PROGNOSTIC VALUE OF ULTRASONOGRAPHY IN DENGUE FEVER, COMPARED WITH CLINICAL AND LABORATORY PARAMETERS

Dissertation submitted in partial fulfillment of the

Requirement for the award of the Degree of

DOCTOR OF MEDICINE

BRANCH I - GENERAL MEDICINE

THE TAMILNADU DR.M.G.R.MEDICAL UNIVERSITY
CHENNAI, TAMILNADU

APRIL 2019

CERTIFICATE FROM THE DEAN

This is to certify that the dissertation entitled "**PROGNOSTIC VALUE OF ULTRASONOGRAPHY IN DENGUE FEVER, COMPARED WITH CLINICAL AND LABORATORY PARAMETERS**" is the bonafide work of **DR. KIRAN TRESA KURUVILLA** in partial fulfillment of the university regulations of the Tamil Nadu Dr. M. G. R. Medical University, Chennai, for **M.D General Medicine Branch I** examination to be held in April 2019.

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DECLARATION

I, Dr. KIRAN TRES KURUVILLA declare that, I carried out this work on "**Prognostic value of ultrasonography in Dengue fever, compared with clinical and laboratory parameters**" in the Department of General Medicine, Government Rajaji Hospital, Madurai under the guidance of **Dr. C.DHARMARAJ, M.D(GM)., D.CH.,** Professor, Department of General Medicine, Madurai Medical College, Madurai.

I also declare that this bonafide work or a part of this work was not submitted by me or any others for any award, degree, Diploma to any other University, Board either in India or abroad.

This dissertation is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the rules and regulations for the award of **Doctor of Medicine (M.D.), General Medicine Branch-I**, examination to be held in **April 2019.**

Place: Madurai

Date **Dr. KIRAN TRESA KURUVILLA**

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CONTENTS

INTRODUCTION

INTRODUCTION

Dengue is the most common important arthropod-borne viral (arboviral) illness in humans which is transmitted by mosquitoes of the genus Aedes, which are widely distributed in subtropical and tropical areas of the world . The incidence of dengue has increased dramatically in recent decades, with estimates of 40%-50% of the world's population at risk for the disease in tropical, subtropical, and, most recently, more temperate areas. A small percentage of persons who have previously been infected by one dengue serotype develop bleeding and endothelial leak upon infection with another dengue serotype. This syndrome is termed severe dengue (also known as dengue hemorrhagic fever and dengue shock syndrome).

Dengue fever is typically a self-limited disease with a mortality rate of less than 1% when detected early and with access to proper medical care. When treated, severe dengue has a mortality rate of 2%-5%, but, when left untreated, the mortality rate is as high as 20%.

Justification of the study:

Dengue fever is one of the major epidemic that the state faces every year. Dengue shock syndrome and dengue haemorragic fever being the deadly form of the disease. Hence close monitoring of the patients are needed to manage with adequate hydration to prevent a profound dengue shock syndrome. Monitoring of the patients are usually done with

laboratory parameters like platelet count, PCV and clinical monitoring of Blood pressure. An ultrasonography of chest abdomen abdomen pelvis along with the clinical and laboratory data can assist in assesing the severity of plasma leakage and can detect evidence of plasma leakage earlier. Hence appropriate management can be done to prevent a shock

OBJECTIVES

OBJECTIVE:

To find the prognostic value of ultrasonography in Dengue fever compared with clinical and laboratory parameters

REVIEW OF LITERATURE

REVIEW OF LITERATURE:

Dengue fever, also known as , breakbone fever - identified as the most common arboviral (arthropod-borne) disease worldwide by WHO.

It is transmitted by female mosquitoes of the genus Aedes, It is mostly in subtropical and tropical geographical distribution.There are 5 antigenically distinct serotypes – (DENV 1-5). The 5th serotype was discovered in October 2013 in malaysia.(sylvatic)

There is a 30-fold increase in global incidence over the last five decades. According to WHO, recent estimate indicates 390 million dengue infections annually ,of which 96 million manifest clinically. About 3.5-5 lakh cases of DHF/DSS cases occur per year .About 3900 million people, in 128 countries, are at risk of infection. The 75% of global disease burden is in Asia-Pacific region. Actual no. of dengue cases are underreported/misclassified. • Dengue virus was isolated in India for the first time in 1945.

