

**Minireview paper**

**DIARRHEA DISEASE: A CONCERN FOR DEVELOPING COUNTRIES**

**ABSTRACT**

Diarrhea is a symptom associated with several gastro intestinal tract diseases. At initial stage of diarrhea illness, diarrhea often goes unnoticed and as it progresses diarrhea present with visible signs and symptoms. Diarrhea ranges from mild, moderate to severe. It can occur suddenly for just a short while (acute) and can likewise persist for a long period of time (chronic).

The rate of death among children under five due to diarrhea in developing countries is an issue of concern. Diarrhea occurrence and prevalence is high in developing countries. The low socio economic status and lack of basic facilities such as safe water and appropriate disposal techniques of developing countries are responsible for this. In addition to this is the fact that many care givers lack knowledge of diarrhea and its home management.

Management of diarrhea should start at home in order to prevent the resultant complications which include dehydration, malnutrition and death. The recommended and effective way diarrhea can be well treated at home is through the use of Oral Rehydration Solution (ORS) and continuous feeding which includes breast feeding. However, studies have reported several home management practices among care givers in developing countries which are based on religious and cultural factors. Hence need for stakeholders to address the issue of inadequate knowledge, lack of good source of water and poor sanitation in developing countries.

**KEYWORDS**

Diarrhea, Developing, Countries, Dehydration, Malnutrition, Oral –Rehydration – Solution (ORS)

**1. INTRODUCTION**

Diarrhea is a significant childhood disease which is also associated with some infections such as malaria, measles and upper respiratory tract infections and all these make it more deadly [1]. It is mostly first identified by mothers at home and if not treated promptly at home diarrhea can result into

26 dehydration and malnutrition [2]. Diarrhea is a major killer disease amongst the poor especially in  
27 developing countries [3]. Globally an estimation of 2.5 billion cases of diarrhea occurs each year [4].  
28 Many cases of diarrhea have been admitted into the hospital because of its consequences such as  
29 dehydration and malnutrition, which often result into death if not treated promptly and adequately [5].

30 Available reports indicated that more than 800,000 deaths of children under five years are  
31 recorded annually as a result of diarrhea disease despite global and local efforts in reducing it [6]. The  
32 rate is quite high in developing countries than the developed countries because of their low standard  
33 of living evidenced by nonavailability of basic facilities such as safe water and appropriate waste  
34 disposals techniques. Diarrhea is prevalent in developing countries due to poor socioeconomic  
35 development of this part of the world. Nigeria is ranked 54<sup>th</sup> among the 78 poorest countries of the  
36 world [7]. In addition Nigeria is among the first five poorest countries Worldwide. This is due to the  
37 poor standard of living, low literacy level and lack of essential facilities such as safe water and this  
38 contributes to high prevalence of diarrhea disease in most of the rural communities in this country [8].

## 39 **2. WHAT IS DIARRHEA**

40 Diarrhea is a symptom of a disease condition which affects people of all ages [9]. It is the  
41 passage of more than two loose stools in a day [10]. Most often diarrhea is of sudden onset and of  
42 short duration. However it can become chronic in people with poor nutritional and low immune status.  
43 Diarrhea is typically caused by micro organism. Its occurrence depends on predisposing factors such  
44 as poor sanitation, poor water among many others [11]. Age is a strong determinant of severity of  
45 diarrhea. Severe diarrhea affects children below the age of two years than those above two years.  
46 The reason for this is that children aged less than two years have less immunity against any disease  
47 and could be easily susceptible to infection than older ones. Generally diarrhea affects children than  
48 adults in terms of dehydration which is one of its major complications since water constitutes the  
49 largest proportion of children's body-weight [12].

