

## Original Research Article

# Case based learning versus traditional didactic lecture in Community Medicine to teach vector borne diseases “malaria and dengue”: interventional study

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### ABSTRACT

**Background:** Traditional didactic lectures do not evoke interactive teaching. Analytical thinking is not fostered. When students are put into the role of primary care physician, a sense of responsibility towards society is instilled in them generating a desire to learn. Case based learning (CBL) is one such method which can be used for meaningful learning. Incorporation of case based scenarios on real life situations in teaching can make medical undergraduate students competent to diagnose and treat common health problems.

**Methods:** The study was conducted amongst third M.B.B.S. students. Interventional study design was used. Intervention group was taught with CBL and control group with didactic method. Pre-test, post-test was conducted to assess cognitive domain scores. To assess perception regarding CBL, feedback questionnaire was given to students. Percentages, unpaired t test were used for statistical analysis.

**Results:** 99.60% of students perceived CBL is helpful to understand key concepts. 95.65% reported its importance in development of critical thinking. 95.66% reported that CBL session promoted meaningful learning as compared to lecture. On application of statistical tests, there was no difference in average marks scored by students taught with CBL as compared to those taught with traditional didactic method.

**Conclusions:** This study demonstrates that CBL arouses interest. It can be incorporated to teach topics in Community Medicine.

**Keywords:** Case based learning, Traditional didactic lecture, Malaria, Dengue

### INTRODUCTION

The Medical Council of India emphasizes on competency based medical education program.<sup>1</sup> The emphasis is on better student comprehension by introducing student centered learning methods. However, in most of the medical colleges the teaching methodology commonly used is the traditional didactic method.<sup>2</sup> According to curriculum guidelines set by the Maharashtra University of Health Sciences, a medical undergraduate student

should know the epidemiological determinants, should develop skills to diagnose and manage common health problems at the individual, family and community levels and also learn the skill to plan and implement health education at individual and community level.<sup>3</sup>

Most of the times students do not relate to application of the subject. The traditional method of lectures is teacher centered. It does not help in inculcating logical reasoning, analytical skills. Students are not enthusiastic about

paying attention during lectures. Remembering or reproducing knowledge in examinations dampens the student's enthusiasm. There is a need to refine the teaching learning method. This can be done through meaningful orientation in learning in which knowledge and skills are learned with understanding. Meaningful learning necessitates interlinking of ideas within a topic as well as to other parts of the course.<sup>4</sup>

One of the ways to meaningful learning is through case based learning. Case based learning is a discussion based small group learning method which enhances comprehension and acquisition of cognitive skills. Learning and its retention is enabled when the topic is connected to real life situations since the students realize the necessity of understanding the topic for future clinical practice.<sup>5</sup> Case based learning can encourage application of knowledge, linkage of knowledge between the basic and clinical sciences, deeper understanding of content, development of clinical reasoning skills, and development of social intelligence. Research in medical education suggests that, the more medical students work through a variety of case discussions with appropriate feedback, the better their clinical reasoning abilities.<sup>6</sup> Case studies help learners identify problems and solutions, compare options and decide how to handle a real situation.<sup>7</sup> Some of the departments of various institutes have conducted studies addressing case based learning method.<sup>8-10</sup>

Therefore the decision to select case based learning method to teach vector borne diseases in "Community Medicine" subject was taken up by as the topic for project to be done as part of fulfilment for Advanced Course in Medical Education at nodal centre of Medical Education Technology Cell at Seth Gordhandas Sunderdas Medical College located at Parel, Mumbai.

### **Research question**

Is case based teaching learning method a better method to teach malaria and dengue to medical undergraduate students of third year as compared to traditional didactic method?

### **Null hypothesis**

There is no difference in average marks scored by students taught with case based teaching learning method as compared to those taught by the traditional didactic method.

### **Alternate hypothesis**

There is a difference in average marks scored by students taught with case based teaching learning method as compared to those taught by the traditional didactic method.

### **Objectives**

- To assess and compare the cognitive domain scores of the students taught vector borne diseases "Malaria and Dengue" by lecture method as compared to those taught by case based learning.
- To know students perception of case based learning.

