Dengue in Rajasthan

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Introduction

In present scenario dengue is the most dangerous and deadly public health problem. As there is no vaccine are available for the prevention of dengue[1]. Still there is lack of early diagnosis of the disease in the early and acute phase of illness. This lack of early treatment of the patient results in the mortality of the patient suffering from the dengue. Dengue is carried by a mosquito vector *Aedes Ageptie* and *Aedes Albopictus*[2]. Dengue is arboviral disease and caused by the virus which belong to the family *Flaviviridae*. Viruses in this family are enveloped virus with the positive single standard RNA. The genome of dengue virus (DENV) and its four types (DENV-1, DENV-2, DENV-3 and DENV-4) is of 11kb in length and consist of three structural proteins (nucleocapsid or core protein(C), membrane protein (M) and envelop protein (M)) and seven non structural proteins (NS1, NS2A, NS2B, NS3, NS4A, NS4B, NS5). The worse form of dengue can also result in DHF/DSS which can even result in the death of the patient. Dengue do not transmit through any outside sources in the area but the dengue virus keeps on circulating in the main stream by maintaining its virus in the body of the host and then from the same infected host to the mosquitoes which are breeding in the same household of the patient suffering from the dengue or mosquitoes may breed and come from the neighboring area where the fresh water is getting continuously logged out and mosquitoes can easily breed and lay egg in such areas. As it is already reported that the position of dengue is becoming serious day by day as the disease is transferring through the trans-overian transfer into the next generation[3]. Through this mechanism mosquito will be maintaining dengue virus in the next generation of mosquitoes. Dengue is becoming deadly day by day, as there is lack of diagnostic facilities in the hospitals and the more over there is lack of early diagnosis of dengue is available which could be helpful.

History of virus

According to the Chinese encyclopedia the dengue fever was reported during the Chinese dynasty of Chin during 265 to 420 AD. That time the disease was named as the “water poison” and people at that time think that the disease was associated with the water and the flying insects over the water which causes the disease of “ water poison”. And slowly, slowly this disease which was considered as the water poison in that era spread all over the places geographically[4,5,6.]Later this disease came to known as dengue- like illness and the distribution of this diseases was observed all over the world. And, by the end of that era almost total population of the world was living under the threat of dengue.

Distribution

According to W.H.O estimation dengue has infected about 50 million people around the globe. In India according to NVBDCP (National Vector Born Disease Control Program) since 2009 dengue is observed in 35 states of a country such as Assam, Bihar, Rajasthan, Tamil Nadu, Andhra Pradesh, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Kerala, Utter Pradesh, Tripura, Delhi etc. Dengue has out reached its extreme limits where the mortality rate has increased sudden. Places like Delhi where situation of dengue is critical and dengue cases are often seen every year. In 2015, the number of dengue cases according to NVBDCP data in the month of September 2015, there were 5982 cases of dengue and 17 deaths were observed. Whereas this data has been raised in the month of October 2015.The total number of dengue cases in Delhi were 15730 and 38 deaths were reported[6] which is dengue outbreak worse in last 20 years. According to National Vector Born Disease Control Program during 1996 a severe outbreak of dengue had occurred in Delhi wherein about 10252 cases and 423 deaths were reported. (Reference- Indian express- See more at: http://indianexpress.com/article/cities/delhi/with-10683-cases-in-delhi-2015-dengue-outbreak-worst-in-last-20-years/#sthash.vnpALz6F.dpuf)

Distribution in Rajasthan

The state of Rajasthan has an area of 342,239 sq. km. and a population of 56.51 million. There are 33 districts, 237 blocks and 41353 villages. The State has population density of 165 per sq. km. (as against the national average of 312). The decadal growth rate of the state is 28.41% (against 21.54% for the country) and the population of the state continues to grow at a much faster rate than the national rate (reference: National Health Mission).

Reference-http://nrhmrajasthan.nic.in/ (24/11/2015)

Though, Rajasthan is arid region geographically still dengue cases are observed in a regular manner. Dengue is observed in Rajasthan because of the common practice of the people living here. People living here use to collect the rain water for the drinking purpose as there is scarcity

of drinking water. So to get drinking water easily they have built the practice to store drinking water in the pots and takas which are the best place for the mosquitoes to breed.

In **2009** there were 1389 dengue cases and 18 deaths i.e.1.29%, in **2010**, 1823 dengue cases and 9 deaths i.e 0.49%, in **2011**, 1072 dengue cases and 4 deaths i.e. 0.37%, in **2012**, 1295 dengue cases and10 deaths i.e 0.77%, in **2013**, 4413 dengue cases and 10 deaths i.e. 0.22%, in **2014**, 1243 dengue cases and 7 deaths i.e. 0.56% and in **2015** 2376 suffered from dengue and 5 deaths i.e. 0.21% were observed. (Reference- NVBDCP). And if we take out the percentages of these dengue cases and deaths caused by dengue we get that

Out of the total population of the state 1% of the population is suffering from dengue and dengue is the main reason of the deaths.

Year	**Number of Dengue cases**	**Number of deaths**	**Percentage**
2009	1389	18	1.29%
2010	1823	9	0.49%
2011	1072	4	0.37%
2012	1295	10	0.77%
2013	4413	10	0.22%
2014	1243	7	0.56%
2015	2376	5	0.21%

If we try to take out the mean of the number of cases of dengue from 2009 to 2015 the mean comes out to be 1944.44 which depicts that out of total population of the state of Rajasthan around 2000 person get suffered from dengue every year.

1389+1823+1072+1298+4413+1243+2376/7=**1944.42**(mean)

approximately 2000 persons every year

And if we try to take out the mean of the number of deaths occurred by dengue we will see that about 9 people died due to dengue in Rajasthan every year.

