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RISK FACTORS FOR ACUTE WATERY DIARRHEA AMONG THE UNDER FIVE IN BENTIU PROTECTION OF CIVILIAN'S SITE, UNITY STATE, SOUTH SUDAN.

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ABSTRACT

According to current global estimates, 1.7 billion cases of childhood diarrheal diseases occur every year. In Africa, it is estimated that every child, on average, has five episodes of acute watery diarrhea per year and that 800,000 children die each year from the disease. In South Sudan, acute watery diarrhea is the number one cause of death among the under-five age bracket, accounting for 42.9% of the annual mortality rate. The objectives of this research are to determine the socio-demographic factors which influence the occurrence of acute watery diarrhea in Bentiu internally displaced camp, the level of awareness of acute watery diarrhea, and to investigate environmental factors that influence the occurrence of acute water diarrhea. A descriptive cross-sectional study design was applied for this study using a mixed method of quantitative and qualitative data collection approaches. A cluster random sampling procedure was used to select the research participants. A total of 439 respondents participated in the study. The results of the study showed that the education level of the caretakers of the under-five children significantly influences the occurrence of watery diarrhea among the under-five (p-Value = 0.007). Additionally, the sex of the child significantly influences the occurrence of diarrhea among the under-five (p-value = 0.007). Vaccinating children with the Rotavirus vaccine has a significant relationship with the occurrence of diarrhea among under-fives (p-value = 0.000). Water treatment methods also



significantly influence the occurrence of diarrhea among under-fives (P value = 0.000). The status and condition of water containers and cups also significantly influence the occurrence of diarrhea among under-fives (p-value = 0.000). The availability of toilet facilities also significantly influences the occurrence of diarrhea among under-fives (p-value = 0.000). Other factors associated with the occurrence of diarrhea among under-five children include personal hygiene of caretakers (0.000), washing hands before feeding (0.000), and exclusive breastfeeding (0.001). Based on these findings, the United Nations and its agencies need to improve sanitation in POCs through the provision of safe and hygienic toilet facilities. The UN and its agencies need to provide effective water treatment methods. International and national organizations providing WASH activities in POCs need to sensitize communities on hygiene and sanitation. The national Ministry of Health, with the state Ministry, needs to provide immunization services, especially Rotavirus antigens, to boost the immune systems of under-fives against diarrheal diseases in Bentiu Protection of Civilian Site. There is a serious need for more studies regarding acute watery diarrhea and the relation of acute watery diarrhea with acute malnutrition.

Keywords: Risk Factors, Acute Watery Diarrhea, Civilian's Site, South Sudan.

BACKGROUND OF THE STUDY

Globally, most deaths of those under five years are due to conditions that are preventable or manageable with access to simple and affordable interventions. Diarrhea is one of the top five causes of mortality and morbidity in the world. Globally it's the second leading cause of mortality in children under the age of five and each year, it accounts for 1 in 9 child deaths worldwide which accounts for 8% of all deaths among children under-five (Mokomane, 2018). In Africa region, it has been estimated that every child has five episodes of acute watery diarrhea per year and that 800,000 children die each year from acute watery diarrhea and dehydration (WHO, 2015). In South Sudan, the under-five prevalence of acute watery diarrhea is 42.9% compared to Kenya where it is 17.0% (UNICEF, 2018). Locally in Unity state protection of the civilian site, the prevalence of acute watery diarrhea in under-five accounts for 43% which is the highest among other protection of civilian sites (WHO, 2016). South Sudan's government had introduced the integrated management of childhood illness (IMCI) by the year 2007 as the basic package of health and nutrition services, so far only four from ten states are currently managing this initiative to some level but not to the satisfaction. With small support from UNICEF, WHO and the ministry of health, training of health workers has been provided but it only reached some counties (UNICEF, 2016). Bentiu protection of civilians site is densely populated, United Nations Mission in South Sudan (UNMISS) camp was created immediately in 2014 after the onset of the ongoing crisis in South Sudan. It is the largest camp in the whole of South Sudan with an estimated population of about 103,424 dominated by the Nuer, the second-largest tribe in the country (IOM, 2017). The ongoing crisis in South Sudan has forced most people in Unity state to seek protection and safety as there were random and targeted killings of civilians, torturing, raping, and forced recruitments into the military. All these forced the residents to leave their homes and settle in the overcrowded camp in search of protection in addition to free basic services including food, water and shelter as the insecurity created by the conflict rendered economic activities impossible.

