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The Ice Berge of Cholera in Hodeidah , Yemen : The Contact Exposure

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Abstract: Cholera is a diarrheal disease caused by a bacterial infection of the intestine. The bacterium is *Vibrio cholerae*, which can either be of type O1 or O139. It can infect both children and adults . A cross sectional design was carried out to investigate the variations between cholera patients and control (contacts). Data were collected from a total of 15 suspected cases from 7 districts in Hodeidah, Yemen and 16 contacts from the same houses of the patients. Data at first fed to the excel program then imported to the SPSS version 23 for statistical analysis. Most of the patients were under 5 years of age with the mean age was 2.1 years (±1.2) with a great variation ,the median age of patients was 5 years. It was a great difference with contact age where the mean age was 34 years (±13) (*p-value* = 0.000) . Al though watery diarrhea was present in 13 out of 15 patients (68.4%) and being more than contacts (6/16; 37.5%) (*p*-value = 0.006) . Two controversial observations were reported in this study regarding history of vaccination and the laboratory result of the stool culture for *V. cholerae*. Most of the patients were vaccinated (86.6%) than contacts (*p*- value = 0.000) and the accepted explanation for this difference is that it may be due that the contacts are adults and may they did not remind their history of vaccination. But the presence of positive culture result for *V. cholerae* in one contacts (6.3%) and never in any of suspected cholera patients raining the questions either of the performance of the laboratory diagnosis of the surveillance or both .

Keywords: Ice berg, Cholera , Contacts , Hodeidah, Yemen

1. Introduction

Cholera is a diarrheal disease caused by a bacterial infection of the intestine. The bacterium is *Vibrio cholerae*, which can either be of type O1 or O139. It can infect both children and adults. Only about 20 per cent of those infected develop acute, watery diarrhea (AWD), and of these, between 10–20 per cent develop severe watery diarrhea with vomiting [1]. Globally; an estimated one billion people remain without adequate access to safe water and sanitation and vulnerable to cholera epidemics [2]. It is estimated that there are 3–5 million cholera cases every year, leading to 100,000–130,000 deaths, mostly in Africa and Asia, and affecting both children and adults [3,4]. Environmental factors are important in the epidemiology of cholera. Changes in surface water temperature and terrestrial nutrient discharge lead to a proliferation of phytoplankton and zooplankton and a consequent increase in *V. cholerae* [5,6]. Cholera rates also increase dramatically during floods compared to non-flood periods [7]. Moreover; the current control strategies have not proven highly effective in areas of the world bearing the global burden of cholera.8 Many areas of uncertainty remain. Will a new serogroup of *V. cholerae* arise, as O139 did? Why are altered variants of *V. cholerae* O1 El Tor developing? Will severe weather events such as regional flooding associated with global warming result in increased cholera? What role would surveillance, screening, vaccination or empiric treatment have in limiting the spread of cholera into immunological naïve populations? Would short course targeted chemotherapy with highly active antimicrobials

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among close community contacts of cholera patients limit transmission, or only lead to drug resistance? How can safe water and improved sanitation be attained in the many parts of the world lacking these? [9]. In this brief report; we investigate the cholera related factors in a group of contacts to cholera patients in Yemen where the worst cholera epidemics still running since 2016. The suspected cholera cases reported in Yemen in 2019 (till 24th December 2019) were two folds as it occurred in 2018 (increased from 371323 cases in 2018 to 849685 cases. Giving the increasing of the attack rate from 130/10,000 to 282.8/10,000 (Table 1).Most of the suspected cases in 2019 were in children under 5 years of age (221,271 cases represented 265 of the total case with a high burden of cholera associated deaths (233 deaths) in this age group (Figure 1) . Unfortunately Hodeidah governorate had the high burden of cholera in Yemen in 2019 .

Table 1. Summary of cholera indicators 2018-2019 (Yemen)

Indicator	**2018** **1 January – 31 December**	**2019** **I January – 24 December**
Suspected	371323	849685
Death cases	505	1020
CFR (%)	0.14	0.12
AR/10000	130	282.8
Total RDTs	193995	174867
Positive RDTs	49442	105514
Confirmed cases	3460	5353
Confirmed death	5	1
Proportion of severe cases	49978	121601
Affected Governorates	22/23 (96 %)	22/23 (96 %)
Affected Districts	272/333 (83 %)	315/333 (95 %)

