DOI: 10.36347/sjams.2017.v05i02.029

Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2017; 5(2B):442-452 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com

Original Research Article

Epidemiology of acute diarrheal diseases among Children under five in Gaza Strip: Post war community based study

Basil J.Y. Kanoa[1], Mueen A. El-kariri[2], Mazen Al-Sakka[3], Adnan Al-Hindi[4], Samaher J. H. younis[5]
[1]Dr. Pharmacist, Ministry of Health, Gaza, Palestine
[2]Director, Health Education, Ministry of Health, Gaza, Palestine
[3]Associate Professor, Faculty of Pharmacy, Al-Azhar University, Gaza, Palestine
[4]Professor, Medical Laboratory Sciences Dept., Faculty of Health Sciences, Islamic University-Gaza, Palestine
[5]Dr. Pharmacist, Ministry of Health, Gaza, Palestine

***Corresponding author**
Prof. Adnan Al-Hindi
Email: ahindi@iugaza.edu.ps

Abstract: Diarrhoeal disease is the second leading cause of death in children under five years old, and is responsible for killing around 760 000 children every year. To study the determinants and the magnitude of acute diarrheal diseases one month after the cessation of the third Israeli aggression against Gaza Strip and to assess its burden among the children under five. This is cross sectional design study**.** Data has been collected throughout Gaza Strip. The sample size included 705 women from three governorates were surveyed out of five**.** Eligible women were interviewed using a pre designed, pre tested interview questionnaire. The period (last month) and the point (24 hours) prevalence rates of diarrheal diseases among children under five years were 46.1% and 17.7% respectively. The Sex of the child had no significant effect on both point and period prevalence of diarrhea. More than sixty percent (63.3%) of period prevalence of diarrhea was recorded among children that have no exclusive breastfeeding before. There are no significant differences for the point prevalence as a result of introducing the complementary feeding. Period and point prevalence rates of diarrhea were not significantly related to the room number. Both rates were higher for children in homes without refrigerators but only significant for point prevalence. It was found that 62.1% of the mother increased fluid intake, 54% of them used ORS. Drugs like anti diarrhea and herbal drugs were used by (61.4% and 40.3%) respectively of the participating mothers. Cleaning of drinking water tanks and the domestic tanks have played a role in reducing the occurrence of diarrhea among children under five with highly statistically significant between both of them. It is concluded that there was high point and period prevalence of diarrhoea still exists among children in Gaza Strip. It is recommended to start to search for diarrhoea causes to reduce its incidence.
Keywords: Diarrhoeal disease, breastfeeding, herbal drugs

INTRODUCTION

Diarrhea is defined by World Health Organization (WHO) as having three or more loose or liquid stools per day or as having more stools than is normal for that person [1]. Acute diarrhoea may be accompanied by nausea, vomiting, abdominal cramping, clinically significant systemic symptoms, or malnutrition [2, 3]. It is the second most common cause of death in children under five years of age worldwide and is responsible for 2.4 million deaths each year [4]. Acute diarrhea is still a leading cause of illness and death among children under 5 developing countries [5, 6]. Diarrhoeal diseases constitute a major burden of disease especially in low- and middle-income countries (LMIC). Of all medical conditions, diarrhea is the second leading cause of healthy time lost to illness (72.8 million DALYs). Dehydration resulting from diarrhea causes approximately 1.8 million deaths every year [7]. Many of the risk factors for contracting diarrheal illnesses are associated with poor socioeconomic conditions, such as lacking access to safe water and sanitation, poor hygiene practices and unsafe human waste disposal [8-10]. Low socioeconomic status can limit access to health care and education, and can affect food safety, housing conditions and other factors that increase likeliness of exposure to infectious organisms or reduce resistance to infectious diseases [11, 12].

In the Gaza Strip, UNRWA epidemiological bulletin showed a constant increasing trend in the last three years (watery diarrhea) with fluctuation in the incidence according to the contextual situation [13]. The reported incidence in 2012 was two fold than one reported in 2005, indicating environmental and sanitary deterioration. Management of diarrhea is unsatisfactory both at home and at the facility level; of children who had diarrhea, only 42% were treated with oral rehydration solution; 50% were treated with home remedies [14]. Some home remedies such as herbals, special food formula (boiled rice water), over warming, body massage and hot compresses over the abdomen may be inappropriate and even dangerous [15]. The aim of conducting this community based survey is to study the determinants and the magnitude of acute diarrheal diseases one month after the cessation of the third Israeli aggression against Gaza Strip and to assess its burden among the children under five.

