well-trained female medical students. Data collection process took about 17 weeks due to the scarcity of mothers that agreed to participate for different social reasons. The final sample attained was 601 mothers.

Statistical Analysis: Cox proportional hazard regression model was used to estimate the prevalence of diarrhea through all independent variables [15,16]. The hazard ratio was used to determine the most important variables affecting the prevalence of diarrhea. Statistical analysis was carried out using SPSS version 21 software for Windows.

Results

The feeding indicators in this study were measured as recommended by WHO [13,14]. Frequencies and proportions of the feeding indicators and the prevalence of diarrhea prevalent in children < 2 years old in Sana'a City, Yemen, are shown in Table 1. The two weeks prevalence of diarrhea among all children was (257/601) 42.8%.

Exclusive Breastfeeding: Ninety six percent of infants less than six months were exclusively breastfed. Out of these infants (79/231) 34.2% had diarrhea.

Bottle milk with and without Breastfeeding: About 63% of children were fed by bottle and breast with bottle, whereas 55% had been fed by bottle alone. Surprisingly, infants and children fed by bottle had less diarrhea (47.4%) as compared to those fed by bottle and breast milk (47.9%).

Minimum Dietary Diversity: For children aged 6-24 months, about 28.1% were fed at least 4 group foods from 7 groups per day as defined by WHO, of them (51/101) 50.5% had diarrhea.

Feeding Indicators	Age Group in months	Total no. of children	n (%)	Prevalence of Diarrhea
Exclusive Breastfeeding	0-6	241	(231) 95.9	(79/231) 34.2%
Bottle and Breastfeeding	0-24	601	(378) 62.9	(181/378) 47.9%
Bottle Feeding	0-24	601	(329) 54.7	(156/329) 47.4%
Minimum Dietary Diversity	6- 24	360	(101) 28.1	(51/101) 50.5%
Complementary Feeding	6-9	120	(102) 85.0	(56/102) 54.9%

Table 1: *The prevalence of diarrhea associated with each independent variable.*

Complementary Feeding: Eighty five percent of children aged 6-9 months received complementary foods, of them (56/102) 55% had diarrhea.

Table 2 displays the results of fitting Cox proportional hazard regression model to study the effect of feeding indicators on prevalence of diarrhea among children < 2 years old in Sana'a City, Yemen. The feeding indicators that were significantly associated with prevalence of diarrhea were bottle feeding with breastfeeding, bottle feeding without breastfeeding and minimum dietary diversity indicators.

Feeding Indicators	Coefficient	Hazard Ratio	95% CI	P-value
Bottle and Breastfeeding	0.665	1.95	1.51-2.51	0.000
Bottle Feeding	0.752	2.12	1.62-2.78	0.000
Minimum Dietary Delivery	0.568	1.77	1.26-2.48	0.001
Exclusive Breastfeeding	1.326	3.77	0.52-27.20	0.188
Complementary Feeding	0.420	1.52	0.92-2.51	0.099

Table 2: *Cox model showing the relation between Diarrhea and Feeding Indicators among Children in Sana'a.*

Bottle milk and bottle milk plus breastfeeding

Healthy hygiene practices during infancy and childhood feeding are to keep them away from infectious diseases. This fact is reflected in this study quite clearly; since those infants and children fed either by bottle milk or bottle milk plus breastfeeding are more vulnerable to suffer from diarrhea. In other words, the chance that any infant or child to be diarrhea infected is about two times more than those who do not.

Minimum Dietary Diversity: It was expected that the more diverse the food provided to children, the more they are protected against infectious diseases. The finding in this study does not support this hypothesis. As there is, a 77% more chance in those children who had four food groups or more to be diarrhea infected.

Exclusive Breastfeeding: The analysis shows that infants who exclusively breastfed are having four times chance more to be exposed to diarrhea. However, the relationship is not significant (P value > 0.05). This result advocates strongly the importance of exclusive breastfeeding in protecting infants from diarrhea.

Complementary Feeding: The chance of a child had a complementary foods to get diarrhea is 52% more. However, there is no enough evidence in this study that complementary foods are increasing the vulnerability children to diarrhea (P value > 0.05).

Discussion

Exclusive breastfeeding: Infectious diseases such as diarrhea are the main cause of mortality and morbidity in infants and children aged less than two years. The importance of exclusive breastfeeding in the prevention of infectious diseases during infancy is well known [4,17]. On the other hand, some other studies claim that exclusive breastfeeding has no role in reducing the prevalence of diarrhea [18,19,20].

In the present study, although no significant association between diarrhea and exclusive breastfeeding had achieved, it was found 34.2% of infants aged 0-6 months had diarrhea. This percentage is considered high comparing to other studies [21,22], it is low comparing with the results of a study done in Taiz, Yemen [18].

Bottle and breastfeeding: The present study reveals that about 63% of children aged 0-24 months have been nourished using both bottle and breast milk. This is higher than the percentage reported by the YNDHS 2013 [8]. The risk of having diarrhea is 1.95 more among children less than two years who were nourished by both bottle and breast milk. Similar result was found in studies conducted in Qatar [23] and in Kersa district (Eastern Ethiopia) [14]. However, in Basrah City (Iraq), infants practiced bottle with breast milk were less likely to suffer from diarrhea than others who aged 6-11 months [24].