Indian scenario; The first recorded epidemic of clinically Dengue like illness in India occurred at Madras in 1780. The first evidence of occurrence of dengue fever in the country was reported in 1956 from Vellore district in Tamil Nadu. The first dengue hemorrhagic fever(DHF) outbreak occurred in Calcutta in 1963.

All 4 serotypes are found in Indian population. Since 1996, the area of endemicity is increasing with about 450 million population at risk. At present, dengue is endemic in 23 states of India. Mortality rates are 10-20% (40% in case of DSS) Incidence increased 30-fold in last 50 years due to:

1) Climatic change
2) Uncontrolled population growth
3) Improper water storage
4) Rapid & unplanned urbanization
5) Increase in air travel

Which all lead to increased proliferation of vector and increased virus transmission.

Epidemiology depends on 3 factors :

1) Agent – virus.
2) Environment.
3) Host – man & mosquito.

AGENT- Dengue virus

Dengue virus belongs the genus flavivirus. These viruses contain a single stranded RNA as its genome and are small in size (30-45nm).There are five antigenically distinct serotypes (DENV 1-5) with abundant genetic variation. These serotypes may be in circulation either in singular, or more than one can be in circulation in any geographical area at the same time.

Antigens can cross react with other members in the same genus. Infection with any one serotype confers lifelong immunity to the virus serotype.

The genome of Dengue virus encodes only 10 proteins. Out of ten, 3 are structural proteins that form the coat of the virus and deliver the RNA to target cells –

1) 1k4r ,the nucleocapsid of core protein,
2) 1ok8, a membrane associated protein (M),
3) 2r6p6, an envelope protein(E).

7 are non-structural (NS) proteins that orchestrate the production of new viral antigens once the virus invades the cell - NS1, NS2A, NS2B, NS3, NS4A, NS4B and NS5

In dengue virus infection, pts have measurable levels of NS1 protein in the blood, which is a diagnostic marker of the infection.

VECTOR-INTERMEDIATE HOST – Aedes

DENV is transmitted by the bite of female Aedes mosquito. In India, Aedes aegypti is the main vector in most urban areas. Rarely by Ae.Albopictus, Ae.polynesiensis, Ae.niveus in some states. Population & Lifespan of the mosquito depends on - rainfall, water storage, temperature and humidity.

Aedes shows year round breeding – (10^{o}C Isotherm). It is distributed over 300 N to 400 S latitude, that is involving the Tropics and sub-tropics. It survives best between 16oC and 30oC and a relative humidity of 60-80%.

Altitude is also a limiting factor for the distribution and is restricted to between sea level and 1000 ft above sea level.

To find a host, these mosquitoes are attracted to chemical compounds emitted by mammals. These compounds include ammonia, carbon dioxide, lactic acid, and octenol. Most commonly it bites at dusk and dawn, indoors & in shady areas.

