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Acute Watery Diarrhea/Cholera outbreak Investigation in Wenbera District, Metekel Zone, Benishangul Gumuz Region, Western Ethiopia September 1-October20/2016

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Abstract: Background: Acute watery diarrhea is a diarrheal disease caused by infection of the intestine. It affects an estimated 3–5 million people worldwide and caused 58,000–130,000 deaths of a year. The aim of this work is to investigate causes and risk factors associated with acute watery diarrhea outbreak in Wombera district, western Ethiopia, from September to October 2016. **Methods**: Case-control study was used. The sample determine by Epi info, which is controls exposed 34.1%, and cases with exposure is 62.9%. The total samples 123 (41case and 82 controls) with 95% CI, 80% power with 3.3 odds ratio. **Case** was any person ≥5 years of age with acute watery diarrhea with and without vomiting. **Control** was any person ≥5 years of age without acute watery diarrhea and vomiting at the time of the study similar with the place where case raised. We collected the data using semi structured questionnaires then checked, entered and analyzed by using Epi Info 7.1.5 and SPSS version20 software. Participant's consents and confidentiality of information was kept. **Results:** The totals of 123 respondents were interviewed. The response rate is 100%. On multivariate analysis: Those who did not having hand washing practice at critical time [AOR=9.2, (95% CI, 2.278–25.824], those who use River water sources [AOR=4.8, (95%CI,1.873-12.434)], those who consume of raw fruits and vegetables a week before illness [AOR=4.5, (95%CI,1.439-12.54)], not utilized latrine [AOR=4.08, (95%CI,1.442-8.861)], not having traditional pit latrine [AOR=3.57(95%CI, 1.44-8.861)], were significantly associated with the occurrences of Acute Watery Diarrhea in the community. **Conclusion**: those who did not have hand washing practices during critical time, using River water sources for drinking, consumption of raw fruits and vegetables a week before illness, not latrine utilized and not having traditional pit latrine were the possible risk factors of this outbreak. Providing Community health awareness and hygiene, provision of safe water and basic sanitation would be an important intervention. [Corresponding Author: Fikadu Ayalew & Getachew Abebe: Acute Watery Diarrhea/Cholera outbreak Investigation in Wenbera District, Metekel Zone, Benishangul Gumuz Region, Western Ethiopia September 1-October20/2016].
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Keywords: AWD/cholera, Ethiopia, Outbreak, Wombera Woreda.

1. Introduction

Acute watery diarrhea/Cholera is a diarrheal disease caused by infection of the intestine with the gram-negative bacteria, Vibrio cholerae. It characterized by the sudden onset of profuse painless watery diarrhea or rice- like watery diarrhea. It is caused by an enterotoxin of small intestine that leads fluid loss and diarrhea, often accompanied by vomiting(2).

The disease manifests through nausea and profuse diarrhea in the early course of illness, if not treated as early as, it can lead to rapid dehydration, acidosis, circulatory collapse, hypoglycemia in children, and renal failure. In most cases, infection is asymptomatic or causes mild diarrhea, especially with organisms of the El Tor biotype01 Vibrio cholera, but the asymptomatic carriers can transmit the infection. In severely dehydrated cases, death may occur within a few hours and the case-fatality rate may exceed 50%. If there were proper and timely rehydration, the death rate can be less than 1%(2, 3) Fever is rare and should raise suspicion for secondary infection or co morbidity. (4).

The cholera bacterium is usually found in water and food sources that have been contaminated by feces (poop) from a person infected with cholera. transmission is usually fecal-oral route(5). It affects only human, has no vectors and animal hosts. It can multiply outside the human body and survive for surprisingly long periods in water sources like shallow well, and water storage tanks. Most likely found and spread in places with inadequate water treatment, poor sanitation, inadequate hygiene, and also live in the environment in brackish rivers and coastal waters,

Shellfish eaten raw have been a source of cholera(5, 6). in this condition, Now outbreaks can occur sporadically in any part of the world (7).

The greatest risk occurs in over-populated communities and refugee settings which increased person-to person transmission, because it is highly contagious. The incubation period is very short (2 hours to 5 days), the number of cases can rise extremely quickly(2, 8).

The capacity of causing symptomatic cholera cases depend on the dose of ingested bacterium, about more than 100 million bacteria must typically be ingested to cause cholera in a normal healthy adult(2, 9). Children are also more susceptible, with two- to four-year-olds having the highest rates of infection. Persons with lowered immunity, such as persons with AIDS or children who are malnourished, are more likely to experience a severe case (2, 9). Individuals' susceptibility to cholera is also affected by their blood type, with those rather than with type O blood group (2, 9). Cholera affects an estimated 3–5 million people worldwide and causes 58,000–130,000 deaths, Children are mostly affected a year as of 2010 (10). Which leads loss of economic (millions of US$) and decreasing life expectancies (11, 12)

Historical descriptions of cholera are found as early as the 5th century BC in Sanskrit. The study of cholera by John Snow between 1849 and 1854 led to significant advances in the field of epidemiology(10, 13), During the 19th century cholera spreads across the world from its original reservoir in the Ganges delta in India. It is the current one of the seven pandemics killer, in the world, starts in south Asia in 1961, and reached Africa in 1971 and American in 1991. Now it is endemic in many countries (2,10, 14)

In Ethiopia there was wide speared acute watery diarrhea (AWD) epidemic in 1990 which persisted with recrudescence of cases till now(15). By 2016 AWD affects all regions of Ethiopia including Addis Ababa. Benishangul Gumuz National Regional State is one of the nine regional states of Ethiopia, which is first onset in July 2016 in Sadal woreda to the end of September a total of 414 AWD cases and 25 deaths were reported from 23 kebeles in 8 woredas in Benishangul Gumuz National Regional state, which were the case confirmed by bacteriological isolation of infectious agents of Vibrio cholera 01 and by RDT (0139) serotype in Wombera woreda(1, 16).

