Dengue Fever Outbreak in Kathmandu and its Management in Ayurveda

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BACKGROUND

Benjamin Rush coined the term "break-bone fever" first for dengue like illness in 1789; and then it was known as "dandy fever" and finally the term "Dengue" was commonly used after 1828. In Ayurveda, there is no direct reference and description regarding dengue; however, it can be correlated with *Dandaka Jwara* which has been described in *parishista* (appendix) of Madhava Nidan.[1] It describes symptoms of *Dandaka jwara* which is similar to dengue fever. Furthermore, it has been described that a particular species of Mosquito is the cause vector of spread of the fever. The symptoms of the fever mostly subside within a week; however, it is said to be more dangerous for the children and old people.

The origins of the word "Dengue" are not clear; however, one theory is that it is derived from the Swahili phrase *Ka-dinga-pepo*, which described the disease as being caused by an evil spirit. Dengue fever (DF) is a mosquito-borne viral disease which is caused by four serotypes of the dengue viruses namely DENV-1, DENV-2, DENV-3, and DENV-4.[2]

History: Probably, the first record of Dengue fever case is in a Chinese medical encyclopedia (265-420 AD) which referred to a "water poison" associated with flying insects. The descriptions of epidemic were mentioned in the 17th century; however, the most plausible early reports of dengue epidemic were from 1779 and 1780; when an epidemic swept Asia, Africa and North America. From that time until 1940, epidemics were infrequent. In 1960, transmission by the *Aedes* mosquitoes was confirmed, and in 1907 dengue was the second disease (after yellow fever) that was shown to be caused by a virus. Further investigations by John Burton Cleland and Joseph Franklin silver completed the basic understanding of dengue transmission. The term dengue fever came into general use only after 1828.[3,4]

Impact of Climate Change: The change of temperature of temperate and subtropical regions to tropical region by 0.06 °C/year[5] is main reason of the expansion of dengue and chikungunya cases and their vectors in the countries of the Hindu Kush Himalayan region, including Nepal.[6]

Epidemiology and distribution: DF has become a major concern of international public health estimating 10,000 deaths and 100 million symptomatic infections per year in more than 129 countries, mainly in Asia followed by Latin America and Africa.[7-10]

In Nepal, the first case of Dengue fever was reported in 2004;[11] however, the first dengue disease outbreak was reported from the lowland areas in 2006 with circulation of all four dengue serotypes.[12,13] Since 2006, Nepal has continued to experience DF outbreaks with increasing cases from the lower altitudes up to the hilly regions, with a significant impact on public health.[6,13-17] Prior to 2019, several sporadic outbreaks of DF were only reported from the lowlands, while the highland regions were considered as non-dengue endemic areas.[14,15,18] In 2019, Nepal experienced a large dengue disease outbreak with more than 17,000 reported cases from the lowland areas below 1500 m above mean sea level (amsl) to the highland areas above 1500 m amsl including some areas which were not previously reported as being dengue-endemic.[14,19] However, the majority of cases until 2018 have been reported from the lowland areas below 1500 m amsl which are densely populated[6,14,20] with known

distribution of *Aedes* vectors, i.e., *Aedes albopictus* and *Aedes aegypti*.[20,21] In 2022, 72 out of 77 districts[22] of Nepal have reported dengue fever cases; and Kathmandu valley is now facing dengue fever outbreaks with 8000 cases till 9th October, 2022.[23]

Transmission/vectors: It is mainly transmitted to humans by the mosquito vectors of *Aedes aegypti* and *Aedes albopictus*. It spreads to tropical and sub-tropical regions around the globe; mainly in urban and semi-urban areas.[24] Humans are the primary host of the Dengue virus, but it can also circulate in nonhuman primates. An infection can be acquired via a single bite of mosquito. Dengue can also be transmitted via infected blood products and through organ donation.[3,4]

Etiopathogenesis: When dengue virus infected mosquito bites a person, the virus enters the human skin together with the mosquito's saliva. It binds to and enters white blood cells and reproduces inside the cells while they move throughout the body. The white blood cells respond by producing several signaling proteins, such as interferon, cytokines, etc. which are responsible for many of the symptoms, such as the fever, the flu-like symptoms and the severe pains. Furthermore, dysfunction of the bone marrow leads to reduced numbers of platelets, which are necessary for effective blood clotting; this increases the risk of bleeding, the other major complication of dengue fever.[3,4]

