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Description of Cholera Outbreak in Blue Nile State, Sudan, 2019

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ABSTRACT

Background: Cholera is a large public health issue, especially in countries with limited resources.

Objectives: This study aimed to describe the cholera and cholera-related mortality in Blue Nile State, 2019.

Materials and methods: A descriptive epidemiological study was carried out in Blue Nile State during cholera outbreak 2019. Data was collected from patients' records during period of outbreak from August to November 2019.

Results: A number of 202 cholera cases were reported during 2019. Most of cholera cases was reported in Elroseries locality 117 (57.9%) followed by Eldamazin locality 72 (35.6%); Bau locality 7 (3.5%). The proportion of deaths was 4.0% with case fatality rate of 0.004/1000. Female was more affected by cholera 126 (62.4%) compared to male 76 (37.6%). Gender and age group not significantly influence the cholera deaths.

Conclusion: It can be concludes that a total of 202 cholera cases were reported during 2019 with

low case fatality rate of 0.004/1000. Collecting, reporting and analyzing characteristics such as age, sex and underlying conditions can improve our understanding of cholera mortality risk factors and can guide future case management recommendations.

INTRODUCTION:

Cholera is an acute intestinal disease caused by Vibrio cholerae. It is characterized by severe watery diarrhea with vomiting and dehydration. It is spread by fecal and oral transmission from infected individuals. (1). Cholera epidemics are likely to spread in the shortest possible time. Death is usually due to dehydration associated with acute severe diarrhea, which can be treated with timely administration of oral rehydration salts (ORS). Cholera continues to be a global health threat. Cholera pandemics have occurred in several countries and sporadically around the world, especially in areas where water supply, sanitation, food hygiene, and safety continue to be challenges. Cholera affects all age groups and both sexes, with the highest rates of infection among children living in cholera-endemic areas;in2014,58 public health events occurred within the World Health Organization (WHO) Africa Region, with infectious diseases accounting for 95% of these, ahead of Ebola (13%),the largest outbreak in recent history, Cholera was the most frequently reported(31%).(2)According to WHO in 2015, new cholera pandemics continue to occur, especially in the context of climatechange:105,287 cholera cases occurred, of which 1,882died,resultinginacasefatalityrate(CFR) in the African sub-region was 1.8%(2). The purpose of this study is to describe the cholera outbreak in Blue Nile Statein2019. **MATERIALS AND METHODS:**

Study design:

A descriptive epidemiological study was carried out. Cholera-related mortality in the year 2019 was analyzed according to location, age, and sex.

Study area:

Blue Nile State lied in southern part of the country bordering from southeast Ethiopia, southwest of South Sudan and north is Sinner state. With an area of 38,000 km square and 1,250.00 populations. Blue Nile River is crossing the state from south to north fed by numbers of streams and tributes. This gives unique feature for agricultural and live stocks herding activities. Rainy season starts early in June and ends in late October. Elroseres High Dam famous hydro-electric project that supplies country with electricity and irrigation water sources, particularly Aljazeera agriculture scheme and it is rich of mechanized agriculture in Al Tadamon locality. BNS is served by number of (160) health facilities (HFs). The population at Blue Nile State depends on

different water sources. Water from network, which covers approximately (25%) of the population; The other sources are out network e.g., Hand pumps, water yards, dug wells (open/closed), river, seasonal streams, open sources (shallow wells, hafeers).

Study population:

Blue Nile State Community.

Inclusion criteria:

All patients during the outbreak attending to health facilities with acute watery diarrhea.

Exclusion criteria:

Patients with diarrhea not diagnosed as cholera case.

Sample size and sampling technique:

All cholera cases during outbreak period.

Data collection:

Data will be collected from all health facilities according to outbreak records.

Data analysis:

Data was analyzed using SPSS version 24.0. Descriptive statistics was used. Chi-square test was used to find an association between variables. P-value considered significant at less than 0.05 levels.

RESULTS:

Table 1 illustrates that most of cholera cases was reported in Elroseries locality 117 (57.9%) followed by Eldamazin locality 72 (35.6%); Bau locality 7 (3.5%) ; Wadalmahi locality 4 (2.0%) and Geisan locality 2 (1.0%).