There are many International and National organizations providing much needed services to the IDPs in Bentiu POC which include, United Nation Children Funds, World Health Organization (WHO), United Nation Population Funds, World Food Program, and United Nation Development Program. Included too are International and National nongovernmental organization such as Medicines Sans Frontiers, Danish Refugees Council, Mercy corps, Universal



Intervention and Development Organization, NILE HOPE, International Organization of Immigration, World Relief, International Rescue Committee, and the International Committee of the Red Cross and so many more. Among other services provided by the partners to the population of the POC are; Health and Nutrition services, WASH services, Protection Services, Education services, Food services, none food item services, and peace building services (IOM, 2018). The camp has 5 primary health care centers own by IOM, World Relief, and IRC respectively, and one hospital which is managed by Medicines Sans Frontiers (MSF) Holland. Despite the great efforts inserted by health partners in the Camp, there is high prevalence of acute watery diarrhea and other communicable diseases like malaria and respiratory tract infections. A number of socio- demographic factors such as caregiver occupation, maternal education sex of the child, age of the child, overcrowding as well as mother age at birth have been attributed in the previous studies to the causes of diarrhea. This is mostly in sub-Sahara Africa because of low income generating activities (WHO 2015). Concerning environmental factors, stool disposal practices in the household, main floor and roof materials of the household unit are risk factors for diarrheal disease (UNICEF, 2016). Interventions should be made in improving Maternal Child Health to reduce the burden of diarrhea and diarrhea-related mortalities in children under five. Targeted approach should be initiated to mitigate the problem of the poor health status of children by providing adequate health care among socio-economically disadvantaged women and children (UNICEF, 2015). The policy-makers and stakeholders should address adverse environmental conditions by the provision of latrine and improved housing facilities. In Knowledge and awareness regarding acute watery diarrhea, most of the studies show a lack of caregivers' awareness of practices related to personal and food hygiene for diarrhea prevention are significant risk factors for acute watery diarrhea globally. This includes knowledge of proper disposal of feces to prevent diarrhea (WHO, 2015).

STATEMENT OF THE PROBLEM

Acute watery diarrhea is a persisting of three or more watery stools with in the day. It signifies the presence of intestinal tract infection which always arrive due to the variety of so many microorganisms and basically, it's mostly targeting under-five because of the lower immunity and poor hygiene. It is the number 2 cause of death in under-five worldwide and every year acute watery diarrhea account for 1 in 9 child deaths worldwide which account for 8% of all deaths among under-five (Mokomane, 2018). This translates to over 2,195 under five dying each day globally despite the availability of simple effective treatment. Throughout the world, there are about 1.7 billion cases of childhood diarrheal diseases yearly. An in sub-Sahara Africa, it has been estimated that every child has five episodes of acute watery diarrhea per year and that 800,000 children die each year from acute watery diarrhea and dehydration (WHO, 2015). In South Sudan, diarrheal disease is the number one cause of death with prevalence of 42.9% of under-five while in the study side the prevalence is 43% (UNICE, 2018). Bentiu protection of civilians' site is mostly populated by children and women and each household comprised about 10 to 15 family members which majority of whom are children below the age of 10 years. Most of the people fetches water for domestic consumption from common pipes managed by IOM and Mercy Corps and they use jerry cans and buckets provided to them by Concern worldwide and UNICEF (WHO, 2019). Majority of the Camp residents are uneducated, having lost their possessions during the conflicts, they entirely depend on the services provided by National and International non-governmental Agencies. Because of the overcrowding as a result of the high population, the hygiene state of the camp is very poor as the wash and sanitation facilities are overstretched, this has negatively contributed to the high prevalence of acute watery diarrhea in Bentiu protection of civilians' site (IOM, 2017).



OBJECTIVES OF THE STUDY

1. To determine the socio-demographic factors of the caregivers associated with the occurrence of acute watery diarrhea among the under-five in Bentiu protection of civilians' site.
2. To assess the level of awareness in regard to acute watery diarrhea among the under-five caregivers living in Bentiu protection of civilian site.
3. To investigate the environmental factors that influence the occurrence of acute watery diarrhea among the under-five caregivers living in Bentiu protection of civilian site.