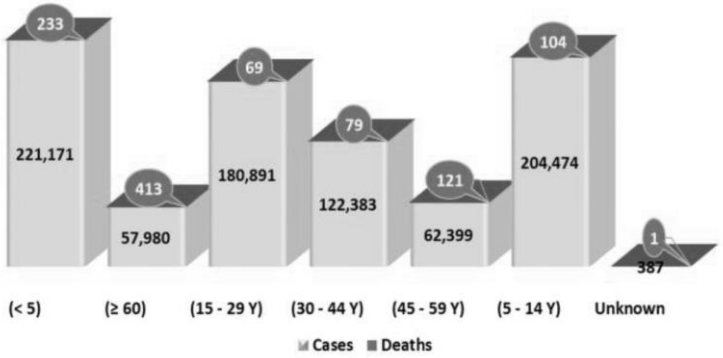

Figure 1. Distribution of suspected cholera cases and deaths (1st Jan -24th December 2019) [10]

2. METHDOLOGY

A cross sectional design was carried out to investigate the variations between cholera patients and contacts. Data were collected from a total of 15 suspected cases from 7 districts in Hodeidah and 16 contacts from the same houses of the patients. WHO case definition were used to identify the cases and epidemiological linkage to the patient was the method to identify at least one contact for each patient. A pre-tested questionnaire was used to set up any association between the patient variables and the contact variables. Stool culture for *V. cholerae* was used to confirm the cholera status. Data at first fed to the excel program then imported to the statistical package for social analysis (SPSS) version 23 for data analysis. Mean, standard deviation (SD) , frequency and percentage were used for descriptive analysis, the tools of inferential statistics were T-test and chi square test or Fischer exact test, A cut off point of 0.05 was considered for significance level. Contacts were matched with sex of the patients.

2. RESULTS AND DISCUSSION

Most of the patients were under 5 years of age with the mean age was 2.1 years (±1.2) with a great variation , the median age of patients was 5 years. It was a great difference with contact age where the mean age was 34 years (±13) (*p-value* = 0.000) raining the questions of why cholera targeted children under 5 years than adults. The findings revealed that there are no difference in the number of family members in both groups (*p-value* = 0.196) (Table 2)**.**

Table 2. Mean age and mean family members in both cholera patients and their contacts

Demographic factors	Cholera patients	Contacts	T test	*p*-value
Mean Age (SD)	2.1 years (±1.2)	34 years (±13)	-9.6	0.000*
Mean family members (SD)	7 persons (±4.4)	8 persons (±3.3)	29	0.196

*Significant : less than 0.05 .

Al though watery diarrhea was present in 13 out of 15 patients (68.4%) and being more than contact (6/16, 37.5%) (*p*-value = 0.006) but the presence of watery diarrhea in contacts may considered bad indicators and could be cholera. Unfortunately bloody diarrhea was present in two suspected cholera patients (13.3%) that indicate either weak laboratory capacity for diagnosis or weak surveillance procedures to understand the case definition of cholera. Vomiting was presented in 13 cholera patients (86.6%) but it was also present in 5 contacts (31%) and the difference was significant (*p*- value = 0.003). Two controversial observations were reported in this study regarding history of vaccination and the laboratory result of the stool culture for *V. cholerae*. Most of the patients were vaccinated (86.6%) than contacts (*p*- value = 0.000) and the accepted explanation for this difference is that it may be due that the contacts were adults and may they did not remind their history of vaccination. But the presence of positive culture result for *V. cholerae* in one contacts (6.3%) and never in any of suspected cholera patients raining the questions either of the performance of the laboratory diagnosis of the surveillance or both (Table 3).

Table 3. Epidemiological and clinical Variations between cholera patients and their contacts

Epidemiological and clinical characteristics		Cholera patients (n=15)	Contacts (n=30)	X^2	*p*-value
Age group	≤ 5 years	15	1	27.2	0.000*
	>5 years	0	15		
Watery diarrhea	Yes	13	6	7.8	0.006*
	No	2	10		
Bloody Diarrhea	Yes	2	0	2.28	0.226
	No	13	16		
Vomiting	Yes	13	5	9.7	0.003*
	No	2	11		
History of vaccination	Yes	13	0	23.8	0.000*
	No	2	16		
Stool Culture result for *Vibrio cholera*	Positive	0	1	0.96	1
	Negative	15	15		

*Significant : less than 0.05

3. CONCLUSION

The probability to find *V. cholerae* among contacts was high. Laboratory capacity for diagnosis of cholera and other etio-pathogenic bacteria or viruses is weak and need to be strengthened**.** Developing more sensitive surveillance tool for cholera contacts was highly recommended.

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