Figure 1 shows that the cholera cases was started in September (2019) 143 (70.8%) and began to decreased in October (2019) 59 (29.2%).

Figure 2 show that female was more affected by cholera 126 (62.4%) compared to male 76 (37.6%).

Figure 3 illustrates that the most age group affected by cholera was the age ranged between 1-20 years 70 (34.7%) followed by the age group 21-40 years 68 (33.7%) and the age group ranged between 41-60 years 36 (17.8%)   while the lowest age group was the age group more than 60 years   28 (13.9%). The mean age of cholera patients was (32.4±21.9) years with maximum age of 85 years and minimum age of 1.0 year.

Table 2 indicates that the proportion of deaths was 4.0% with case fatality rate of 0.004/1000.

As displayed in table 3 there was no significance difference found between gender, p>0.05.

Table 4 shows that there was no significance difference between cholera deaths among age

group, p>0.05. The proportion of deaths was not significantly found high among age group less than one year (62.5%).

Table 1. Distribution of cholera cases by localities in Blue Nile State, 2019

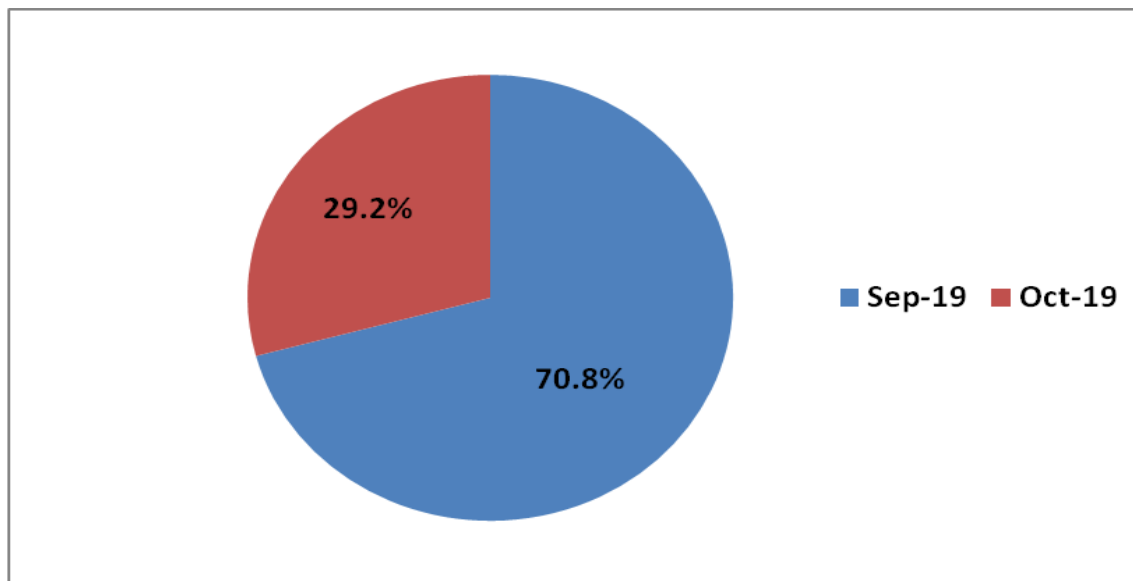| Locality	No.	%
Elroseris	117	57.9
Eldamazin	72	35.6
Bau	7	3.5
Wad Almahi	4	2.0
Elkurmuk	0	0.0
Geisan	2	1.0
Eltadamon	0	0.0
Out of state	0	0.0
Total	**202**	**100.0**