The control of the disease requires a combination of interventions that range from quality and quantity of water supply and sanitation improvements at the community level to the use of currently available rehydration and antibiotic treatment at the individual level. The primary treatment is oral rehydration therapy the replacement of fluids with slightly sweet and salty solutions. Zinc supplementation is useful in children. In severe cases, intravenous fluids and antibiotics may be beneficial (2,6, 17).

1.1. General Objective

To investigate causes and risk factors associated with suspected AWD/cholera Outbreak in Wombera District October 2016.

1.2Specific Objectives

To verify the suspected AWD/Cholera outbreak in Wombera district.

To describe AWD/Cholera outbreak magnitude by time, place, person .

To identify associated risk factors for the occurrence of the outbreak.

To give doable recommendation based on the finding.

2. Methods and materials

2.1. Study area and population

Wombera woreda is one of seven woredas in the Metekel zone, Benishangul Gumuz regions state. It located at 661 Kms far from Addis Ababa at western direction and 523km from regional capital city of Asossa. Total area of the woreda is 7,174.22 square km. Total of 33 kebele, of which are 31 rural and 2 urban kebeles and has health services coverage of Health (HP) 26(79%) and Health center (HC) 3 (100%) with Total health coverage of 85%, safe water coverage 48.5% and unimproved latrine 81% in the Wombera woreda.

Projections from the 2007 population and housing census document reviewing, estimated total population for the year 2009 E.C (2016) in the Wenbera woreda to be 81535 populations. Of these, 41420(50.8%) were males and 40115(49.2%) were female. The main incomes of Wenbera woreda population are agriculture, cattle raised and traditional gold panning/ digging, as well as small trading (Figure1).

2.1 Study Design

Community based Unmatched case-control study was used. Both descriptive and analytic studies were carried out to describe the magnitude and risk factors of AWD infection.

2.2 Study Period

The data was analyzed from line listed reported cases since September 01/ 2009 E.C. until the last line listed case reported on October 20/2009 E.C.

