

Epidemiology of Chikungunya Fever Outbreak in Western Jamaica - A Comprehensive Review

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Abstract: *In the article “Epidemiology of Chikungunya fever outbreak in Western Jamaica during July - December 2014”, Pham and their colleagues [1] from the University of Alabama, as well as Montego Bay Ministry of Health, wrote about the 2014 outbreak of CHIKV in Western Jamaica. This report aims to evaluate the study. Chikungunya Virus is a virus spread by mosquitos that causes fever - like symptoms. First discovered in Tanzania, CHIKV is transmitted from human to human by the Aedes aegypti and Aedes albopictus mosquitos, among others. Three genotypes of the virus exist, known as the West African, East - Central - South African (also known as the Indian Ocean Lineage,) and Asian genotype. The incubation period for the people who develop symptoms is typically a 3–7 - day range. Forecasting the transmission of mosquito - borne diseases is essential to implement public health services in a community and help physicians in prompt decision making. With the help of predictive analytics and machine learning algorithms it is possible to identify factors resulting in disease outbreaks, like the environmental conditions or the historical trends in reported cases, enabling timely intervention and spread of the diseases. However, for urgent situations with limited data on the infection rates, disease progression it is challenging to achieve precise and prompt predictions [2]. By analyzing the information collected from multiple sources such as demographic information, environment data, socio economic data such as sanitation and access to healthcare, public health agencies would be able to forecast the occurrence and spread of mosquito - borne diseases which in turn would enable in providing timely interventions in terms of increasing public awareness and health campaigns to mitigate the spread of diseases and minimize the impacts.*

Keywords: Chikungunya, CHIKV, Epidemic, mosquito - borne diseases, demographics, health informatics

1. Introduction

The report is a retrospective study of 609 clinically defined CHIKV cases that occurred in the Western Regional Health Authority's four parishes, in the island of Jamaica. Note that although the cases were not confirmed by lab tests, they met clinical and epidemiological criteria of the fever. The study also evaluated the severity of the disease in terms of specific CHIKV symptoms for the people with pre - existing conditions such as cardiovascular diseases (CVD).

The advantages of this retrospective cohort were quicker, cheaper, and easier can address rare diseases and will be able to identify potential risk factors (e. g., case - control studies). This study may be used as the initial study generating hypotheses and can be studied further to evaluate similar such outbreaks in different geographies of the world.

One of the limitations of this study being Retrospective it was observational in nature and relies on data of healthcare records that have already been collected. Other limitations include Inferior level of evidence and can be prone to bias. These retrospective cohorts cannot determine causation and rely only on association and some key statistics would be difficult to measure like the mortality in this case. In some cases where the outcome would be rare the retrospective cohort studies would need large sample sizes and could be difficult to gather the data.

2. Summary of Methodology - Sample and Data Collection

For this study, the team obtained patient records from the Epidemiology Unit at the WRHA and reviewed to collect limited sociodemographic information (age, sex, and address) and clinical data, including pre - existing clinical conditions. The team was able to use opensource geographic information

system QGIS and the web mapping Mango Map to capture the address of each patient and they created graphs for number of cases in each parish was also made using Microsoft Excel. Pham and team mentioned in the article that the sample used in this study was limited to the members who sought health care based on their symptoms, and they obtained the categorical variable data from the CHIKV investigation form. So, it could be possible that CHIKV are overrepresented due to the members with severe health conditions. They could not accurately evaluate severity or mortality as there was no data on disease outcome. They were unable to assess the environmental factors influencing the disease occurrence as they did not have the information on the water settlements, garbage collection etc. [1]

3. Ethical Principles

The Institutional Review Board of the University of Alabama and the Western Regional Health Authority gave ethical consent. The review boards also granted a waiver of consent, which was crucial as without it, the Ministry of Health would not have been able to gain crucial data about the outbreak. The patient records needed for the study were obtained from the WRHA's Epidemiology Unit. The team got a waiver of patient consent from the review boards. Select information, such as sociodemographic information and pre - existing conditions were obtained. The team took strict precautions to maintain confidentiality, and identification numbers instead of patient names were placed on the survey instruments. To fit in the criteria, anyone who lived in the WRHA's four parishes seen at a health facility between July and December 2014 (regardless of hospitalization), and who met the criteria of CHIKV fever were included. The Jamaican Ministry of health used the World Health Organization, South - East Asia Region's case definition of Chikungunya Virus [1]. It included an acute onset of fever of 38.5 degrees and severe

arthralgia and arthritis without any other medically explainable reason.

4. Analysis

Descriptive Analysis in addition to the case series plots were used in this analysis. Descriptive analysis is the first step in epidemiology to understanding the presence, extent, and nature of a public health problem and is useful for formulating research hypotheses. In setting variables, exposures of interest included pre - existing conditions such as CVD, arthritis are marked as “yes” if the patient has those conditions otherwise it was marked as “no” and demographic info, such as sex and age. Age was categorized into 5 groups, <2, 2 - 15, 15 - 45, 45 - 65, and ≥ 65), following the provisional guideline on standard international age classification for general purpose, under the World Health Organization section. These standardized definitions ensure similar epidemics can be treated equivalent to other cases irrespective of where or when the epidemic occurred. The only difference was the first age group, being moved from <1 to <2 to increase the sample size of the group. Sex was listed as either male or female.