### **METHODS**

#### **Study design**

Interventional study design.

#### **Study setting**

Department of Community Medicine of K. J. Somaiya Medical College and Research Centre, Sion, Mumbai.

#### **Study population**

The study was conducted amongst the third year M.B.B.S. students regular 2015 Batch. There were 50 students in the batch.

#### **Study period**

6 months.

#### **Sample size**

Intervention group: 23 Control group: 22.

#### **Methodology**

The study was conducted amongst the third M.B.B.S. students of 2015 batch during their VI Semester. They were divided in two groups control group (Batch A) and intervention group (Batch B). Each group consisted of 25 students. The students were explained that purpose of the study is to teach vector borne diseases "Malaria and Dengue" by case based teaching learning method to one batch of students and by traditional lecture method to the other batch. They were assured that marks of pre-test and post-test conducted as part of the study will not be considered for internal assessment for university exams. The students were invited to participate in the study. An informed written consent was taken from them. The time slots for these sessions were arranged in a way so as to three hours were allocated for taking the topics of malaria and dengue. It was prepared in such a way that when one group goes for field visit at rural health training centre, the other group will attend the class for learning vector borne diseases. The interventional group was taught vector borne diseases "Malaria and Dengue" using the case based learning method (CBL) and the control group was taught the topic using the traditional didactic method by the same faculty (Figure 1). Case studies were presented in paper format and images with defined learning objectives (Annexure 1 and 2). Guidelines to

formulate case studies were followed.<sup>6,11</sup> The case scenarios were designed to include the following components of the individual topic i) epidemiological determinants, ii) clinical features iii) diagnosis iv) treatment v) preventive and control measures. They were designed according to the local context, which is relevant to urban and rural setup of our country. These case studies were reviewed and validated by three subject

experts. Pre-test, post-test were designed using modified essay questions. These were conducted for both the groups on the day when the topics were taught. A feedback on perception about CBL was taken from the students belonging to the intervention group. This was done with the help of a self-administered questionnaire using a Likert scale (Table 1).

**Table 1: Perception regarding experience of students learning the topic "vector borne diseases" using case based learning (CBL).**