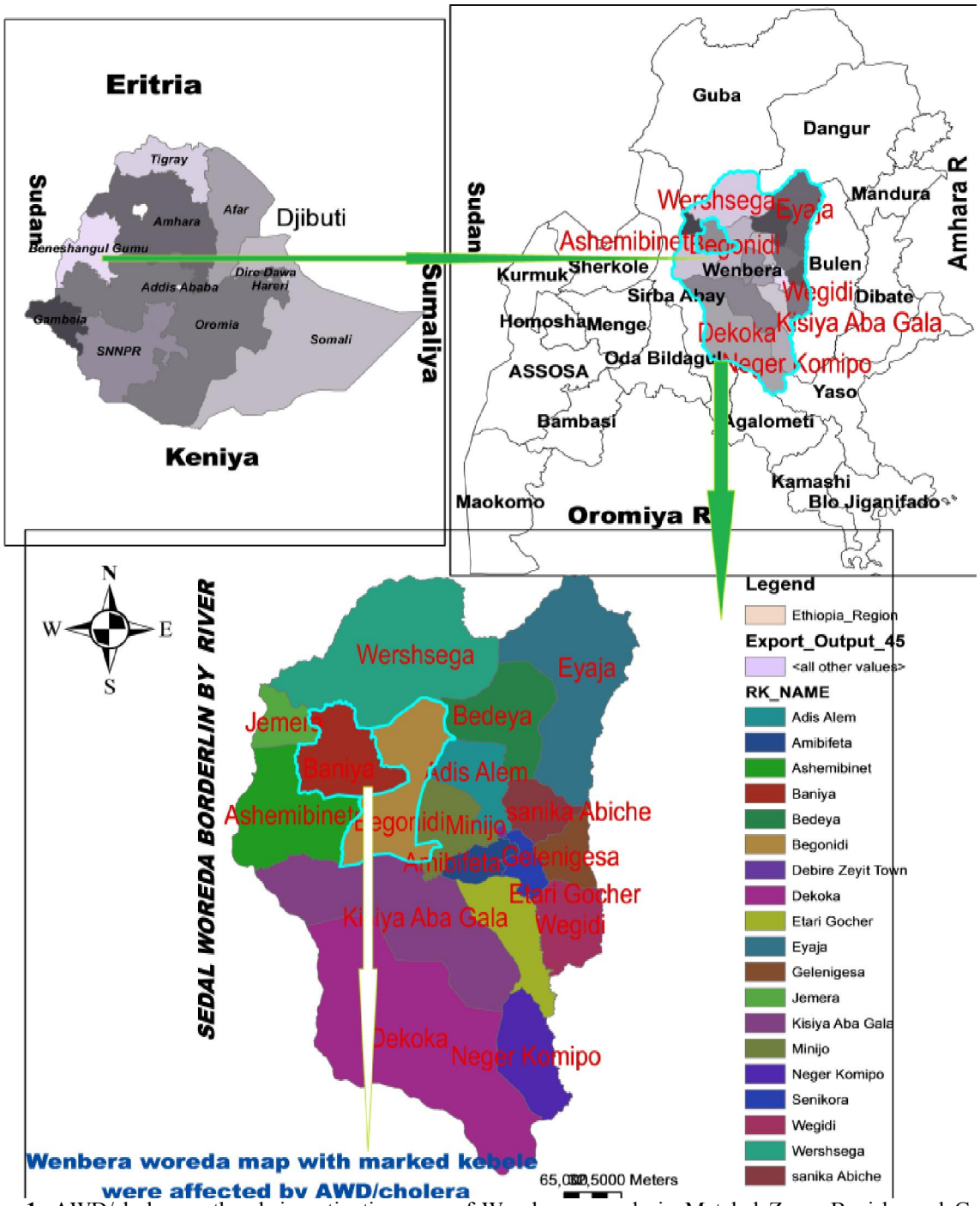


Figure 1: AWD/cholera outbreak investigation area of Wombera woreda in Metekel Zone, Benishangul Gumuz region/Ethiopia 2016.

2.3 Sample Size Determination

The sample size was determined by using single population proportions. calculate by Open Epi version 7.1 statistical software package with considering the percent of controls exposed among the controls is 34.1% (main exposure variable), Percent of cases with exposure is 62.9%(18). 95% CI, 80% power of the study and control to case ratio of 1:2 ratio. Total sample size 123 of these 41 cases and 82 controls were including in this study.

2.2. Sample selecting criteria and procedures

Case definition: Any person greater than 5 years of age with history of onset acute watery diarrhea and/ or vomiting sign and symptom observed from September 1-octob 20/ 2009 E.C. in muze and begundi kebele of Wombera woreda.

Control definition: Any person greater than 5 years of age in these kebele without sign and symptom of suspected cholera at the time of the study similar with place where cases were raised. Purposive sampling was selected in Wombera woreda two kebeles since the suspected cholera case would be raised there. Cholera cases were selected for the investigation by clinical and epidemiological case definition criteria which were illegible for the case, and non-cases (controls) were selected if there was no sign and symptoms of case in that area case raised. In addition, respondents had to be willing and well enough to have an interview of a length of 15 minutes to participate in this interviewed.

2.3. Data collection procedure

A line listing of suspected cases was done by investigation team from woreda health office to describe the outbreak by place, person and time. Case control study was used to assess associated risk factors for the outbreak. Surveillance reports and records were reviewed. Structured questionnaire was used to interview cases and controls. In addition to this we conducted sanitary survey of water schemes.

2.4. Data analysis

Data from questionnaires were entered and analyzed into a computerized data base using SPSS version 20 and Micro Soft Excel 2007. During the analyses odds ratio (OR) with 95% confidence interval (CI) and p-value were used to assess risk factors.

2.5. Data quality assurance

The collected data was checked daily during the investigation period. The completeness of the questionnaire was also checked before data entry.

2.6. Laboratory investigation

By using Immuno chromatographic rapid visual antigen test (vc RDT) and Cary Blair media (CBM) for transportation and culture isolation from stool to detect Vibrio cholera was done to confirm for suspected cholera cases.

2.7. Environmental investigation

We conducted water sanitary survey/ assessment for water schemes was done in collaboration with Metekel zone water, mineral and energy resource department bureau.

2.8. Cholera Epidemiological Case Definition

Suspected case definition of cholera

In an area where the disease is not known to be present; a patient aged 5 years or more develops severe dehydration or dies from acute watery diarrhea;

And In an area where there is a cholera epidemic; a patient aged 5 years or more develops acute watery diarrhea, with or without vomiting.

Community case definition of cholera

Any person 5 years of age or more with profuse acute watery diarrhea and vomiting.

Confirmed case: A suspected case in which Vibrio cholerae O1 or O139 has been isolated from their stool.

Severe case of cholera: Severe dehydration with or without vomiting receiving treatment in cholera treatment center or hospitalization area.

Moderate case of cholera: No dehydration or mild dehydration and watery diarrhea with or without vomiting; only treated as outpatient with oral rehydration salt (ORS).

Cholera outbreak: A suspected case in which Vibrio cholerae O1 or O139 has been isolated from their stool and eight RDT positive out of ten suspected cases.

Epidemiologically linked case: A suspected case of cholera living in the same or in an adjacent district/ Kebele with a laboratory confirmed cholera case.

Cholera death: For surveillance purposes; any death from the area of confirmed case or epidemiologically linked case of cholera within 5 days of onset of watery diarrhea with or without vomiting.

Action threshold level of cholera (threshold levels for declaring an epidemic for cholera): Single Vibrio cholera (O1 or 0139) case confirmed by laboratory is enough to declare Epidemic.