Theoretical FRAMEWORK

Health belief model is used to give guidance to disease prevention and health promotion programs. It entails and predicts individual changes in health behavior. The model was developed in 1950 by Social Psychologist Hochbaum Rosenstock and others. Accordingly, health planning for diarrhea is the sole function and attributes of both epidemiology patterns and community beliefs of Health, illness and needs. The model is a framework that relates patterns of distress explanatory models, health seeking and treatment practices to seek and put in use the oral rehydration therapy (ORT), Nutrition management, other ways of treatment and health policy issues which explain to us and give us the understanding for the review of research on diarrheal disease related beliefs and practices. There is a serious need to appreciate the local cultural models and the diversity of cultural understanding which enable health professionals and communities to identify and address mutually comprehensible objectives that are perceived locally as very important and useful. It also gives us the basis to identify the function of local understanding of diarrheal diseases in regards to its major outcomes and receptive needs. This will practically be useful in Bentiu POC where the culture and beliefs are strong pillars and must be respected without any question, (Kirsch, J.P 1978).

EMPIRICAL LITERATURE REVIEW

Kamran Sadiq, et al, (2022), conducted a study in Pakistan. This study evaluated the factors associated with diarrhea in children under the age of 5 in a rural district of Pakistan. They established that breastfeeding was associated with a lower likelihood of diarrhea in children under the age of 5. Breastfeeding is evidently one of the most cost-effective interventions to lesser childhood morbidity and mortality. Evidence indicates that approximately half of all diarrhea episodes and 72% of hospital admissions due to diarrhea can be prevented by breastfeeding. A meta-analysis evaluating the impact of breastfeeding on diarrhea-related morbidity and mortality showed that breastfed children ages 6–23 months had less than half the risk of dying due to diarrhea than children who don't breastfeed.

Bui Viet, (2006) conducted the study in Vietnam. In his study, he widely recognized that diarrhea is a major cause of morbidity and mortality among children under the age of five, especially children in developing countries like Vietnam. Vietnam is a low-income country, where diarrhea is the second leading cause of deaths among children less than five years of age. Low socio-economic status, limited education, poor environmental sanitation, and low hygienic practices



pose a serious threat to people's health, especially children's health. Risk factors for diarrhea vary with the child's age, the pathogens involved, and the local environment. This is in addition to few studies that have been conducted so far in rural areas in Vietnam.

Hanaa H, (2017), in his study conducted in Northern Nigeria found out that the age of the mother was positively associated with child diarrhea in the northwest and north central regions. The older the mother the lesser was the probability of the under-five child to have diarrhea. Level of mother education and religion was also positively associated with the occurrence of diarrhea among children under five years of age where the higher the education of the mother the less was the odds of the child to experience diarrhea episodes. Moreover, in comparison to other religions, diarrhea was highest among children to Muslim mothers compared to Christian mothers. The source of drinking water also showed a significant association with under 5 diarrheas in the northeastern region only. Under five children residing in households using unprotected sources for drinking water had a higher likelihood to have diarrhea compared to those using protected sources according to his study. The presence of diarrhea was higher among households with natural floor as a main floor material, followed by finished floor and the least was among households with wood and palm/bamboo planks as main floor material. Diarrhea was higher among children who did not get a full DPT vaccination whereas it was lower among those who were fully vaccinated. Polio3 vaccination showed a significant association with diarrhea in all three northern regions. Diarrhea was higher among children who were fully vaccinated and lower among those who did not get the full vaccination. The mother working status was positively associated with diarrhea in the northeastern region only where diarrhea was higher among children of working mothers.

In the study conducted by Gorard et al. (2015) established that chronic diarrhea and constipation were precipitated by depression in individuals with depression than in individuals with no depression. Within the psychological factors predicting disordered bowel habits, moderate and severe depression, and resilience were independent predictors for chronic diarrhea, but not anxiety. Additionally, only mild depression was the independent predictor of chronic constipation. In the future, a large cohort study will be needed to identify the causation and temporal relationships between psychological factors and bowel habits.