Classification: World Health Organization (2009) has classified dengue fever into two groups such as uncomplicated and severe. However, the older classification is still widely in practices; which are categorized into three such as (1) Classical (Simple) Dengue Fever, (2) Dengue Haemorrhagic Fever (DHF) and (3) Dengue Shock Syndrome (DSS).[25] The classical (simple) Dengue fever is a self-limiting disease and does not kill the patient. However, the other types (i.e. DHF & DSS) can prove fatal if prompt treatment is not started. Details of clinical features are;

Classic Dengue Fever (Breakbone Fever): The incubation period is usually 4-6 days (range 3-14 days) followed by abrupt onset of fever, chills, headache, retro-orbital pain and backache. The fever is around 39-40°C and is followed by a remission phase lasting for few hours to 2 days, which is again followed by a second febrile phase of 1-2 days (Biphasic curve). Severe headache, myalgia, painful joints, metallic taste, loss of appetite, vomiting and stomach pain are the clinical manifestations. A transient generalized erythematous rash may also appear during first 24-48 hours.

The physical examination may reveal relative bradycardia and lymphadenopathy. Leucopoenia and neutropenia are observed; and thrombocytopenia may also occur due to increased platelet destruction, which contribute to bleeding.[25,26]

Dengue fever may also be associated with haemorrhage; particularly epistaxis, gastro-intestinal bleed, haematuria, menorrhagia. DHF is the more severe form of Dengue fever.

Dengue Haemorrhagic Fever: DHF is more frequently observed during the secondary dengue infection. Primary dengue infection can also result DHF in infants due to maternally attained Dengue antibodies.[27] It is defined as an acute febrile illness with minor or major bleeding, thrombocytopenia and evidence of plasma leakage & pleural & other effusions. Susceptibility to DHF falls considerably after 12 years of age. DENV-2 is more dangerous than others serotype.

Clinical Features: These are high grade fever (38-40°C) for 2-7 days, positive tourniquet test, petechiae, easily bruised skin and subcutaneous bleeding at venipuncture sites and transudation in pleural and abdominal cavities due to excessive capillary permeability.[25,26]

Dengue Shock Syndrome: It is DHF with the signs of circulatory failure, including narrow pulse pressure (30 mm of Hg), hypotension or Frank shock. The four warning signs of impending shock are: intense, sustained Abdominal pain; persistent vomiting; restlessness or lethargy and sudden change from fever to hypothermia with sweating and prostration.[25,26] Patient may recover rapidly after volume replacement but shock may recur during the period of excessive capillary permeability.

Mortality: The mortality is 1-5% without treatment and less than 1% with adequate treatment.[3,4]

Diagnosis: Early diagnosis of dengue infection is difficult, as it may mimic another viral fever. Therefore, detection of the virus by reverse transcriptase-polymerase chain reaction-based liquid hybridization (RT-PCR-LH) has been developed. Serological methods, such as enzyme-linked immunosorbent assays (ELISA), may confirm the presence of a recent or past infection, with the detection of anti-dengue antibodies. IgM antibodies are detectable ~1 week after infection and remain detectable for about 3 months. The presence of IgM is indicative of a recent DENV infection. IgG antibody levels take longer to develop and remains in the body for years. The presence of IgG is indicative of a past infection.[28]

Severity of the disease: Furthermore, an individual can be infected with dengue several times, which eventually increases the risk of severe dengue infection.[29] The viruses travel in the blood stream and that they destroy the body capacity to produce new platelets and the platelet count started falling after 2 to 3 days of the infection.

Management (Modern perspective)

At present there is no specific treatment is available in modern Medicine. There is only focus on providing the symptomatic relief, complete rest and adequate fluid intake. Treatments of Dengue fever is symptomatic with paracetamol, rest & oral rehydration therapy. In DHF the careful and repeated estimation of volume status and fluid replacement are the cornerstone in the management. Dengue patients should preferably receive SDAP (Single Donor

Apheresis Platelets) as compared to RDP (Random Donor Platelets) to lower the risk of alloimmunization, in case of severe Thrombocytopenia. Ibuphren and Aspirin are avoided to use in Dengue fever because of their action of blood thinning effect.[25,26]

Prevention: In the absence of an efficacious vaccine and specific antiviral treatment, vector prevention and control strategies have helped to minimize the increase in dengue frequency and the severity of dengue epidemics.[30] In the meantime, the vaccine development against DF has made remarkable progress in recent years, however, the vaccines are unavailable in Nepal and also do not protect against all serotypes of DF.[10,31,32]