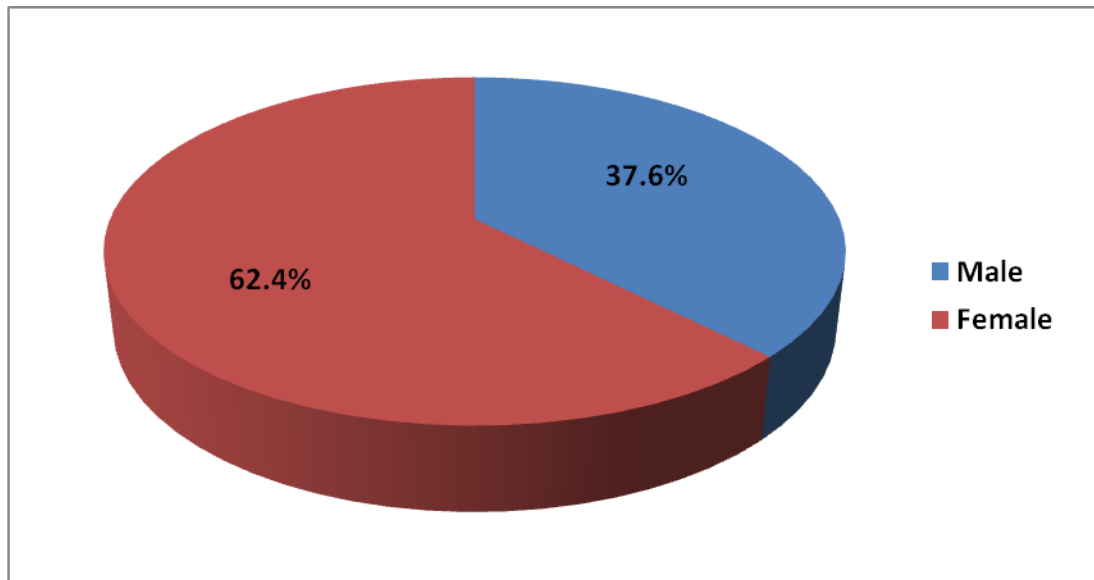**Fig.1.** Distribution of cholera cases according to months in Blue Nile State 2019 (n=202)

Fig.2. Distribution of cholera cases according to gender in Blue Nile State 2019 (n=202)
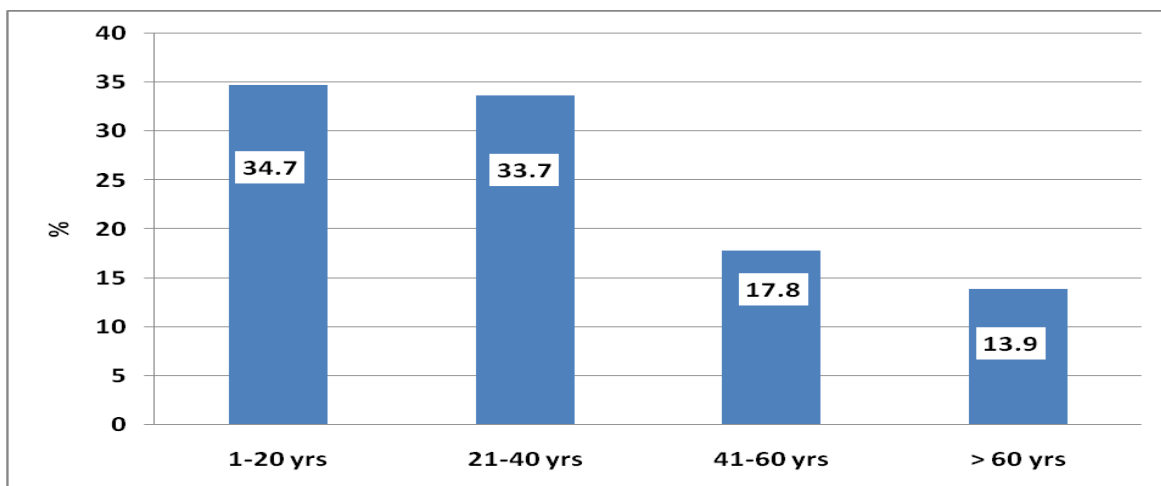

Fig.3. Distribution of cholera cases according to age group in Blue Nile State 2019 (n=202)

Mean age: mean± SD= 32.4±21.9; Maximum age = 85 yrs; Minimum age= 1.0 yr.