The Government of India (2015), conducted a study for a various socio-demographics such as rural-urban residence, caste, religion, region, child's age and sex are associated with the risk of diarrhea among under-five children in India. Diarrhea is very common among rural, scheduled caste, Muslim, and poor families' children. About environmental factors, practices like stool disposal in the household, main floor cleanliness and roof materials of the household unit are risk factors for diarrheal disease. So many Interventions should be made to improve Maternal Child Health to lessen the negative impact of diarrhea and diarrhea-related mortalities in children under five. Specific methods should be put in place to mitigate the problem of the poor health status of children by offering adequate health care among socio-economically disadvantaged and vulnerable groups. The government and other stakeholders should improve the adverse environmental conditions by providing pit latrine and doing something on the housing facilities for these vulnerable groups.

CONCEPTUAL FRAMEWORK

INDEPENDENT VARIABLES

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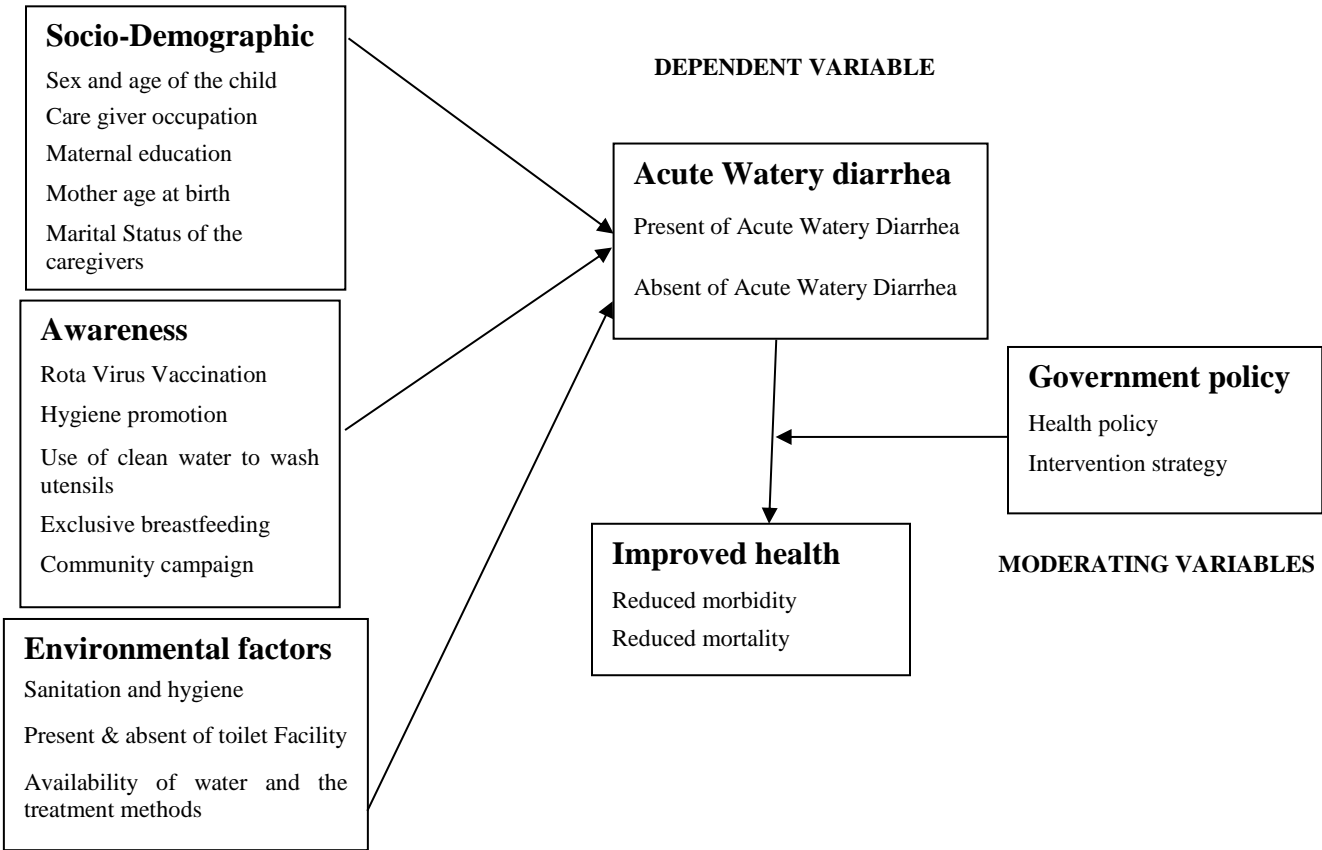