50 Diarrhea can be categorized into mild, moderate and severe. Mild diarrhea is often  
51 asymptomatic (without signs of dehydration) but as it progresses to moderate diarrhea in children  
52 under five years following symptoms emerges such as sunken eyes, decreased skin elasticity, sunken  
53 fontanelle, thirst, dry mouth and restlessness. Severe diarrhea is the most chronic stage which is also  
54 characterized by above signs and symptoms, lethargy and unconsciousness inclusive. Severe or

chronic diarrhea can lead to serious and life threatening complications [13]. Another significant complication of chronic diarrhea in children under five years is malnutrition and this depends on the duration of diarrhea, the cause of diarrhea and the state of the gastro intestinal tract [14]. It is important to know that malnutrition does not only accompany diarrhea, it can also precede diarrhea. A malnourished child has high tendency to develop diarrhea. The state of a child nutritional status does not impact only diarrhea but also other diseases. The major underlying cause of deaths due to childhood illness is malnutrition [15]. Malnutrition causing diarrhea or resulting from diarrhea which ever form it takes affects child's physical growth and development, and may lead to long term disability and morbidity in the future. Hence the need to emphasize through health education the benefits of continuous feeding during episodes of diarrhea [13].

65

### 3. WHY DIARRHEA IS A CONCERN IN DEVELOPING COUNTRIES

Despite better interventions that have brought about serious drop in diarrhea morbidity and mortality rate in developed countries, diarrheal diseases still remains a public health concern of developing countries. It has been observed that the prevalence of diarrhea in developing countries has not changed much since 1990s till 2003 with 3.5 episodes per child per year in 1993 and 3.2 episodes per child per year in 2003 [16]. Although on the average across the nations of the World, deaths due to diarrhea has reduced from 4.6 million in the 1980s to 3.3 million in the 1990s and to 2.5 million in the year 2000 [17] and by 2011 diarrhea accounted for 750,000 deaths [18]. However there has not been serious reduction in mortality rate in developing countries. In the 1900s it was 2.1 million deaths per year and by 2000 it reduced to only 1.6 million deaths per year [16]. It is worth noting that diarrhea still remains one of the diseases responsible for death among children less than five years in developing countries. The continuity of any society depends on child bearing and child rearing. Any disease that can affect this process needs to be taken care of [16].

Children are the most vulnerable group susceptible to diverse form of illnesses due to their level of immunity and developmental changes. Poor socio economic status and some socio cultural beliefs and practices in developing countries are the leading causes of malnutrition among children under five years [19].

Diarrhea if not treated early easily leads to dehydration and malnutrition which are life threatening [10]. The rates of hospital admission due to these complications are still on the increase and many of such has led to death among children under five years in developing countries [20]. The relationship that exists between nutritional status and diarrhea is very significant and an important factor to be considered [21]. The impact of repeated or persistent diarrhea on nutrition and the effect of malnutrition on making children to be susceptible to diarrhea are interwoven. This relationship requires great attention among children in developing countries where poor nutrition and sanitation are prevalent [22].

91

## **4. FACTORS RESPONSIBLE FOR PREVALENCE OF DIARRHEA IN DEVELOPING COUNTRIES**

Prevalence of diarrhea in developing countries is due to the following: inadequate knowledge, poverty and its associated factors, poor management of diarrhea to mention but a few.

### **4.1 Inadequate knowledge**

Poor knowledge has been one major factor responsible for the prevalence of many diseases in developing countries. Many mothers don't have adequate knowledge of diarrhea, its causes and the complications [23]. A study carried out among some set of caregivers to under-five children in Ethiopia discovered that most mothers don't have knowledge about diarrhea, its causes, transmission, complications and even its prevention. This was observed to be common among people living in rural setting [12]. Furthermore it has been reported that children whose mothers did not attend formal education were more likely to develop diarrhea compared to children whose mothers attend any formal education [5]. Generally, mothers' education, occupation, economical status, and experience have been observed to have significant relation with knowledge of diarrhea [24].

