

# Epidemiologic Features of Cholera Epidemic In Al Hilla City-Babylon Province-Iraq 2015

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## Abstract

**Background:** Cholera is a diarrheal disease, if untreated, leads to high morbidity and mortality. It has economic and social impact, several epidemics occurred in Iraq during the last years.

**Objective:** To describe the cholera epidemic in a person place, and time epidemiologic model

**Methodology:** This is a descriptive cross sectional study (describe the occurrence of disease in person, place, and time descriptive epidemiologic approach). Data were collected using records of patients admitted to merjan and pediatric teaching hospitals in Hilla city who were diagnosed and confirmed by stool culture (according to the central public health laboratory results) during the period of the last epidemic (from the first of August through November 2015). The duration of this study started from the beginning of February to the end of May 2016. A sample of 150 confirmed cholera cases were selected in a systematic random sample technique, the missed data of these cases were completed by phone after getting the verbal consents of patients or their families.

**Results:** This study revealed that the peak frequency incidental cholera cases was on September, and most of cholera cases occurred in Al-Tajea district. The most affected age group was (5-20), no significant difference was reported according to gender.  $p > 0.05$  most of the cases were illiterate, lived in overcrowded houses, The disease is more common in internally displaced persons and those who drink water from wells and rivers.

**Conclusion:** Cholera cases were at highest incidental rate in September and in Al-Tajea district, the most affected age group was (5-20 years), the disease was more common among illiterate people, living in overcrowded houses. Internally displaced and those who use river and well water.

**Keywords:** Epidemiologic features, cholera epidemic, AlHILLA, Babylon province, Iraq

## الخلاصة

**خلفية البحث:** مرض الهيضة هو مرض معدي يصيب الإنسان بالإسهال، إذا لم تتم معالجته بصورة صحيحة وبسرعة يؤدي إلى الموت وله تبعات اقتصادية واجتماعية. فوعات وبائية للمرض حصلت في العراق في السنوات الأخيرة.

**هدف الدراسة:** وصف وباء الكوليرا باستخدام الثالث الوبائي الشخص، الزمان المكان.

**طرائق البحث:** دراسة وصفية مقطعية باستخدام الثالث الوبائي (الشخص، المكان، الزمان).

هذه البيانات جمعت من سجلات المرضى الراقدين في مستشفى مرجان التعليمي ومستشفيات الأطفال في مدينة الحلة تم تأكيد الحالات اعتمادا على نتائج الزرع الجرثومي من مختبر الصحة العامة المركزي في بغداد. استمرت هذه الدراسة من الأول من شهر شباط 2016 الى الثلاثين من شهر أيار من نفس السنة. وتم خلالها اختيار عينه منهجية عشوائية شملت 150 حالة مؤكدة من المصابين بمرض الهيضة.

واخذ عناوين وارقام هواتف المصابين لاستكمال البيانات عبر الهاتف الجوال بعد اخذ الموافقات المهنية والأخلاقية.

**النتائج:** اعلى معدل انتشار للإصابات كانت في منطقة التاجية وأظهرت هذه الدراسة ان اعلى نسبة من الإصابات سجلت في شهر أيلول وقعت اعلى للإصابات في الفئة العمرية (5-20) سنة، لا يوجد فرق إحصائي معنوي للإصابات بين الإناث والذكور ( $p > 0.05$ ). بينت الدراسة ان الأميين هم الأكثر تعرضا لخطر هذا المرض وبشكل إحصائي يعتد به  $p < 0.05$  وقد اثبت في هذه الدراسة ان الازدحام في المنزل مرتبط بانتشار المرض حيث كان الساكنون في البيوت المزدحمة والقليلة الغرف أكثر عرضه للإصابة. وبينت هذه الدراسة ان المهجرين هم الأكثر استعدادا للإصابة بالمرض و شرب ماء النهر والإبار هو احد عوامل نقشي الوباء.

الاستنتاج: ان حالات الكوليرا كانت الأكثر في شهر أيلول في منطقة التاجية .وان الأمية والازدحام في المساكن والتهجير وشرب الماء من النهر والإبار هي عوامل مرتبطة بحدوث المرض بين سكان مدينة الحلة خلال الوباء الأخير .