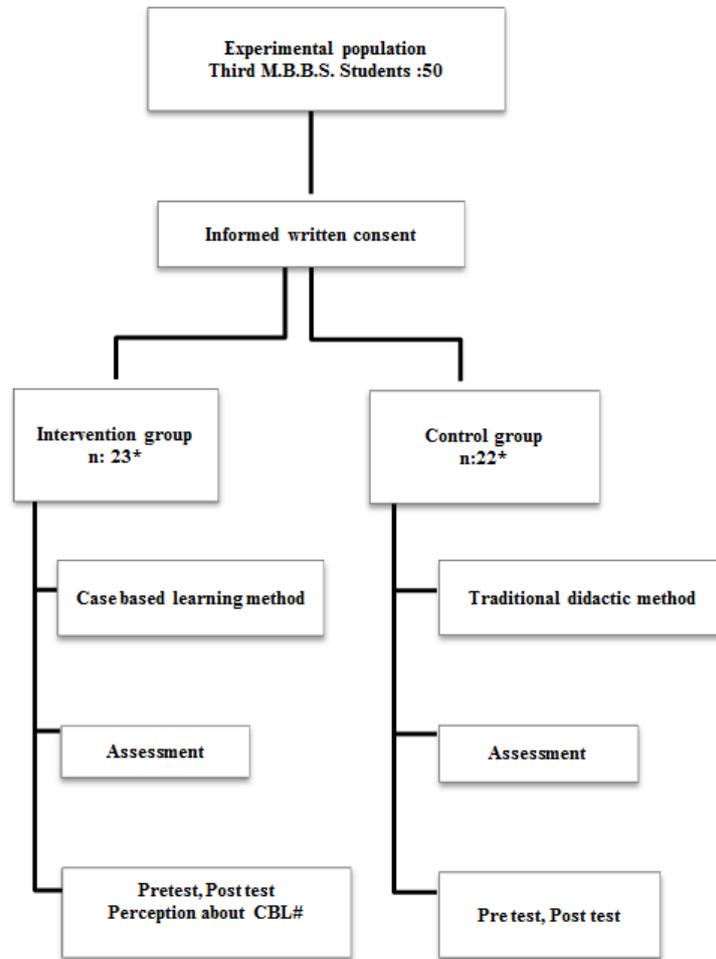
Q. no.	Question	Opinion			
		Strongly agree N (%)	Agree N (%)	Disagree N (%)	Strongly disagree N (%)
1	In understanding today's topic, CBL was very useful.	12 (52.17)	11 (47.83)	0 (0)	0 (0)
2	Clinical cases given in today's class were interesting.	10 (43.48)	13 (56.12)	0 (0)	0 (0)
3	CBL session was helpful in understanding the key concepts.	10 (43.48)	13 (56.12)	0 (0)	0 (0)
4	CBL session was helpful in bringing up interaction from the students.	11 (47.83)	10 (43.48)	2 (8.7)	0 (0)
5	CBL session was very important in terms of development of critical thinking.	12 (52.17)	10 (43.48)	1 (4.35)	0 (0)
6	CBL session was useful in terms of future application of knowledge.	14 (60.86)	8 (34.78)	1 (4.35)	0 (0)
7	CBL session motivated you to learn the topics.	10 (43.48)	12 (52.17)	1 (4.35)	0 (0)
8	CBL session promoted meaningful learning as compared to the didactic lecture.	11 (47.83)	11 (47.83)	1 (4.35)	0 (0)
9	Role of teacher was very important in CBL session.	13 (56.52)	8 (34.78)	2 (8.7)	0 (0)
10	Group discussion during the CBL session was very useful.	11 (47.83)	11 (47.83)	1 (4.35)	0 (0)
11	CBL session was helpful in terms of preparation for university exam.	9 (39.13)	11 (47.83)	3 (13.04)	0 (0)
12	CBL sessions can be used to teach other topics in Community Medicine	16 (69.57)	7 (30.43)	0 (0)	0 (0)
13	CBL sessions can be used to teach these topics for future batches too.	18 (78.26)	5 (21.74)	0 (0)	0 (0)

**Table 2: Group statistics unpaired t test.**

	Group	n	Mean	Standard deviation	Standard error of mean	p value
<b>Pre-test</b>	Control	22	7.682	2.0676	0.4408	0.82
	Intervention	23	7.543	1.9995	0.4169	
<b>Post-test</b>	Control	22	14.818	2.3732	0.5060	0.43
	Intervention	23	15.370	2.3023	0.4801	
<b>Difference</b>	Control	22	7.136	2.2582	0.4815	0.23
	Intervention	23	7.826	1.5196	0.3169	

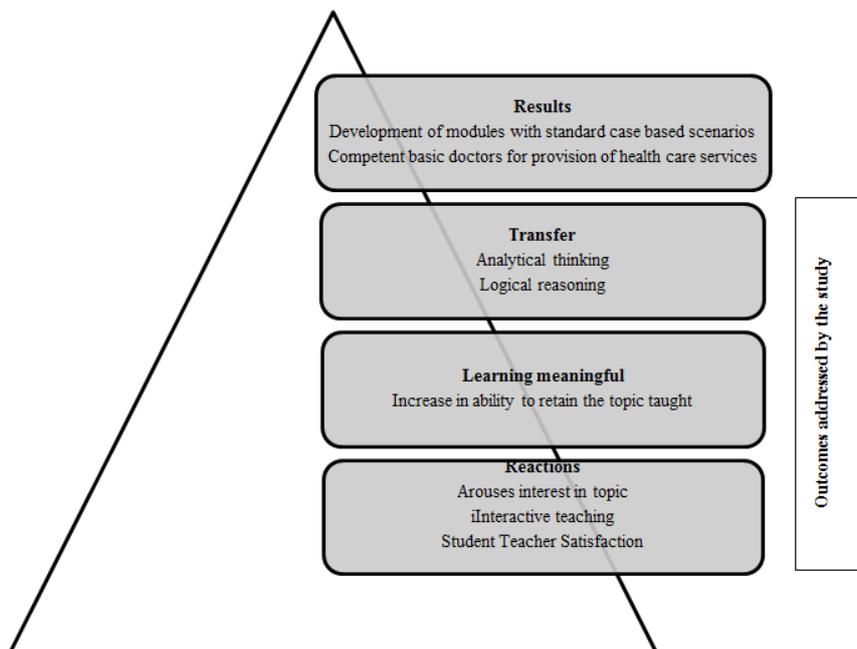
**Table 3: Matrix depicting outcome, indicators, data source and data collection method.**

