SUBJECT: INCLUSION OF QUESTION ON DENGUE IN EXAMINATIONS

Please refer to this office earlier letter No. DD(M)/Dengue/Vol-II/2013, dated 15th August, 2013 on the subject cited above.

2. I am directed to state that the Department is running anti-Dengue campaign throughout the province through active participation of field formation and educational institutions. For the purpose of proper teaching and awareness on Dengue, informative material has been made part of Curriculum and textbooks. The competent authority has desired that all Boards of Intermediate & Secondary Education in Punjab and the Punjab Examination Commission may ensure setting of Question on Dengue in Examinations to be conducted under their respective Board / PEC.

3. I am therefore, further directed to request you to ensure implementation of instructions of the Government. A report of action taken / compliance in this regard may kindly be communicated to this department for information of the high-ups.

ADDITIONAL SECRETARY (GENERAL)

CC:
- PS to Secretary School Education
- PS to Special Secretary Schools.
1. INTRODUCTION

1.1 What is Dengue Fever?

Dengue fever is an infectious disease spread by mosquitoes and caused by dengue virus. Dengue fever is found mostly during and after the rainy season in the tropical and sub-tropical areas of the world. It is also known as break bone fever, because it may cause severe joint and muscle pain.

![Female of Aedes aegypti](image)

**Figure 1.1: Female of Aedes aegypti**

Dengue is transmitted by *Aedes* mosquito. Its virus has four different sub-types (serotypes). Infection with one serotype usually gives lifelong immunity against that type only. Since no vaccines are available, prevention is the best remedy.

**Note:** English teacher can take help of science teacher if required.
This can be achieved by reducing the breeding sites of the mosquito and avoiding the contact of mosquito with human body.

1.2 History

(i) Origin & Occurrence

The dengue viruses originated in monkeys and then these were transferred to human beings in Africa and South East Asia through mosquitoes. There is some evidence of an epidemic in 17th century. During the Second World War, the coincidental transport of *Aedes* mosquito in cargo is thought to be one of the major causes of spread of virus. In 1906, transmission by *Aedes* mosquito was confirmed and by the year 1907 dengue was recognized as a major viral disease.

![Diagram of virus transmission from monkeys to man](image)

**Figure 1.2: Transmission of virus from monkeys to man**

In Pakistan the first outbreak of dengue fever was recorded in Karachi in 1994, which probably came from Thailand and Malaysia either through the trade of used tyres or through infected travellers. Then this disease moved towards Punjab, the most challenging and alarming situation was observed in Lahore, during the year 2011, where it claimed many lives.

It should be mentioned here that in most of the cases dengue was not the only cause of reported deaths. The mortality was found to be associated with a number of other diseases of heart, kidney and liver; the person was suffering from. These diseases had already weakened the immune system when dengue took over its job.
(ii) Geographical distribution:

Dengue is one of the most common viral disease transmitted by *Aedes* mosquito. The spread of dengue is due to expanding geographic distribution of dengue virus and its vectors. The most important vector predominantly, is the urban species, *Ae. aegypti*. Dengue fever is most frequent in almost 100 tropical and sub tropical countries in the world. South East Asia, Africa and Western Pacific are the most seriously affected. Prior to 1970, only nine countries had experienced epidemics.

WHO estimates that approximately 2.5 billion people are now at risk of dengue fever. An estimated 50-100 million cases of dengue fever occur each year. The incidence of dengue has increased 30 fold between 1960 and 2010. This increase is believed to be related to the overall changes in climate and environment.

![Geographical distribution of Aedes aegypti](image)

**Figure 1.3: Geographical distribution of Aedes aegypti**

1.3 **Various Factors related to the spread of dengue:**

1.3.1 **Global Warming:**

Rise in temperature due to global warming promotes viral reproduction and transmission through the mosquito. The spread of disease intensifies during rainy
season. Warm temperature and high humidity are the most favourite for mosquito. Dense population, high growth rate, urbanization, lack of sanitation and inefficient mosquito control further worsen the scenario.

1.3.2 Population growth

In the densely populated urban areas, chances of contact between man and mosquito increases. The controlling measures become inadequate as these do not match the rapidly growing population. Nowadays the strategy of control has changed. More emphasis is given to limit the chances of contact between man and mosquito by the use of sprays, mosquito repellents, coils, and screens etc.

1.3.3 Urbanization:

The increased population density (Number of people/sq. km) due to ill planned urbanization has disturbed the existing ecological balance resulting in the outbreak of disease in the form of an epidemic.

