

## DENGUE FEVER: A MAJOR PUBLIC HEALTH CONCERN IN PAKISTAN

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Over the last few years, Pakistan has faced devastating natural calamities like earthquake, torrential rains and floods that not only destroyed the local infrastructure but also threatened the health status of general public. Due to overcrowded cities, unsafe drinking water, inadequate sanitation facilities, huge number of refugees and poor vaccination, Pakistan is prone to large epidemics of various water borne and vector borne diseases.<sup>1</sup> The most rapidly spreading, vector borne viral disease in the world is Dengue fever (DF).<sup>2</sup>

According to WHO estimates, every year about 50 million dengue viral infections occur worldwide and two fifths of the world's population is at risk of dengue infection.<sup>3</sup> In Pakistan, the first major outbreak of Dengue fever was documented in 1994-1995 in Karachi.<sup>4</sup> Since then, various studies have reported dengue epidemics from different parts of Pakistan.<sup>5-16</sup> For the last 4-5 years, situation of dengue virus transmission is getting worst in Pakistan, especially in the post monsoon period and big cities like Karachi and Lahore are under severe threats of dengue epidemics.<sup>14-16</sup> This situation has been adversely affected by the recent floods.<sup>1</sup>

Dengue fever is a viral disease, transmitted to human beings through bites of infective female mosquitoes, most commonly the mosquito *Aedes Aegypti* (yellow fever mosquito), which is found in tropical and subtropical areas. This mosquito breeds in stored stagnant waters and its common breeding sites include both indoor and outdoor water containers, animal water container, tree holes, rock holes, roof gutter, tanks, water coolers, jars, drums, barrels, pots, buckets, flower vases, plant saucers, discarded bottles, used tyres and other places where rainwater collects or is being stored.<sup>1,2</sup> *Aedes Aegypti* mosquito acquires the dengue virus by biting the infected person and after an incubation period of 8-10 days, it can transmit the virus to non-infected persons by biting and also to its offsprings through eggs.

Dengue Virus (DENV) is an enveloped, single-stranded, RNA positive-strand virus and a member of the family *Flaviviridae*, genus *flavivirus*. DENV has got four distinct serologic subtypes; DENV-1, DENV-2, DENV-3 and DENV-4.<sup>17</sup> Each serotype has got distinct genotypes or lineage showing extensive genetic variability of dengue serotypes.<sup>2</sup> This genetic variability is causing difficulty in developing a vaccine against dengue as the vaccine should be effective against all four subtypes of DENV.<sup>3</sup> Infection of one serotype of DENV results in life-long protection against the homologous serotype but does not provide complete immunity against other serotypes.<sup>18</sup> So a person recovering from one serotype of

DENV in an endemic area is likely to get infected with other serotypes and this subsequent infection can cause more severe and life threatening illness.<sup>2</sup> Out of 4 serotypes, DENV-2 and DENV-3 are associated with severe disease along with secondary dengue infections.<sup>19,20</sup> In Pakistan, although DENV-2 and DENV-3 have been isolated from several outbreaks,<sup>5,8,10</sup> combination of DENV-1 and DENV-2 has also been reported.<sup>21,22</sup>

Dengue virus has a wide spectrum of illnesses, ranging from ordinary infection, flu-like mild undifferentiated fever, and classical DF to the more severe forms like Dengue hemorrhagic fever (DHF) and Dengue shock syndrome (DSS). DF is a systemic infection, presenting with high grade fever, headache, nausea, vomiting, generalized bodyaches, skin rash, bleeding gums and epistaxis etc. Because of severe pain in bones, joints and muscles, dengue fever is also known as "breakbone fever." Patients may have dehydration, generalized maculopapular rash, lymph node enlargement, hepatosplenomegaly, altered mental and hemodynamic state. In endemic area, patients presenting with acute febrile illness and blood counts showing thrombocytopenia must be investigated for DF. Laboratory Investigations for diagnosis of dengue virus include detection of specific virus, viral antigen, genomic sequence by a nucleic acid amplification technology assay and dengue virus-specific antibodies (IgM).<sup>18</sup> Complications of dengue include multi-organ failure, disseminated intravascular coagulation, hypovolumic shock and death. Classical Dengue fever itself is not lethal but fatality rates in untreated cases of DHF may exceed 20%.<sup>3</sup>

There is no specific treatment against the dengue virus and DF. Patients are hospitalized for observation and treated conservatively with acetaminophen, intravenous & oral fluids and oxygen. Even with supportive treatment, early recognition and adequate management of complications like severe plasma leakage, severe bleeding, shock and multi-organ impairment, the fatality rate may be reduced from 20% to 1%. Although research is being carried out with some hopeful interim results, no vaccine is yet available against Dengue virus infection. Hence the vector (mosquito) control is the only way to control and prevent the dengue virus transmission. WHO has published excellent guidelines for prevention and control of Dengue,<sup>2</sup> but these guidelines are not followed in true spirit by public health and other government authorities. Few steps based on these guidelines are mentioned here, which can be of great help in combating this serious infectious disease.

Important step in this regard is to change the dengue friendly environment by specialized community-based programmes for proper solid waste disposal and improved water storage practices. Previously mentioned sources of stagnant water and potential breeding sites of *Aedes Aegypti* mosquitoes should be destroyed. Water-storage containers may be specially designed to prevent access by mosquitoes. Domestic solid waste may be properly collected in plastic bags and disposed of regularly. Street cleansing and proper drainage system should be ensured by concerned authorities especially during planning or construction of new buildings, infrastructure or any new housing scheme. Old tyres may be recycled or disposed of by proper incineration. Chemical control of vector may be achieved by mosquito larvicides or adulticides. Larvicides used for treating drinking-water are temephos and methoprene and for non-potable water containers are organophosphates (Pirimiphos-methyl, Temephos), insect growth regulators (Diflubenzuron, methoprene) and biopesticides (*Bacillus thuringiensis israelensis*). Adulticides (organophosphates and pyrethroids) are used against adult vectors mosquitoes either as residual surface treatments (hand-operated compression sprayers) or as space treatments (as cold aerosols or thermal fogs). During outbreaks, preventive measures by individuals like use of full length clothing trousers, insecticide-treated mosquito nets, household insecticide aerosol products, repellents lotions, mats or mosquito coils or other insecticide vaporizers may provide some protection. Simple household fixtures like window and door screens and air-conditioning are usually helpful in reducing mosquito bites.

Preventive strategies should also incorporate mass awareness programs on electronic and print media and inclusion of dengue related information in syllabus at schools level. For effective control of dengue we need multidimensional approach with involvement of individuals, community workers, local municipal departments, public health authorities, health & education departments, non-governmental organizations and print/electronic media. Besides that provision of health care facilities to existing sufferers of dengue virus and continuous research in vaccine development for future prevention cannot be underemphasized. We also need to produce more specialists in the field of medical entomology and particularly in vector control of diseases like dengue, malaria and leishmaniasis etc.<sup>23</sup>

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