Type of outcome	Outcome	Indicator	Data source	Data collection
<b>Short term</b>	<ul style="list-style-type: none"> <li>Students satisfaction</li> <li>Arouses interest</li> <li>Helps in analytical logical thinking</li> </ul>	% of students satisfied with case based teaching learning method	Students	<ul style="list-style-type: none"> <li>Feedback from students perception of CBL with questionnaire</li> <li>Administration of MEQ's to test analytical thinking component Pre and Post test</li> </ul>



**Figure 1: Study design of the interventional study.**

\*Students who did not attend the entire three hour session /absent were excluded from the study. #CBL-Case based learning.



**Figure 2: Kirkpatrick's level of outcomes addressed by the study indicated by the textbox.**

The study addresses the following levels of Kirkpatrick model i) level 1 reaction ii) level 2 learning iii) level 3 results (Figure 2).

Table 3 is the matrix which depicts the short term outcome of the study, the indicators used, source of data and details of data collection for the study.

### ***Definition case based learning***

It is an active learning strategy involving small groups in which the group focuses on solving a presented problem. Form of learning which involves a clinical case, a problem or question to be solved and stated set of learning objectives with a measured outcome.

### ***Inclusion criteria***

Student who gave informed written consent and present throughout for the three hour session.

### ***Statistical method***

Proportions, unpaired t test.

## **RESULTS**

There were total 45 students. The intervention group consisted of 23 students and the control group had 22 students. 99.60% of students perceived CBL to be helpful to understand the key concepts. 91.31% students reported CBL was helpful in bringing an interaction from students. 95.65% of students reported importance of the session in development of critical thinking. 95.66% reported that CBL session promoted meaningful learning as compared to the didactic lecture. However on application of unpaired t test there was no difference in the scores of the students taught with CBL as compared to those taught with lecture method (Table 2).

## **DISCUSSION**

The students reported that CBL promotes meaningful learning brings about an interaction from students and helps them to think critically. These findings were similar to that found in a study conducted by Schapiro et al to evaluate the effectiveness of integrative cases in the medical student curriculum.<sup>12</sup> The study reported that integrative cases provided experiences that offered expansive view of medicine and public health and the students responded that the cases helped them to understand public health issues and how to apply the knowledge gained to patient care.<sup>12</sup>

In our study few students reported that it does not help them in preparation for university exams. This can be overcome by giving the students short answer questions, long answer questions and multiple choice questions expected from the topic with the model answers.

All the students agreed that this methodology can be used to teach other topics also to the future batches. Case based scenarios can be prepared jointly by all the faculty and these can be incorporated for teaching. In the long run, to begin with, these case based scenarios can be used in designing and developing modules for teaching other communicable diseases. The same can then be extended to incorporate the National Health Programmes addressing these communicable diseases.

