IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)
e-ISSN:2278-3008, p-ISSN:2319-7676. Volume 13, Issue 5 Ver. II (Sep – Oct 2018), PP 58-61
www.iosrjournals.org

Distribution of *Vibrio Cholera* in Iraq during 2017

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Abstract
Background: *Cholera is one of the most important waterborne disease which cause only by O1 and O139/Vibrio cholera strains, highly morbidity and mortality among general population.*
Objective: *To determine the infection rate of Vibrio cholera in Iraq during 2017.*
Materials and Methods: *All data presented in this paper was collected from Communicable Disease Control Center - Bacteriology Unit in Baghdad, during the period from January 2017 till December 2017 then analyzed by use the statistical analysis system program for 2012.*
Results: *The majority 109(63.75%) was in Baghdad-Alrisafa, followed by Babylon 34 (19.88%) and Wassit 24(14.04%) respectively, while lower frequency were recorded in 3(1.75%) Diwaniya and 1 (0.58%) Najaf, also there were no infections noticed in the other governorates, the infection is more predominant in age group above 15 years also in females 93(54.40 %) than males 78 (45.60%) but statistically non-significant.*
Conclusion: *Infection rate of Vibrio cholera is still high in some Iraqi cities, high rate of infection were occurred in age group over 15 years and among females. The government should be develop a practical strategy to address poor water quality resulting from intermittent wars in Iraq also should be increase educational programs about causes of diarrhea in general population. Further research needs to explore the reasons behind high rate of infection.*
Key word: *Vibrio cholera, surveillance, waterborne pathogens, Iraqi province.*

Date of Submission: 08-09-2018 Date of acceptance: 26-09-2018

I. Introduction

Diarrhoeal diseases responsible for 1.5 million deaths each year especially among children aged 1-4 years [1]. The etiology responsible for diarrhea is bacterial such as *Vibrio Cholerae, Salmonella Spp., Shigella Spp., Escherichia coli, Campylobacter jejuni, Yersinia enterocolitica, Staphylococcus, Vibriopara hemolyticus, Clostridium diffcile* or viral mainly as rotavirus, adenovirus, colicivirus, and astrovirus. Parasites are another cause including *Entameba coli, Entameba histolytica, Giardia, lamblia, Cryptosporidium and Isospora* other causes are including metabolic disease, hyperthyroidism, diabetes mellitus, pancreatic insufficiency, food allergy, lactose intolerance, antibiotic associated diarrhoea, irritable bowel syndrome[2].

According to report presented by Zoinlkon (2013), infection rate of cholera is 4697 after 2005 [3]. Cholera differs from other infections in the incubation period and epidemic pattern, which its rapidly spread to different countries [4].

Vibrio cholerae is a facultative anaerobic, gram negative, non-spore forming curved rod. It is a human pathogen found in coastal waters that causes the acute gastrointestinal disease. Cholera is a major health threat in poor nations. It is widely acknowledged as one of the most important water borne pathogen [5]. The threat of epidemic cholera is restricted primarily to developing countries with warm climates [6].

Cholera infections are most commonly acquired from drinking water in which *V. cholerae* is found naturally or into which it has been introduced from the feces of an infected person. Other common vehicles include contaminated fish and shellfish, produce, or leftover cooked grains that have not been properly reheated. Transmission from person to person, even to health care workers during epidemics, is rarely documented. *Vibrio cholerae* thrives in aquatic environment, particularly in surface water. The primary connection between humans and pathogenic strains is through water, particularly in economically reduced areas that do not have good water purification systems [7].

Vibrio cholerae, which produces an enterotoxin that causes copious, painless, watery diarrhea that can quickly lead to severe dehydration and death if treatment is not promptly given. Vomiting also occurs in most patients[8]. In endemic areas, 75% of cases are asymptomatic, 20% are mild to moderate, and 2-5% are severe forms such as cholera gravis [9]. The disease is also particularly dangerous for pregnant women and their

fetuses during late pregnancy, as it may cause premature labor and fetal death [10][11]. In cases of cholera gravis involving severe dehydration, up to 60% of patients can die; however, less than 1% of cases treated with rehydration therapy are fatal. The disease typically lasts 4-6 days [12].

Several epidemiological studies done in Iraq about prevalence of Vibrio cholera after several outbreak such as study of Al-Abbassi *et al*.,(2005) in Baghdad, Noaman *et al*., (2011) in Kirkuk , Malik and Hasan (2015) in Al Hilla city- Babylon province. The present study expects to decide the rate of *Vibrio cholerae* in Iraqi province during 2017.

II. Methods

The data presented in this paper was gathered from the Communicable Diseases Control Center, bacteriology Units in Baghdad for the period from January 2017 until end of December 2017. The data analysis was based on results of brucellosis cases from most Iraqi governorates to the Communicable Diseases Control Center; the dataset was rigorously tested.

All stool samples incubated in an enrichment medium of alkaline peptone water (APW) over night at 37 ºC, then about 0.1 ml was inoculated on the surface of thiosulfate citrate bile salts sucrose (TCBS) agar at 35-37°C [16]. Finally different bacteriological and biochemical tests used to recovery the positive cases [17].