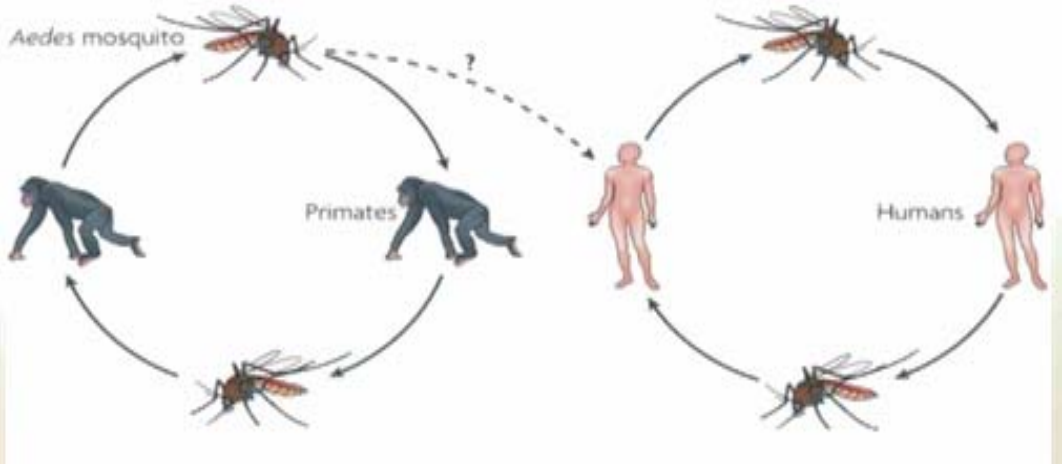
It breeds in areas of stagnant water, such as flower vases, uncovered barrels, buckets, and discarded tires, but the most dangerous areas are wet shower floors and toilet tanks, as they allow the mosquitos to breed in the residence.

Research has shown that certain chemicals (fatty acids associated with bacteria involved in the degradation organic matter in water) stimulate the female mosquitoes to lay their eggs.It can transmit the infection trans-ovarially.

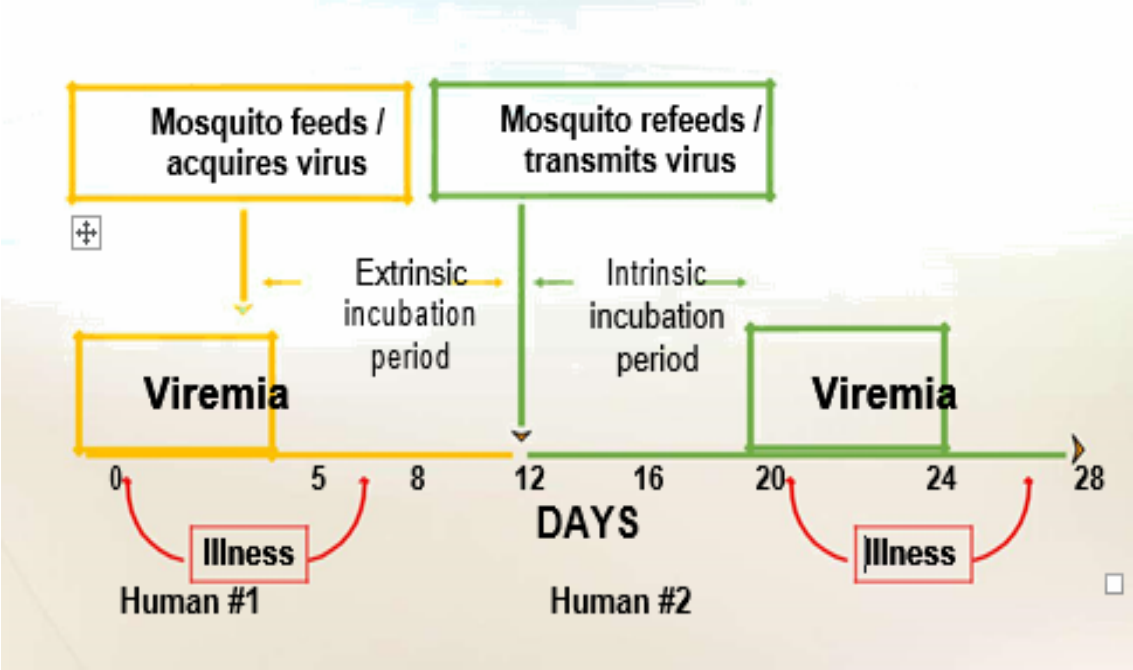
HOST – Humans

The DENV infects humans and several species of lower primates. People of all ages and both genders are at risk. (more in <15 yrs age groups & in females). Secondary dengue infection is a risk factor for DHF, including passively acquired antibodies in infants. Travel to dengue endemic areas is a most important risk factor. Migration of a patient during viremia to a non-endemic area may introduce dengue into that area. The geographical spread of dengue has been reported to occur mainly by people travelling from endemic areas to non-endemic areas.