There was no difference in the cognitive domain scores of the students taught vector borne diseases "Malaria and Dengue" by lecture method as compared to those taught by case based learning. Our study findings are different from that conducted by Nair et al to teach Biochemistry in medical students. The findings were statistically significant ( $p < 0.0001$ ). There was an increase in the test score of the academic performance in the study subjects as compared to that in the controls. All the students felt that the CBL model was a good tool for understanding concepts as compared to the didactic lectures.<sup>8</sup> Another study conducted by Gade et al to teach Physiology to medical students found that there was significant difference in the pretest and post test scores ( $p = 0.018$ ). Their study revealed that CBL was appreciated by the students (86.7%). Majority of the students (83%) opined that CBL helped them in self-study and improved their problem solving ability.<sup>9</sup> The results are also different from that conducted by Bhattacharya et al to teach reproductive physiology to medical students. Their study found difference in cognitive domain scores after attending lectures and case-based learning. The overall mean score increased from  $5.36 \pm 0.97$  (95% CI: 5.11 - 5.62) in the pre-test to  $6.49 \pm 1.14$  (95% CI: 6.19 - 6.79) in the post-test.<sup>10</sup>

The reasons for no significant difference in pretest and posttest findings as compared to other studies could be (i) the control group had reinforcement of the sub topics, these were addressed by faculty during their field visit to the rural health training centre; (ii) the control group had also presented a seminar on family case studies conducted in the urban field practice area where subtopics were covered; (iii) students from the intervention group being taught with this teaching learning methodology for the first time.

Students from the control group were later showed the case based scenarios used for teaching after completion of their traditional didactic lecture. They shared that they too would like to be taught with the help of case based scenarios and it would be interesting.

### ***Limitations***

i) Time slot inadequate. Time slot required is more for discussion ii) availability of time for joint discussions for preparation of case based scenarios with other faculty from the same as well as other institutes; iii) students should have baseline knowledge of the topics to be

taught. This is a prerequisite for using this teaching method.

## CONCLUSION

It is fruitful to teach with this method as it is both teacher students centric, arouses interest in the students, evokes interaction. Most important of all, when case based scenarios are framed on real life situations placing the students in a physician's role, it helps them to understand their responsibility as a primary care physician and motivates them to acquire knowledge, learn and apply the knowledge gained.

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*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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## ANNEXURE 1

### CASE SCENARIOS ON MALARIA

#### Case scenario: 1

Place: Urban slum Pratiksha Nagar, Sion.

Family: Jadhav family.

Season: Post monsoon. Look at the Figure 1.



**Figure 1 (A-C): Case scenario post monsoon.**

30 cases of malaria have been detected in the urban slum within a span of 10 days. There are new building projects coming up in this area. The construction work is going on in full swing.

#### Questions

- Enumerate the environmental factors responsible for cases of malaria.
- Which vector is responsible for spread of malaria in urban areas?
- What advice will give to Jadhav family regarding precautions to be taken for water storage in drums?
- What is manmade malaria?

#### Case scenario: 2

An adult male residing in Navi Mumbai, comes to the OPD with history of fever with chills and rigors for 3 days. He also has headache, generalized weakness and nausea. On physical examination you find that the temperature is 40 degree Celsius. Pulse is 80 beats per minute. Blood pressure is 110/70 mm of Hg. There is no splenomegaly.

#### Questions

- What investigation will you advise?
- On examination of the blood smear there are asexual forms of *Plasmodium Vivax* parasite seen.
  - What treatment will you give to the adult male?
  - What is the dose of the drugs you will give?
  - By which route will you give the drugs?
  - For how many days will you give the drug?
- What advice will you give to the patient?

#### Case scenario: 3

A girl child Rita Jain 4 years of age, is brought to the OPD with history of fever for four days and cold since three days, ear pain for one day. On general examination you find that the general condition is fair, her temperature is 39.4 degree Celsius and discharge of pus from the left ear. Other systems are normal. Blood smear microscopy reveals presence *P. Vivax*. malaria parasites.

### Questions

- What is your diagnosis?
- What treatment will you prescribe?
- If the blood smear microscopy was negative for malaria, will you give antimalarial treatment?
- What instruction will you give to the mother?

### Case based scenario 4a

Place: Urban area, Navi Mumbai.

*Patient:* A 30 year old male Ravi Mhatre. Ravi has high grade fever since last three days. He goes to a private practitioner. The doctor gives him chloroquine tablets without advising blood investigations. Ravi takes the tablet for one day. He feels apparently well the next morning. So he does not take the subsequent doses of chloroquine. He stops medication on his own. The following morning he again develops high grade fever with chills and vomiting.