18+9+4+10+10+7+5/7=**9**

This depicts that in every year around 2000 people get suffered from dengue and out of these 2000 people, 9 die due to dengue which shows 0.45% mortality every year is contributed due to dengue or approximately 1% death every year.

These number of dengue cases will be increased in the coming years as dengue is increasing its periphery day by day. And it can be reduced by developing new diagnostic tools which can

detect the dengue virus very early or in the acute phase with the high specificity and accuracy in no time.

Diagnostic Methods

The dengue fever is divided into two phases of illness i.e. primary phase and the secondary phase of illness. During illness the patient shows the clinically symptoms such high fever, headache, vomiting, nausea, loss of appetite etc.

In the primary infection of the dengue can be determined by the low titre of the antibodies in the blood serum. During the primary infection the first antibody that appears is IgM antibody. And anti dengue IgG at very low concentration can be detected in the blood serum after the first week of the illness by dengue virus[5].

In secondary infection the titre of antibodies is very high in the blood serum of the dengue patient. The concentration of IgM reduce in the patient blood serum and test for anti dengue IgM is observed false during the secondary infection of dengue.

There are different serological diagnostic methods are used and practiced in the hospitals and health care units. These serological methods such as NS1 strip test, ELISA (Enzyme- linked immunosorbent assay) test, HA-HI (Haem-Agglutination Haem-Inhibition) test, and various other tests for detection of dengue virus are like cell cuture method for dengue isolated virus in mosquito cell line C6/36 cell line which is a cloned from *Aedes Albopictus* , Nuclic acid detection by Real-Time PCR etc are present for the detection of dengue virus which is used for the detection of virus in the blood serum of the patient.

Serological methods

Hemagglutination-inhibition test (HI): HI was a standard method to diagnosis of dengue virus. This method was sensitive and was easy to perform as this method can detect the antibodies during primary and secondary infection of dengue virus. During primary infection i.e during acute phase HA-HI test can detect the antibodies in the 3 to 5 days of infection where the titre of the antibodies in the serum is very low or above 1: 10. In the case of secondary infection when the titre of antibodies is very high in the serum sample this test can easily detect the dengue infection during the convalescent phase. The disadvantage or the limitation of this method is that this method is its specificity and inability to identify the serotype of the virus[7,8].

Complement Fixation test (CF): This test is usually not performed as it is difficult test to perform. To use this test in practice it required lot of trained and skilled practitioner who can perform this test easily. Complement fixation test is basically based on a complement used by the antigen-antibody reaction.

Neutralization test (NT): Neutralization reaction test is the most sensitive and specific serological test which could be used for the detection of dengue. But this method had some disadvantage like high cost and more time to perform the method with the skilled technique.

MAC-ELISA- This method uses dengue specific antigens for capturing or detecting the dengue specific antibodies from the patient blood serum. The limitation of MAC-ELISA is that the antigens of dengue sometimes captures some other antibodies in place of dengue specific antibodies which are circulating around the antigen of dengue and due to this cross reactivity is observed[5].

IgG-ELISA- This method is uses the same antigens as the MAC-ELISA to detect the dengue virus. This method is also used for the detection of dengue virus in the blood serum of patient suffering from dengue fever.

Molecular Methods- Molecular diagnosis has arised as the main method for the diagnosis of dengue fever in the detection of the dengue virus. The PCR based technique is the most widely based technique used as the detection of dengue. The molecular technique such as the RT-PCR and Reverse Transcriptase method are come across the diagnosis of dengue. Various types of PCR have been also used for the detection of dengue. The product amplified in the PCR (Polymerease Chain Reaction) is then separated by the technique known as gel electrophoresis.

In the real time PCR the viral RNA which is separated and collected is then run in the Real Time-PCR and when this product is run completely it will show the graphs which will depict the dengue virus presence or absence in the blood serum sample of the patient. This method of detection is widely used because this method is rapid and as well as the very specific against the specific antigen antibody. But still this method do not fulfill the need of early diagnosis of dengue virus during acute phase of illness.

The study shows that the new RT-LAMP in diagnosis of dengue. RT-LAMP is more specific and sensitive than RT-PCR and can detect the dengue virus in early phase as well as in the intermediary stage where NS1 antigen titre is very low[9].

Virus culture-The dengue virus can also be detected with the help of viral culture technique where we can cultivate dengue virus in three different ways:

1) Inoculation of virus in the mosquitoes.
2) Various *invitro* cultured cell line such as C6/36 cell line of mosquito cell line which is available from MCCS, Pune.
3) Injecting dengue virus in the suckling mice intracerebrally.
   These technique of viral culture is a specific technique for the specific detection of dengue virus in the chosen specimen as this method will contribute the pure form of virus in the specimen. This method of viral culture is effective but it requires more precision in handing the virus and a better environment with all biosafty in the laboratories[8]

Various other conventional methods are used for the detection of dengue, various types of kits are developed through which the viral RNA can be easily extracted, various types of purification kits for RNA has been developed so that all the impurities which get associated with the viral RNA during the extraction process and washing process can be easily removed and the pure form of RNA can be obtained.

Conclusion: It is pity to say that still people die due to biting of the small insect. But feeling pity will not give the solution of the problem. As everyone knows that dengue is a getting critical day by day. The diagnostic techniques which are present and are practiced in our health care units and hospitals are based on conventional methods of the diagnosis. All these diagnostic methods are specific and sensitive to detect the dengue virus from the serum sample of the patient very easily and with precision. But still these diagnostic methods are unable to detect the virus presence in 1 to 3 days of illness when the antibodies are not formed against the virus in the blood stream. We have still lot to do to develop the new serological techniques which can detect the dengue virus in no time at the very early and acute phase of illness. So that we can prevent the patient from the adverse effect of the illness and its severity to become DHF and DSS.

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