MATERIALS AND METHODS

Ethical considerations

Ethical approval was obtained from the Ministry of Health and oral approval from each participant was obtained.

Study area

Gaza Strip is a small area on the southwestern corner of Palestine lying on the coast of the Mediterranean Sea. It is boarded by Egypt from the South, Negev desert from the East. Gaza Strip is 50 Km long, from Beit-Hanon in the north to Rafah in the South. Its width reaches 5-12Km from North to the South with a total surface area of 365 km². Its population is around 1.7 million [16]. Gaza Strip is divided into five governorates north, Gaza city, Middle, Khanyounis and Rafah governorates. According to Palestinian Central Bureau of Statistics (PCBS) about 19% of the population was children under five years of age [17].

Study period

Data of this study was collected during the period of one month after Israeli hostile act. A community based survey was conducted in three of Gaza governorates during the period from 21st Sept till 21st Oct 2014.

Eligibility criteria, sample size

Eligibility criteria were being women ever married and have at least one child below the age of five. Sample size 705 women was estimated based on the prevalence diarrhea reported in the annual report.[15] Multistage sampling technique was used to enroll eligible women. Three governorates were surveyed out of five to allow generalization of the findings. The number of women selected from each governorate was determined by proportional allocation; implicit in the procedures was that the larger numbers of women were drawn from the larger population 9 villages, camps and rural areas were surveyed. Eligible women were interviewed using a pre designed, pre tested interview questionnaire.

Study design

This is cross sectional design study where data has been collected through out Gaza Strip.

Sampling

Simple random sample has been approached so three governorate have been identified out of the five areas. Stratification of the three geographical localities was applied, and the total of three refugee camps, three civil areas and three countryside areas selected.

Multistage random sampling

Out of the five governorates we selected three ones bsed on a simple random technique, out of these three list of camps, cities and rural are drawn. Out of each cohort, 7 areas represent 2 villages, 3 cities and two camps were selected-bsed on simple random sampling technique. Proportion of the sample size was considered since cities outweigh the size of the camps and the villages.

Tool of the study

Questionnaire

The validity of questionnaire was conducted by three consultants in the area of epidemiology, public health and pediatrician. The consultants deeply revisited the assessment tools compared to the objectives. The tool was also divided into four separate parts to assure a good level of repeatability and reliability. Face to face interview by using questionnaire as a tool of measurement was used and it was included the following themes; socio-demographic characteristics, children characteristics, parents characteristics, childhood morbidity, household conditions and behavioral scope of the mothers and their children.

STATISTICAL ANALYSIS

Data processing and analysis was performed with SPSS version 18. Data were presented as the mean, the SD, and the 95 corresponding confidence interval CI.

RESULTS

The period (last month) and the point (24 hours) prevalence rates of diarrheal diseases among children under five years were 46.1% and 17.7% respectively (Table 1). The rate of period prevalence was significantly higher among North governorates children than Gaza city and South governorates and among refugee camp residents comparing to city and village children.

Point and period prevalence rates of diarrhea were the highest at the age of 6 month but with no significant effect (Table 2). The Sex of the child had no significant effect on both point and period prevalence of diarrhea. More than sixty percent (63.3%) of period prevalence of diarrhea was recorded among children that have no exclusive breastfeeding before. There are no significant differences for the point prevalence as a result of introducing the complementary feeding.

Mother education but not father education had a strong correlation with diarrheal diseases at point prevalence (Table 3). Period and point prevalence rates of diarrhea were not significantly related to mother and father occupation. Only period prevalence rate of diarrhea was statistically significant among families with income less than 1000NIS. Table 4 reported the Prevalence of diarrheoal diseases according to the housing conditions. Period and point prevalence rates of diarrhea were not significantly related to the room number. Both rates were higher for children in homes without refrigerators but only significant for point prevalence. Only period prevalence of diarrheal disease was significantly higher among children with mobile tankers as a source of drinking water. Findings shown above revealed that the families breeding animals had significant association with diarrheal episodes among their children as shown in table 5.