2.9. Operational definition

Potable water supply: - Water which is free from bacteriological contaminants which may not harm the consumer's health.

Hand washing: The state of hand washes practicing at critical times (after latrine visit, before preparing meal and feeding child, before meal) with or without soap or ash).

Improved latrine: a latrine that have cleanable floor; door, roof and wall.

Knowing modes of transmission: a person responds correctly the mode of transmission of cholera disease from infected person to the non-infected individual.

Knowledge of prevention: a person responds correctly the methods prevention of cholera disease.

Knowledge of treatment option: a person responds correctly how to prepare homemade oral rehydration salt.

2.10. Ethical consideration

This study was conducted following the permission given by the Benishangul Gumuz Regional health Bureau. Informed consent was also obtained from study participants that mean all agreed to be take

part and the confidentiality of the information collected from them was kept confidential.

2.11. Data dissemination

The study result will be disseminated to Bahir Dar University, School of Public Health, Ethiopia Field Epidemiology Training Program, and also the study result will be submitted to Benishangul Gumuz RHB, Metekel Zone and Wombera woreda health office. One day briefing will be prepared at Wenbera woreda health office in related to the study result.

3. Results

3.1. Descriptive Epidemiology

A total of 133 cases and 19 deaths were identified during the outbreak in 2 kebeles (begondi 74, Baniya (Muz) 56,) of Wombera woreda from September 1 to October 20/2009 EFY. On September 1/2009 E.C the first male case (index) age 90 years old, was registered and reported from Baniya (Muze) kebele; which was one of the remote and road inaccessible to reach Kebele in Wombera Woreda**.** The twenty one **(**21) (16.2%) cases were severely dehydrated and treated in cholera/case treatment center (CTC), 22 treated as outpatient and the rest were treated at home with ORS and all the deaths were at community before intervention started. A total of 7 cases were positive for RDT, from these **four** samples were sent to Bahir Dar regional laboratory for confirmatory test. Its result was two positive (those 50% of sample collected for culture test were positive). Overall Attack Rate (16/10000) and case fatality rate 14.6% at Wombera woreda is parts of Metekel zone, Benishangul Gumuz regional state**.**

Verification of the outbreak

First rumors were raised in Begondi kebele which was uncommon sign and symptoms and unknown cause of death were happened on some individuals in the community then reported to kebele health extension workers and kebele administrative Leader. Health extension workers report the problem to cluster health center and woreda health office. After that the woreda health office calls to zonal health department. Then the zonal health department rapid response/RRT deployed, the problem was true increment of cases and numbers of death were accounted then by using epidemiological case definition verify the outbreak and started response depend on priorities setting action.

Descriptive epidemiology by person

From the total 130 cases, 77(58%) were females and 56(42%) were male. The mean age of the cases was 33 years with a median age of 28 year and range from 5 to 90 years. In this Age category, 86(65%) case were in age 15-44 year and whereas high CFR (42%) were in 44+age group (Table1).

Table 1:-Cholera cases distribution by sex and age from 1/01/2009 - 20/02/2009 EC in Wenbera Woreda; Metekel Zone, Benishangul Gumuz regional state, Ethiopia/ October 2016

S.No		Sex	Population	Cases	Percents	Death	CFR	AR/10000
1	Sex n=133	Male	41420	75	58%	7	9.1%	18.1
		Female	40115	55	42%	12	21.4%	14
2	Age N=133	<5		2	1.5%	0	0	
		5-14		16	12%	0	0	
		15-44		86	64.7%	11	13%	
		>44+		19	14.3%	8	42%	

Descriptive epidemiology by place

Wombera woreda has 33 kebeles, of those 2 kebele were affected by outbreak of AWD/cholera, More cases were reported in rural part which the kebeles along abaye river of the woreda's especially Muze health centers cluster kebeles, high cases were observed in Begundi, kebele (AR=7.2 per 100), in Baniya kebele (AR= 3.1 per 100). But High CFR 20.4% was observed in baniya (Muz) kebele. (See Table2)

Table 2: Cholera cases distribution by Kebeles from 1/01/2009 - 20/02/2009 EC in Wenbera Woreda; metekel Zone of Benishangul Gumuz regional state, Ethiopia, October /2016

No	Kebele	Population	Number of cases	percent	Attack Rate/100	death	CFR
1	Begundi	1034	74	57%	7.2	8	11.3%
2	Baniya/muze	1785	56	43%	3.1	11	20.4%
	Total	2819	130	100%	4.6	19	14.6%

Descriptive epidemiology by time

The outbreak started on September 1/2009 and reported to the Zone on Sep.15/2009, and then the zone RRT deployed on 16/01/09 and verified the outbreak then made need assessments subsequently reported Regional PHEM office by phone on Sep 22/2009. The index case was 90 years old male in Muze kebele who was traveled to epidemic area neighboring woreda (sedal woreda) before 7 days following the onset of the symptom and died on 1/01/09, during funerals the diseases transmitted to neighboring kebele. The magnitude of the epidemic was increased from September 14- 28 but peak on September 16 and 26/2009. (Figure2).