Figure 1: Conceptual Framework

RESEARCH METHODOLOGY

A cross-sectional study design was applied for this study using a mixed method of quantitative and qualitative data collection approaches. A cluster random sampling procedure was used to select the research participants. A total of 439 respondents participated in the study. This study took place in Unity state, Bentiu protection of civilian site which is under the control of UN soldiers. The Bentiu protection of the civilian site is the biggest internally displaced persons camp in South Sudan and that is why I chose it because of its high-density population. It is a low land area with two seasons which are rainy and dry season. It borders Sudan to the north at a place called Heglij which is 96 kms from Bentiu town. The diameter of the camp is in square of 1.5kms and an area of 2.25 square kilometers. The estimated population of Unity State before the crisis was 585,801 while the estimated population in the camp is 103,424 with 35% of this population estimated to be under-five (IOM, 2017).

RESEARCH FINDINGS AND DISCUSSIONS



This chapter precisely discussed and summarize the research presentation, interpretation and discussion of the results and findings. All the discussions are guided by the research objectives as below.

Demographic factors for caretaker

Table 1: Demographic factors for caretaker n=439

Demographic	Category	Frequency	Percent
Sector	1	62	14.1
	2	92	21
	3	101	23
	4	83	18.9
	5	101	23
Category	Father	10	2.3
	Mother	387	88.2
	grand mother	20	4.6
	Other	22	5
Gender	Male	10	2.3
	Female	429	97.7
Marital status	Single	48	10.9
	Married	360	82
	Widowed	19	4.3
	Cohabiting	12	2.7
Education level	Primary	102	23.2
	Secondary	53	12.1
	College	34	7.7
	not educated	250	56.9
Occupation	Student	98	22.3
	house wife	322	73.3
	Employed	3	0.7
	business personnel	12	2.7
	Unemployed	4	0.9

Table 2: other demographic information

Category	Minimum	Maximum	Mean	Std. Deviation
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Age of respondent	13	70	30.99	10.144
Household size	4	25	9.38	4.107
Number of U5	1	9	2.39	1.286
Age of child	1	5	2.73	1.412

Table 3: Age distribution among the under-five children participating in the study

Age category	Frequency	Percent
1	100	22.8
2	135	30.8
3	69	15.7
4	68	15.5
5	67	15.3
Total	439	100

Logistic regression analysis

Table 4: Regression analysis - Omnibus Tests of Model Coefficients

Omnibus Tests of Model Coefficients				
		Chi-square	Df	Sig.
Step 1	Step	8.624	2	.007
	Block	8.624	2	.007
	Model	8.624	2	.007

The overall test of the model is shown in the “Omnibus Tests of Model Coefficients” table above. As shown in the table the overall model is statistically significant, χ^2 at df 2 = 8.624, and p = 0.007 which is <0.05

Table 5: Regression analysis - Model Summary

Model Summary



Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	68.870 ^a	0.485	0.613

a. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

The table above contains the Cox & Snell R Square and Nagelkerke R Square values, which are both methods of calculating the explained variation. These values are also referred to as pseudo R² value. Therefore, the explained variation in the dependent variable (Watery diarrhea) based on our model ranges from 48.5% to 61.3%, according to Cox & Snell R² or Nagelkerke R² methods, respectively. In this study, results have pointed out that 64.2% of the participants confirmed that their children had suffered from diarrhea in the past 2 weeks. This is a clear indication that diarrhea is one of the most causes of morbidity among the under-five in the POC and its prevalence is higher (64.2%). The majority of the caretakers who participated in the study were mothers (88.2%) who were married (82%) as housewives (73.3%) and had no formal education (56.9%). We can say these mothers were housewives and jobless since they have no formal education. They solemnly rely on their spouses or had limited access to employment opportunities. Because of the lack of education which limited them to lack resources, they entirely depend on the food ration offered by United Nations. They cannot afford to offer balance diets to their children under five and this predisposed them to acute watery diarrhea. These findings were consistent with the study conducted in Ethiopia by A Getachew (2018), who carried out the prevalence of diarrhea and sociodemographic factors among under-five children in rural areas of the North Gondar Zone in which maternal lack of education, overcrowding, and maternal age at birth predisposed the child to acute watery diarrhea (Getachew, 2018).