TRANSMISSION



Because of the high level of viraemia resulting from Dengue infection of humans, the viruses are efficiently transmitted between mosquitoes and humans without the need for an enzootic/sylvantic amplification host



PATHOGENESIS OF DENGUE HAEMORRAHGIC FEVER

Homologous Antibodies Form Non- infectious Complexes during the first attack of Dengue fever.

Heterologous Antibodies of first serotype infection form Infectious Complexes with second serotype in case of second infection

Heterologous Complexes Enter More Monocytes & macrophages, Where Virus Replicates. The affected macrophages release vasoactive mediators that increase vascular permeability, leading to vascular leakage, hypovolemia, and shock.

Infants born to mothers who have had dengue, as maternally derived dengue neutralizing IgGs wane, are also thought to be at risk for enhanced disease. Activation of classic complement pathway & Cross reactivity at T-cell level results in increased production of IFN-γ & TNF-α leading to Increased vascular permeability & bleeding. Antibody dependent enhancement (ADE) & inappropriate memory T-cell response are central to pathogenesis of DHF/DSS.

Abnormal hemostasis :

1. Vasculopathy
2. Thrombopathy with impaired platelet function & moderate-severe thrombocytopenia (due to interaction of virus with platelets through IgM antiplatelet antibody)
3. Coagulopathy, with activation of coagulation & fibrinolysis, and later in severe disease,DIC.
4. Bone Marrow depression – reduced megakaryocyte production
5. Suppressed megakaryocytopoiesis & increased platelet clearance by DENV induced apoptosis & antiplatelet antibodies.

Factors influencing Dengue haemorrhagic syndrome:

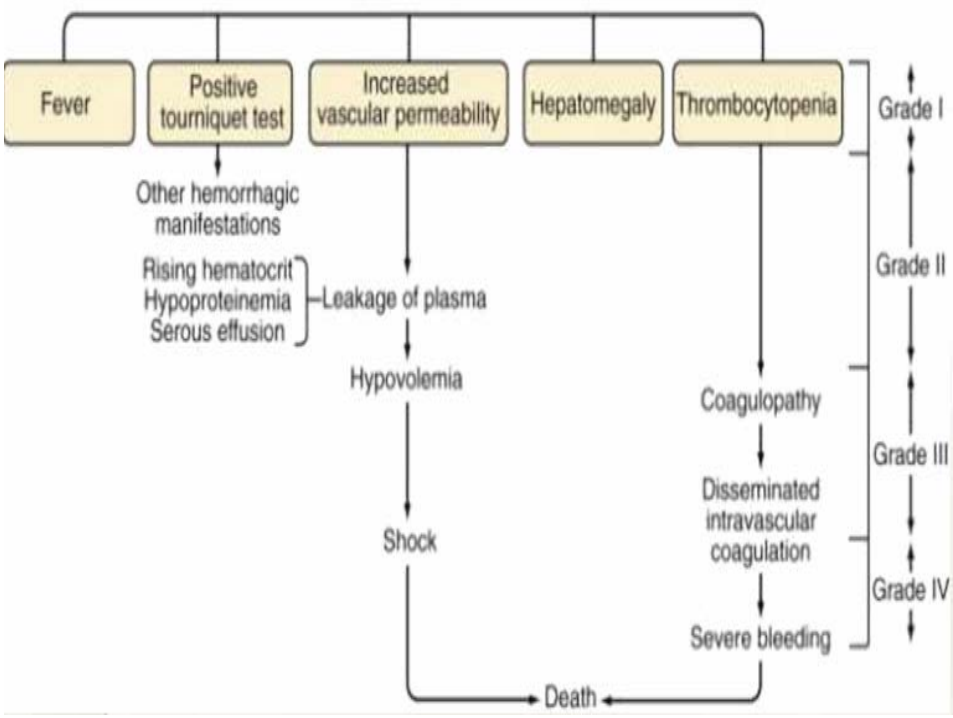
- Presence of enhancing and non neutralising antibodies