Ayurvedic perspective of Dengue fever Management

Jwara is considered as an important and independent disease which is also commonly associated with some of the other diseases. *Jwara* occurs due to *Sharira* and *Manas* doshas. The *sharira doshas* are *vata, pitta and kapha*; and *manas doshas* are *raja* and *tama*. Since Ayurveda mentions various types of *Jwara; D*engue fever can be correlated with one of Jwara; which may be *Dandaka Jwara*. *Dandaka Jwara* isn't described separately in classical literatures such as *Samhitas*; however, *Madhava Nidana* describes *Dandaka Jwara* in its appendix chapter. Symptoms of *Dandaka Jwara* are similar with the *Vata-kaphaja* and *Sannipataj Jwara.*

Premonitory symptoms (Purvarupa): Purvarupa of Dandaka Jwara are *Angamarda* (bodyache) *Klama* (tiredness), *Aruchi* (dyspepsia) and *Avasada* (sedation).[33]

Symptoms (Rupa): *Rupa* of *Dandaka Jwara* are severe breaking pain in the bones and joints; as if someone has been beaten by stick, reddish or purpuric rashes on the body, fleeting/shifting joint pain associated with tenderness and swelling; high temperature of 103 to 105 degrees Fahrenheit may relapse within three to four days. On 8th day, it subsides on its own. Symptoms of common cold (*Pratishyaya*) like cough and sore-throat or throat pain are also present; which becomes endemic due to virulence of *kapha* and *vata* dosha.[43]

Principle of management: As there is no treatment for Dengue in modern science; Ayurveda can be very useful for providing an effective treatment and management of this disease. Ayurveda treatments particularly puts emphasis on strengthening the immune system and keeping the temperature of the body under control.

Dengue fever can be treated with *jwarahara* (anti-pyretic), *shothahara* (anti-oedematic), *vedanahara* (analgesic and anti-inflammatory), *Balya* and *rasayana* (tonic and rejuvenating agents).

Single drugs: Although there is no specific treatment for disease, Ayurveda stresses to strengthen immune system of the body and keeping a control on hyperthermia. *Amrita*[35] (*Tinospora cordifolia* (Willd.) Hook. f. and Thoms.), *Tulsi*[36] (*Ocimum sanctum* Linn.), *Sunthi*[37] (*Zingiber officinalis* Rosc.) and *Papaya*[38] (*Carica papaya* Gaertn.) are commonly available medicinal plants and used to prevent its complications by potentiating immune system so that disease gets controlled within a period of 4 to 8 days. An herbal drink made out of boiling the stems of *Guduchi* and *Tulsi* leaves precisely provides the same. *Tulsi* water is prepared by boiling 15 leaves of holy basil[39] and black pepper[40] (*Piper nigrum* Linn.) in a glass of water; and is taken at an interval of two hours for building up the immune system. As the need of the hour is to increase the blood platelet count, Ayurveda strongly prescribes *Papaya* leaves. The leaves of *Papaya* can be directly consumed after crushing them or making a juice out of them. Either way, it results in rendering good results not only for increasing platelet count but also relieves the symptoms of tiredness and nausea.[41] Akin to *Papaya*, the dried rhizomes of Goldenseal (*Hydrastis canadensis* Linn.) also have the special ability of relieving the symptoms of Dengue.[42] It can be taken by making a concoction make out of it. In general, eatables that are rich in Vitamin C such as *Amla* (*Emblica officinalis* Gaertn.), oranges, sweat lime can be taken to enhance the absorption rate of Iron.[43] *Punarnava* (*Boerhavia diffusa* Linn.) is an excellent choice to flush out the toxins through perspiration. Herbal tea made out of Fenugreek (*Trigonella foenum graecum* Linn.) and Coriander leaves (*Coriandrum indicum* Linn.); having antiviral properties[44,45] can be taken to reduce the body temperature. Neem (*Azadirachta indica* Linn.) leaves in dengue increase the platelet count, remove the toxins from the body, and strengthen the immune system.[46] Two to four leaves of *Neem* can be used to prepare an herbal brew by steeping them in a glass of water; and can be drunk the brew throughout the day.