Figure 1 shows the perception and believes of the participated mothers for the management of diarrhea at home. It was found that 62.1% of the mother increased fluid intake, 54% of them used ORS. Drugs like anti diarrhea and herbal drugs were used by (61.4% and 40.3%) respectively of the participating mothers. Figure 2 presented the beliefs and attitudes of all participated mothers regarding the best prescriber of ORS. Doctors and pharmacists were the best prescriber for ORS among 91.1% and 41.1% of the participating mothers respectively. All most 100% of the mothers gave their children herbs of non specific antidiarrheal effect such as chamomile, ginger, caraway and anise oil. Moreover, around 43% of them give their children volatile oil with estrogen properties commonly named mixture of herbs that may have harmful effect especially on the male. Data not shown Primary health care centers were the main source of information for diarrhea among 81% of the participating mothers. Other sources of information like magazines and internet were used by 10.6% and 9.8% of the participating mothers (Figure 3). In this survey, 472 (67%) mothers declared that diarrhea may occurred due to the digestion of contaminated food, 332 subjects (47.1%) reported that the teething may cause diarrhea, and the highest percentage 491(69.6%) mentioned the common cold as an etiology of diarrhea (Figure 4). Figure 5 indicated the main sign and symptoms of diarrhea, it was found that frequency of defecation three times and more 609 (86.4%) and abdominal pain 584(82.8%) constitutes the highest percentages among the participants.

Table 6 reported the prevalence of diarrheoal diseases according to hygienic practices; it was observed that children washed their hands by water has less episodes of diarrheal attack both during one month and at a point of time. This was statistically significant with the occurrence of diarrhea ($P \leq .01$). Cleaning of drinking water tanks and the domestic tanks have played a role in reducing the occurrence of diarrhea among children under five with highly statistically significant between both of them. Table 7 indicates the frequency and signs of diarrhea according to their mother's claims. Where the episode of diarrhea 3 times or more was 45.1%. and the moderate dehydration showed 30.5%.

Table 1: Prevalence of diarrheoal diseases and its variation according to the governorates, residence and crowding index

Variables	Sample		Diarrhea during the last: 24 hour		last Month	
	No	%	No	%	No	%
Overall	705	100	124	17.7	325	46.1
Governorates						
North	194	27.5	20	10.3***	156	80.4***
Gaza city	363	51.4	73	20.1	120	33.1
South	148	20.9	31	20.9	49	33.1
Residence						
Refugee	103	14.6	10	9.7	61	59.2***
Village	80	11.3	13	16.3	25	31.25
City	522	74.0	101	19.3	239	45.8
Crowding index						
≤ 7	527	74.8	87	16.5	248	47.1
>7	178	25.2	37	20.8	77	43.3

*P≤0.05 **P≤0.01 ***P≤0.001

Table 2: Prevalence of diarrheal diseases according to children's characteristics

Variables	Total		Diarrhea during the last: Month		24 hour	
	No	%	No	%	No	%
Overall	705	100	325	46.1	124	17.7
Age						
6 moth	30	4.2	25	83.3	13	43.3
7-24	250	35.5	85	34.0	40	16.0
25-60	425	60.3	215	50.5	71	16.7
Sex						
Male	367	52.1	162	44.1	55	15.0
Female	338	47.9	163	48.2	69	20.4
Exclusive breastfeeding						
Yes	460	65.2	170	37***	84	18.3
No	245	34.8	155	63.3	40	16.3
Complementary feeding						
At 4 month and less	162	23.0	65	40***	34	21.0
At 5 to 6 month	471	66.8	223	47.3	80	17.0
After 6 month	72	10.2	37	51.3	10	13.8

*P≤0.05 **P≤0.01 ***P≤0.001

Table 3: Prevalence of diarrheoal diseases according to parents' characteristics

Variables	Total		Diarrhea during the last: Month		24 hour	
	No	%	No	%	No	%
Overall prevalence	705	100	325	46.1	124	17.7
Maternal age (years)						
19-24	136	19.3	53	39.0	26	19.1
25-35	501	71.1	243	48.5	84	16.8
More than 35	68	9.6	29	42.6	14	20.6
Maternal education						
Less than 6 years	131	18.6	47	35.8	32	24.4*
6-12 years	444	63.0	217	48.8	76	17.1
More than 12	130	18.4	61	47.0	16	12.3
Maternal employment						
Working	127	18.0	56	44.1	19	15.0
Not working	578	82.0	269	46.5	105	18.2
Father education						
Less than 6 years	153	21.7	55	35.9	34	22.2
6-12 years	411	58.3	211	51.3	70	17.0
More than 12	141	20.0	59	41.8	20	14.2
Father employment						
Working	393	55.7	189	48.1	66	17.8
Not working	312	44.3	136	43.6	58	18.6
Family income						
Less than 1000NIS	389	55.2	201	51.7***	70	18.0
1000 NIS and more	316	44.8	124	39.	54	17.1