1.3.4 Poor sanitation

Deterioration of Public health infrastructure results in poor sanitary condition. Inadequate removal of the sewage and rain water, improper disposal of solid waste and unhygienic social conditions provide ideal breeding places for the mosquito.
1.3.5 Travelling and Cargo

Dengue viruses and vectors are mostly transported through travel and trade.

2. SYMPTOMS AND DIAGNOSIS

![Diagram showing symptoms of dengue fever]

Figure 1.5: Typical symptoms of dengue fever

2.1 Principal Symptoms

Dengue virus incubates usually for four to seven days before the symptoms of the disease appear in the infected person. The fever starts with chills, headache, pain behind the eyes, aching in muscles and joints. The temperature rises quickly as high as 104°F, with low heart beat and blood pressure. The eyes may become red; a red rash may appear on the body.

2.2 Types of Dengue

Dengue can be divided into three types i.e. Dengue fever (DF), dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS).

2.2.1 Mild Dengue Fever (DF)

This form of the disease hardly ever results in serious or fatal complications. The symptoms of mild dengue fever are pain in muscles and joints, body rash, high fever,
intense headache, pain behind the eyes, nausea and vomiting.

2.2.2 Dengue Hemorrhagic Fever (DHF)

Symptoms at onset may be mild, but gradually worsen within a few days. DHF can result in death if not treated properly. Bleeding from mouth, nose and gums starts. Lymph and blood vessels are damaged. Black vomit and stools indicate internal bleeding. Lower number of platelets and WBC in the blood, small blood spots under the skin and weak pulse are observed.

![Figure 1.6: Typical rash of dengue fever on human body](image)

2.2.3 Dengue Shock Syndrome (DSS)

This is the worst form of dengue which can be fatal. Mild symptoms become severe. Intense stomach pain, disorientation and regular vomiting occur. High fluid leakage from blood vessels cut down the supply to vital organs that take the patient into a state of shock.

2.3 Diagnosis

The dengue fever is diagnosed when a patient exhibits typical symptoms of dengue. Doctor advises following tests for accurate diagnosis.

(i) Blood Test:

**CBC (Complete Blood Count)**

This is a general test used for simple screening of different diseases. It tells us about the total number of RBC, WBC and Platelets present per unit volume of the blood.

**ELISA (Enzyme Linked Immunosorbent Assay):**

This test is carried out to detect the presence of IgG or IgM antibodies produced against viral antigen.
Tourniquet Test:

WHO has recommended this test for dengue. In this test the degree of fragility of the capillary walls is noted to determine the risk of hemorrhage in Dengue.

(ii) Assessment of the medical history:

The doctor takes history of the patient regarding travel and previous exposure to mosquitoes to diagnose the secondary complications like DHF and DSS.

2.4 Potential complications of dengue

Majority of people suffering from dengue fever recover within two weeks. However, some individuals can experience fatigue for months after the disease. Dengue fever can develop into more severe forms of the disease i.e. dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS).

2.4.1 Dengue hemorrhagic fever

DHF can appear as relatively less severe infection at first but can quickly develop into a life threatening illness. It can be distinguished from DF as it progresses through its three predictable phases:

Febrile phase (high fever): This phase is characterized with high fever, generalized pain and headache; this usually lasts for seven days. At this stage, a rash may occur on first two to three days. Enlargement of liver, mild hemorrhage; less frequent bleeding of the gums can be observed.

Critical phase (plasma leak phase): The temperature drops to normal usually within seven days, followed by varying degree of plasma leak into the pleural and abdominal cavities. Decreased volume of circulating fluid results in low blood pressure, increased heart beat, weak pulse and decrease in urine output.

Reabsorption phase (convalescent phase): Plasma leakage stops and re-absorption of plasma and fluids takes place. A sense of improvement, return of appetite and increased urine output is observed. Fluid overload may cause unconsciousness.

2.4.2 Dengue Shock Syndrome (DSS)

DSS is a continuation of DHF. Fluid leakage results decrease in the amount of blood in the blood vessels. The supply of blood to the vital organs is badly affected
and patient goes into shock.

2.5 Risk groups:-

Dengue can be life threatening to people with chronic disease like diabetes and Asthma.

3. CAUSATIVE AGENTS OF DISEASE

3.1 Types of dengue virus

Dengue is caused by Dengue virus (DEN). The four different types of the virus are DEN-1, DEN-2, DEN-3 and DEN-4. The first infection is not so serious, but secondary infection (with other types of dengue virus) has been reported to cause severe diseases i.e. DHF and DSS, both in children and adults.

