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RESEARCH ARTICLE

Epidemiological review of dengue fever in Yemen

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Abstract

Dengue fever is a mosquito borne disease that is spread rapidly in new governorates in Yemen in last ten years. The large scale of dengue outbreak in Alhodeidah governorate is due to the high vector circulation (*Aedes aegypti*), poor infrastructure, and excesses of raining period more than other cities in Yemen, ineffective vector and infectious disease surveillance and low level of education are the main reason for the increase incidence rate of dengue fever in Yemen. Current review was focused on highlighting the development spreading and the current status of the dengue fever disease in Yemen. In conclusion, dengue fever was spreading in different region in Yemen with high distribution in Alhodeidah, Taiz, Aden and Al-Mukalla. More vector controlling and preventive measurement and management should be considered.

INTRODUCTION

Dengue fever one of the most arboviral infections for human in recent decade. Recently increase of distribution and incidence of dengue fever (DF) and dengue hemorrhagic (DEH) and it's emerging in new countries is not fully understood(1).this disease is a mosquito-borne infection in which it doesn't transmitted directly from human to human (2). It is an important disease in areas where mosquitoes breed under optimal conditions (3). There are three form of the dengue disease, dengue fever (DF), dengue hemorrhagic fever (DHF) or dengue shock syndrome (DSS)(1). The classical dengue fever is mild from and usually patient recovered shortly after illness. However, I some cases (DF) can lead to DHF or DSS which can be life threatening(4). The mosquito is the main transmitted vector of dengue virus to humans through the bites of infected female of *Aedes aegypti* and *Aedes albopictus*. The transmission of dengue Virus has increased dramatically in recent years and spreading in urban and semi-urban endemic settings, especially in Americas, Western Pacific, South and South-east Asia and the (5).Infection with one serotype give memory immunity for the same serotype long life but not for the other serotypes. (6).

ETIOLOGY:

Dengue virus was first isolated in 1943(7). It is RNA virus belong to *Flaviviridae* family which cause the most common arboviral, vector born disease(8). There are four closely dengue virus serotypes, dengue virus-1 to dengue virus-4. The closest antigenic relationship exists between type1 and 4. Dengue virus has four serotypes dengue virus from 1-4. Sequencing of dengue viral RNA has further verified strain variation within a serotype allowing viruses to be classified into genetically distinct groups within serotypes called genotypes (9). Based on the analysis of the envelope protein there are at least four genotypes (1 to 4) (3).

DISTRIBUTION:

Dengue virus was widely distributed in Asia, Pacific ,Medial East, Central and South America and Africa(10). In Yemen, dengue was first recorded in pandemic outbreak reported by Hirsch between 1870 and 1873(11).After that the pandemic dengue fever occur in Alhodeidah governorate in 1954 which affected 98% from the population and in 1984 traveler returned from Yemen confirmed to have dengue antibodies(12). Dengue has been a significant health problem especially in the coastal areas. Dengue fever was first reported and confirmed in Shabwah governorate and it widely distributed in nautical governorates as see in figure2(13, 14).Aden, Alhodeidah and Almukalla is the highest governorate affected by dengue fever in 2014(14).however the highest governorate was Aden, Alhodeidah and Taiz as in figure Dengue virus serotype 3 was isolated from an outbreak of viral hemorrhagic fever in Al-Mukalla city Hadaramut governorate republic of Yemen. This study recommended using IgM and NS1-antigen tests to confirm acute dengue particularly under the adverse field conditions, where proper storage and transportation of specimens are missing, which substantially reduce the sensitivity of the RT-PCR for detecting dengue RNA(15). Another study, conducted in Taiz governorate, showed high prevalence of Pulmonary manifestations among the complicated cases of dengue fever either Dengue hemorrhagic fever or dengue shock syndrome (2). Moreover DENV 1 was confirmed in Alhodeidah governorate whereas DENV 3 was confirmed in Hadramout governorate in 2010 outbreak (16, 17).all three dengue viral serortyp1-3 was confirmed to be in Yemen by using PCR but Dengue virus type 2 was the predominant serotype in Yemen(18).