*P≤0.05 **P≤0.01 ***P≤0.001

Table 4: Prevalence of diarrheoal diseases according to the housing conditions

Variables	Total		Diarrhea during the last:			
			Month		24 hour	
	No	%	No	%	No	%
Overall prevalence	705	100	325	46.1	124	17.7
Floor type						
Cement	502	71.2	243	48.5*	80	15.9*
Asbestoses	203	28.8	82	40.4	44	21.6
Room number						
1-2	288	40.9	139	48.3	52	18.1
More than 2	417	59.1	186	44.6	72	17.3
Sources of Drinking water						
Mobile tankers	640	90.8	306	47.8***	113	17.6
Home filter /others	65	9.2	19	29.2	11	17.0
Sewage system						
Closed	541	83.0	251	46.4	91	16.8
Open	111	17.0	54	48.6	25	22.5
Availability of Refrigerator						
Present	603	85.5	269	44.6	95	15.7***
Absent	102	14.5	56	55.0	29	28.4

*P≤0.05 **P≤0.01 ***P≤0.001

Table 5: Prevalence of diarrhea according to the breeding animals' type

Variables	Total		Diarrhea during the last:			
			Month		24 hour	
	No	%	No	%	No	%
Overall prevalence	705	100	325	46.1	124	17.7
Cheap breeding						
Yes	56	7.9	27	48.2	19	34.0**
No	649	92.1	298	46.0	105	16.2
Rabbit breeding						
Yes	51	7.2	24	47.1	15	29.4*
No	654	92.8	301	46.1	109	16.6
Birds breeding						
Yes	150	21.3	78	52.0	37	24.6***
No	555	78.7	247	44.5	87	15.6
Dogs breeding						
Yes	39	5.5	18	46.2	14	35,9***
No	666	94.5	307	46.1	110	16.5

*P≤0.05 **P≤0.01 ***P≤0.001

Table 6: Prevalence of diarrheoal diseases according to hygienic practices

Variables	Total		Diarrhea during the last:			
			Month		24 hour	
	No	%	No.	%	No.	%
Washing hands of Children by water						
Yes	663	94.0	301	45.4	109	16.4**
No	42	6.0	24	57.1	15	35.7
Washing hands of Children by soap and water						
Yes	649	92.1	298	46.0	108	16.6*
No	56	7.9	27	48.2	16	28.6
Cleaning of the tanks of drinking water						
Yes	492	69.8	247	50.2***	77	15.6*
No	213	30.2	78	36.6	47	22.1
Washing of domestic water tanks						
Yes	362	51.3	186	51.4***	52	14.4*
No	343	48.7	139	40.5	72	21.0

*P≤0.05 **P≤0.01 ***P≤0.001

Table 7: Frequency and signs of diarrhea according to their mother's claims

Signs of diarrhea	No	%
Frequency of diarrhea		
One to two time	252	35.7
3 times or more	318	45.1
Children with abdominal colic and spasm		
Yes	567	80.4
No	138	19.6
Duration of diarrhea	597	84.7
Less than one week	572	81.1
One week and more	25	3.5
Frequency of defecation	611	86.7
Less than 3 times	198	28.1
4-6 times	395	56
More than 6	18	2.6
Blood in stool	241	34.2
Vomiting	360	51.1
Frequency of vomiting	350	49.6
Less than 4	316	44.8
4 and more	34	4.8
Dehydration status	565	93.0
No dehydration	201	28.5
Weak	221	31.3
Moderate	215	30.5
Severe	19	2.7
Contact with person with diarrhea	259	36.7
Children bought from vendor	220	31.2
Follow up the PHC and hospital admission	289	41.0
Stool inspection	470	66.7