Table 2. Proportion of cholera death in Blue Nile State 2019

Condition	No.	%	Case Fatality rate (CFR)
Alive	194	96.0	
Dead	8	4.0	0.004
Total	**862**	**100.0**	

Table 3. Distribution of cholera deaths according to gender in Blue Nile State 2019

Sex		General condition		Total	χ2	df	P-value	OR	95% CI	
		Alive	Dead						Lower	Upper
Male	n	72	4	76						
	%	37.1%	50.0%	37.6%						
					.054	1	.349	.6	.1	2.4
Female	n	122	4	126						
	%	62.9%	50.0%	62.4%						
Total	n	194	8	202						
	%	100.0%	100.0%	100.0%						

Table 4. Distribution of cholera deaths according to age group in Blue Nile State 2019

Age		General condition		Total	χ2	df	P-value
		Alive	Dead				
>1 yr	n	65	5	70			
	%	33.5%	62.5%	34.7%			
1-20 yrs	n	67	1	68			
	%	34.5%	12.5%	33.7%			
21-40 yrs	n	36	0	36	5.2	3	.158
	%	18.6%	.0%	17.8%			
41-60 yrs	n	26	2	28			
	%	13.4%	25.0%	13.9%			
> 60 yrs	n	194	8	202			
	%	100.0%	100.0%	100.0%			
Total	n	853	9	862			
	%	100.0%	100.0%	100.0%			

DISCUSSION:

This descriptive study aimed to describe the cholera outbreak during the year 2019 in Blue Nile State. This study showed that a number of 202 cholera cases were reported. Most of cholera cases was reported in Elroseries locality 117 (57.9%) followed by Eldamazin locality 72 (35.6%). Moreover the study revealed that the proportion of deaths was 4.0% with case fatality rate of 0.004/1000. Similar seventh outbreaks in Africa cholera reached Africa in 1970 and spread rapidly (3). During the nearly five decades until 2017, African countries reported over 4 million cholera cases to the WHO (4, 5, 6). In 2017, there were explosive outbreaks in the

Democratic Republic of the Congo (DRC), Ethiopia, Nigeria, Somalia, South Sudan, Sudan, and Zambia (7). The total number of cholera cases and deaths officially reported to the WHO from Africa in 2017 was 179,835 and 3,220, respectively, with reported case fatality rates ranging from 0 in many countries to 3.2% in Zambia, 5.2% in Angola and 6.8% in Chad (6). These high case fatality rates reflect significant limitations in access to adequate case management in large parts of the African continent. This study indicated that female was more affected by cholera 126 (62.4%) compared to male 76 (37.6%).The most age group affected by cholera was the age ranged between 1-20 years 70 (34.7%) followed by the age group 21-40 years 68 (33.7%). There was no significance difference found between gender, p>0.05. The study indicated that there was no significance difference between gender regarding cholera death, p>0.05. Also the study showed that there was no significance difference between cholera deaths among age group, p>0.05. The proportion of deaths was not significantly found high among age group less than one year (62.5%). In previous outbreaks of cholera during 2016, 2017 female have more proportion of cholera death. The question arises about the reason of sex-selective mortality due to diseases. According to Johansson (8) young males are less capable (less buffered) than females of effectively responding to environmental insults. Females generate a more robust immune response than males after a clash with an infectious agent, and they respond to natural and vaccine exposures by producing substantially more antibodies (9). Genetic explanations are focused on possession of two X chromosomes by females, i.e., which gives more variable genetic background for immune system in females than in males, and this in turn results in their stronger immune responses (10,11). Having two different alleles on the two X- chromosomes may also contribute to the physiological diversity, which can be advantageous when encountering new immune challenges (24). Muenchhoff and Goulder (12) showed that females are less susceptible to infections than males due to their stronger Th1 immune responses. High level of testosterone may cause immuno-suppression and increase morbidity and mortality (13,14). Men tend to be more susceptible to a variety of diseases: both the incidence of infections and their intensity are often higher in men than in women (14, 15). The research of Zarulli and the team (24) shows that in crises caused by epidemics and famines women at all ages survived longer than men did.

CONCLUSION:

It can be concludes that a total of 202 cholera cases were reported during 2019 with low case fatality rate of 0.004/1000. Collecting, reporting and analysing characteristics such as age, sex

and underlying conditions can improve our understanding of cholera mortality risk factors and can guide future case management recommendations.

DECLARATION OF COMPETING INTEREST:

The authors declared that there is no conflict of interest.

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