الكلمات المفتاحية: السمات الوبائية , الكوليرا , الحلة , محافظة بابل , العراق

## Introduction

Cholera is an acute diarrheal disease caused by the bacterium, *vibrio cholerae*; it is an infection in the intestine that can kill even a healthy adult in a matter of hours(WHO,2016).

It is considered to be endemic in many countries and the pathogen causing cholera cannot currently be eliminated from the environment(Ali *et al*,2012)

The disease can spread by contaminated water or food leading explosive epidemics (Southwick ,2015)

Regions of the world where cholera is currently prevalent are Africa, Asia and parts of the Middle East including Iraq(Gaffga *et al*,2007).

Iraq is at risk of epidemic spreading from neighboring countries because it lies on the way of pilgrimage to Mecca and contains a number of holy Shrines. During the epidemic of 1820 when cholera first spread to Basra, there were a great number of deaths and many sectors of the city were completely depopulated (Al-Wardi A,1969)

Cholera is considered to be endemic disease in many parts of Iraq (Abdul-Shaheed 2005; Al-Shok and Baiee, 2009; AL-Naddawi and Khalid, 2009; WHO country profile, 2010; Noaman *et al*,2011; Alauadi, 2014)

The recent outbreak that occur in Iraq during August-November 2015, a total of 2,810 laboratory confirmed cases of *vibrio cholera O<sub>1</sub>* Inaba had been confirmed in Iraq at the central public health laboratory (Al-Abassi and Anema, 2015)

In Babylon 675 cholera cases were confirmed, this is the highest number of cases among other provinces in Iraq(WHO. Emergencies preparedness response,2015)

This study was conducted to describe the epidemiological feature of the last cholera epidemic in Hilla city using the person, place ,and time model.

## Methodology of Data Collection

Descriptive cross sectional study was applied to describe the disease information about cholera patients during the last epidemic ( that occurred during the year 2015) in Hilla city- Babylon province. A person, place ,and time epidemiological model was used to achieve this task in; .person (age and sex and other demographic characteristics such as living in crowded houses, level of education ,beside the behavioral characteristic of patients ,place of residence at districts and sub districts levels , and the time trend of disease occurrence by (months).A systematic random sample group of patients was selected from three referral teaching hospitals (Merjan and pediatric teaching hospitals in Al- Hilla city ) using records of patients admitted who were diagnosed and confirmed by stool culture(according to the results of central laboratory of public health in Baghdad) during the period of the cholera epidemic( from the first of August through November 2015.The duration of this study started from the beginning of February,2016 through the end of May of the same year.The inclusion criteria for cholera cases are the following

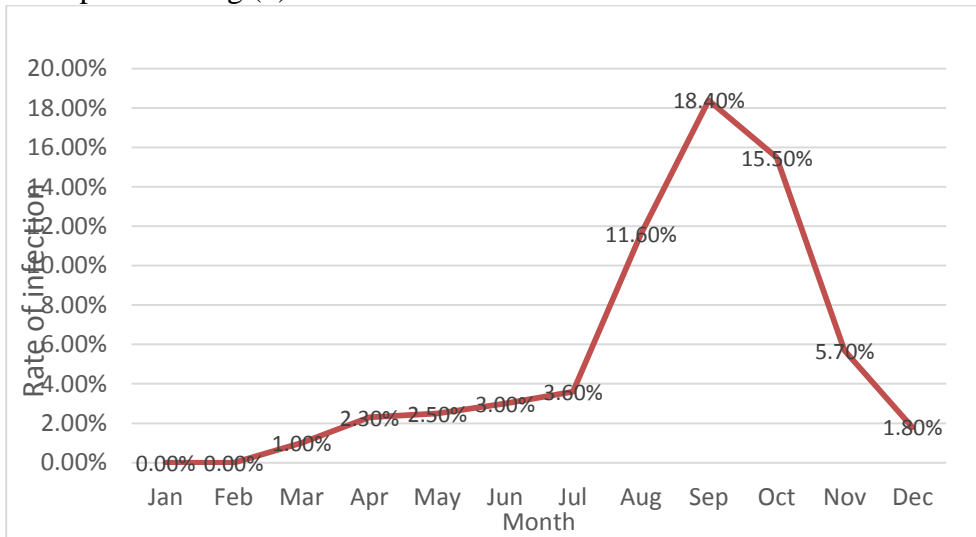
Those with signs and symptoms of cholera that confirmed by stool culture from the central public health laboratory in Baghdad. (Al-Abassi and Anema, 2015All ages both sexes, patients who are living in Hilla city were included in this study.