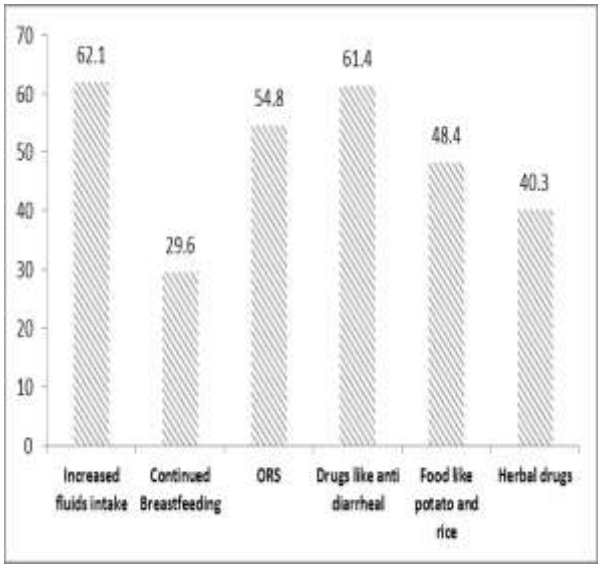

Fig-1: Home care practices of diarrhea according to the participating mothers

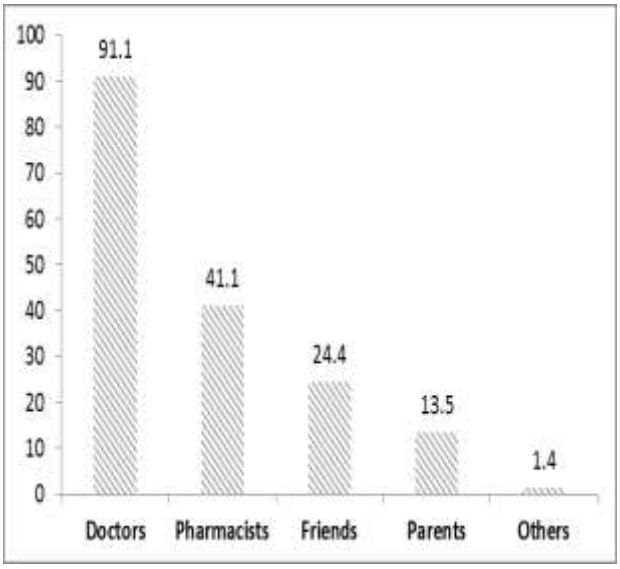

Fig-2: Beliefs and attitudes of mothers regarding the best prescriber of oral rehydration solution (ORS)