Among all the five focus group discussions conducted in the five sectors of the protection of civilian's sites, the majority of the respondents stressed the issue of overcrowding as the serious cause of acute watery diarrhea in the protection of civilian sites. One of the participants gives an example of her family which is 16 members residing in small tukul. The majority of the respondents also talked about lack of education which is preceded by unemployment and eventually leads to low income which affects the growth and immunity of children under the age of five. Other social concerns that were raised by the respondents include; underage marriages as many young girls are forced to get married below the age of 18 years and they could not take care of their children properly. Many children under the age of five lost their parents during the war in South Sudan which left so many of them under the care of their grandparents who can hardly provide for them. The issue of polygamy was also raised by a few participants as the social factors which support the occurrence of acute watery diarrhea in sense that one man may have about 10 wives and few concubines which he may not supported financially. This will increase the poverty line which mostly affect under five children, even if the child is sick, the father will not afford the medications and good health services, (UNICEF, 2017).

These findings are in line with the study conducted by Gebru (2017) who found that Most of the acute watery diarrheal diseases can be prevented by implementing proper water sanitation and hygiene programs which all aim at preventing fecal oral route transmission. (Gebru, 2017). In correlation analysis between demographic factors of the caretakers and occurrence of watery diarrhea among under five. The association was tested at alpha 0.05 level of significance with 95% level of confidence. As indicated, sex of the child is associated with occurrence of watery diarrhea (p value 0.007) and



the likelihood ratio is 7.4 that diarrhea occurred among the males (boys). This is so because male boy gender plays a lot compare to female gender. These findings were consistent with the Dhaka study conducted by Adam C in 2018 who found out that male child suffered acute watery diarrhea than female child (Adam c ,2018). Age of the under-five is also associated with occurrence of watery diarrhea (P-value 0.014) and the likelihood ratio is 12.3 that diarrhea occurred among the under-five who were aged between 1-2 years. Marital status of the caretakers had no influence on the occurrence of watery diarrhea since the p-value 0.138 is greater than 0.05. Occupation of the mothers is also associated with occurrence of watery diarrhea among the under-fives (p-value 0.005) and the likelihood ratio is 19.7 that diarrhea occurred among the under-five children whose mothers were unemployed. Education level of the caretakers (p-value 0.007) also influences the occurrence of diarrhea among the under-fives and the likelihood ratio is 12.5 that diarrhea occurred among the under-five children whose mother's education level was primary or not educated, (Gebru, 2017).

Attitude and awareness of the respondent towards prevention of diarrhea.

In this study, results have found that majority of the caretakers had high level of awareness (59.6%) and average (35.6%) level of awareness on causes and control of diarrhea. These findings are consistent with the study by Agegnehu 2019 in which 62.6% were aware about diarrhea and about 1/3 which is 34.4% of those who participated were able to know and affirmed diarrhea as the passage or loose stool more than one in a day (Agegnehu, 2019).

The mothers (caretakers) were able to give the sick child from diarrhea more fluids (44.3%) to drink which was a prerequisite for rehydration for children suffering from diarrhea. The attributed factors included, poor sanitation (77.3%), poor personal hygiene (92.2%), and poor water quality (89%), and contaminated food (94.3%) among others. Out of 282 of the mothers whose children had suffered from diarrhea in the past 2 weeks before the study, 169 (59.9%) took the child to health facility 75 (26.6%) treated the child with ORS, 22 (7.8%) gave the medicine from the drug store. This indicates high level of awareness. However, this study is inconsistency with the study conducted by Mohamed in Omdurman locality, Sudan in regard to awareness and attitude towards dehydration management amongst mothers and factors influence in under five children (Mohamed, 2020). The study is also in disagreement with the study conducted by WHO in Tanzania in 2017 in regard to the level of awareness of acute watery diarrhea, although majority of mothers know the signs of dehydration, the level of awareness of the causative agents and predisposing factors were very poor (WHO, 2017). Another study carried out (WHO, 2015) in Tanzania and Indonesia also came with the same similar results. Majority of the mothers could not mention all the steps and right preparation of ORS solution. This may be due to mothers' lack of experience on the solution and volume required, lack of proper education and knowledge on diarrhea and its management at home (WHO, 2015). Among the mothers of Musahar in Nepal, even though they know about the diarrhea and its home management, they have little knowledge for some vital issues such as danger sign of dehydration, the role of rehydration fluid during diarrhea and of course its exact preparation concerning its amount were very poor. (Mekonen, 2018). Out of 282 of the mothers whose children had suffered from diarrhea in the past 2 weeks before the study, 169 (59.9%) took the child to health facility 75 (26.6%) treated the child with ORS, 22 (7.8%) gave the medicine from the drug store. This indicates high level of awareness. The caretakers were able to give the sick child from diarrhea more fluids (44.3%) to drink which is a prerequisite for rehydration for children suffering from diarrhea. The attributed factors as cause of acute watery diarrhea included, poor sanitation (77.3%), poor personal hygiene (92.2%), poor water quality (89%), and contaminated food (94.3%) among others. The possible preventive measures for diarrhea include: Washing hands more frequently (98.6%), Cooking food thoroughly (99.6%), Cleaning dishes (97.2%) and covering prepared food (74.8%). This demonstrated high level of knowledge and awareness among the caretakers. As indicated, on figure 4