In Yemen, climate variability and change combined with demographic and socioeconomic factors (such as population increase social instability and poverty) may all aggravate the problem posed by dengue. Over the last decade, the temperatures and rainfall on the Arabian Peninsula have been unusually high, with severe floods in Yemen, Saudi Arabia and Oman. Such conditions are not only likely to favor mosquito breeding perhaps explaining the epidemics and high incidences of dengue fever recently observed in Yemen (19, 20) but may also allow mosquito vectors to move up to altitudes that were once too cool for their survival(21). Al-hodeidah governorate was the epidemic foci for several vector-borne outbreaks in the past including dengue fever in 2005 and 2012 (22).

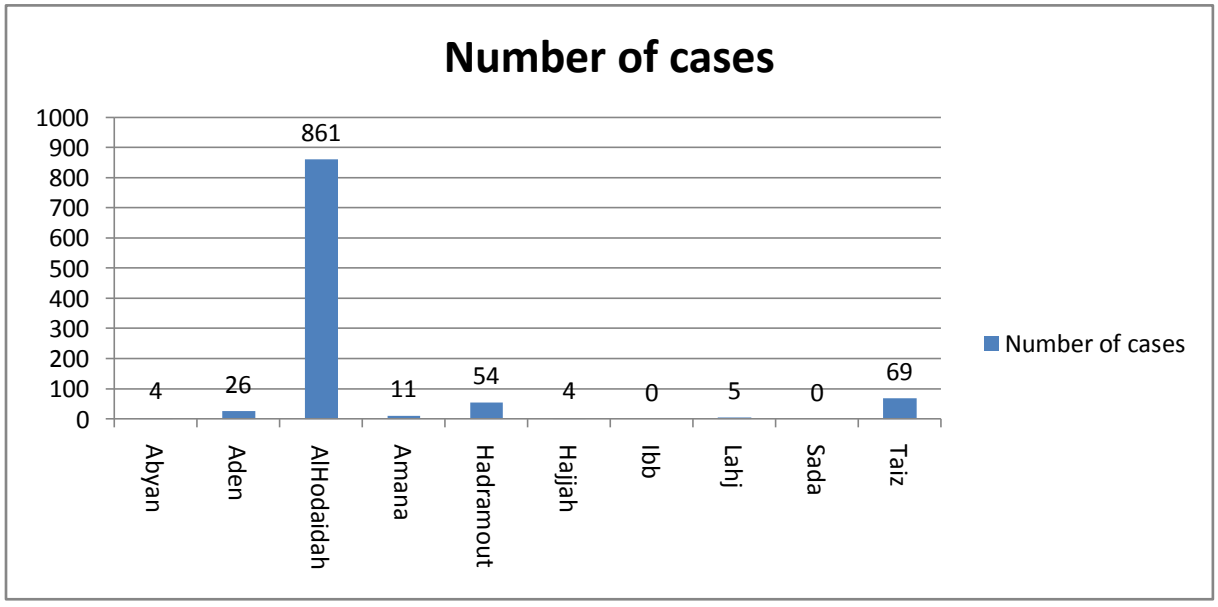

Figure 1 Distribution of dengue fever by governorate from week (1-24) in 2014 (14).

RESERVOIR:

Human/ Mosquitoes, *Aedes aegypti and Ae. Albopictus*, cycle were the main reservoir for the Dengue virus whereas the Zoonotic cycle includes monkey/ mosquito *Aedes* species like *Ae. Scutellaris*, *Ae. Nivaeus* and *Ae. furcifer-taylori* complex in Polynesia, Malaysia and Africa respectively are involve to monkey/mosquito transmission(23).Non human primate don't seem to represent a significant reservoir of Dengue virus(24).