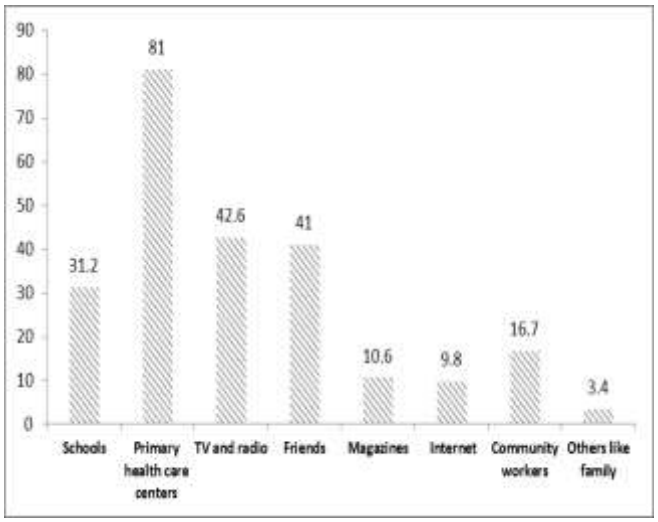

Fig-3: Source of information on diarrhea

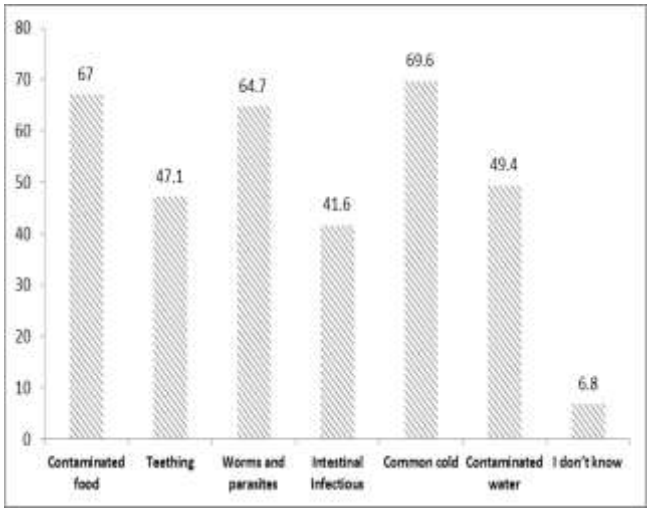

Fig-4: Mother perception towards the causes of diarrhea

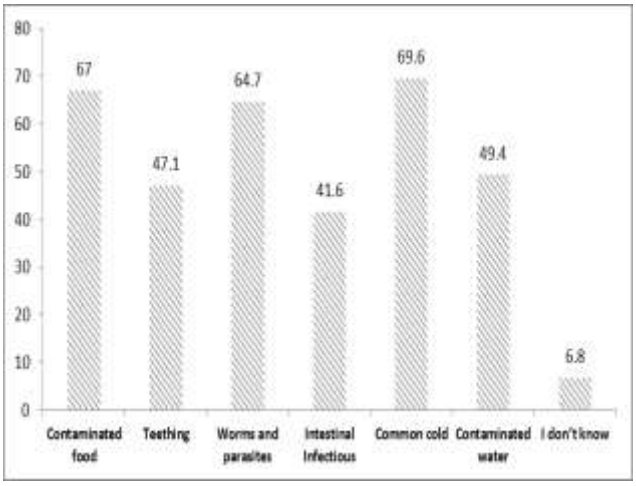

Fig-5: Mother perception towards signs and symptoms

DISCUSSION

Diarrhoeal disease is a leading cause of child mortality and morbidity in the world, and mostly results from contaminated food and water sources. Worldwide, it is responsible for killing around 760 000 children every year mostly in developing countries [18]. Considering the usually scanty resources available in developing countries, a reduction in diarrhea-related mortality may be possible by identifying high-risk subjects and targeting them for intensive intervention [19].

In this study, 46.1% of children under five were reported to have had diarrhea in the last month preceding the survey (period prevalence rate) and 17.7% were reported to have had diarrhea in the last 24 hours preceding the survey (point prevalence rate). In the study was done in 2009, the women that reported that their children had diarrhea was 77.4%. This phenomenon indicated the difficult health situation of the children and risk factors related to diarrhea [20].
The results were also matched with the Gaza household survey 2010 where one in five households (20 per cent) had at least one child under the age of five who had been infected with diarrhea in the four weeks prior to being surveyed. The survey revealed that poor water quality, poor hygiene practices, and lack of sanitary conditions are the main contributing factors [21].

In the present study the high period prevalence of diarrhea can be explained by the fact that this study was conducted at the end of summer season and directly after the last Israeli operation –aggression-2014 on the Gaza Strip where a considerable percentage (25% of people were displaced and stayed at UNRWA, governmental schools, non-hygienic places such as garages or even non well prepared places. In the present study, children gender was not important factor in diarrheal disease occurrences. Results of many previous studies were inconsistent regarding these variables [22-24]. In our study, only point prevalence rate was significantly higher among children from north governorates and among refugees. This may be attributed to the high percentage of people displaced during the Israeli operation against Gaza Strip to these areas from the north, East of Gaza and even Khanyounis.

A part from the first 6 months of life when maternally acquired immunity and breastfeeding without supplementation played protective role, diarrhea morbidity increased significantly among the child age 6 months and less. The prevalence of diarrhea was higher at 6 month and decreased thereafter. This might be due to the introduction of the bottle formula which was largely distributed as a humanitarian relief jointly with low and bad hygienic conditions as well as the lack of conducive environment to support the breast feeding practices. In addition, toddlers and crawling age usually started at this period and the risk of ingestion contaminated materials is high, especially in unhygienic environment they lived. Children with birth order of 4 or higher were more likely to have diarrhea than others. With higher birth order children, the focus of mother and her care are affected and consequently mean more exposure to pathogens. Similar findings were reported in Ethiopia and Tanzania [25, 26].

Childhood diarrhea morbidity decreased significantly with higher education level of the mothers. Better educated mothers tended to marry similarly advantaged men with higher education and to enjoy a relatively higher standard of living. Also, education was reflected in child rearing and child health care practices during illness. Similar findings have been previously reported from Philippines where it was stated that maternal education protects against infant diarrhea in the more economically and socially advantaged communities in Philippines [27].

Although this was not the case for Ethiopia where low level of maternal education were found to be

the risk factors for childhood diarrhea after adjusting for other variables in North West Ethiopia [28]. The prevalence of childhood diarrhea either during the point or period prevalence rate was associated with family income. Socioeconomic standards and diarrhea morbidity were inversely associated. In families of high social class, both parents tended to be highly educated and to work as professionals or semi-professionals with high income. These characteristics were reflected in better hygiene, child care.

According to the results of the present study, the working mother does not affect the prevalence of diarrheal disease. In a study performed in Thailand, non-working mothers had been determined as an important risk factor of diarrheal diseases. It is thought that working mothers have higher educational levels than housewives and they are more conscious of factors that may impact on their children's health [29]. Absence of the habit of washing hands significantly increased the prevalence of diarrheal disease. The importance of washing hands with regard to diarrheal diseases has been shown by different studies [30, 31]. Washing hands is a simple but a very important way of preventing infectious diseases, especially gastrointestinal infections [29].