### **4.2 Poverty and its associated factors**

Diarrheal is a disease of the rich and poor, the old and the young, people in developed countries and those in developing countries alike, yet a strong relationship exists between poverty, an unhygienic environment, and the prevalence of diarrhea among children under five [16]. The rate

of impact of this disease is attributed to its sensitive mode of spread which is mainly through contaminated water and poor hygienic condition [25]. It is worth noting that poverty is associated with poor housing, unhygienic environment, lack of access to sufficient clean water, cohabitation with domestic animals that may carry human pathogens, and poor food storage all of which increase the occurrence and frequency of diarrhea. Poverty also impacts the quality of foods given to healthy children and the pattern of feeding when children experience diarrhea [16].

#### **4.3 Poor management of diarrhea**

Apart from the conventional methods of managing diarrhea, mothers have used different remedies and traditional therapies in managing diarrhea. This includes oral and topical medicines made from plants (leaves, stems, roots) and amulets placed around the waist or wrist [26]. Some mothers believe that diarrhea should be managed by both traditional and modern approaches. The local available foods commonly used in the management of diarrhea include loose soft rice and pulse water [9]. In addition some mothers in developing countries are of the opinion that certain foods are to be avoided such as spicy, oily and rotten foods and that milk are harmful and should be stopped whenever a child experiences diarrhea [20].

Quick and safe recovery from diarrhea will require prompt and appropriate treatment of diarrhea at home by caregivers hence the need for them to have knowledge on the use of appropriate home remedies in treating diarrhea. Such readily available homemade remedies and interventions for treating childhood diarrhea may include fresh fruit juices, milk, salt sugar solution, and breast milk. The treatments of diarrhea should be right from its mild stage with focus on restoring lost fluids via oral rehydration solution and continuous feeding [12]. Continuous feeding is important for reducing the nutritional consequences of diarrhea illness. Meanwhile continuous breast feeding should be highly promoted among children in low income countries, where the burden of diarrhea and malnutrition is greatest [3]. In addition continuous feeding with locally available foods should be promoted for all diarrhea cases in children already on complementary feeding in developing countries. This continuous feeding helps in maintaining body immune status [12].

## 5. FACTORS INFLUENCING THE HOME MANAGEMENT OF DIARRHEA IN DEVELOPING COUNTRIES

Mothers in developing countries have several local means of treating diarrhea at home which is deeply rooted in cultural and religious belief [11]. A study conducted in Katanga Province, Democratic Republic of Congo identified that despite awareness of the mode of transmission for childhood diarrhea, majority of the mothers that participated in the study strongly believed that occurrence of diarrhea is either due to God's will, the breach of a taboo, eating of forbidden food and/or witchcraft attack. Witchcraft was much more prevalent than others [27].

In most African countries many mothers treat diarrhea based on the characteristics of the stool, and circumstances surrounding it. Inadequate knowledge of diarrhea process and its management is one key factor responsible for the poor management of diarrhea among mothers in developing countries. The perceptions of mothers as regards diarrhea have given rise to several locally classifications of diarrhea which informed the way each has been managed [20]. A study among most mothers of Morang district, Nepal revealed that diarrhea was classified based on stool appearance and constituency and it was managed based on the appearance and presentation. The various classifications made includes thin watery stool, red stool, green stool, stool like sputum, oily stool, black stool, egg like stool, yellow stool and stool like mustard flower . Out of these, thin watery stool was identified as the most serious type [12].

Also inadequate knowledge of the disease process and its management is another factor that determines the management of diarrhea which is high among the illiterate than the literate counterpart of mothers in low income countries [20]. Mothers with higher education are thought to have better opportunity for information as regards the management and prevention of diarrhea diseases [12]. Some studies carried out in some developing countries, Nigeria inclusive revealed that there was higher prevalence of diarrhea in the households whose mothers had no education [5].