Statistical analysis was carried out using SPSS version 20. Categorical variables were presented as frequencies and percentages.

The Pearson's chi-square test ( $\chi^2$ ) test (goodness of fit) was used to determine the associations between variables. A p-value of  $\leq 0.05$  was considered as statistically significant.

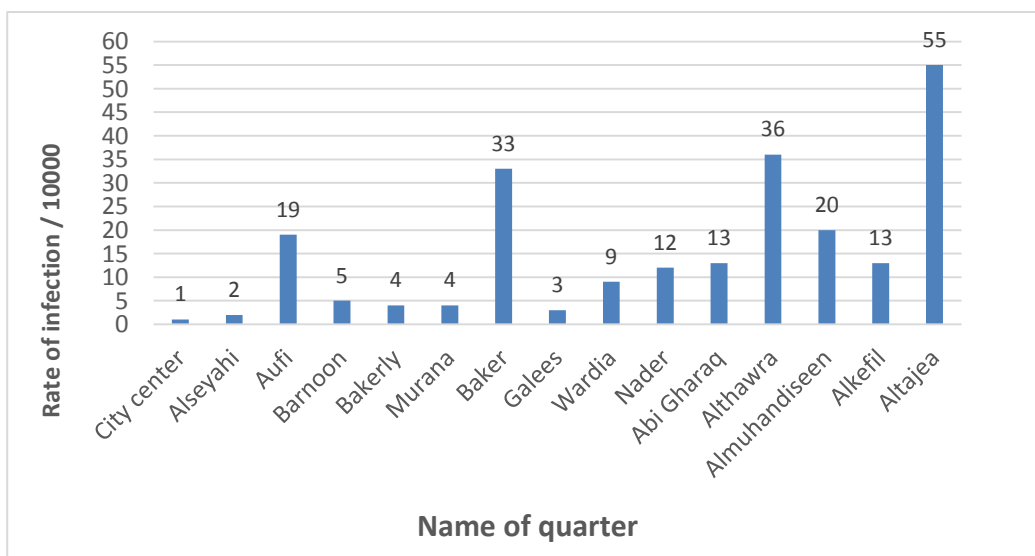
## Results

Regarding the time factor of this epidemic it was started on August and continued through December 2015. The peak frequency of incidental cholera cases was on September. Fig (1)