### Questions

- Was the doctor right in starting treatment without advising blood microscopy?
- Was Ravi right in stopping medications on his own? Give reason.
- Why did Ravi get better after the first dose of chloroquine?
- What instructions the doctor should have given to Ravi?

### Case based scenario 4b

*Patient:* Ravi Mhatre, 30 year old Male. Diagnostic test - blood microscopy reveals *Plasmodium Vivax* parasite.

### Questions

- What treatment will you give to Ravi?
- What instructions will you give to Ravi regarding medication?
- What advise will you give regarding personal protective measures?

### Case based scenario 5

Place: Gujarat

*Patient:* Mrs. Priti Kanojiya 25 year old. Mrs. Priti comes to the OPD with complaints of fever, body ache since five days. The fever is accompanied with chills. She is in her second trimester of pregnancy. On physical examination there is no other contributory finding. The foetal heart sounds are heard. The foetal heart rate is normal. Rapid diagnostic test is positive for *Falciparum Malaria*.

### Questions

- Does Priti belong to specific risk group for malaria?
- Which are the other specific risk groups for malaria?
- Name the drugs which you will use to treat Priti.
- What is the dosage schedule of the drug to be given?
- What other observations are necessary in this patient?

### Case based scenario 6

Place: Mumbai.

*Patient:* Mrs. Shalini Jindal age 27 years. Mrs. Shalini Jindal is suffering from fever since last five days. She is in first trimester of pregnancy. She visits the local hospital. She is advised blood microscopy. The test is positive for *Plasmodium Falciparum*.

### Questions

- What drug treatment will you give to Mrs. Shalini?
- What is the side-effect of the drug given?
- What tests will you advise for monitoring the side effect?
- What instructions will you give to Mrs. Shalini?
- What can be the effects on foetal outcome?

### Case scenario 7

Place: Mumbai.

Patient: Miss Priya Kamdar age 22 years. Priya is a student of zoology. She is going on a study tour for 1 month to South Africa. She is going to travel in the next month. She comes to you for advice regarding medications.

### Questions

- As a medical officer, which drugs will you advise for chemoprophylaxis?
- What is the dosage schedule for the drug advised?
- When will you begin the chemoprophylaxis?
- Till what duration, will you advise Priya to continue with the chemoprophylaxis?

### Case based scenario 8

The place: Urban area Navi Mumbai. International airport.

Patient: Raju Jadhav 20 years of age. Labourer at building construction site.

Raju works as a labourer at construction work site in Navi Mumbai Karanjade. He has fever since 7 days. To begin with, it was mild but over the next two days he developed high grade fever with chills rigors and vomiting. He also developed jaundice. Blood microscopy reveals parasite of *Plasmodium Vivax* and *Falciparum*.

### Questions

- What are the clinical features?
- Is Raju suffering from severe malaria? Give reasons
- What are the clinical features of severe malaria?
- What treatment will you give to Raju?
- Which drugs will you avoid in treatment?

### Case based scenario 9

### Questions

- Refer to images A, B, C again.
- As a medical officer of ward what measures will you take?
- What messages will you include in the health education session to be conducted in the community?

## ANNEXURE 2

### CASE SCENARIO ON DENGUE

#### Part I

Mr. Mahadev Gurav resides in urban slum of Mumbai since the last 30 years. He works at a local grocery shop. His family comprises of his wife and son aged 15 years. Mahadev got ready to go his work with his colleague Shankar. It was drizzling since early morning.

“Hello, Mahadev you seem to be tired? Is everything alright?” Shankar asked. I could not sleep at night” answered Mahadev as he killed another mosquito. “There are lots of mosquitoes this year. I could not rest at night. And also my elder son Ramesh is not well”

“What happened?” Shankar asked.

Mahadev answered “My son Ramesh is having fever since three days. He also is complaining of joint pain, headache, nausea and a rash on his body “

“Did you take him to the doctor?” asked Shankar. “Mahadev, there is an article on front page in today’s newspaper about many cases of dengue fever in the city. The public health department is carrying out fogging activities in the city.”