3.2 Life cycle

3.2.1 Within the mosquito

Dengue virus is transmitted by female of the Aedes mosquitoes, which bites primarily during early morning hours and before dusk. Human beings are the primary host of the virus. If a female mosquito takes a blood meal from a person infected with dengue virus, it also acquires the virus. The virus proliferates in the body of the mosquito and the virus comes to the salivary glands of the mosquito and is injected to the healthy person by her bite. The virus has no harmful effect on the mosquito.

3.2.2 In Human body

When a mosquito carrying dengue virus bites a healthy person, it enters into the skin along with mosquito saliva. It enters the white blood cells, and reproduces there. The white blood cells release a number of protein which produce symptoms like fever and severe pains.

4. DENGUE VECTOR (CARRIER)

4.1 Identification of the carrier mosquito.

Aedes mosquito is about 10 mm in size. Its color is black with white spots on the body and legs. It has white stripes on thorax. The male mosquito can't bite because of the absence of biting mouth parts. The female mosquito has stylet which is
used to pierce and suck the blood meal during the bite. Both male and female feed on plants nectar, but the female needs blood for laying the eggs.

![Image of male and female mosquitoes](image1.8(a): Difference between the mouth parts of male and female Dengue mosquito.)

![Image of female mosquito of Aedes](image1.8(b): Female mosquito of Aedes)

### 4.2 DIFFERENCE BETWEEN MALARIAL (*ANOPHELES*) AND DENGUE (*AEDES*) MOSQUITO.

<table>
<thead>
<tr>
<th><strong>Anopheles Mosquito</strong></th>
<th><strong>Aedes Mosquito</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Eggs are laid singly by the <em>Anopheles</em> on the surface of stagnant water.</td>
<td>1. Eggs are laid by <em>Aedes</em> singly in clean standing water even if it is in very small quantity.</td>
</tr>
<tr>
<td>2. Eggs cannot live in dry conditions.</td>
<td>2. Eggs survive in dry conditions.</td>
</tr>
<tr>
<td>3. Larva has spiracles for breathing and rests parallel to water surface.</td>
<td>3. Larva has a distinct breathing tube called siphon. It hangs vertically in water.</td>
</tr>
<tr>
<td>4. Pupae have short breathing trumpet.</td>
<td>4. Pupae have longer breathing trumpet.</td>
</tr>
<tr>
<td>5. Mostly bites at night.</td>
<td>5. Bites at dawn and dusk hours.</td>
</tr>
<tr>
<td>6. It carries <em>Plasmodium</em> and spreads malaria.</td>
<td>6. It carries dengue virus and spreads dengue fever.</td>
</tr>
</tbody>
</table>
4.3 **Breeding sites:**

Inside houses, the most important breeding places are unused drinking water jar, neglected flower pots and vases, unused toilets, old tyres, food cups and plates, animal drinking pans, rain water barrels, sagging roofs, gutters, water tanks, broken buckets, holes in concrete or cement floor, fences and open or broken septic tanks.

They also breed in barrels or buckets kept for fire protection, basement sumps, and elevator pits, trash piles, leaking water taps, shallow wells. Neglected flower containers in graveyards are also dangerous.

![Image of breeding sites]

*Figure 1.9: some of the breeding sites of Dengue mosquito*
4.4 Life cycle:

The average life span of the adults is 30 days.

![Life cycle of Dengue mosquito diagram]

**1. Eggs**: The *Aedes aegypti* female lays its eggs after a meal of blood. It requires blood proteins to lay eggs above the water surface or on the sides of a container. It lays 50-300 eggs in batches at intervals of 4 or 5 days. Hatching into larvae occurs after the eggs are submerged in water. The eggs may survive in the dry conditions up to one year.

**2. Larvae**: Larvae have a distinct breathing tube or siphon. It hangs from the surface by this siphon. When disturbed, the larvae swim to the bottom. It is a bottom feeder. Larva changes to pupa in about a week.

**3. Pupae**:
Pupa:

The pupa does not feed. It changes to mosquito in two days.

Adult:

The dorsal surface of the pupa splits and the adult emerges from it. The adult mosquito rests on the water surface for sometime and then flies away.

![Diagram of mosquito life cycle](image)

**Figure 1.11: Different developmental stages of the larva**

### 4.5 TRANSMISSION

The dengue fever is transmitted through a biological vector, female adult *Aedes*. The transmission of dengue virus from one generation of mosquitoes to the next through eggs is called transovarial. Transmission through trade and travel is also possible (i.e. by infected travellers bringing the disease to new areas, by accidental transport of infected dengue mosquitoes or eggs etc.).
5. **PREVENTIVE MEASURES AND CONTROL**

The epidemic control of dengue involves initiatives targeting at the following two areas.