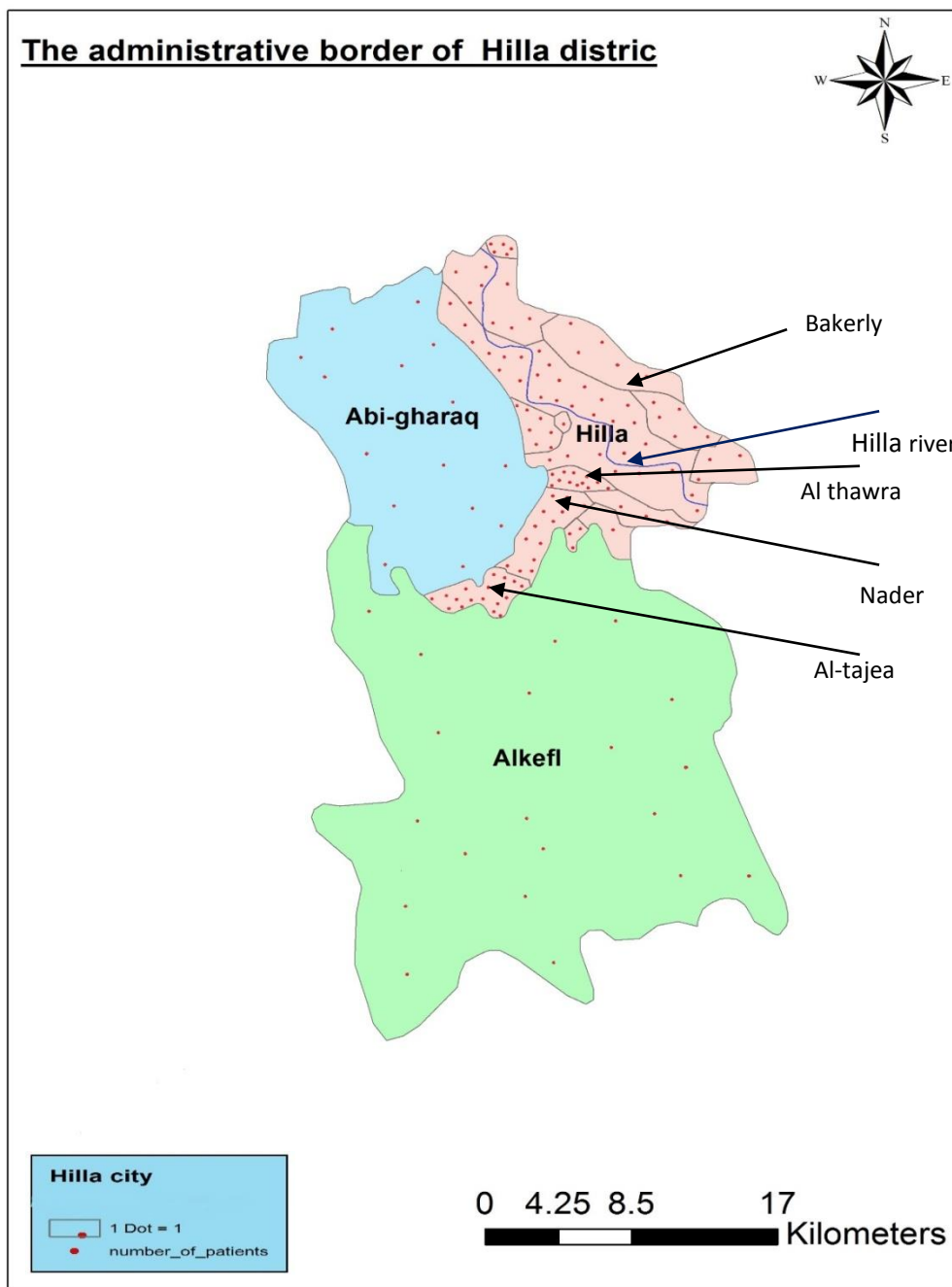


**Figure (1): Distribution of cholera cases during epidemic according to months in Al Hilla city**

Regarding the place, most of cholera cases occur in Al-Tajea with a rate of 55/10000 followed by Al-Thawra district with a rate of 36/10000. While the lowest rate was in the city center with a rate of 1/10000 as shown in Figures (2) and (3).



**Figure (2): Distribution of cholera cases rates by districts of Hilla city**



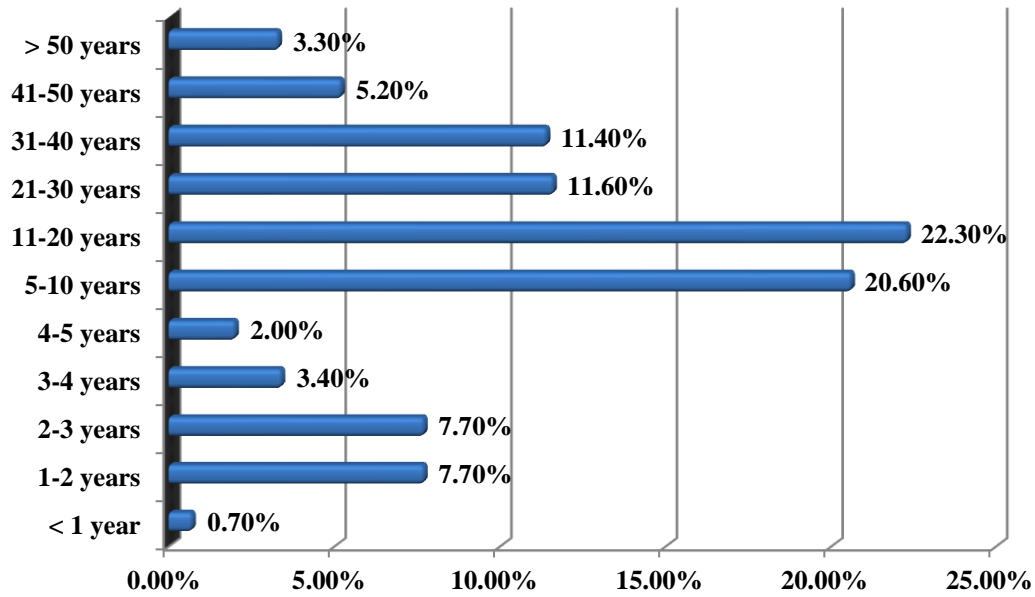


Figure (4): Distribution of cholera cases according to age

Table (1) shows that most of cholera patients live in urban area (64%). Illiterate people were highly and significantly affected by cholera  $p < 0.05$