Bottle Feeding: It was found that the risk of diarrhea among of children less than two years is 2.12 times the hazard than those not bottle fed. Similarly, this finding was found in Basrah City among infants aged 6-11 months, Iraq [24]. Another study from Chile showed that most feeding bottles harbored large numbers of pathogens that could cause gastrointestinal infection [25].

Minimum Dietary Diversity: Children aged 6-23 months should receive foods from 4 or more food groups out of the 7 recommended food groups [9,10]. The cut-off of at least 4 of 7 food groups was selected because it is associated with better quality diets for both breastfed and non-breastfed children [26]. Consumption of foods from at least 4 food groups on the previous day would mean that in most populations the child has a high likelihood of consuming at least one animal-source food and at least one fruit or vegetable that day, in addition to a staple food [9,10]. In this study, only 28.1% of children aged 6-23 months were feed at least 4 group foods per day. However, this result is not in a harmony with a study conducted in Korogocho Slum, Nairobi, were less than 50% of children were fed of the minimum of 4 food groups [27].

In this study, the risk of diarrhea was significantly higher among children who had at least 4 food groups per day, where it was 1.77 times. The opposite was found in a study conducted in Korogocho Slum, Nairobi (Kenya) [27]. This result could serves in understanding why the risk of having diarrhea is 1.77 times more among them.

Complementary Feeding: The nutritional inadequacy of the complementary diet, both quality and quantity, and the undermining effects of infections on the nutritional status of the child remain major problems affecting infants and young children in the world today [28]. For that reason, introduction of liquids, solids, semi-solids and soft foods at 6-9 months are provided along with breast milk [9,10].

For infants aged 6-9 months, a higher prevalence of diarrhea among infants who practice complementary feed than the others, it was found 1.52 times but not significant. Similar result found in Brazilian studies conducted in city of Imperatriz on infants aged 6-12 months and in city of Feira de Santana [21,29] on infants less than one year, however significantly finding found in rural Bangladesh [30].

Conclusion

In conclusion, one of the major problems when comparing similarly designed studies in different settings is that infant feeding patterns are not well defined. An advantage in this study was that five levels of infant and children feeding indicators could be compared. These are exclusively breastfed, bottle practice plus breastfed, only bottle feeding, complementary feeding and minimum dietary diversity indicators. The definitions of WHO for feeding indicators were applied [9,10]. In addition, findings of this study provide a useful baseline for interventions and comparisons with future studies.

Infant and young child feeding is critical for child health and survival. The recommendations of WHO and UNICEF that infants must be exclusively breastfed for the first 6 months of life and thereafter receive adequate complementary foods in addition to continued breastfeeding until 2 years of age or beyond [1,31]. The protective effect of breastfeeding against diarrhea incidence was lower among infants aged ≤ 6 months. Several mechanisms for a possible protective effect of breastfeeding against gastrointestinal infections have been proposed, including the presence in breast milk of substances with antimicrobial or immunological properties, avoidance of contamination (as in non-human milk or baby bottles), and the general nutritional status of breastfed infants [32]. Baby feeding bottles should be avoided because, in addition to being an important source of contamination for the infant, they interfere with oral dynamics [33].

The results of this study showed that diarrhea is prevalent among infant and children who had bottle with or without breast milk and who had at least 4 food groups than others in Sana'a city, Yemen. There are many causes that may be related to prevalence of diarrhea such as drinking water and weaning foods, personal hygiene practices of mothers, child defecating on the floor, use of unsterilized and dirty feeding bottles for the children.

Childhood diarrhea remains an important health concern in the study community. Occurrence of diarrhea could be minimized by interventions aimed to improve sanitation, hygiene and child birth spacing. Therefore, Ministry of Public Health and Population and other organizations working on child survival programs in Yemen should integrate water, sanitation and hygiene interventions with UNICEF to educate mothers on the need and benefits of breastfeeding and also to equip them with knowledge and skills on hygiene, prevention of diarrhea and water treatment with the aim of lowering diarrhea incidence.

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References

1. WHO (World Health Organization) and United Nations Children Emergency Fund (UNICEF). *Global Strategy for Infant and Young Child Feeding* (2003).
2. Gartner LM., *et al*. "Breastfeeding and the use of human milk". *Pediatrics* 115.2 (2005): 496-506.
3. WHO. "Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: a pooled analysis. WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality". *Lancet* (2000): 451-455.
4. Arifeen SE., *et al*. "Exclusive breastfeeding reduces acute respiratory infection and diarrhea deaths among infants in Dhaka slums". *Pediatrics* 108.4 (2001): 67-74.
5. Martorell R., *et al*. "Reversibility of stunting: epidemiological findings in children from developing countries". *European Journal of Clinical Nutrition* 48 (Suppl 1) (1994): 45-57.
6. WHO. R*eport of Informal Meeting to Review and Develop Indicators for Complementary Feeding*. Washington D.C. (2002).
7. GBD PROFILE: YEMEN from: http://www.healthmetricsandevaluation.org
8. MOPHP (Ministry of Public Health and Population) and CSO (Central Statistical Organization). *Yemen National Health and Demographic Survey 2013 (YNHDS)*. Preliminary Report, MOPHP and CSO, Sana'a, Yemen, (2014).