(i) **Educating the masses:**

Raising awareness among the masses at personal level, household level and community level. It also includes special training and workshops.

(ii) **Improvement of public health infrastructures**

This will provide an active laboratory based surveillance for prevention and control of the epidemics at different levels.

5.1.1 **At Personal Level:**

**By Physical Method**

- One should wear full sleeves or cover one’s body properly and avoid using dark colors in daytime, decreasing the risk of being bitten by mosquitoes.
- Sleep under bed nets
- Close house inlets (windows / doors) in evenings and early mornings to keep mosquitoes away.
- Keep an eye on the accumulation of water in your surroundings, whether it is your school, college, office or place of work (e.g. in tyres or flower pots)

**By Chemical Methods.**

- Use insecticide and repellents to protect ourselves from the mosquito bites.

5.1.2 **Household level:**

Household protection can be obtained by using the following methods.

**Physical methods**

- Use electric Mosquito Killer, and LED lamps.
- Regularly empty the refrigerator pan.
- Do not let water stand in flower pots.
- Keep the saucer of flower pot dry.
- Keep the surroundings of house clean and dry
• Do not throw litter, rubbish such as ice cream cups, disposable glasses, dishes, and plastic food packaging.

• Use screen gauzes on the windows and doors, so that mosquitoes may not enter the house.

• Bags, bottles which can collect rain water and provide breeding place for mosquitoes should be disposed off.

• Keep the house yards and lawn etc. free of standing water.

Chemical methods.

• Spray every corner of your house, whether it is behind the curtains, under the bed etc.

• Use coils and other repellents.

The government is leaving no stone unturned in eradicating dengue mosquito breeding sites but efforts at the individual level should be given topmost priority. Our own effort and determination is the foremost in preventing mosquito from biting us.

5.1.3 Community level:

Let your family, friend and neighbours know about the danger related to the breeding of dengue mosquito. Better sanitation and comprehensive solid waste management procedures play a key role in dengue control.

PHYSICAL METHODS

Destroy, remove or turn “bottom up” unneeded containers exposed to rain.

• Frequently empty animal drinking pans and flower vases.

• Dry or spray rain filled cavities in trees, bamboo internodes, and leaves.

• Cover drinking water in jars barrels etc.

• Drain unused water tanks.

• Periodic draining of swimming pools, ponds, along with the filling of depressions, and excavated sites will eliminate the breeding sites of mosquito.

• Old automobile tyres should be either discarded or kept in dry covered areas
• Remove unused utensils, tools, toys (cans, buckets)
• Fumigate air planes, trucks and public transport.

CHEMICAL METHOD
• Use aerosol dispensers, fogging of the insecticidal spray in the streets, roads and parks, so the insecticidal mist will drift over the areas to be protected.
• Use larvicidal chemicals to kill the larvae of mosquito.
• Use chlorinated water in swimming pools.

NATURAL ENEMIES & BIOLOGICAL CONTROLS:
Biological control means the control of one living organism which is harmful through another living organism, but which is not harmful to humans. This method is preferred because it is environment friendly and less expensive.
• Many birds and bats feed actively on adult mosquitoes
• In tropics, wall lizards / geckos and jumping spiders destroy number of mosquitoes in dwellings.
• Certain kind of fish is of great value in the control of mosquito larvae in natural water.
• Copepods (arthropods) are also used for eliminating mosquito larvae.
• Certain bacteria can be used as biopesticides for infecting & eliminating various developmental stages of mosquitoes.

6. DISEASE MANAGEMENT:

6.1 Management of the patient at initial stages:
Since no vaccine is available, the best possible treatment available to the dengue patient is the use of supportive therapy. A complete understanding of the symptoms of the disease, as it progresses through different phases is very important. The treatment may include oral rehydration at home with close follow up. Hospital admission is necessary, if advised by the doctor. Dengue infected patients are either asymptomatic or symptomatic; in the later case they may have dengue fever (with or without hemorrhage) that can convert into the more severe form i.e. Dengue shock
syndrome (DSS).

- Dengue fever without hemorrhage can be controlled through complete bed rest, sponging and use of paracetamol etc.

6.2 Management of the patient at later stages:

Dengue hemorrhagic fever (DHF) and Dengue shock syndrome (DSS):

As fever progresses through its different phases, it is handled accordingly. The patient is advised to take complete bed rest and oral rehydration along with therapy for controlling fever (i.e. different sorts of fresh fruit juices can be given to the patient).

- In the hospital, doctors will monitor temperature, blood pressure, liquid intake, urine output and platelets count to decide on the future management of the patient.