- Age : susceptibility to DHF/DSS drops significantly after 12 yrs of age
- Sex : females more often affected than males
- Race : Caucasians more often affected than blacks
- Nutritional status : malnutrition is protective
- Sequence of infection : example, serotype 1 followed by serotype 2 is more dangerous than serotype 4 followed by serotype 2
- Infecting serotype : type 2 more dangerous than others
- Infecting genotype : Asian type 2 causes DHF/DSS while American type is not responsible for the illness

Dengue clinical syndromes

1. Undifferentiated fever
2. Classic Dengue fever
3. Dengue haemorrhagic fever
4. Dengue shock syndrome

Dengue infection



<u>Probable dengue</u>

Live in or travel to a dengue endemic area

Fever and any 2 of the following

1) Nausea ,vomiting
2) Rashes
3) Aches and pains
4) Tourniquet test positive
5) leukopenia
6) Any warning sign

Warning signs

1) Abdominal pain or tenderness
2) Persistent vomiting
3) Clinical fliud accumulation
4) Mucosal bleed
5) Lethargy , restlessness
6) Liver enlargement more than 2 cms
7) Lab: increase in hematocrit concurrent with a decrease in platelet count

Severe dengue infection

1) Severe plasma leakage

   leading to shock

   fluid accumulation leding to repiratory distress
2) Severe bleeding
3) Severe organ involvement

   Liver Ast or ALT more than 1000

   CNS – impaired consciousness

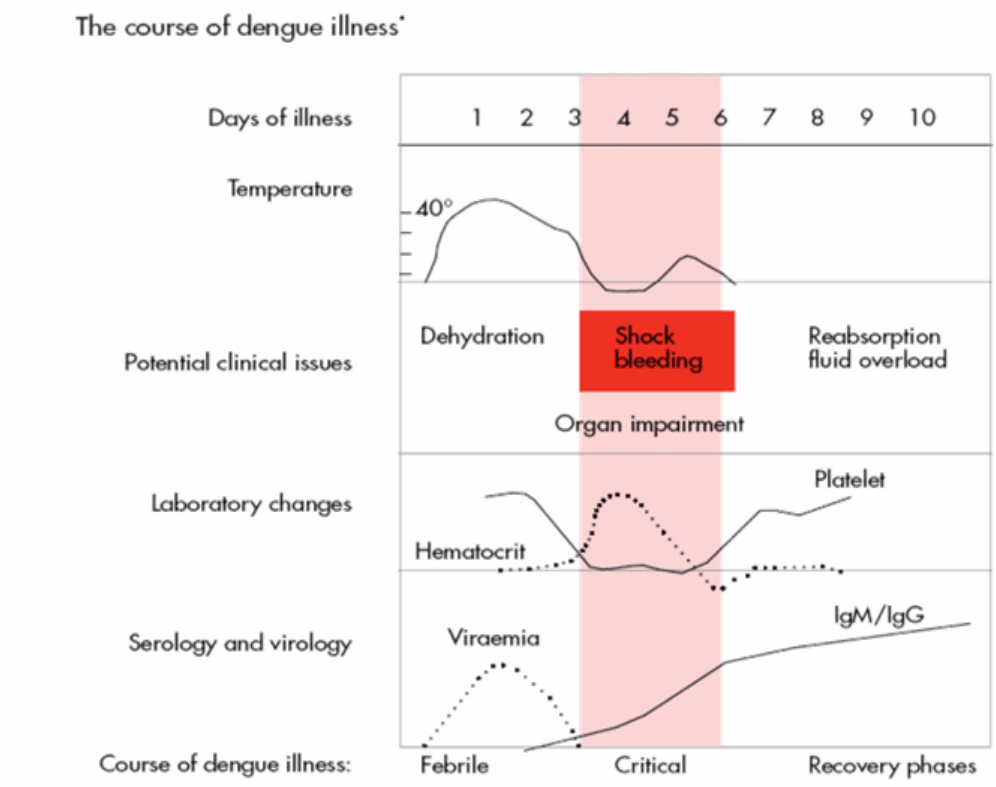
   Heart or other organs

NATURAL COURSE

The clinical course of illness passes through 3 phases:

- Febrile phase

- Critical phase
- Convalescent phase



Febrile phase:

The onset of dengue fever is usually with sudden rise in temperature which may be biphasic, lasting 5-8 days and commonly associated with headache, flushing and rash. There may be pain in retro-orbital area, muscles, joint or bone.