above, 97.7% of the caretakers of the under-five acknowledged that children's feces are potential hazard for diarrheal diseases. This indicates high level of awareness regarding causes of diarrhea, (Mekonen, 2018).

Environmental factors

In this study, the findings for the possible environmental factors that are attributed to watery diarrhea occurrence among the under-five are discussed below. As indicated, 52.6% of the participants had no means of treating water for drinking instead they just leave it stand and settle. 87.5% confirmed that they did not have toilets and use open defecation (bush). Meanwhile, for those who use toilets (12.5%) lamented that sanitary condition of their toilets was very dirty and this predisposes the children to diarrheal diseases. The reason why a majority of the participants did not have toilet facilities in POC is because there was no space (67.2%) to construct the toilets and it's very expensive to construct a toilet (28.7%). The under five were being assisted by the caretakers (71.8%) to collect feces and throw to the bush. In conclusion, there is poor sanitation in the POC, no access to safe water, toilet facilities that predisposes the people most especially the under-five to diarrheal diseases. The following environmental factors that are attributed to watery diarrhea occurrence among the under-five included, 87.5% confirmed that they did not have toilets and use open defecation (bush) and this predisposes their children to get watery diarrhea. Meanwhile, for those who use toilets (12.5%) lamented that sanitary condition of their toilets was very dirty and this predisposes the children to diarrheal diseases. These results are inconsistent with the study conducted by Guarino, 2018 to determine the prevalence of diarrheal disease and to evaluate the environmental factors of diarrheal disease prevalence within children below 5 years (Guarino, 2018).

According to the focus group discussion, majority of the respondents argued on the lack of wash facilities like toilets and pit latrines are the major cause of acute watery diarrhea. Before this camp was turn into internally displace camp, it was a protection of civilian's site under the care of United Nation Mission in South Sudan, there used to be pit latrines which were services by the UNMISS and its agencies. Since it was turned into IDP camp, those services were cut short. All those pit latrines were full and no agency to provide the hygiene and sanitation services and therefore they are no longer use. All the population in the protection of civilian's site resorted into open defecation and since then, there is high prevalence of acute watery diarrhea among the under-five residing in the POC. Drinking water are not treated like previously when this camp was under the control of United Nation. Previously, they use to provide treated drinking water to the population in civilian site but since the camp was turned into internally displace (IDP) camp and handed over to the government, those services they used to render to the civilians were stopped including the treatment of drinking water. This has forced the communities inside the POC to fetch the water from the stagnant sources and the rainy water. Those who have incomes are able to buy drinking water while those who have no incomes could not afford to buy the drinking water and had no option rather to fetch from the stagnant rainy water which already mixed with feces since the entire population resorted to open defecation. According to the respondents, this is one of the leading causes of acute watery diarrhea among the children under-five in Bentiu Protection of civilians' site. Lack of wastes disposal in the camp; majority of the respondents argued out that there is no organized wastes disposal in the camp. They just throw the wastes at the close proximity which attract so many flies and lead to the outbreak of acute watery diarrhea. Open defecation; According to the vast majority of respondents, the entire population of the camp resorted to open defecations in the bushes. This could be due to the lack of wash facilities as well as cultural beliefs and practices which support the open defecations. Improper hygiene in the camp; due to the status of the camp with overcrowding, the hygiene status of the camp was so poor and this can easily lead to high prevalence of acute watery diarrhea as per the respondents during the



focus group discussions (UNICEF, 2017).