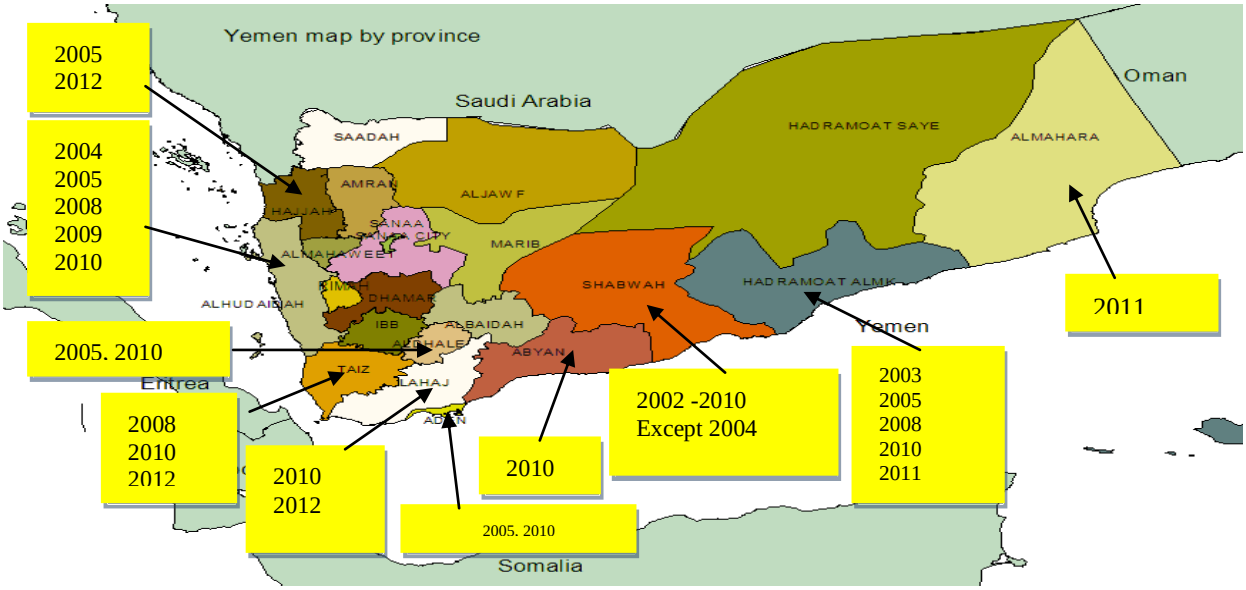

Figure 3 Reported Dengue/CHIK Outbreaks in Yemen (13, 14).

INCUBATION PERIOD AND PERIOD COMMUNICABILITY:

Incubation period ranged from 3-14 days. The mosquito will be able to transmitted the disease after 8-18days after getting viremic blood meal and remain so for life(23).

CLINICAL SIGNS:

The dengue fever has three clinical manifestation forms. The mild form is acute febrile illness which characterized by headache, retro-ocular pain, body aches and arthralgia in more than 90% of apparent cases, combined by nausea or vomiting, amaculopapular rash, fever remitting, relapse, pain in the muscles and bones so it called '*break bone fever'(*25*)*. DHF/DSS forms of dengue fever are, the more severe forms, but it is less common dengue fever. It is characterized by fever, thrombocytopenia<$20x10^3$, hemorrhagic manifestation and evidence of increased vascular permeability with leakage of intravascular fluid into the intestinal space (26-28). The DHF forms mainly affected the children and is occasionally accompanied by a shock syndrome with case fatality 50% (25). The sever forms of dengue infection usually showed after infection by more than one virus serotypes ,e.g. serotype 1 and serotype 2, which characterized by fever vomiting enlarged of liver petechiae persist for 5-10days (25, 29). All three forms of dengue fever have been reported in Yemen with most common manifestation as shown in figure 3 (15, 16).