Rash may be maculopapular or rubelliform and usually appear after 3 or 4 day of fever and commonly seen in face, neck and other part of the body which generally fades away in the later part of the febrile phase. Localized cluster of petechiae may appear over upper and lower limbs.

During the first 24-48 hours of fever, children may develop a transient generalized macular erythematous rash which blanches upon pressure. The convalescent rash of dengue fever appears about 2-3 days after defervescence. It is characterized by generalized confluent petechial rash which does not blanch upon pressure, with multiple small round islets of normal skin. It is otherwise called "white islands in a sea of red"

Critical phase:

DF/DHF patients usually go to critical phase after 3 to 4 days of onset of fever. During this critical phase plasma leakage and high haemoconcentration are documented and patients may develop hypotension. Abnormal haemostasis and leakage of plasma leads to shock,bleeding, accumulation of fluid in pleural and abdominal cavity. High morbidity and mortality in DHF/DSS are commonly associated with various organ involvements and metabolic derangement. The period of plasma leakage usually persists for 36-48 hrs.

Convalescent phase:

During the recovery phase the extracellular fluid which was lost due to capillary leakage returns to the circulatory system and signs and symptoms improve.

This phase occurs after 6-7 days of fever and last for 2-3 days. (48-72 hours). Longer convalescence may be expected in some of the patients with severe shock, organ involvement and other complications which may require specific treatment. Patient may develop pulmonary oedema due to fluid overload if the fluid replacement is not optimized carefully

Clinical evaluation of Dengue fever:

- Blood pressure
- Evidence of bleeding in skin or other sites
- Hydration status
- Evidence of increased vascular permeability-- pleural effusions, ascites
- Tourniquet test -Inflate blood pressure cuff to a point midway between systolic and diastolic pressure for 5 minutes

Positive test: 20 or more petechiae per 1 inch2 (6.25 cm2).

Laboratory diagnosis

- Virus isolation
- Genome detection
- Antigen detection
- Serological diagnosis

Virus isolation : - cultured mosquito cells /mammalian cells used

It is the gold standard“gold standard”. But it has low sensitivity and takes long detection time

Genome detection :

1) nested RT-PCR

2) single step RT-PCR

3)NASBA assay

Antigen detection :

1) E/M antigen

2) NS I antigen

Serological diagnosis :