Many single herbs like *Guduchi,* Holy Basil, dried Ginger and juice of Carica leave are the common herbs used to potentiate the immune system controlling fever in 4-8 days and to prevent its complications. Pomegranate (*Punica granatum* Linn.) juice and the juice of Carica leaves can be taken to increase the platelet count.[47]

Polyherbo-mineral formulation: *Shamshamani Vati* (*Guduchighana Vati*), *Sudarshanaghana Vati*, *Godanti Bhasma* and *Amritottara kwatha* used as per the symptoms.[47] Symptomatic treatment of Dengue can be further managed by prescribing *Arogyavardhani vati* for chronic fever,[48] *Dashmula kwatha* for back pain,[49] *Patolyadi kwatha* for fever;[50] and *Maharashnadi kwatha* for joint pain.[51]

I-immune capsules: a polyherbal combination of *Triphala*[52] (equal proportion of *Haritaki*; *Terminalia chebula*, *Bibhitaki*; *Terminalia bellirica* and *Amalaki*; *Emblica officinalis*), *Trikatu*[53] (equal proportion of *Pippali*; *Piper longum* Linn., *Marich*; *Piper nigrum* Linn. and *Sunthi*; *Zingiber officinalis* Linn.), *Guduchi satva* (*Tinospora cordifolia*), *Manjishtha*[54] (*Rubia cordifolia*), Leaves of *Papaya*[38] (*Carica papaya*), *Yashtimadhu*[55] (*Glycyrrhiza glabra*) *Ashwagandha*[56]

(*Withania somnifera*), *Haridra*[57] (*Curcuma longa* Linn.), and Wheat grass[58] (*Triticum sativum* Linn.). It improves digestion, platelets and WBC counts; enhances immunity; and expedites recovery from symptoms of Dengue. *Chyawanprasha* (Polyherbal semi-solid) Ayurvedic immune enhancing preparation can be taken. *Amrityadi Kashaya* (main ingredient as *Tinospora cordifolia*) and *Guduchi satva* (aqueous extract of *Tinospora cordifolia*) are some of the good herbal medicines advised in Dengue fever because of its anti-viral properties.

Beneficial in relieving of symptoms: In initial stage, *Shadanga pania Kashaya* contains *Musta (Cyperus rotundus* Linn.*), Parpataka (Fumaria indica* (Hausskn.) A. Parsa*), Usheera (Vetiveria zizanioides* (L.) Nash*), Chandana (Santalum album* Linn.*), Udeechya (Andropogon vetiveria* (Linn.) Urban) and *Shunthi (Zingiber officinale)* which is beneficial in the condition of dehydration of dengue patients.[59] The decoction of *trishnanigrahana dravyas* are also beneficial to improve health condition in dengue fever which are mainly prepared with *Dhamyaka (Coriandrum sativum* Linn.*), Parpataka (Fumaria indica), Kiratatikta (Swertia chirata* (Wall.) C. B. Clarke*),* and *Musta (Cyperus rotundus* Linn.*)* may be advised.[60] In case of hemorrhagic condition, *Vasa (Adhatoda vasica* Linn.*), Draksha* (*Vitis vinifera* Linn.) and *Haritaki* (*T. chebula*) along with sugar candy (*Mishri*) mixed with honey may be added in the *Kwatha* and advised to the patient.[61] Water of Cardamom (*Elletaria cardamoum* Linn.) and Clove (*Syzygium aromaticum* Linn.) and Green coconut (*Cocos nucifera* Linn.) water may be given in suitable quantity in 3-4 hours interval.[4,47]

Pathya-pathya (Do's and Don'ts): Patients are advised to take light, nutritive, warm and easily digestible foods and proper rest and sleep and maintain personal as well as environmental hygiene.

Diet: Rice gruel (Kanji), rice porridge (Khichari) cooked with ginger and lemon is useful. Tea prepared with *tulsi, ginger* and *cardamom* may be taken at two hourly intervals. Drink plenty of warm/boiled water to keep away from dehydration. Pomegranate and black grape juice can be taken to increase blood count.

Avoidance: Patients are also advised to avoid chilled foods and drinks, strenuous exertion and stressful conditions. Spicy and oily food should be strictly avoided.

The all above prescriptions are quite exhaustive and they are mentioned here that medications can be prepared with commonly available medicinal herbs. It should be borne in the mind that all these medications may not necessarily suit every individual, especially pregnant woman. Hence it is always advisable to consult your ayurvedic physician before consuming these herbs.

CONCLUSION

Dengue fever is a common public health problem which is challenging to large number of countries i.e. about 129 countries around the globe. It is also shifting rapidly to geographical region of Himalayan countries because of the global warning. As there is no effective treatment available in modern medical science to cure dengue, chances of mortality with this disease increases many-folds specially in resource limited setting of health care such as remote rural areas of the country. By understanding the Ayurveda aspect of this fever, it will be of much help in managing the patients of dengue fever. Ayurveda medicines could be a pivotal in the management of Dengue. So, understanding of Dengue fever from both the prospective i.e. Modern as well as Ayurveda is of prime importance in managing the disease more effectively.

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