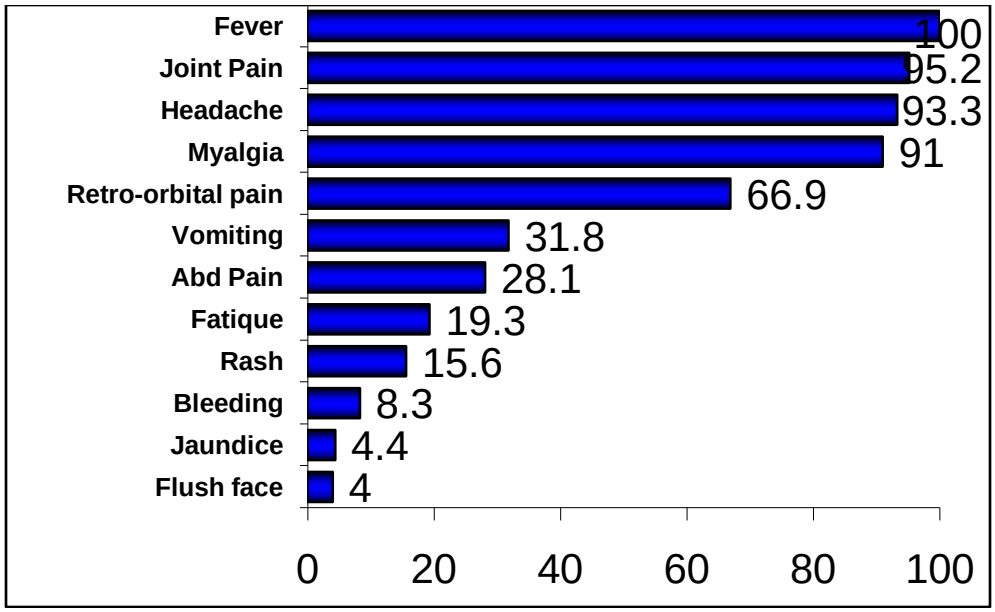

Figure 3 Most symptoms recorded in suspected dengue fever in Yemen (14).

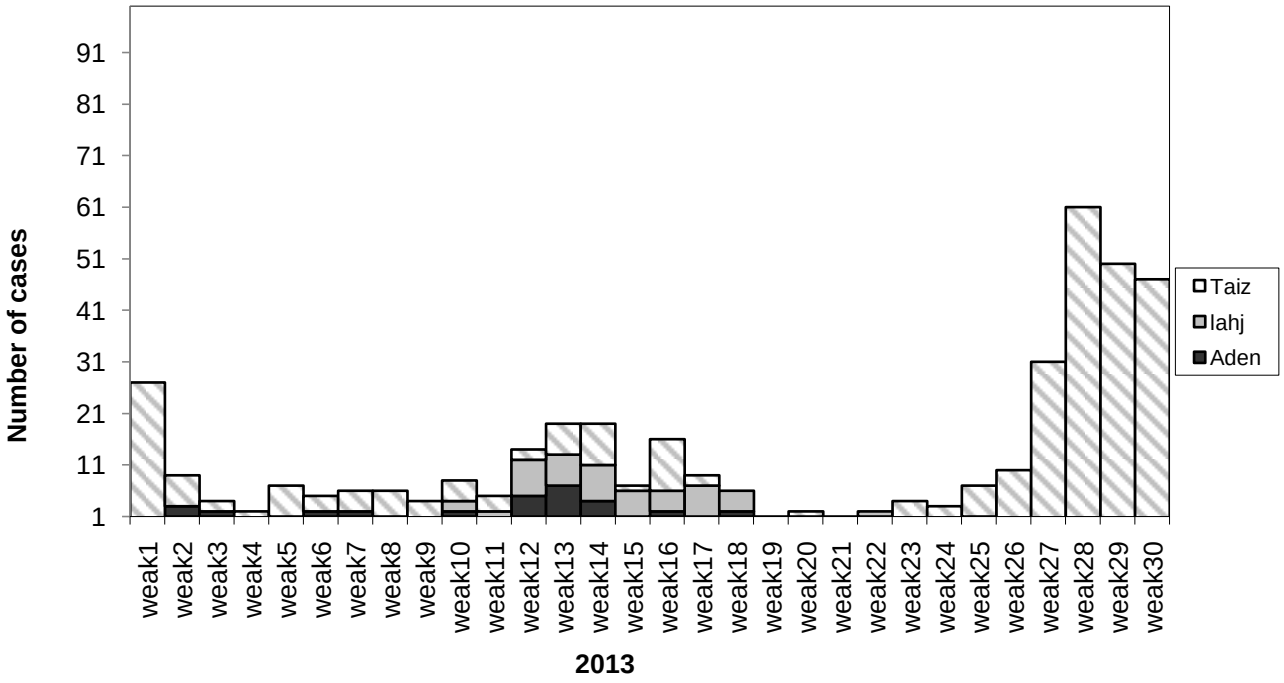

Figure 2 Epidemiological curve of dengue fever in first 30 weeks of 2013 at Taiz, lahj and Aden governorates (14).