## 6. CALL FOR ACTION

Reducing the prevalence of diarrhea has for a long time been a global concern. The focus of interventions is highly directed towards developing countries because of peculiar features that characterized these countries. Actions to take require joint effort by all stake holders. These actions

include provision of better access to clean water, provision of low cost sanitation system, improving health education program, improving the availability of Oral Rehydration Solution (ORS) among many others [28].

## **6.1 Provision of better access to safe water**

Unsafe water and poor sanitation are the main sources of diarrhea disease in developing countries. One major way government can ensure there is supply of safe water to every household is by constructing piped - in - system. However some countries may have financial constraints in achieving this, hence such may involve private bodies. This intervention is very cost effective at the long run as families spent less on hospital bills. Apart from the build in pipe system other interventions that can be carried out in rural areas include construction of boreholes and deep wells [29].

## **6.2 Provision of low cost sanitation system**

Improving access to safe water at communities' level can only have impact when families and community at large live under good sanitary conditions. This requires all households' participation with the use of simple available and appropriate technology acceptable to the people. Such interventions include construction of household latrines, provision of households waste disposal bins, public incinerators and schools sanitation. Implementing this cannot be achieved only by the government there is need for collaboration with interested private organizations [30].

## **6.3 Improving health education program**

Beliefs held tenaciously by the care givers as regards diarrhea are responsible for the reason they could not associate the prevalent socio problems such as poor sanitation, poor hygienic condition and poor water in developing countries with the occurrence of the disease. Hence, health education should be directed at improving mothers knowledge on factors causing the disease, importance of continuous feeding/ breast feeding and administration of ORS when managing diarrhea at home [25]. History has revealed the effectiveness of health education in causing a behavioural change or improvement. Mothers with decision making power and with formal education are more likely to take yield to educational interventions. However some studies revealed that older women with formal education are able to make decision better than the younger mothers. Hence the health

education must be designed in such a way to meet the need of all different categories of mothers. Nevertheless irrespective of the level of education and age of the mother, there is need for health care providers to make mothers to first understand the benefits of keeping their children healthy. This will change their attitude towards educational interventional program [31].

## 6.4 Improving the availability of ORS

Prompt recognition and treatment of diarrhea at home is very important for effective management of diarrhea. The replacement of fluid is the recommended first line of treating diarrhea over the years. Among various home remedies used in managing diarrhea, ORS remains the most effective of all the interventions [21]. ORS is a simple and proven intervention that can be used in treating diarrhea and its complications. Improving the availability of ORS will require the contributions of private and government sectors, including pharmaceutical companies in making ORS readily available at households' level [27].

## 7. CONCLUSION

Diarrhea is one major illness of concern among children under five especially in developing countries. The state of development of most low income countries makes its eradication a bit difficult couple with strong cultural and religious beliefs held by the care givers in this part of the World. Eradication of this disease will require efforts of all that are involved in issue related to children health and care.

## REFERENCES

1. Mugeni C, Levine AC, Munyaneza RM, Mulindahabi E, Cockrell HC, Glavis-Bloom J, et al. Nationwide implementation of integrated community case management of childhood illness in Rwanda. *Global Health: Science and Practice*. 2014; 2(3): 328-341. Accessed 5 Aug. 2014. Available: doi: 10.9745/GHSP-D-14-00080. PMID: PMC4168626
2. WHO. Treatment of diarrhea at home. Rehydration Project. 2014. Available: [rehydrate.org/diarrhoea/tmsdd/4med.html](http://rehydrate.org/diarrhoea/tmsdd/4med.html)
3. Gaffey MF, Wazny K, Bassani DG, Bhutta ZA. Dietary management of childhood diarrhea in low- and middle-income countries: a systematic review. *BioMed Central*. 2013; 13:(3) 7. Accessed 17 Sept. 2013. Available: doi: [10.1186/1471-2458-13-S3-S17](https://doi.org/10.1186/1471-2458-13-S3-S17). PMID: PMC3847348
4. UNICEF. Diarrhea: Why Children are still dying and What can be done. 2009. Available: [www.unicef.org/.../Final\\_Diarrhoea\\_Report\\_October\\_2009\\_fina...UNICEF](http://www.unicef.org/.../Final_Diarrhoea_Report_October_2009_fina...UNICEF)