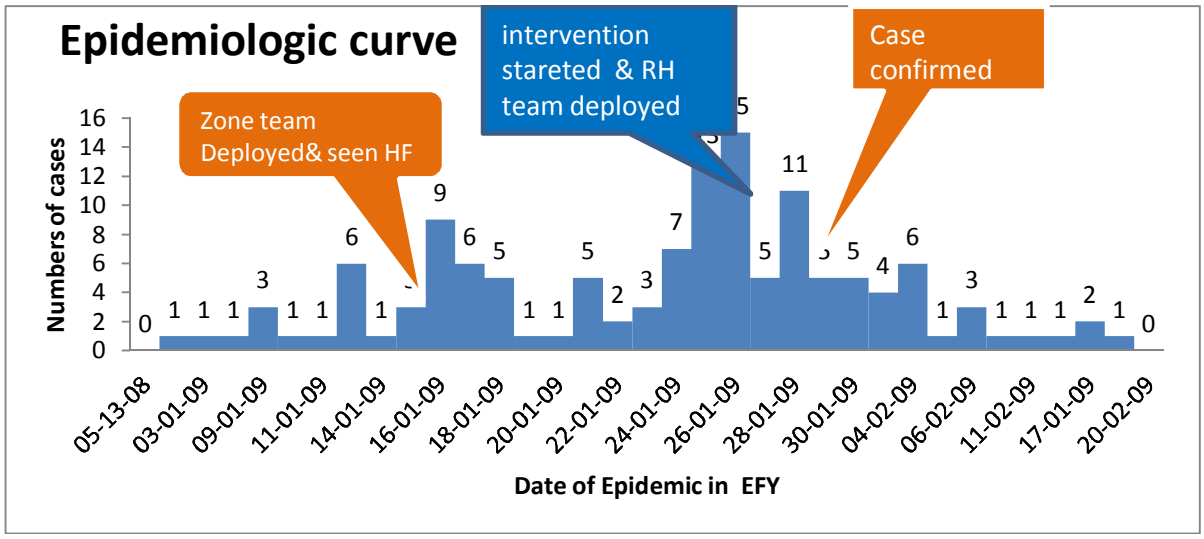


Figure 2: Time trend of Cholera cases reported by date of onset of sign and symptom from 1/01/2009 - 20/02/2009 EC in Wenbera Woreda; Metekel Zone, Benishangul Gumuz regional state, Ethiopia/ October 2016.

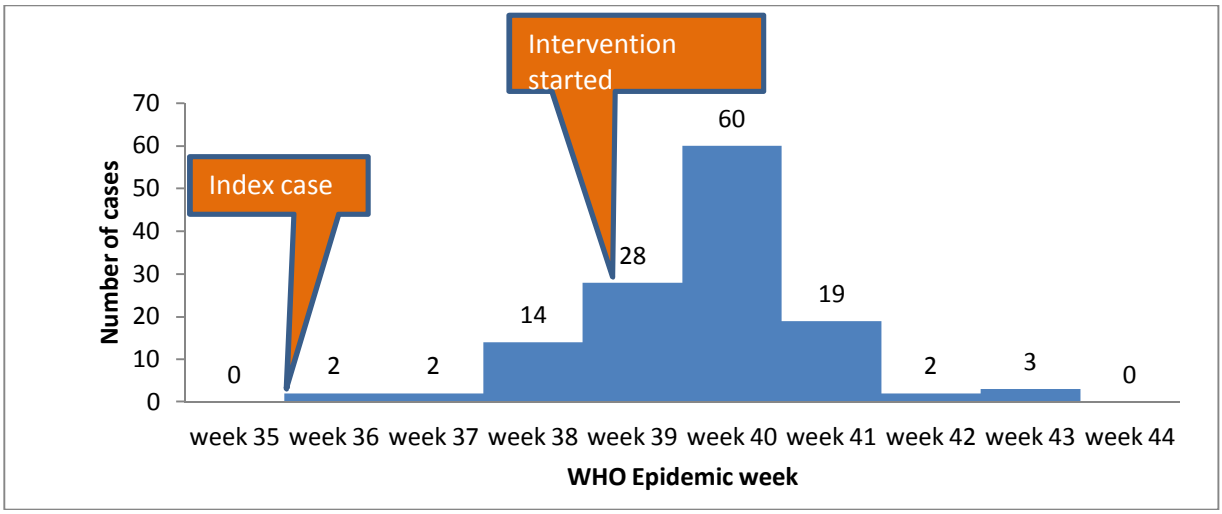


Figure 3:- trends of cholera cases by WHO Epid week from 1/1/2009 - 20/02/2009 EC in Wenbera Woreda; Metekel Zone, Benishangul Gumuz regional state, Ethiopia/ October 2016.

Laboratory investigation

Prior to the investigation period sample of stool was collected, Immunochromatographic rapid visual antigen detection test (vc RDT) for Vibrio cholera was done for seven suspected cholera cases. Among those cases, 5 cases were positive for vc RDT. To identify the etiologic agent of the outbreak **four** specimens were collected and sent by Cary Blair media to Bahir Dar regional laboratory for culture isolation, **Two** out of **four** were positive. Total 7 cases were lab and RDT confirmed, other cases were epidemiologically linked with laboratory confirmed cases based on epidemiological case definition.