DIAGNOSIS:

Diagnosis of dengue fever is mainly depending on clinical symptoms, hypovolumenemi and isolation of the virus(30). Diagnosis of DENV stereotyping was depending on IgG or IgM ELIZA technique. Recently RT-PCR was used to diagnosis the four serotypes of DENV in connection with group specific primers(31, 32).One step RT-PCR was also developed for rapid typing of different dengue virus serotypes(4). In Yemen diagnosis still based on IgM ELIZA. Blood specimens were tested according to WHO (1997) guideline for confirmation using IgG and IgM-ELISA at Yemeni Ministry of Public Health and Population (MOPHP) and other samples was Sent to Thai National Institute of Health or tested at U.S.NAMRU-3 for confirming stereotypes and genotype by RT-PCR(16, 33). DENV 1 was confirmed in 2011 outbreak in Alhodeidah governorate which showed 4(2.9%) from suspected cases (34) .The differential diagnosis from other likely febrile diseases should be considered and differentiated depending on clinical sing and local prevalence of that diseases which including other arboviral diseases, measles, rubella, adenovirus infection, enterovirus infection, viral hepatitis, typhoid, malaria, leptospirosis and bacteria sepsis(35).

TREATMENT:

There is no specific antiviral therapy used for treatment of dengue fever. However, replacement of fluid, blood transfusion and plasma protein transfusion are essential for treatment of DHF and DSS cases with continuous testing of electrolytic(30).

CONTROL AND PREVENTION:

The general strategy for control dengue fever is a vector control which including physical controlling by elimination of specific breeding area of *Aedes spp*., landscape management and continuous surveillance risk area(36). Biological control strategy was also used to control *Aedes aegypti* like using carnivorous fish (*Gambusia affinis*) and personal protection methods like covering skin with clothes at dusk and repellant(30, 36, 37).Chemical controlling of mosquitoes like insecticide and larvicides is useful in outbreak to reduce incidence rate of vector borne diseases(38).treated bed net was used also for controlling of mosquitoes which including 2% permethrin incorporated into polyethylene fibers of bed net which showed effectiveness in reduction of mosquito population in Haiti (39).Surveillance using remote sensing technique and satellite mapping are useful methods for prevent of dengue fever outbreak's before it happened(40). The vaccine with tetravalent attenuated live virus is the prophylaxis methods for dengue fever. This vaccine is inducing neutralizing antibody for all four serotypes. However this vaccine doesn't sufficiently tested(30).Community health education for prevention and controlling procedure of dengue fever has significant impact to reduce risk of dengue fever disease(41).

CONCLUSION:

Dengue fever was spreading in new governorates in Yemen in last ten years. The large scale of dengue outbreak in Alhodeidah governorate is due to the high vector circulation (*Aedes aegypti*), poor infrastructure, and excesses of raining period more than other cities in Yemen, ineffective vector and infectious disease surveillance and low level of education are the main reason for the increase incidence rate of dengue fever in Yemen. In conclusion, dengue fever was spreading in different region in Yemen with high distribution in Al-Hodeidah, Taiz, Aden and Al-Mukalla. More vector controlling and preventive measurement and management should be considered. Sentinel-based surveillance systems for acute febrile illness should be enhanced in areas with high incidence of malaria and dengue fever. More genotyping, biodiversity, molecular characterization and climate changing studies needed to be conducted on dengue virus in Yemen.

