Archives of Immunology and Allergy

Volume 1, Issue 1, 2018, PP: 41-45

A Case Report of Chikungunya Versus Dengue During an Acute Outbreak of Dengue Fever in The Solomon Islands, 2013

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Abstract

The presence of both dengue fever and chikungunya in Pacific Island jurisdictions, as well as other developing settings, such as Southeast Asia, the Caribbean and South America, as well as sub-Saharan Africa, is increasingly common, as is illustrated by this case study from the Solomon Islands in 2013. Given such, it is increasingly important the medical and clinical officers, as well as ancillary staff, such as nursing and laboratory staff, be able to differentiate between the two conditions, given that while chikungunya can be serious, recovery is generally unremarkable; whereas, dengue fever can have serious, life-threatening complications. This case report presents a typical patient presenting during a dengue outbreak in the Solomon Islands in 2013, which was misdiagnosed as dengue fever, given the similar signs of the two diseases, but who in actuality had the first recorded case of chikungunya in the Solomon Islands. The monograph concludes by making recommendations for additional education of clinical personnel to differentiate between the two diseases for both clinical as well as epidemiological reasons.

Keywords: *dengue, chikungunya, Solomon Islands, epidemiology, outbreak, infectious diseases, laboratory diagnosis, haemorrhagic fever, tropical medicine, fevers of unknown origin*

Introduction

Historically, in the practice of tropical medicine, dengue fever and chikungunya were used interchangeably prior to the days of enhanced laboratory and immunological diagnostics techniques (Staples, et al., 2009). Not until 1952, were chikungunya and dengue fever identified as separate viral entities (World Health Organization [WHO], 2009). Still, in many developing settings where chikungunya and dengue fever are both presents, such as in the Pacific Islands environment, as well as other settings such as the Caribbean and Latin America, as well as Southeast Asia and sub-Saharan Africa, where diagnostics is often based on symptomologies versus serological diagnosis, the two may still be diagnosed interchangeably in many unintentional instances (WHO, 2009).

Both are viral illnesses with similar symptomologies and presentations, including febrile illness with headache, retro-orbital eye pain, rash, and lethargy. Both are vector-borne illnesses spread by the *Aedes aegypti* mosquito, which is present in tropical environments, which may have limited medical and diagnostic resources. It is possible for a patient to be infected with both dengue fever and chikungunya at the same time. While chikungunya is caused by the *Togaviridae alphavirus*, dengue fever is caused by *Flaviridae flavivirus* (WHO, 2009); and epidemiologically, dengue fever has a higher prevalence, as well as case fatality rates, than chikungunya in the developing settings where they are most prominently found (WHO, 2009); but chikungunya can still have lifelong consequences, such as chronic joint pain that impacts quality of life and ability to engage in activities of daily living, including maintaining a livelihood (Staples, et al., 2009).

Given such, it is increasingly important the medical and clinical officers, as well as ancillary staff, such as

nursing and laboratory staff, be able to differentiate between the two conditions, given that while chikungunya can be serious, recovery is generally unremarkable, with a small percentage of patients experiencing chronic joint pain; whereas, dengue fever can have serious, life-threatening complications.

This case report represents a typical patient presenting during a dengue outbreak in the Solomon Islands in 2013, which was misdiagnosed as dengue fever, given the similar signs of the two diseases, but who in actuality had the first recorded case of chikungunya in the Solomon Islands. Following the case report, the monograph outlines recommendations for clinical, medical and other personnel in differentiating between chikungunya and dengue fever based upon internationally recognised standards of case definition epidemiology and laboratory diagnosis available in most laboratory settings in the developing world

Medical Presentation

Regarding case presentation, there are five main areas that can be used to differentiation between chikungunya and dengue fever in terms of patient presentation, as opposed to serological diagnosis, which are of value to the clinical or medical officer working in a resource-limited environment, including (1) duration of the disease, (2) presentation of symptoms, (3) joint and muscle pain, (4) skin rashes, and (5) complications.

Duration of Disease

Chikungunya has an incubation period of 1-12 days; whereas, dengue fever has an incubation of 3-7 days following the viremic blood meal of the vector (Taraphdar, et al., 2012). Following the incubation, chikungunya has a duration of 1-2 weeks, but symptoms such as joint pain, may persist for months or even years, impacting quality of life; whereas, dengue fever has a duration of 4-7 weeks (2012).

Presentation of Symptoms

Both diseases present with fever, muscle pain, joint pain, headache, including retro-orbital eye pain, and rashes which may be difficult to identify in dark-skinned individuals (Gould, et al., 2010). The similarity of presentation is often one reason for the common difficulty in differentiating chikungunya from dengue fever clinically, particularly during and outbreak, in which case definition may be more widely relied upon as opposed to serological diagnosis, owing to limiting factors in terms of availability of laboratory facilities, as well as financial constraints.