- 225 5. Mohammed S, Tamiru D. The Burden of Diarrheal Diseases among Children under Five  
226 Years of Age in Arba Minch District, Southern Ethiopia, and Associated Risk Factors: A  
227 Cross-Sectional Study. International Scholarly Research Notices. 2014; (2014) 6 pgs.  
228 Accessed 18 Nov. 2014. Available: <http://dx.doi.org/10.1155/2014/654901>
- 229 6. Ogbu O, Agumadu N, Uneke C, Amadi E. Aetiology of Acute Infantile Diarrhoea in the south-  
230 Eastern Nigeria: An Assessment Of Microbiological And Antibiotic Sensitivity Profile. The  
231 Internet Journal of Third World Medicine. 2007;7 (1). Available: [ispub.com/IJTWM/7/1/4460](http://ispub.com/IJTWM/7/1/4460)
- 232 7. Ali-akpajak SCA, Pyke T. Measuring poverty in Nigeria. London: Oxfam working papers  
233 Publish. 2003. Available: <https://books.google.com/books?isbn=085598502X>
- 234 8. Udo B. Premium times. Accessed 11 April 2014. Available:  
235 [www.premiumtimesng.com/.../158554\\_nigeria\\_ranks-third-among-count](http://www.premiumtimesng.com/.../158554_nigeria_ranks-third-among-count)
- 236 9. Mwabete KD, Joseph R. Knowledge and perception of mothers and caregivers on  
237 childhood diarrhea and its management in Temeke Municipality, Tanzania. Tanzania Journal  
238 of Health Research. 2010;12 (1). Accessed January 2010. Available:  
239 [www.popline.org/node/220425](http://www.popline.org/node/220425)
- 240 10. O'Reilly CE, Jaron P, Ochieng B, Nyaguara A, Tate JE, Parsons MB et al. Risk Factors for  
241 Death among Children Less than 5 Years Old Hospitalized with Diarrhea in Rural  
242 Western Kenya, 2005–2007: A Cohort Study. Public library of Science. 2012; 9(7). Accessed  
243 3 July 2012. Available: doi: [10.1371/journal.pmed.1001256](https://doi.org/10.1371/journal.pmed.1001256) PMID: PMC3389023
- 244 11. Njume C, Goduka NI. Treatment of Diarrhea in Rural African Communities: An Overview of  
245 Measures to Maximise the Medicinal Potentials of Indigenous Plants. International  
246 Journal of Environmental Research and Public Health. 2012; 9(11): 3911–3933. Accessed  
247 26 Oct. 2012. Available: <http://www.mdpi.com/1660-4601/9/11/3911>. PMID: PMC3524604
- 248 12. Merga N, Alemayehu T. Knowledge, Perception, and Management Skills of Mothers  
249 with Under-five Children about Diarrhea Disease in Indigenous and Resettlement  
250 Communities in Assosa District, Western Ethiopia. Journal of Health Population and  
251 Nutrition. 2015; 33(1): 20–30. Accessed Mar 2015. Available:  
252 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4438645/>.
- 253 13. Ferdous F, Das SK, Ahmed S, Farzana FD, Latham JR, Chisti MJ et al. Severity of  
254 Diarrhea and Malnutrition among Under Five-Year-Old Children in Rural Bangladesh.  
255 The American Journal of Tropical Medicine and Hygiene. 2013; 89 (2):223-228. Accessed 7  
256 Aug. 2013, Available: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3741240/>
- 257 14. Gorospe EC, Oxentenko AS. Nutritional consequences of chronic diarrhea. Best Practice and  
258 Research Clinical Gastroenterol. 2012; 26(5):663-75. Accessed October 2012. Available:  
259 <http://www.ncbi.nlm.nih.gov/pubmed/23384810>
- 260 15. Nel ED. Diarrhea and malnutrition. S Afr J Clin Nutr. 2010; 23(1): S15-S18.  
261 [www.ajol.info/index.php/sajcn/article/viewFile/52763/41365](http://www.ajol.info/index.php/sajcn/article/viewFile/52763/41365)
- 262 16. Keusch GT, Fontaine O, Bhargava A, Boschi-Pinto C, Bhutta ZA, Gotuzzo E et al. Disease  
263 Control Priorities in Developing Countries. 2nd edition. The World Bank Group. 2006.