Table (1): Demographic characteristics ( age, sex ,residence ,educational level) for cholera cases

Variable	Patients (n=150) N(%)
<b>Sex</b> Male Female	79 (52.7) 71 (47.3) $p > 0.05$ $df = 1$
<b>Residence</b> Urban area Rural area	96 (64.0) 54 (36.0) $p < 0.05$ $df = 1$
<b>Educational level</b> Child Illiterate Primary school Secondary school University/diploma	7 (4.7) 50 (33.3) 29 (19.3) 26 (17.3) 38 (25.3) $P < 0.05$ $d.f = 4$

\*p value  $\leq 0.05$  is significant

Some socioeconomic characteristic of cases are shown in table (2) where members who are illiterate appear to be more likely to have cholera than others.

Crowding families with family members  $\geq 6$  members have a significantly higher rate of cholera than non-crowded, and those live in houses  $< 3$  rooms also have a statistically significant higher rate of disease.

Displaced families members appear to be at risk of getting the disease they constituted about one third of the reported cases.

Drinking water from river and wells was highly associated risk with cholera, about one sixth of cases mentioned that they drink water from rivers or wells.

**Table (2) :Some socio-economic characteristics (crowding, family income ,displaced family and source of water supply) for cholera cases.**

Variable	Patients (n=150) N(%)
Family members $< 6$ members** $\geq 6$ members	61 (40.7) p<0.05 89 (59.3)
Family income Not enough Enough	99 (66) p<0.05 51 (34)
Displaced family Yes** No	49 (32.7) 101 (67.3) p<0.05
House rooms $< 3$ rooms** $\geq 3$ rooms	132 (88.0) p<0.05 18 (12.0)
Source of water River & Well** Tap water RO	23 (15.3) p<0.05 11 (7.) 116 (77.3)

\* p value  $\leq 0.05$  is significant.

## Discussion

This study was conducted to describe epidemiological features of the last cholera epidemic in Al Hilla city, that took place in 2015 and to identify some associated factors related to this epidemic.

Describing the occurrence or distribution of the disease epidemiologically is the first important step in prevention and control of future similar epidemics through paving the way to generating hypotheses and identifying the important preventable and modifiable risk factors (Gordis, 2015).

This study explains the time trend of cholera epidemic, The type of this epidemic is a point source epidemic showing its peak in September and disappear in December of the same year, this finding reflects, the role of environmental factors (whether) on the distribution of this disease in our city according to time factor (seasonal variation),the effect of climate on occurrence and distribution of cholera cases could be related mainly to increase temperature of water to certain degree(around 24 degree

centigrade) which is suitable for the growth of this microorganism (Louis *et al.*,2003; Vezzulli *et al.* ,2015; Semenza, 2015; Lugomela *et al.*, 2015; Esteves, 2015) and this usually leads to explosive epidemic due to highly polluted water and to increase of chances of exposure to high doses of the causative agent, this finding is similar to what had been reported by other study conducted in Iran(Moradi, 2016) while the peak epidemic in Africa occurs in rainy season(Munyuli, 2013)

This study reveals that most of cholera cases occur in poor places (districts and sub districts) of the city such as shanty towns and informal settlement places. Al-Tajea has the highest rate of cases followed by Al-Thawra district, these two districts were over crowded with poor housing, with poor environmental sanitation.