Environmental investigation

Sanitary survey was conducted for 16 drinking water schemes hand pump including river and unprotected spring. By using 8 drinking water schemes (Pip, hand pump) and sources contamination assessment tool, These assessment of drinking water source revealed that; only 2(12.5%) drinking hand pump functional and Based on sanitary risk score, from 10 out of 16 (63%) high risk of contamination in the area of outbreak occurred and almost in all drinking water sources had have highly risk of contamination.

Public health action and Responses during outbreak

Multidisciplinary RRT from woreda, Zone and regional heath bureau with NGO agencies (WHO and UNICEF) were deployed in the area where affected by AWD/cholera then initiate the responses prior from the action setting. Response focuses on rapid assessment of outbreaks, outbreak investigations, implementing control and prevention measures, and monitoring of the interventions.

During the epidemic control activates: we got the following outputs:- 21 (16.2%) cases were severely dehydrated and treated with intravenous (IV) fluid and antibiotics. based on national cholera treatment protocol in cholera treatment center (CTC), 22 treated as outpatient and the rest were treated at home with ORS and all the deaths 19 were at community before intervention started.

Case tracing and disinfection of the houses of all AWD patient and contacts with chlorine was undertaken.

Sixteen water schemes undertake sanitary survey and out of this 14 nonfunctional water schemes were maintenances were done for all nonfunctional water schemes in both AWD affected kebeles.

About 150 new traditional pit latrines were built in those affected kebeles. More than 2000 water guard of 1.5% of 150ml "Wuha agar" were distributed in the woreda.

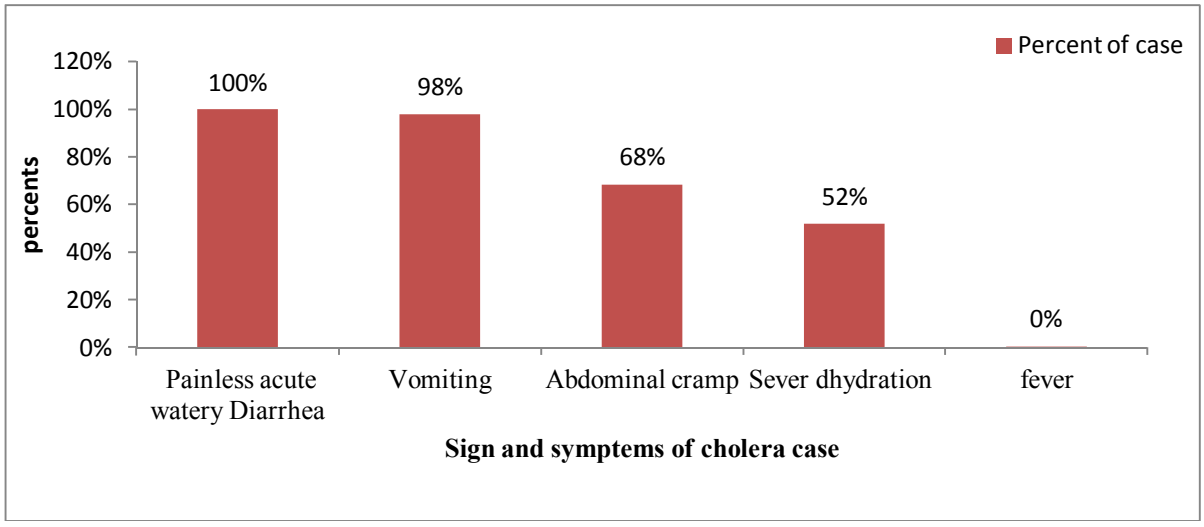
A total of 3,500 people were participated on information, education and communicating about cholera disease in camp, health institutions, kebele meetings and sanitation campaigns sites, and more than 4000 brochures and leaflet were distributed in the woreda. Through regional FM radio were given informing education about acute watery diarrhea.

3.2. Analytical investigation

During outbreak investigation period, 41 cases and 82 controls were identified to assess possible risk factors for the epidemic, and controls were selected from the place where case raised.

Sign and symptoms on cases respondents

Out of the 41 case respondents; the leading symptom were acute watery diarrhea (100%) followed by vomiting 127(97.7) Figure 4. The percentage of clinical presentation during the time of outbreak investigation in Wenbera district metekel zone in Benishangul region, Ethiopia from September 1-october 20/2016 (N=41).



Out of the total 41 cases; 82 control 19(46.3%) and 34(41.5%) were males while the remaining 22 (53.7%) and 48(58.5) were females respectively. most of the respondents case and control in the age were 17(41.5) and 57(69.5) in the between 15-44years respectively. (See table 3)