- 264 Available: [www.ncbi.nlm.nih.gov/...](http://www.ncbi.nlm.nih.gov/...)National Center for Biotechnology Information. PMID:  
265 [21250309](https://pubmed.ncbi.nlm.nih.gov/21250309/)
- 266 17. Boschi-Pinto C, Lanata CF, Mendoza W, Habte D. Disease and Mortality in Sub-Saharan  
267 Africa. 2nd edition. Chapter 9Diarrheal Diseases. 2006. Available:  
268 [www.ncbi.nlm.nih.gov/...](http://www.ncbi.nlm.nih.gov/...)National Center for Biotechnology Information
- 269 18. Diouf K, Tabatabai P, Rudolph J, Marx M. Diarrhea prevalence in children under  
270 five years of age in rural Burundi: an assessment of social and behavioural factors at  
271 the household level. Global Health Action. 2014; 17. Available: [www.globalhealthaction.net](http://www.globalhealthaction.net) ›  
272 Home › Vol 7 (2014) › Diouf
- 273 19. Nielsen M, Hoogvorst A, Konradsen F, Mudasser M, Hoek W van der. Childhood Diarrhea  
274 and Hygiene: Mothers' Perceptions and Practices in the Punjab Pakistan.  
275 International Water Management Institute. 2001. Available:  
276 [www.ircwash.org/sites/default/files/Nielsen-2001-Childhood.pdf](http://www.ircwash.org/sites/default/files/Nielsen-2001-Childhood.pdf)
- 277 20. Ansari M, Ibrahim MIM, Hassali MA, Shankar PR, Koirala A, Thapa NJ. Mothers beliefs  
278 and barriers about childhood diarrhea and its management in Moran district, Nepal.  
279 BioMed Central. 2012; 5:576. Accessed 24 Oct. 2012. Available: doi: [10.1186/1756-0500-5-](https://doi.org/10.1186/1756-0500-5-576)  
280 [576](https://doi.org/10.1186/1756-0500-5-576) PMCID: PMC3517331
- 281 21. Walker CLF, Perin J, Aryee MJ, Boschi-Pinto C, Black RE. Diarrhoea incidence in low-  
282 and middle-income countries in 1990 and 2010: A Systematic Review. Bio Med Central.  
283 2012;**12**:220. Accessed 21 March 2012. Available: [http://www.biomedcentral.com/1471-](http://www.biomedcentral.com/1471-2458/12/220)  
284 [2458/12/220](http://www.biomedcentral.com/1471-2458/12/220)
- 285 22. Mugeni C, Levine AC, Munyaneza RM, Mulindahabi E, Cockrell HC, Glavis-Bloom J et  
286 al. Nationwide implementation of integrated community case management of childhood  
287 illness in Rwanda. Global Health: Science and Practice. 2014; 2(3): 328-341. Accessed 5  
288 Aug. 2014. Available: doi: 10.9745/GHSP-D-14-00080. PMCID: PMC4168626
- 289 23. Mumtaz Y, Zafar M, Mumtaz Z. Knowledge Attitude and Practices of Mothers about  
290 Diarrhea in Children under 5 years. Journal of the Dow University of Health Sciences  
291 Karachi 2014; 8 (1): 3-6. Available: [www.duhs.edu.pk/download/jduhs](http://www.duhs.edu.pk/download/jduhs)vo...DowUniversity of  
292 Health Sciences
- 293 24. Ghasemi AA, Talebian A, Alavi NM, Mousavi GA. Knowledge of Mothers in Management  
294 of Diarrhea in Under-Five Children, in Kashan, Iran. Nursing and Midwifery Studies.  
295 2013; 1(3): 158-62. Accessed March 2013. Available:  
296 [nmsjournal.com/?page=article&article\\_id=10393](http://nmsjournal.com/?page=article&article_id=10393)
- 297 25. Hung BV. The most common causes of and risk factors for Diarrhea among children less than  
298 five years of age admitted to dong Anh Hospital, Hanoi, Northern Vietnam. 2006. Available:  
299 <https://www.duo.uio.no/handle/10852/30133>
- 300 26. Wilson SE, Ouédraogo CT, Prince L, Ouédraogo A, Hess, S .Y., Rouamba, N et al.  
301 (2012). Caregiver Recognition of Childhood Diarrhea, Care Seeking Behaviors and  
302 Home Treatment Practices in Rural Burkina Faso: A Cross-Sectional Survey. BioMed Central.  
303 2012; 7(3):13. Accessed 13 Mar. 2012. Available: doi: [10.1371/journal.pone.0033273](https://doi.org/10.1371/journal.pone.0033273)