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REFERENCES:

1. Gubler DJ. Dengue and dengue hemorrhagic fever. Clinical microbiology reviews 1998;11(3):480-496.
2. Mohamed NA, El-Raoof EA, Ibraheem HA. Respiratory manifestations of dengue fever in Taiz-Yemen. In; 2013. p. 319-323.
3. Fatima Z, Idrees M, Bajwa MA, Tahir Z, Ullah O, Zia MQ, et al. Serotype and genotype analysis of dengue virus by sequencing followed by phylogenetic analysis using samples from three mini outbreaks-2007-2009 in Pakistan. BMC microbiology 2011;11(1):200.
4. Harris E, Roberts TG, Smith L, Selle J, Kramer LD, Valle S, et al. Typing of dengue viruses in clinical specimens and mosquitoes by single-tube multiplex reverse transcriptase PCR. Journal of clinical microbiology 1998;36(9):2634-2639.
5. Koo C, Nasir A, Hapuarachchi HC, Lee K-S, Hasan Z, Ng L-C, et al. Evolution and heterogeneity of multiple serotypes of Dengue virus in Pakistan, 2006â€“2011. Virology journal 2013;10(1):275.
6. Kurane I, Takasaki T. Dengue fever and dengue haemorrhagic fever: challenges of controlling an enemy still at large. Reviews in medical virology 2001;11(5):301-311.
7. Messina JP, Brady OJ, Scott TW, Zou C, Pigott DM, Duda KA, et al. Global spread of dengue virus types: mapping the 70 year history. Trends in Microbiology 2014;22(3):138-146.
8. Bain SV. Dengue Fever: An Emerging Infectious Disease in The Bahamas. International Journal of Bahamian Studies 2011;17(2).
9. Holmes EC, Burch SS. The causes and consequences of genetic variation in dengue virus. Trends in microbiology 2000;8(2):74-77.
10. Pourrut X, NkoghÃ© D, Gonzalez J-P, Leroy E. No evidence of dengue virus circulation in rural Gabon. Emerging infectious diseases 2011;17(8):1568.
11. Van Kleef E, Bambrick H, and, S H. The geographic distribution of dengue fever and the potential influence of global climate change. TropIK A Reviews (TropIK A.net). In; 2011.
12. Jimenez-Lucho VE, Fisher EJ, Saravolatz LD. Dengue with hemorrhagic manifestations: an imported case from the Middle East. The American journal of tropical medicine and hygiene 1984;33(4):650-653.
13. Jaawal AA. Dengue Fever or Chikungunya Outbreak? Hodeidah Governorate-Yemen, April 2012. 1st Arab world conference on public health Dubai, UAE:4-6 April, 2013.
14. MoPHP. Reporting system of infectious diseases. . Ministry of public health and population, Republic of Yemen. 2014.
15. Madani TA, Abuelzein el TM, Al-Bar HM, Azhar EI, Kao M, Alshoeb HO, et al. Outbreak of viral hemorrhagic fever caused by dengue virus type 3 in Al-Mukalla, Yemen. BMC Infect Dis 2013;13:136.
16. Bin Ghouth AS, Amarasinghe A, Letson GW. Dengue outbreak in Hadramout, Yemen, 2010: an epidemiological perspective. Am J Trop Med Hyg 2012;86(6):1072-6.
17. Ravanini P, Huhtamo E, Hasu E, Rosa F, Costantino S, Crobu MG, et al. Imported dengue virus serotype 3, Yemen to Italy, 2010. Emerg Infect Dis 2011;17(5):929-31.
18. Giovanni RezzaComments to Author GE-S, Giovanni Faggioni, Fenicia Vescio, Ranya Al Ameri, Riccardo De Santis, Ghada Helaly, Alice Pomponi, Dalia Metwally, Massimo Fantini, Hussein Qadi, Massimo Ciccozzi, and Florigio Lista. Co-circulation of Dengue and Chikungunya Viruses, Al Hudaydah, Yemen, 2012. Emerging Infectiouse Disease 214;20.
19. Al-Mansoob M, Al-Mazzah M. The role of climate on malaria incidence rate in four governorates of Yemen. Medical Journal of Malaysia 2005;60(3):349.
20. WHO. Dengue: Guideline for Diagnosis, Treatment, Prevention and Control.Geneva. Geneva: World Health Organization

2009b.

21. Al-Mekhlafi A, Al-Mekhlafi H, Mahdy M, Azazy A, Fong M. Human malaria in the highlands of Yemen. Annals of Tropical Medicine & Parasitology 2011;105(3):187-195.
22. MoPH&P. Reporting system. Ministry of public health and population. Republic of Yemen. 2013.
23. Heymann DL. Control of communicable diseases manual. Washington, DC: American Public Health Association. 2008; 2008.