In correlation analysis between environmental factors and occurrence of diarrhea among under-five. The association was tested at alpha 0.05 level of significance with 95% level of confidence. As indicated, source of water does not significantly influence the occurrence of watery diarrhea among the under-fives. (p value 0.086). Water treatment method (p value 0.000), greatly influences occurrence of water diarrhea among the under-fives and likelihood ratio is 42.9 that caretaker who do not treat water, diarrheal will occur among their children who are under-five. Condition and sanitation status of the cup used to fetch water significantly influences the occurrence of watery diarrhea among the under-fives with p-value of 0.000. The likelihood ratio is 18.3 for diarrhea to occur among the under-fives for the mothers whose cups for fetching drinking water are dirty. Availability of toilet facility is also associated with occurrence of watery diarrhea with p-value 0.000. The likelihood ratio is 20.8 that diarrhea will occur among under-five children whose mothers have no toilet facility at home, (By Researcher, 2021). Logistic regression was performed to estimate the probability of occurrence of watery diarrhea that is significantly affected by the independent variables. If the estimated probability of watery diarrhea occurring is greater than or equal to 0.5, it is classified as occurring. If the probability is less than 0.5, it is classified as not occurring. A binomial logistic regression was used to predict whether cases can be correctly classified (predicted) from the independent variables. Therefore, it was necessary to have a method to assess the effectiveness of the predicted classification against the actual classification.

CONCLUSION

The study found that the education level of caretakers of under-fives significantly influences the occurrence of acute watery diarrhea among under-fives (p-Value = 0.002). Children of caretakers with primary education levels or no education have 3.1 times higher chances of getting diarrhea than other caretakers with other education levels. The study also found that the sex of the child significantly influences the occurrence of diarrhea among under-fives (p-value = 0.006). Male children have 2.8 times higher chances of getting diarrhea than female children. Furthermore, the study found that vaccination of a child with the Rotavirus vaccine has a significant relationship with the occurrence of diarrhea among under-fives (p-value = 0.000). Children who are not vaccinated with Rotavirus have 36.6 times higher chances of getting diarrhea than those who are vaccinated. Additionally, the study found that water treatment methods significantly influence the occurrence of diarrhea among under-fives (P value = 0.002). Caretakers who leave the water to stand and settle down as a method of water treatment have 3.1 times higher chances of their children getting watery diarrhea than those who use other water treatment methods like boiling, and chlorination. The study also found that the status and condition of water containers significantly influence the occurrence of diarrhea among under-fives (p-value = 0.003). Children of caretakers with dirty water containers are three times more likely to get diarrhea than those with clean water containers. The study also found that the availability of a handwashing facility significantly influences the occurrence of diarrhea among under-fives (p-value = 0.000). Children of caretakers without a handwashing facility are 9.3 times more likely to get diarrhea than those with a handwashing facility. Finally, the study found that the availability of toilet facilities also significantly influences the occurrence of diarrhea among under-fives (p-value = 0.002). Children of caretakers without toilet facilities are 3.1 times more likely to get diarrhea than those with toilet facilities.



RECOMMENDATIONS

The United Nations and its agencies need to improve sanitation in the POC through the provision of safe and hygienic toilet facilities. The United Nations and its agencies need to provide effective water treatment methods. International and national organizations providing WASH activities in POC need to sensitize the community on hygiene and sanitation. The national ministry of health with the state ministry needs to provide immunization services, especially Rotavirus antigens, to boost the immune systems of the under-five against diarrheal diseases. There is a serious need for more studies regarding acute watery diarrhea and the relation of acute watery diarrhea with acute malnutrition.

AUTHOR CONTRIBUTIONS

Acute watery diarrhea is among the top five killer diseases among children under the age of five. The author findings and recommendations are useful and added to the literature of acute watery diarrhea. The recommendations and findings can be adopted by health workers in Bentiu Protection of Civilian site as well as UN agencies and state ministry of health offering support to the vulnerable community in protection of civilian site.

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CONFLICT OF INTEREST

The author declared that there is no conflict of interest in publishing this research. Ethical issues, Plagiarism and consents were strictly observed.

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