- 304 27. Merten S, Schaetti C, Manianga C, Lapika B, Hutubessy R, Chaignat C et al. Socio  
305 cultural Determinants of Anticipated Vaccine Acceptance for Acute Watery  
306 Diarrhea in Early Childhood in Katanga Province, Democratic Republic of Congo. The  
307 American Journal of Tropical Medicine and Hygiene. 2013; 89(3): 419–425. Accessed 4 Sep  
308 2013. Available: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3771276/>
- 309 28. Zwane AP, Kremer M. What Works in Fighting Diarrheal Diseases in Developing  
310 Countries? A Critical Review. 2009; Pg 1-47. Harvard University Brookings Institution and  
311 NBER. Available: <http://www.hks.harvard.edu/centers/cid/publications/faculty-working-papers>
- 312 29. Michael Kremer, Amrita Ahuja and Alix Peterson-Zwane. Providing Safe Water: Evidence  
313 from Randomized Evaluations. Harvard environmental Economics Program. Harvard  
314 Kennedy School. Accessed 7 April 2010. Available:  
315 [http://heep.hks.harvard.edu/files/heep/files/dp23\\_kremer-ahuja-petersonzwane.pdf](http://heep.hks.harvard.edu/files/heep/files/dp23_kremer-ahuja-petersonzwane.pdf)
- 316 30. Cheraghi Z, Okhovat B, Irani AD, Talaei M, Ahmadnezhad E, Gooya M M et al. 2013.  
317 Knowledge, Attitude, and Practice regarding Food, and Waterborne Outbreak after  
318 Massive Diarrhea Outbreak in Yazd Province, Iran, Summer. Internationally  
319 Scholarly Research Notices. 2014; 7 Pgs. Available:  
320 <http://dx.doi.org/10.1155/2014/403058s>
- 321 31. Liu, J. 2009. Maternal beliefs and behaviors in the prevention of Childhood diarrheain Dar  
322 Es Salaam, Tanzania 1-104. Available:  
323 [https://studentaffairs.stanford.edu/sites/default/files/haas/files/Jessie%2520Liu%2520The](https://studentaffairs.stanford.edu/sites/default/files/haas/files/Jessie%2520Liu%2520The%2520sis.pdf)  
324 [sis.pdf](https://studentaffairs.stanford.edu/sites/default/files/haas/files/Jessie%2520Liu%2520The%2520sis.pdf)