The study shows that most common cases of cholera in this epidemic occurred in the age group (5-20) years. This finding is similar to the findings of other investigator (Dickson *et al.*, 2015) in the Buea health district of Cameroon in the year 2015 who found that most of cholera cases were below 21years old while the lowest age group affected the age < 1 years, infants are immune from getting this diarrheal disease due to breast milk feeding and their infrequent chance of exposure to polluted water as compared to other age group

The finding of this work shows that there is no significant difference in frequency of getting the disease of cholera between males and females, this finding agrees with the findings of other researchers (Shultz *et al.*,2009; Rosewell *et al.*, 2013; Moradi, 2016) and disagrees with the findings of others (AL-Abbassi *et al.*,2005; Al-Shok and Baiee, 2009; Deepthi *et al.*, 2013) who reported that females were more liable to have this disease than males.

This study explains that the majority of patients are urban inhabitants, this finding is similar to the finding of a study conducted in Kirkuk province - Iraq, and to the findings of other two studies conducted outside Iraq in Iran and in Ghana (Noaman, 2011; Moradi, 2016).

Our study documented that the internally displaced people are liable to have this disease, this expected finding can be explained by the unhealthy situations they face (poor sewage disposal, inadequate safe water supply, stresses and shortage of preventive health services, this finding is similar to that reported by (Rosewell *et al.*, 2010) in Papua New Guinea in the year 2012 who proved that displaced peoples were more susceptible to cholera

The study shows that about one sixth of patients drinks water from wells and river, this finding goes with the findings of other investigators (Rosewell *et al.*,2012; Sasaki *et al.*, 2008), this reflects the important role of provision of safe and adequate water supply for prevention, control and elimination of this endemic disease in our country.

In conclusion cholera cases were at highest incidental rate in September and in Al-Tajea district, the most affected age group was(5-20years), the disease was more common among illiterate people, living in overcrowded houses, internally displaced persons and those who use river and well water as a source for drinking water.

## Recommendations

Education programs that can target poor and uneducated people should be put in place using different types of mass media in addition to enhancing the role of religious and community leaders in transmitting the healthy knowledge to protect people at risk especially the poor people.

Improving the sanitation and healthy environment is highly requested to prevent further similar future epidemics.

A multi disciplinary team work strategy (including all related sectors in the province) should be urgently started to reduce and solve this high priority public health problems.

Development and improvement of active and passive surveillance successful and sustainable program is essential to prevent and control this neglected disease in our country.

## References

- AL-Abbassi, A.M.; Ahmed, S. and AL-Hadithi T. Cholera epidemic in Baghdad during 1999: Clinical and bacteriological profile of hospitalized cases. *Eastern Mediterranean Health Journal*2005.11 (2):6-13
- Al-Abassi AR, Anema SM. The cholera epidemic in Iraq during 2015. *TOFIQ Journal of medical sciences*. 2015; 2(2): 27-41.
- 3-Alauadi RF. Frequency of *V. cholerae* in Babylon Province. *Journal of Babylon University/ Pure and Applied Science*.22(9): 2014
- Abdul-Shaheed Y. Clinical analysis of *V. cholera* cases in Babylon. *Journal of Babylon University*.2005 10 (4): 20
- Ali M., Lopez A.L., You Y., Kim Y.E., Sah B., Maskery B., Clemens J. The global burden of cholera. *Bulletin of the World Health Organization*, 2012 March; 90(3): 209–18.
- AL-Naddawi MN and Khalid ZH. A Clinical Study of Vibriosis During 1999 in Al-Mansour Children's Teaching Hospital, *The Iraqi Postgraduate Medical Journal*,8(2):148-152. 2009.
- Al-Shok MM and Baiee HA. Clinical Study on Cholera Patients in Babylon. *Medical Journal of Babylon*. 2009; 6(2): 420-3.
- Al-Wardi A. *Lamahat Ijtima'iyya min Ta'rikh al-Iraq al-Hadith*. Cholera epidemic. (Social aspects of Iraqi modern history). Baghdad, Matba'a al-Adib al- Baghdadiyya, 1969: 244–5
- Deepthi R1, Sandeep SR, Rajini M, Rajeshwari H, Shetty A. Cholera outbreak in a village in south India-Timely action saved lives. *Journal of infection and public health*, 2013 Feb 28; 6(1):35-40
- Dickson S N, Atashili J, Fon PN , Tanue EA, Ayima C, Kibu OD. Assessing the risk factors of cholera epidemic in the Buea Health District of Cameroon *BMC Public Health*. 2015; 15: 1128.
- Esteves K, Hervio-Heath D, Mosser T, Rodier C, Tournoud M-G, Jumas-Bilak E, Colwell RR, Monfort P. Rapid proliferation of *Vibrio parahaemolyticus*, *Vibrio vulnificus*, and *Vibrio cholerae* during freshwater flash floods in French Mediterranean coastal lagoons. *Applied and Environmental Microbiology* 81(21):7600 –9.
- Gaffga NH, Tauxe RV, Mintz ED. Cholera: a new homeland in Africa? *The American Journal of tropical medicine and hygiene*, 2007 Oct 1; 77(4): 705-13.
- Gordis L. *Epidemiology* , fifth edition , Elsevier,2015:230-7Patz JA, Huq A, Colwell RR. Predictability of *Vibrio cholerae* in Chesapeake Bay. *Applied Environmental Microbiology*. 2003 May;69(5):2773-85
- Lugomela C, Lyimo TJ, Namkinga LA, Moyos Goericke R, Sjoling S. convariation of cholera with climatic and environmental parameters in coastal regions of Tanzania. *Western Indian Ocean Journal and Marine sciences*. 2015:93; 101-9