Joint and Muscle Pain

Both chikungunya and dengue fever present with joint and muscle pain, but with key differences. Chikungunya presents primarily with joint pain in the hands and feet, with the swelling being more prominent in the mornings; whereas, dengue presents with more diffuse joint pain, but most specifically in the knees and shoulders (WHO, 2009); further, dengue may also present more commonly with pain in the back, arms and legs (Ingram, et al., 2009). However, once again, the similar presentation is such that medical officers in developing settings, who may be the single provider in a remote community during an outbreak, may be overwhelmed by patient load, and thus not able to concentrate on specific differences in presentation of muscle and joint pain; not to mention the fact that such specific differences may not be as strictly seen in a clinical setting.

Skin Rashes

Both chikungunya and dengue fever present with skin rashes, which as mentioned previously may be diagnostically unremarkable in dark-skinned patients in which it is difficult to identify the rash. However, there are some key differences. Whereas in chikungunya the rash is primarily seen on the trunk, limbs face, palms, and soles of the feet, in dengue fever the rash is usually limited to the face and limbs (Ingram, et al., 2009).

Medical Complications

Of patients presenting with a serologically-confirmed case of chikungunya, 10% will develop chronic joint pain, which as noted before is associated with disability impacting activities of daily living, including economic subsistence (WHO, 2009). And while such long-term pain is serious, chikungunya is generally not fatal (Lee, et al., 2009). Compare this against dengue fever, and in particular dengue haemorrhagic fever, which can present with life-threatening complications, such as haemodynamic shock and difficulty breathing leading to cardiopulmonary shock and death (Lee, et al., 2009; WHO, 2009) if not readily recognised and treated. Such further underscores the need for practitioners to

recognise the differences, and respond appropriately, to the different diseases which may be present in the population at the same time.

Case Presentation

NA is a 58-year-old male farmer who initially presented to a community health centre in Honiara, the capital of the Solomon Islands, complaining of fever, joint pain, and malaise, in the midst of a nationwide dengue outbreak in April 2013. NA was diagnosed by the medical officer on duty as having dengue and sent via taxi to the National Referral Hospital for further testing and treatment. NA presented to the National Referral Hospital two days later, stating that he had to return to his farm to tend his crops, as he was the only source of income for his family, and hoped that paracetamol and rest would improve his symptoms without the need to go to the hospital. However, he stated that his fever had not gone away, along with the joint and muscle pain. There were no specifics on what his fever had been at the community health centre, nor the specific diagnostic criteria used to make his diagnosis, as NA had failed to bring his referral note with him to the National Referral Hospital.

Upon presentation at the hospital, NA had a fever of 39.1 degrees Celsius. History and physical revealed a five-day history of fever, retro-orbital eye pain, and headache. The medical officer on duty in the Accident and Emergency Department at the National Referral Hospital also noted a diffuse rash on NA's trunk and face. Additionally, joint pain and swelling were noted prominently in the hands and feet, but the patient also complained of pain in his knees, although it was later learned that he had a history of osteoarthritis that would have better explained this single symptom that was not consistent with chikungunya versus dengue fever.

As noted above, all of the symptoms the patient presented with were consistent with chikungunya versus dengue fever; particularly the differences in location of the joint pain in the hands and feet (chikungunya) versus the knees and shoulders (dengue fever). Additionally, the location of the rash was significant, as NA presented with a rash on the trunk and face (chikungunya) versus the face and limbs (dengue fever). Aside from the presence of welling in the knees, which could better be explained by the history of osteoarthritis of the knees, all clinical signs pointed to chikungunya. Yet, the medical officer on duty concurred with the diagnosis of dengue fever given at the community health centre, and admitted NA to a temporary holding unit for laboratory testing and treatment.

Whilst in retrospect it may seem that the medical officer had missed key clues in the diagnosis, it must be remembered that the medical officer was working in the midst of an outbreak, in which large numbers of patients were presenting to the National Referral Hospital, and the medical officer on duty was a recent medical graduate who was still completing his training internship year, and may not have had significant exposure to tropical medicine and differential diagnosis of fevers of unknown origin.

Management and Outcome

Upon admission to a temporary holding unit created in response to the dengue outbreak, clinical laboratory data obtained on NA showed lymphocytopenia, but no significant neutropenia, thrombocytopenia, and no hemoconcentration. In terms of diagnostic differences between chikungunya and dengue fever, the above results were consistent with the laboratory total blood count (TBC) results that would be expected for a chikungunya patient; versus a dengue patient in which there would be pronounced neutropenia, thrombocytopenia, and hemoconcentration, and lesser levels of lymphopenia (Hochedez, et al., 2008; Lee, et al., 2008). These differences were not identified by either the laboratory personnel, nor the medical officer who continued to follow the patient during his stay in the temporary unit created to hold, diagnosis, and provide palliative treatment to patients diagnosed with dengue in the midst of the outbreak; and hence, the diagnosis of dengue persisted.