9. WHO. "*Indicators for Assessing Infant and Young Child Feeding Practices*". Part I: Definitions. Conclusions of a consensus meeting held 6-8 November 2007 in Washington D.C., USA. Geneva; (2008).
10. WHO. "*Indicators for Assessing Infant and Young Child Feeding Practices*". Part 2, Measurement. WHO, 20 Avenue Appia, 1211 Geneva 27, Switzerland, (2010).
11. El-Gilany AH and Hammad S. "Epidemiology of diarrhoeal diseases among children under age 5 years in Dakahlia, Egypt". *Eastern Mediterranean Health Journal* 11.4 (2005): 762-775.
12. Stanly AM., *et al.* "A population based study of acute diarrhoea among children under 5 years in a rural community in South". *Sri Ramachandra Journal of Medicine* 1.1 (2009): 1-7.
13. Desalegn M., *et al*. "Predictors of under-five childhood diarrhea: Mecha District, West Gojjam, Ethiopia". *Ethiopian Journal of Health Development* 25.3 (2011): 174-232.
14. Mengistie B., *et al*. "Prevalence of diarrhea and associated risk factors among children under-five years of age in Eastern Ethiopia: A cross-sectional study". *Open Journal of Preventive Medicine* 3.7 (2013): 446-453.
15. Hosmer DW and Lemeshow S. "Applied Survival Analysis; Regression Modeling of Time to Event Data". *John Wiley and Sons Inc*. (1999): 87-112.
16. Landau S and Everitt BS. "A Handbook of Statistical Analyses using SPSS". Chapter 10. Chapman and Hall/CRC. 2004.
17. Quigley MA., *et al*. "How protective is breast feeding against diarrheal disease in infants in 1990s England? A case-control study". *Archives of Disease in Childhood* 91.3 (2006): 245-250.
18. Al-Badani A., *et al*. "Rotavirus Diarrhea among Children in Taiz, Yemen: Prevalence-Risk Factors and Detection of Genotypes". *International Journal of Pediatrics* (2014).
19. Al-Khasra KR., *et al.* "The detection of rotavirus among infants and young children suffering from diarrhea in Sana'a". *Yemen Medical Journal* 4.1 (2002): 60-63.
20. Al-Wardi HA., *et al*. "Rotavirus gastroenteritis in infants and young children in Sadam City in Baghdad". *Saudi Medical Journal* 11.6 (1990): 457-459.
21. Santos FS., *et al*. "Breastfeeding and Acute Diarrhea among Children Enrolled in the Family Health Strategy". *Texto Contexto Enferm* 25.1 (2016):1-8.
22. Berhe H., *et al.* "Prevalence of Diarrhea and Associated Factors among Children Under-Five Years of Age in Enderta Woreda, Tigray, Northern Ethiopia, 2014". *International Journal of Therapeutic Applications* 31 (2016): 32-37.
23. Ehlayel MS., *et al.* "Protective effect of breastfeeding on diarrhea among children in a rapidly growing newly developed society". *The Turkish Journal of Pediatrics* 51.6 (2009): 527-533.
24. Mahmood DA., *et al.* "Infant Feeding and Risk of Severe Diarrhoea in Basrah City, Iraq: a case-control study". *Bulletin of the World Health Organization* 67.6 (1989): 701-706.
25. Monckeberg F. "Factors conditioning malnutrition in Latin America with special reference to Chile". *Bibl Nutr Dieta* 14 (1970): 23-33.
26. FANTA and AED (Working Group on Infant and Young Child Feeding Indicators). "*Developing and validating simple indicators of dietary quality and energy intake of infants and young children in developing countries*:" Additional analysis of 10 data sets. Washington, DC, USA. 2007.
27. Korir JK. "*Determinants of Complementary Feeding Practices and Nutritional Status of Children 6-23 Months Old in Korogocho Slum, Nairobi County, Kenya*". Kenyatta University, Kenya (2013).
28. Nti CA and Lartey A. "Young child feeding practices and child nutritional status in rural Ghana". *International Journal of Consumer Studies* 31.4 (2007): 326-332.
29. Vieira GO., *et al.* "Child feeding and diarrhea morbidity". *Journal of Pediatrics* 79.5: (2013): 449-454.
30. Mihrshahi S., *et al.* "Association between infant feeding patterns and diarrhoeal and respiratory illness: A cohort study in Chittagong, Bangladesh". *International Breastfeeding Journal* (2008).

31. WHO. *The optimal duration of exclusive breastfeeding. Report of an Expert Consultation*. Geneva; WHO, (2001).
32. Horta BL and Victora CG. "S*hort-term effects of breastfeeding: a systematic review on the benefits of breastfeeding on diarrhoea and pneumonia mortality*". *WHO* (2013).
33. WHO. Guiding principles of complementary feeding. Geneva, Switzerland, (2001).