Table 3: Distribution of respondent socio demographical status of Wenbera Woreda; metekel Zone of Benishangul Gumuz regional state/ Ethiopia/ October 2016

s. no	Variables	Case status of respondents		Remarks
		Case N=41 and%	Control N=82 & %	
1	Sex Male	19 (46.3)	34 (41.5)	
	Female	22(53.7)	48(58.5)	
2	Age in years <5	2(4.8)	2(2.4)	
	5-14	7 (17.1)	9(11)	
	15-44	17(41.5)	57(69.5)	
	44+	15(36.6)	14(17.1)	
3	Religious Orthodox	2(4.8)	5(6.1)	
	Muslim	36(88)	74(90.2)	
	Protestant	2(4.8)	2(2.4	
	Others	1(2.4	1(1.3)	
4	Marital status single	14(34.1	28(34.1)	
	Married	26(61)	47(57.3)	
	Widowed	1(2.4)	4(5)	
	Divorced	1(2.4)	3(3.6)	
5	Occupational status Farmers	20(48.8)	27(32.9)	
	Students	13(31.8)	28(34.1)	
	Small traders	1(2.4)	7(8.5)	
	House wife's	6(14.6)	13(16)	
	Civil servants	1(2.4	7(8.5)	

On multivariate analysis: out of total 34(87.8) cases and 36(44%) control were not practicing hand washing and only 5(12.2%) case and 46(56%) control had hand washing practices with soap/ detergent and water respectively. The analysis of the study shown that people who have not history of Hand washing practices with soap/ detergent and water before meal, preparing food and after latrine visit were {AOR; 9.2, 95% CI (2.278 – 25.82), P-value 0.0001}.

This implies that those who have not hand washing, were AOR 9.2 time more likely to have disease of cholera as compare those who have had hand washing with soap/ detergent and water.

From the total respondents 23(56.1%) cases and 14(17.1%) control had not traditional pit latrine, and 18(44%) case and 68(82.9%) control have had traditional pit latrine. This study shown that people who have not traditional pit latrine {AOR, 3.57(95%CI, 1.44-8.861), P- value 0.006}, this implies that people who have not traditional pit latrine were OR 3.57 times more likely to have disease of cholera as compare those who have traditional pit latrine.

The analysis of the study shown that people who have been not properly utilized latrine, the AOR of 4.08 times more likely to have disease of cholera as compare those who have utilized latrine properly [AOR, 4.08 (95% CI,1.442-8.861) P-value 0.003].

People who have history of close contact with a case/person with disease with were AOR 5.24 times more likely to have disease as compare those who have not history of close contact with a case/person with disease [AOR,5.24 (95%CI 2.15-12.78), P-value 0.009]. The likelihood of people who have no education level were OR 7.2 times more likely to have cholera than those who have high school and above level of education that means people with unable to read and write high risk of having disease of cholera or1- 1/7.2*100=86% more likely to have disease of AWD/cholera [AOR 7.2, 95%CI 1.765-16.2, P-value=0.003] and also secondary and educational level were 2.2 times more likely to have cholera as compared to those who have high school and above education level that mean having 2^{ndry} education 1/2.2=0.45 times more likely to have preventive effect (AOR = 2.2, 95% CI: 0.841–6.41, P-Value =0.1). This is not statistically significant as p-value is 0.1) whereas People Take raw fruits or vegetables; fruit drinks, a week before illness were OR 4.5, (95%CI 1.439-12.537), P-value =0.009, not using water treatment chemicals/ water garden for drinking water were OR 4.65 (95%CI 1.662-12.987), P-value =0.003 and river water sources using for drinking, bathing, and cleaning kitchen utensils were OR 4.83(95%CI, 1.873-12.434), P-value=0.001 had shown statistical significant association with being cases (See Table 4).

Table 4: Bivariate and multivariate analysis of associated risk factors of AWD/cholera in Wenbera district, western Ethiopia from September 1- October 20/2016

No	Variables	Exposure Status	Diseases Status		COR	AOR	95%Ci		P-Value
			Casen=41 N (%)	Controln=82 N (%)			Lower Limit	uper Limit	
1	Did you wash hands with soap/ detergent before having meal, preparing food and after latrine?	NO	36(87.8)	36(44)		9.2	2.278	25.8	0.0001
		YES	5(12.2)	46(56)		1.0			
2	Did you have traditional pit latrine?	NO	23(56.1)	14(17.1)	6.21	3.57	1.442	8.86	0.006
		YES	18(43.9)	68(82.9)	1.0	1.0	1		
3	Did you use latrine properly?	NO	36(87.8)	39(47.6)	7.94	4.08	1.333	12.5	0.01
		YES	5(12.2)	43(52.4)	1.0	1.0			
4	Did you have Close contact with a case/person with similar illness?	NO	29(70.7)	22(26.8)	6.59	5.24	2.15	12.8	0.002
		YES	12(29.3)	60(73.2)	1.0	1.0			
5	Did you take raw fruits or vegetables; fruit drinks, a week before illness?	NO	31(75.6)	29(35.4)	5.67	4.25	1.439	12.5	0.009
		YES	10(24.4)	53(64.6)	1.0	1.0			
6	Did you use water treatment chemicals/ water garden?	NO	30(73.2)	32(39)	4.26	4.65	1.662	13	0.003
		YES	11(26.8)	50(61)	1.0	1.0			
7	What are your water sources for drinking, bathing, and cleaning kitchen utensils?	RIVER	30(73.2)	25(30.5)	6.22	4.83	1.873	12.4	0.001
		HAND PUMP	11(26.8)	57(69.5)	1.0	1.0			
9	Educational status								
	no education		25(61)	20(24.4)	7.2	5.35	1.765	16.2	0.003
	Elementary		10(24.4)	27(33)	2.2	2.33	0.841	6.45	0.1
	high school and above		6(14.6)	35(42.6)	1.0	1.0			