It should be noted that at this point in the outbreak, approaching week six since the initial epidemic declaration was made, and with the epidemiological curve suggesting that the outbreak was resolving, serological diagnosis was no longer being made for several reasons. First, it is not uncommon in an established outbreak to rely on case definitions as the outbreak draws to a close; and second, because rapid diagnostic testing was no longer available locally due to financial constraints, and overseas testing was deemed too expensive or onerous at this point in the epidemiological management of the outbreak. Rather,

medical personnel were relying on case presentation, and locally available laboratory testing in the form of TBC's.

The patient received symptomatic care, including rehydration and pain relief. NA was discharged later that day with oral rehydration solution, paracetamol, and instructions to return to the health centre if the fever did not resolve in the next 2-3 days. Platelet transfusion was not considered.

The following day, routine quality assurance review of the TBC and patient history by an infectious disease epidemiologist assigned to assist in the dengue outbreak, first raised the question as to whether NA's presentation and laboratory findings were not consistent with dengue, but rather chikungunya, which at the time was not present in the Solomon Islands. NA's place of residence was identified from his chart, and he was requested through the community public health nursing team to return to the National Referral Hospital. During his follow-up visit, which occurred three days after his discharge, NA's fever was found to have resolved, along with his retro-orbital pain and rash; however, he continued to complain of knee joint pain (again, more closely aligned with his previous history of osteoarthritis of the knee), as well as pain in his hand and feet; all of which, when taken with his previous history and physical, along with the TBC, suggested that NA was actually suffering from chikungunya and not dengue fever.

Blood samples were obtained and sent to a public health laboratory in Australia, which confirmed NA as the first case of chikungunya diagnosed using serology in the Solomon Islands, in the midst of a national dengue outbreak and emergency. NA continued to follow-up with the community health centre intermittently for both his osteoarthritis of the knee, as well as ongoing chronic pain of the feet, which was felt to be related to his chikungunya, which is consistent with the 10% of patients who develop chronic joint pain (WHO, 2009). However, he was lost to follow-up approximately two months following his diagnosis with chikungunya.

Discussion and Application

Although no specific additional treatment was provided to NA at the time of his diagnosis with chikungunya, there were significant lessons to be learned regarding future differential diagnosis between chikungunya and dengue fever. Significant diagnostic clues were missed by both the medical officers at the community health centre and the hospital; as well as by laboratory personnel, that could have led to an earlier diagnosis of chikungunya versus dengue. And although there is little difference between the symptomatic treatment of both diseases, it is important from a population-based medicine/epidemiological standpoint, as well as a clinical standpoint, that patient's like NA be accurately diagnosed. This is particularly true if the misdiagnosis were to be chikungunya versus dengue, given that dengue is much more likely to be associated with haemorrhage and high rates of mortality in its more serious forms.

Given this, it is recommended that clinicians working in environments in which chikungunya and dengue are endemic receive additional training on how to differentiate the two diseases based upon a quality history and physical that focuses on the duration of the disease, presentation of symptoms, joint and muscle pain locations, skin rash locations, and finally understanding the possible complications of each. This, taken with inexpensive, generally locally available laboratory diagnostic tests, such as the TBC, can be used to more accurately differentiate between chikungunya and dengue. Which, as mentioned above, is of significant value not only in terms of clinical treatment, but also in terms of epidemiological disease surveillance. It is recommended that simple dichotomous trees (Lee, et al., 2008; Lee, et al., 2009) be developed based upon the differences in the five presenting criteria, and that these criteria be covered in the standard history and physical of someone presenting with fever of unknown origin, along with the laboratory criteria associated with each disease that would be present in a TBC at various stages of the disease progress.

Conclusion

Chikungunya and dengue are tropical diseases of increasing importance in both the Pacific as other tropical settings globally. As the prevalence of both of these diseases continues to grow globally (WHO, 2009), it is important that medical practitioners be able to differentiate between the two in terms of diagnosis. This is particularly important given the potential life-threatening consequences of dengue fever; as well as the potential for chikungunya to develop into chronic joint paint, as well as lesser present neurological

complications, which may require patient counselling and lifestyle adaptation to meet future social and economic needs.

Given this, it is highly recommended that clinical and medical officers, as well as nursing and laboratory personnel, receive additional training on key diagnostic differences in patient presentation, as well as laboratory results which do not require specialised immunological testing, but instead rely on readily available techniques, such TBC's in concert with quality history and physical examination.

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Citation: **Dr. Brian P. Mangum, Dr. Tamara L. Mangum, Aleczander P. Mangum.** *A Case Report of Chikungunya Versus Dengue During an Acute Outbreak of Dengue Fever in The Solomon Islands, 2013. Archives of Immunology and Allergy. 2018; 1(1): 41-45.*