- Munyuli MT, Kavuvu JM, Mulinganya G, Bwinja GM. The Potential Financial Costs of Climate Change on Health of Urban and Rural Citizens: A Case Study of *Vibrio cholerae* Infections at Bukavu Town, South Kivu Province, Eastern of Democratic Republic of Congo. *Iran J Public Health*. 2013 Jul 1;42(7):707-25
- Noaman AM., Jumaa LF., Hassan M.D. Studying the Outbreak of Cholera among children in Kirkuk Central Pediatric Hospital in 2007. *Tikrit Journal of Pure Science* Vol. 16 No. (1). 2011.
- Nsagha DS, Atashili J, Fon PN, Tanue EA, Ayima CW, Kibu OD. Assessing the risk factors of cholera epidemic in the Buea Health District of Cameroon. *BMC Public Health*. 2015 Nov 14; 15(1):1Moradi G, Rasouli MA, 18-Mohammadi P, Elahi E, Barati H. A cholera outbreak in Alborz Province, Iran: a matched case-control study. *Epidemiol Health*. 2016 May 14
- Rosewell A1, Addy B, Komnapi L, Makanda F, Ropa B, Posanai E, Dutta S, Mola G, Man WY, Zwi A, MacIntyre CR. Cholera risk factors Papua New Guinea, 2010. *BMC Infections diseases*. 2012 Nov 5;12(1):287.
- Sandeep SR, Rajini M, Rajeshwari H, Shetty A. Cholera outbreak in a village in south India-Timely action saved lives. *Journal of infection and public health*, 2013 Feb 28; 6(1):35-40
- Sasaki S, Suzuki H, Igarashi K, Tamba B, Mulenga P. Spatial analysis of risk factor of cholera outbreak for 2003-2004 in a peri-urban area of Lusaka, Zambia. *The American Journal of tropical medicine and hygiene*. 2008 Sep 1; 79(3): 414-21.
- Semenza JC. Change hydrology and global impact on water born disease. *Global climate change and Human Health: from science to practice*. 2015 oct 14:103.
- Shultz A, Omollo JO, Burke H, Qassim M, Ochieng JB, Weinberg M, Feikin DR, Breiman RF. Cholera outbreak in Kenyan refugee camp: risk factors for illness and importance of sanitation. *Am J Trop Med Hyg*. 2009 Apr;80(4):640-5
- Talavera, A., Perez, E.M. Is cholera disease associated with poverty?. *The Journal of Infection Developing Countries*. 2009; Jul 1; 3(6):408–11.
- Vezzulli L, Pezzati E, Brettar I, Höfle M, Pruzzo C. Effects of Global Warming on *Vibrio* Ecology. *Microbiology Spectrum*. 2015 Jun;3(3): 2165-2497
- World Health Organization. Cholera (2016). Available at: <http://www.who.int/entity/wer/2015/wer9040.pdf?ua=1>. ccessed March, 31/2016
- World Health Organization. Cholera (2016). Available at: <http://www.who.int/entity/wer/2015/wer9040.pdf?ua=1>. Accessed March, 31/2016.
- World Health Organization (WHO). Cholera outbreak: accessing the outbreak response and improving preparedness in cholera. *Outbreak 2004*. WHO.