On their awareness on the causes of diarrhea, most of the mothers identified contaminated food and water as a major causes of diarrhea. Mothers who could identify the causes of diarrhea may be able to avoid such causative factors that may reduce incidence of diarrhea among their children. Teething and cold were also identified by 47.1% and 69.6% of the respondents as causative agents of diarrhea respectively. This false knowledge provides a greater challenge for health education and other preventive interventions and calls for greater flexibility and adaptability in the implementation of such programs. The study also showed the importance of making use of a number of different approaches when obtaining information on the local perceptions of childhood diarrhea [32].

Despite positive treatment practices of diarrhea like increase fluid intake and using oral rehydration solutions (ORS) but using drugs like Anti-diarrheal agents still frequently used and with high percentage. Anti-diarrheal and Antibiotics drugs were the most frequently prescribed drugs (80.9% and 46.0% respectively). These drugs may be used frequently because mothers and physicians may be more interested in treatments that will rapidly stop diarrhea especially Anti-diarrheal agents. Children living in unsanitary conditions and households were the most vulnerable victims of diarrhea in our study and other studies [25].

Diarrhea was encountered more often among children in homes with one toilet. Presence of two and more toilet played a role in reducing the chance of diarrhea. The availability of used refrigerators as preservation source of food was statistically associated with low prevalence of diarrhea, probably because it ensures the proper food safety required for the meals. Breeding animals like cheep, rabbits, birds and dogs was associated with high prevalence of diarrhea. Availability of animals at homes probably provides condition sites for flies and others insects that convey pathogens to humans. Early introduction of bottle formula in emergency are widely used as emergency relief (humanitarian issue) during Israeli operations against Gaza Strip. This might play role in increasing and provoking the diarrheal attack especially among less than 6 month of age. Washing and cleaning technique was inappropriate (incorrectly match with standard way for tanks cleaning since the majority of the sample mentioned that they cleaned their tanks by only water.

There is continuous increase in the incidence rate of diarrhea from 2009 to 2013. The incidence rate in 2010 and 2011 was (30.1% and 32.6%) respectively, the rate up to 41.0% and 41.5% in 2012 and 2013 respectively [33]. As compared to our study 2014, period prevalence was 46.1% and this is an indicator of continuous increase in the rate of diarrhoeal incidence that could be attributed to the deterioration of infrastructure in the Gaza Strip especially after war 2014. UNRWA reports showed an increased in the number of diarrhoeal cases during the conflict period in Gaza year 2014 [34]. Contaminated food, poor water quantity and quality and bad sanitation and hygiene dramatically deteriorated the conditions [33].

REFERENCES

1. WHO. "Diarrhea" World Health Organization, 2007.
2. Thielman NM, Guerrant RL. Acute infectious diarrhea. New England Journal of Medicine. 2004 Jan 1; 350(1):38-47.
3. Ansari S, Sherchand JB, Parajuli K, Paudyal BM, Adhikari RP, Shrestha S, Mishra SK, Dahal RK, Tandukar S, Khadka R, Shreshta R. Pattern of acute parasitic diarrhea in children under five years of age in Kathmandu, Nepal.
4. Cooke ML. Causes and management of diarrhoea in children in a clinical setting. South African Journal of Clinical Nutrition. 2010; 23(1).
5. Parashar UD, Hummelman EG, Bresee JS, Miller MA, Glass RI. Global illness and deaths caused by rotavirus disease in children. Emerging infectious diseases. 2003 May 1; 9(5):565-72.