Source: 2016 investigation

4. Discussion

Cholera is a diarrheal disease caused by infection of the intestine with the gram-negative bacteria Vibrio cholerae Isolation and identification of *V. cholerae* sero group O1 or O139 by culture of a stool specimen remains the gold standard for the laboratory diagnosis of cholera, However; The Crystal VCD dipstick for Rapid Detection of Cholera can be used as an immune chromatographic rapid visual antigen detection test for *Vibrio cholerae* from stool specimens(2, 19)

So this investigation takes cover off occurrence of cholera outbreak in muze and begundi kebeles of Wombera woreda of Melekel zone. 5 cases were positive for RDT and 2 out of 4 cases of Infectious agent of Vibrio cholera O1 and O139 biotype were isolated from stool specimen by culture media. In this case in Ethiopia one confirmed case of cholera is enough to declare an outbreak(2)

In this study the overall attack rate of the cholera was 163 per 100,000. these result is much lesser than the assessment of 2009 Cholera outbreak occurred in Afar, Ethiopia, 2009 (900 cases for every 100,000 people and CFR 44/1000)(15). The difference might be due to the study area coverage difference; this study was done district based but Afar outbreak was Region based and effective surveillance activities, early prevention and control mechanism was made the difference. And overall CFR (14%) is high as compare other country study Nigeria CFR was 6.1%(20), and Republic of Haiti C2011) CFR was 3.8%(21). This due to lack of road to access to health service and shortage of medical supplies were there in the facilities and pr-existing medical condition of cased person and also high CFR reflects that patients reached the health facilities too late. The age groups 15-44age was more affected by AWD/cholera due to they are more movable for different socio economic activities and helps being cased patients. In this condition they acquire easily the disease of AWD/cholera.

This study shown people not practices hand washing during critical times (with soap/detergents, before meal prepare, feed and after latrine visit) to have more risk of develop disease of cholera {COR 9.2) this results much higher than the study done in Oromiya and Afar region(15, 22) the difference may

due to the awareness and attitude towards hand washing practices during critical times, of those region people. This because 87.8% cased respondents were not having hand washing practices during critical times and about 90.5%case and 68.5% of control respondents were not know mode of transmission and prevention methods of watery diarrhea diseases in this study.

In this study Access to traditional pit latrine and properly utilization of latrine, People Take raw fruits or vegetables; fruit drinks, a week before illness, using water treatment chemicals/ water garden for drinking water and water sources using for drinking, bathing, and cleaning kitchen utensils have significance association with the disease of cholera as consistence of other studies like Oromiya, Afar region and Nigeria (15, 20, 21).

5. Limitation of the study

There is no denominator data of age group to calculate Age specific AR. There was not done water quality test for drinking water sources.

Logistic issues for additional sample transportation; the case definition used to detect the suspected cholera cases was designed by exclusion of < 5 years of age children. Presence of multiple Enterobactera species for RDT (RDTs sensitivity is high (93%–98%) and limited specificity (67%–96%) is less optimal to verify and determine cholera outbreak.

6. Conclusion

In this outbreak the overall case fatality rate (14 %) was higher than the WHO's recommendation. *Vibrio cholera* 01 serotype was a responsible for the occurrence of acute watery diarrhea outbreak in the Wombera woreda.

The Epi-curve has many peaks (Figure 2 & 3) which showed a progressive person to person transmission, this could be due to the absence road access health service and weak response activity of the woreda epidemic task force. Risk factors like hand washing during critical time /with soap/detergents, before meal prepare, feed and after latrine usage/, Access to traditional pit latrine and properly utilization of latrine (unsanitary latrines), unsafe drinking and utilization water sources, contact to a cased person had shown statistically significant association with AWD in Bivariate and multivariate analysis.

7. Recommendations

✓ RHB and other government and non-government organizations at all levels should work on AWD and other diarrheal diseases prevention and control activities such as strict monitoring of hygiene availability of safe water and sanitarian conditions for woreda and in the local community.

✓ Strengthening and supporting HEW with HDA then strict monitoring and evaluating should be continuing to regular basis.

✓ Support additional operational cost for capacity building for rapid respond team (RRT); heath workers and health extension workers and road constriction should be consider for accessible health center.

✓ Early detection and diagnosis such type of diseases should be continuing in all levels.

✓ The Woreda Health Office and cluster Health center should strengthening active and passive surveillance system in order to detect case early as much as possible.

✓ The Woreda Health Office and cluster Health center At community level should be perform a regular water quality mapping and conduct regular sanitary survey of public drinking water supply systems and treat and correct hygienic and sanitarian conditions .

✓ Restocking emergency drugs and supplies at Woredas and health center level.

✓ HEWs should work on health education by integrating with WHDA about hygiene and sanitation like hand washing practices during critical times, constructing traditional pit latrine by using local material, properly utilization of latrine, using drinking water sources safe and periodically treat and drinking treated water to prevent AWD/cholera diseases.

✓ In community level one house there should be at least with one latrine.

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