24. Zavala R, Devesa M, Loureiro CL, Pernalete JM, Henríquez A, Liprandi F, et al. Prevalence of antibodies to dengue virus, hepadnavirus and rotavirus in non-human primates. Acta CientÃfica Venezolana 2006;57(1):22-27.
25. Greenwood D, Slack RC, Barer MR, Irving WL. Medical Microbiology: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. With STUDENT CONSULT Online Access: Elsevier Health Sciences; 2012.
26. Nimmannty Ai. Clinical spectrum and management of dengue haemorrhagic fever. Southeast Asian Journal of Tropical Medicine and Public Health 1987;18(3):392-397.
27. Lye DC, Lee VJ, Sun Y, Leo YS. Lack of efficacy of prophylactic platelet transfusion for severe thrombocytopenia in adults with acute uncomplicated dengue infection. Clinical infectious diseases 2009;48(9):1262-1265.
28. Whitehead SS, Blaney JE, Durbin AP, Murphy BR. Prospects for a dengue virus vaccine. Nature Reviews Microbiology 2007;5(7):518-528.
29. Halstead SB. Pathogenesis of dengue: challenges to molecular biology. Science 1988;239(4839):476-481.
30. Krauss H, Weber A, Appel M, Enders B, Isenberg HD, Schiefer HG, et al. Zoonoses: infectious diseases transmissible from animals to humans: ASM Press Washington, DC:; 2003.
31. Drosten C, GÃ¶ttig S, Schilling S, Asper M, Panning M, Schmitz H, et al. Rapid detection and quantification of RNA of Ebola and Marburg viruses, Lassa virus, Crimean-Congo hemorrhagic fever virus, Rift Valley fever virus, dengue virus, and yellow fever virus by real-time reverse transcription-PCR. Journal of clinical microbiology 2002;40(7):2323-2330.
32. Trent DW, Chang G-J. Detection and identification of flaviviruses by reverse transcriptase polymerase chain reaction. In: Diagnosis of Human Viruses by Polymerase Chain Reaction Technology: Springer; 1992. p. 355-371.
33. WHO. Dengue haemorrhagic fever: diagnosis, treatment, prevention and control. In. 2nd edition ed. Geneva: World Health Organization; 1997.
34. Malik MR, Mnzava A, Mohareb E, Zayed A, Al Kohlani A, Thabet AAK, et al. Chikungunya outbreak in Al-Hudaydah, Yemen, 2011: Epidemiological characterization and key lessons learned for early detection and control. In; 2014.
35. Simmons CP, Farrar JJ, van Vinh Chau N, Wills B. Dengue. New England Journal of Medicine 2012;366(15):1423-1432.
36. Chadee DD, Williams FL, Kitron UD. Impact of vector control on a dengue fever outbreak in Trinidad, West Indies, in 1998. Tropical Medicine & International Health 2005;10(8):748-754.
37. Lardeux Fdr, RiviÃ¨re Fo, SÃ©chan Y, Loncke Sp. Control of the Aedes vectors of the dengue viruses and Wuchereria bancrofti: the French Polynesian experience. Annals of tropical medicine and parasitology 2002;96:S105-16.
38. Ballenger Browning KK, & Elder JPE, John P. Multi modal Aedes aegypti mosquito reduction interventions and dengue fever prevention. Tropical Medicine & International Health 2009;14(12):1542-1551.
39. Lenhart A, Orelus N, Maskill R, Alexander N, Streit T, McCall P. Insecticideâ€•treated bednets to control dengue vectors: preliminary evidence from a controlled trial in Haiti. Tropical Medicine & International Health 2008;13(1):56-67.
40. Kalluri S, Gilruth P, Rogers D, Szczur M. Surveillance of arthropod vector-borne infectious diseases using remote sensing techniques: a review. PLoS pathogens 2007;3(10):e116.
41. Khun S, Manderson L. Community and school-based health education for dengue control in rural Cambodia: a process evaluation. PLoS neglected tropical diseases 2007;1(3):e143.