7. COMMUNITY PARTICIPATION

For the control of this disease, an effective awareness campaign must be launched with all our efforts. This involves creating awareness among masses through electronic and print media, teachers, students and khatibs.

7.1 General awareness:

ROLE OF MEDIA

Any plan to wipe out dengue will not be fruitful without the integration of community and school based education and awareness. Complete elimination of dengue virus from Pakistan is not possible unless there is a mass awareness campaign through media. It can be done through print and electronic media which has a great potential to educate masses about how to fight the dengue mosquito.

Messages on radio and TV in all local and regional languages along with advertisements in newspapers informing people about preventive measures and eradication of breeding sites of the mosquitoes are necessary.

ROLE OF TEACHERS

Teachers have an important role in the control of mosquito related diseases like malaria and dengue, etc. They can educate their students on different aspects related to Dengue such as its vector and its breeding places, etc, by using audio visual
ROLE OF STUDENTS

After becoming fully aware of the disease, the students will spread the message to their family, their neighbours and mates.

ROLE OF KHATIBS

Khatibs can deliver messages regarding dengue, to common man especially in Juma prayer and on special occasions such as Eid prayers etc.

ROLE OF MARKET COMMITTEES

The market committee can also play an important role by keeping the business centers clean and free of mosquitoes.

DENGUE AWARENESS THROUGH UTILITY BILLS

Message printed on utility bill is a useful way of spreading dengue prevention messages at a minimal cost.

7.2. Cleanliness of the environment:

7.2.1. Removal of solid waste:

Solid waste management and its disposal is very important for the maintenance of hygienic conditions. Dirty environment is mosquito friendly because it offers excellent breeding sites.

Government’s efforts for control of dengue

Government of the Punjab has made extensive efforts to control the epidemic. It includes public awareness through print and electronic media, cleanliness campaign, spray and fogging, free diagnostic camps and improvement of medical facilities in hospitals.
EXERCISE

Q.1 Write down the symptoms of dengue fever.
Q.2 Differentiate between the breeding sites of dengue and malaria mosquito.
Q.3 Write down the comparison between the life cycle of Aedes and Anopheles mosquito.
Q.4 What precautions should be taken to avoid dengue fever?
Q.5 Differentiate between Dengue Hemorrhage Fever and Dengue Shock Syndrome.
Q.6 Name the vectors of dengue and malaria fever, also differentiate between male and female dengue mosquito.
Q.7 Discuss the different preventive measures for the control of this disease.
Q.8 How different sectors of the society can participate in the campaign against dengue?
Q.9 Write a note on “Biological Control” of dengue mosquito.

Multiple Choice Questions

1. Choose the correct answer.

   i. Dengue fever is common in which parts of the world.
      (a) Tropical
      (b) Sub-tropical
      (c) Polar
      (d) Both a & b

   ii. Dengue fever is also known as:
       (a) Yellow fever
       (b) Break bone fever
       (c) Typhoid fever
       (d) T.B.
iii. Which city of the Punjab has been severely affected by Dengue?
   (a) Faisalabad
   (b) Gujranwala
   (c) Lahore
   (d) Rawalpindi

iv. It is suspected that Dengue came to Pakistan through the trade of
   (a) Old clothes
   (b) Used tyres
   (c) Old toys
   (d) Machines

v. Which type of food should be given to the patients of Dengue?
   (a) Fresh fruit juices
   (b) Jelly
   (c) Ice cream
   (d) Custard

vi. Black vomit and stool indicate which type of fever
   (a) Dengue fever
   (b) Dengue hemorrhage fever
   (c) Dengue shock syndrome
   (d) Malaria

vii. The female *Aedes* mostly bites
    (a) At night
    (b) Early morning
    (c) At dusk
    (d) Both b & c

viii. The female *Aedes* needs blood meal for
     (a) Food
     (b) Egg laying
     (c) Fertilization
     (d) Growth
ix. The temperature of a dengue fever may rise up to
   (a) 100°F
   (b) 106°F
   (c) 104°F
   (d) 102°F

x. Supportive therapy for Dengue fever includes
   (a) Complete bed rest
   (b) Sponging
   (c) Use of Paracetamol
   (d) All of these

Activity

1. Invite students to propose different ways of useful community participation for dengue control.

2. Give different assignments to the students regarding various aspects of the disease. Arrange competitions and give awards to the winner.

3. After the completion of the lecture, invite the students for group discussion on it.

4. Ask the students to survey their locality and report about different breeding sites of mosquito; also suggest a plan to eradicate them.

5. Launch a cleanliness campaign in your school. Allocate different parts to different groups of the students.