Statistical Analysis

The Statistical Analysis System-SAS (2012) program was utilized to ponder the impact of several factors in contemplate parameters and look at between rates in this examination.

III. Results

One hundred seventy one positive cases of vibrio cholera. The majority 109(63.75%) was in Baghdad-Alrisafa, followed by Babylon 34 (19.88%) and Wassit 24(14.04%) respectively, while lower frequency were recorded in 3(1.75%) Diwaniya and 1 (0.58%) Najaf, also there were no infections noticed in the other governorates as shown in table (1).

Table (1): Incidence of *Vibrio cholerae* in the Iraq 2017.

No.	Province	Total No.(%)
1	Anbar	0
2	Babylon	34(19.88%)
3	Baghdad-Alkarkh	0
4	Baghdad-Alrisafa	109(63.75%)
5	Basrah	0
6	Dohuk	0
7	Diwaniya	3(1.75%)
8	Diyala	0
9	Erbil	0
10	Kerbala	0
11	Kirkuk	0
12	Missan	0
13	Muthanna	0
14	Najaf	1(0.58%)
15	Nineveh	0
16	Salah Al-Din	0
17	Sulaimani	0
18	Thi-Qar	0
19	Wassit	24 (14.04%)
20	Total	171 (100%)

Figure (1) shows that out of the 171 positive *Vibrio cholera* cases recruited into this study. There were 32 (18.71%) in age less than 15 years and 139 (81.29%) in age over 15 years, with significant differences (P< 0.0001).

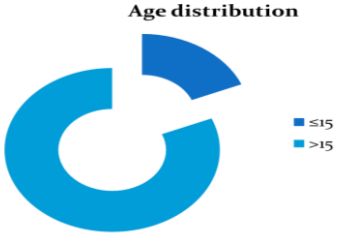

Figure (1): Age distribution among studied group.

Among positive cases, of which 78 (45.60%) were in males and 93(54.40 %) were females, on the other hand statistical analysis did not showed significant differences as shown in figure 2.

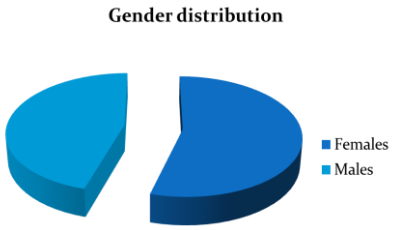

Figure (2): Gender distribution among studied group.

IV. Discussion

Water is essential in providing nutrients, but contaminated water contributes to poor population health, water quality and availability can change in unstructured situations, such as war [3]. In this study, the result found most of the cases 109(63.75%) were from Alrisafa district in the eastern side of Baghdad, This percentage lower than reported in 1997 (147.425 cases and 6274 death) [18][19][20]. Also this lower than reported by Al-Abassi and Amenia (2015) after August outbreak in 2015, a total of 2,810 laboratory confirmed cases of vibrio cholera O1 Inaba had been confirm in Iraq [21]. This could be related with fact Alrisafa district which are poor districts suffering from shortages in the water supply with unsafe drinking water most of the time. Addition to the lowest standards of hygiene and continuous contamination of the water sources by human faeces at this time, the attack rate among previously uninfected population living in crowded unsanitary conditions can be very high, even though most infections are mild or sub-clinical, followed by Babylon 34 (19.88%) and Wassit 24(14.04%) respectively, this result agreement with several studies done by Al-Shok and Baiee (2009) in Babylon city [22]. And Karim (2018) in Karbala [23]. So the infection rate was high in impoverished and malnourished population exposed to contaminated water sources. While lower frequency were recorded in 3(1.75%) Diwaniya city and 1 (0.58%) Najaf city. The differences and similarities in this study with others could be related with the endemicity of infection in some area, climate, educational level, immune status, sample size, sociocultural practices could account for this.

According to age group the present study recorded high frequency among age group over 15 years. These findings are similar to those reported from other cholera endemic areas, such as Karim in 2018 young adults between 20-44 years of age were the worst affected and represent 46% from the overall patient number [23]. And with study done by Malik and Hasan (2018) the most effective age group 5-20 years [15]. While this results disagreed with Al-Abbassi *et al*., (2005) found age group less than 15 years more effective than others [13].

In this study we found that *Vibrio cholera* was greater in female than males, this agreed with result of Al-Abbassi *et al*., (2005) in Baghdad who recorded 424 cases were males and 450 cases were female, also with Al-Shok and Baiee, 2009 in Babylon city [22]. Also with study done by Malik and Hasan (2018) did not revealed any significant differences between both of them [15].

In conclusion, infection rate of *Vibrio cholera* is still high in some Iraqi cities, high rate of infection were occurred among females and patients in age group over 15 years. The government should be develop a practical strategy to address poor water quality resulting from intermittent wars in Iraq also should be increase educational programs about causes of diarrhea in general population. Further research needs to explore the reasons behind high rate of infection in some areas.

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