The outcomes of interest were symptoms. It is comprised of fever, arthralgia, headache, skin manifestation, asthenia, myalgia, back pain, nausea, vomiting, periarticular edema, and several symptoms. Each was listed as yes or no, depending on if the patient showed signs of the symptom in question. The Symptoms were then categorized into five groups based on the number of symptoms shown.

Demographic variables such as parish and type of health facility were treated as categorical variables. Cases of CHIKV by date of review were plotted on an epidemic curve showing the distribution of the disease over time. Since the dates of onset were not recorded, the date the case was reviewed by a medical facility was used, with a predicted ~2 - 3 days in difference. The address of each patient was mapped out, and a list of cases in each parish was created in a Microsoft Excel spreadsheet. Socio - demographic factors and clinical symptoms were recorded and analyzed by calculating the number and percentage of cases. The likelihood of having a specific symptom among those with a pre - existing condition was determined by calculating the odds ratio between the two. Ratios were adjusted for age, sex, and other conditions.

Along the six - month period, the first case was reported on July 13th, 2014, by the Trelawny Health Department. A month later, St. James had two identified cases on August 11th and 12th. The number of cases then gradually rose each day and peaked on October 30th. The epidemic then slowly declined until the end of December. The Urban areas showed high number of cases. Among the four parishes, St. James had the most cases reporting a total of 264, with Hanover having just a little less, with 220 cases. They constitute around 80% of Chikungunya cases in the area. The graph below represent percentage of CHIKV cases in each parish as outlined in the article [1].

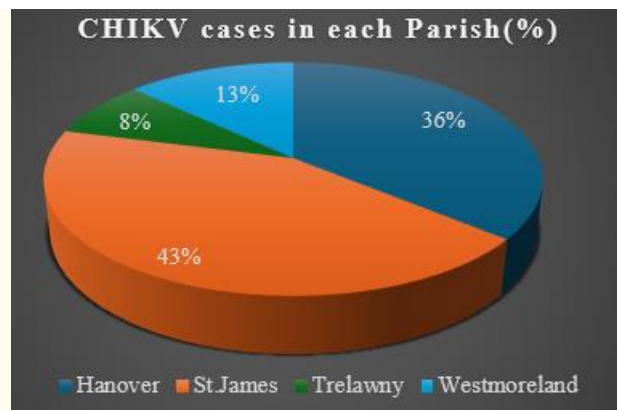


Figure 1

Percentage of CHIKV cases in four parishes.

Most cases (62.2%) were females. Most fit in the 15 - 45 age groups, and everyone visited a clinic and the frequency of the symptoms such as skin manifestation and periarticular edema are higher in females in comparison to male population. A particularly important focus of the study is the difference in symptoms among cases. Every patient had fever, and only 5.8% of them did not have arthralgia. The other symptoms appeared in around 50% or less of cases, not striking most patients. The study also analyzed the relation between the pre - existing conditions and the symptoms and observed that females with CHIKV have higher number of pre - existing conditions compared to male population. The study observed that those with arthritis as a preexisting condition were more likely to have many CHIKV symptoms after adjusting for socio demographic factors and clinical symptoms [1].

5. Conclusion

Retrospective cohorts are observational in design and sometimes referred to as historic cohorts. The study indicates that to better manage the outcome of the disease the government should create programs to monitor the young infants who are likely to show more symptoms and people with pre - existing conditions like arthritis as currently there is no specific treatment or a commercial vaccine. Because the study was to describe this population of 600+ patients, inclusion of all cases/patients was appropriate for this retrospective study design.

Despite the limited population used for this research, Pham and team's research is free of extraneous variables and data and they depended on the initial values like temperature, population, age, gender, and regions to determine rates of infection. Even though the sample that Pham and team used for this study is small, they have incorporated all the critical parameters for this epidemic like demographics, population density, regions, weather, and the symptoms and would aid in forecasting the potential peak of CHIKV with enough accuracy [1].

6. Evaluation of Research Study's Relevance to Health Informatics

Informatics plays a vital role in interdisciplinary team - based efforts to implement and increase the success of patient - centered care coordination. This study would help in Health informatics across globe in supporting clinicians and others

delivering health care and support, and in increasing effectiveness, efficacy, and efficiency. Predicting the spread of mosquito - borne disease like Chikungunya would help rapid decision support for when and how to develop an effective program to prevent the spread; however, accurate and fast predictions, becomes hard to achieve without a proper data evidence. Thus, this retrospective study is a valuable tool to aid the Informaticians. These findings would also help public health officials develop an effective program to prevent the spread of outbreaks by focusing on crowded urban cities. Thus, their study would contribute to building predictive models using only publicly available information. Informatics is relevant in preparing evidence - based outbreak management plans; providing technical support guidance to countries for the effective management of the epidemic and provide support to improve the reporting systems. Using the power of health informatics, public health agencies can improve the predictability, prevention, and control mosquito - borne diseases, such as malaria, dengue, and chikungunya etc. and help reduce the financial burden on healthcare systems and improve health outcomes.

The findings would also help the researchers in understanding how climate - based changes could be used to classify regions in the country according to epidemic risk, which could result in more targeted programs.

References

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