“No. I have not taken Ramesh to the doctor” replied Mahadev. “Why don’t you come home today and visit Ramesh too”

Mahadev resides in urban slum of Pratikshanagar. He stays in one room. There is no adequate cross ventilation and the room is ill lit during day time. There is one small window without any screen. The water supply being intermittent, people in the community store water in drums.

Refer to Figure 1.

“Ramesh has high fever “He needs to be taken to the doctor.” Remarked Shankar.

#### Questions

- Which are the environmental conditions described in Mahadev’s residential area favourable for mosquito breeding?
- In the given situation, explain the probable cause of Ramesh’s illness.

#### Part II

Shankar advises Mahadev to take Ramesh to Urban health Training Centre of Pratiksha Nagar.

The doctor examines Ramesh. Fever is 40 degree Celsius. On general examination there is no pallor, icterus, cyanosis no lymphadenopathy. There is retro-orbital tenderness. There are rashes present on the body. The systemic examination is normal. Blood pressure is 110/70 mm of Hg. The doctor performs a tourniquet test. It is negative.

The doctor suspects dengue fever. The doctor advises blood tests CBC, Hb, PS for MP and Dengue NS1 antigen test.

The NS1 test comes positive for dengue. Hb is 13 gm%. White blood cell count is 4000 cells/cubic mm and platelet count is 1,40,000.

The doctor prescribes tablet paracetamol. The doctor says there is no specific treatment for dengue fever. He advises Ramesh to take oral rehydration salt solution, juices without sugar. The doctor advises Mahadev to get Ramesh for follow up after two days. He also advises that if in case Ramesh develops any of the following warning signals like abdominal pain, persistent vomiting, lethargy, restlessness, bleeding from mouth, gums, nose, he should immediately be taken to the hospital at the earliest.

Shankar thought of the article he had read and tells the doctor “The newspaper is reporting that the number of cases is on rise in Mumbai.”

“Yes” replied the doctor. Recently there is a rise in dengue cases especially in urban areas. This is bad, as this can also lead to an increase in the no of more dangerous condition, Dengue haemorrhagic syndrome.

“What causes Dengue fever?” asked Mahadev

Dengue fever is caused by a virus carried by *Aedes Aegypti* mosquito commonly called as tiger mosquito, and transmitted by bite of infected female *Aedes* mosquito. The mosquito thrives in favourable breeding sites like artificial containers such as tins, cans, tyres, metal drums, buckets, coconut shells. Vegetated areas that hold small pools of water are excellent breeding sites for *Aedes* mosquitos. Adult female mosquito lays the eggs in small water bodies: the larvae emerge from the eggs and grow to become mature adults within about 7 days. These mosquitoes bite during day time. The possibility of dengue outbreak increases as the number of *Aedes* mosquitoes increases.

### *Questions*

- In the above case, what clinical features Ramesh has?
- What are the positive findings by the doctor?
- What is the probable diagnosis?
- What investigations the doctor has advised?
- What are the laboratory investigations to diagnose dengue?

### *Part III*

After 2 days Ramesh became restless, he was feeling more lethargic. He also has abdominal pain, passage of black colored stools and persistent vomiting. Mahadev takes Ramesh to the nearest hospital as suggested by the doctor. His blood pressure is 90/70mm of Hg. Following are the blood investigation reports.

- WBC 4500/ cubic mm
- Platelet count 9,000 /cubic mm.

He is given platelet transfusion.

After two days Ramesh’s condition improves. He is kept under observation for 1 more day. There is absence of fever during these 24 hrs, without the use of antipyretic drugs. His urine output is good. His appetite returns. His platelet count has improved to 1,00,000/ cu.mm.

### *Questions*

- What are the different clinical manifestations of dengue virus infection?
- What complains does Ramesh have? What do they suggest?
- What is the difference between dengue fever and dengue haemorrhagic fever? Why does haemorrhage occur?
- Grade the severity of dengue infection in Ramesh.