6. Kolahi AA, Nabavi M, Sohrabi MR. Epidemiology of acute diarrheal diseases among children under 5 years of age in Tehran, Iran. Iranian J of Clinical Infectious Diseases. 2008 Jan 1; 3(4):193-98.
7. WHO. The global burden of disease, 2004 update. Geneva, World Health Organization. 2008.
8. Daniels DL, Cousens SN, Makoae LN, Feachem RG. A case-control study of the impact of improved sanitation on diarrhoea morbidity in Lesotho. Bulletin of the World Health Organization. 1990; 68(4):455.
9. MANUN'EBO MN, HAGGERTY PA, GAIE MK, ASHWORTH A, KIRKWOOD BR. Influence of demographic, socioeconomic and. Journal of tropical medicine and hygiene. 1994; 97:31-8.
10. Graf J, Meierhofer R, Wegelin M, Mosler HJ. Water disinfection and hygiene behaviour in an urban slum in Kenya: impact on childhood diarrhoea and influence of beliefs. International journal of environmental health research. 2008 Oct 1; 18(5):335-55.
11. Forsberg BC, Gwatkin D, Tomson G, Allebeck P, Petzold MG. Socioeconomic inequalities in the prevalence and management of childhood diarrhoea: potential health gains to be achieved. The Open Infectious Diseases Journal. 2009 Apr 2; 3(1).
12. Ahs JW, Tao W, Löfgren J, Forsberg BC. Diarrheal diseases in low-and middle-income countries: incidence, prevention and management. The Open Infectious Diseases Journal. 2010; 4(4):113-24.
13. UNRWA: Epidemiological Bulletin for the Gaza Strip, Issue 8, Vol. 5, 2013.
14. Map and save the children: Gaza's children: Falling behind-the effect of the blockade on child health in Gaza. Gaza Palestine 2012.
15. Ministry of Health: Health sector strategic plan: Gaza governorates 2014-2018. 2013.
16. Palestinian Central Bureau of Statistics PCBS, 2007.
17. Palestinian Central Bureau of Statistics PCBS, 2011.
18. World Health Organization. Diarrhoeal disease, Fact sheet No. 330. Geneva, World Health Organization. April, 2013.
19. Abu-Elamreen FH, Abed AA, Sharif FA. Viral, bacterial and parasitic etiology of pediatric diarrhea in Gaza, Palestine. Medical Principles and Practice. 2008 Jun 3; 17(4):296-301.
20. Kanoa BJ, Al-Hindi AI. Mother knowledge, attitudes, perception regarding intestinal parasites and diarrhoea in three regions of Gaza strip, Palestine. Journal of the Egyptian Society of Parasitology. 2009 Dec; 39(3):827-36.
21. UNICEF. Water, Sanitation and Hygiene: Household Survey Gaza. 2010.
22. Pereira MD, Atwill ER, Barbosa AP, Silva SA, García-Zapata MT. Intra-familial and extra-familial risk factors associated with Cryptosporidium parvum infection among children hospitalized for diarrhea in Goiânia, Goiás, Brazil. The American journal of tropical medicine and hygiene. 2002 Jun 1; 66(6):787-93.
23. Etiler N, Velipasaoglu S, Aktekin M. Risk factors for overall and persistent diarrhoea in infancy in Antalya, Turkey: a cohort study. Public Health. 2004 Jan 31; 118(1):62-9.
24. Bozkurt Aİ, Özgür S, Özçİrpİcİ B. Association between household conditions and diarrheal diseases among children in Turkey: a cohort study. Pediatrics international. 2003 Aug 1; 45(4):443-51.
25. Mihrete TS, Alemie GA, Teferra AS. Determinants of childhood diarrhea among underfive children in Benishangul Gumuz Regional State, North West Ethiopia. BMC pediatrics. 2014 Apr 14; 14(1):102.
26. Gascon J, Vargas M, Schellenberg D, Urassa H, Casals C, Kahigwa E, Aponte JJ, Mshinda H, Vila J. Diarrhea in children under 5 years of age from Ifakara, Tanzania: a case-control study. Journal of clinical microbiology. 2000 Dec 1; 38(12):4459-62.
27. Dargent-Molina P, James SA, Strogatz DS, Savitz DA. Association between maternal education and infant diarrhea in different household and community environments of Cebu, Philippines. Social Science & Medicine. 1994 Jan 1; 38(2):343-50.
28. Mihrete TS, Alemie GA, Teferra AS. Determinants of childhood diarrhea among underfive children in Benishangul Gumuz Regional State, North West Ethiopia. BMC pediatrics. 2014 Apr 14; 14(1):102.
29. Bozkurt Aİ, Özgür S, Özçİrpİcİ B. Association between household conditions and diarrheal diseases among children in Turkey: a cohort study. Pediatrics international. 2003 Aug 1; 45(4):443-51.
30. Awasthi S, Pande VK. Seasonal pattern of morbidities in preschool slum children in Lucknow, north India. Indian pediatrics. 1997 Nov 1;34(11):987-3.
31. Pinfold JV, Horan NJ, D DUNCAN MA. Seasonal effects on the reported incidence of acute diarrhoeal disease in northeast Thailand. International Journal of Epidemiology. 1991 Sep 1; 20(3):777-86.

32. Nielsen M, Hoogvorst A, Konradsen F, Mudasser M, Van Der Hoek W. Childhood diarrhea and hygiene: Mothers' perceptions and practices in the Punjab, Pakistan. IWMI; 2001.
33. Palestinian Ministry of Health 2014 (MoH): communicable diseases in Gaza Strip: Annual epidemiological report. General Directorate of Primary Health Care Preventive Medicine, epidemiology Department 2014.
34. UNRWA Health Department Annual Report 2014: Department of Health.