1) ELISA

2) IgM & IgG antibody detection

ELISA-based NS1 antigen tests

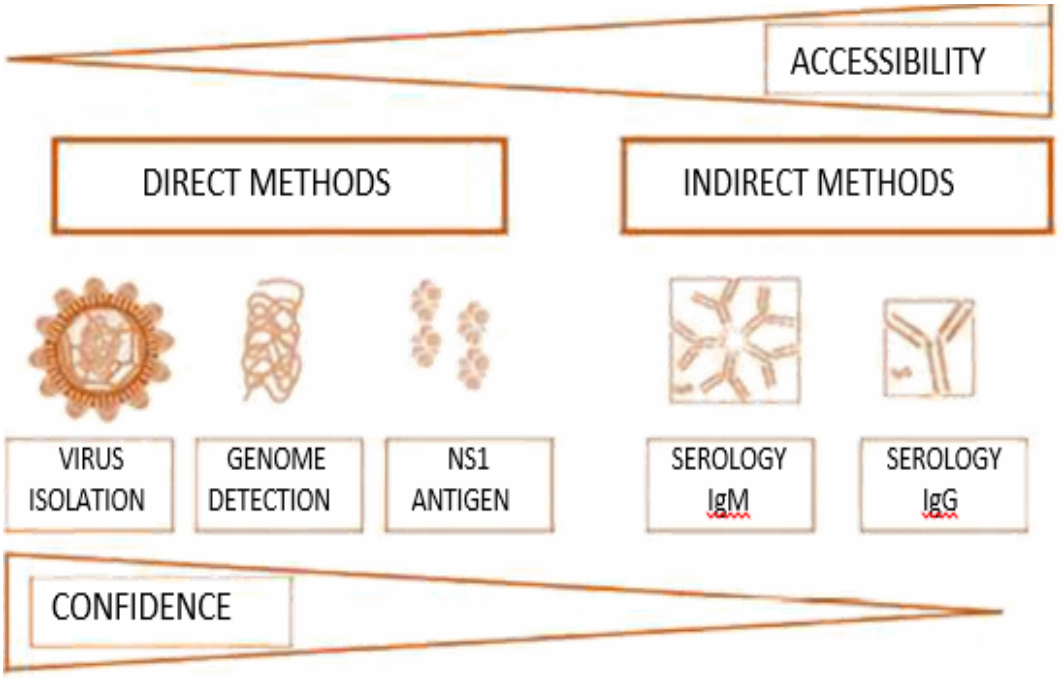
Dengue NS1 antigen is a glycoprotein which is produced in both membrane-associated and secretion forms, is seen in the serum of patientsin the early stages of dengue viral infection. It is a useful investigation for the diagnosis of acute dengue infection. It is a simple test that has specificity and high sensitivity.

NS1 appears in blood in early viremic stage itself. So it helps in early diagnosis of Dengue infection..The NS1 ELISA-based antigen assay is widely available. Its another use is that ,it can be used to distinguish Dengue infection from other Flavi virus infection.

IgM-capture (MAC-ELISA)

In the past few years, MAC-ELISA is a test that is used commonly. It is a simple test that and doesn't require any complicated equipment. Anti Human IgM that is already to the solid phase is used to detect the IgM Dengue antibodies in MAC-ELISA. Dengue antigen is added to this, if the IgM antibody from the patient's serum is anti-dengue,then it will bind to dengue antigen. Dye added will make colour change if the antibody is present in serum.

Comparison of diagnostic tests according to their accessibility and confidence



Interpretation of Dengue diagnostic tests

Highly suggestive of Dengue :

One of the following:

IgM + in a single serum sample

IgG + in a single serum sample

with a HI titre of 1280 or greater

Confirmed

One of the following:

1) PCR +

2) Virus culture +

3) IgM seroconversion in paired sera

4) IgG seroconversion in paired sera or fourfold IgG titer increase in paired sera

Interpretation of dengue serology reports

IgM	IgG	Interpretation
Negative	Negative	Early sample/not dengue
Negative	Positive (low titre)	Past dengue infection
Negative	Positive (high titre)	Secondary dengue infection
Positive	Negative	Primary dengue infection
Positive	Positive (low titre)	Recent primary dengue infection
Positive	Positive (high titre)	Secondary dengue infection

Supportive investigations

- Complete blood count (CBC)
- Metabolic panel
- Serum protein and albumin levels
- Liver panel
- Disseminated intravascular coagulation (DIC) panel

- Chest X-Rays - Effusion
- USG Abdomen - Ascites

Characteristic findings in dengue fever :

- Thrombocytopenia (platelet count < 100 x 109/L)
- Leukopenia
- Mild to moderate elevation of aspartate aminotransferase and alanine aminotransferase values

In patients with dengue hemorrhagic fever:

- Increased hematocrit level secondary to plasma extravasation and/or third-space fluid loss
- Hypoproteinemia
- Prolonged prothrombin time
- Prolonged activated partial thromboplastin time
- Decreased fibrinogen Increased amount of fibrin split products

Markers for severe disease :

- Increased urinary levels of heparan sulphate
- Increased plasma levels of pentraxin 3
- Decreased serum albumin
- Increased levels of vascular endothelial growth factor (VEGF)
- Increased levels of soluble vascular cell adhesion molecule – 1 (VCAM-1)

Differential diagnosis

- Dengue-like diseases [Chikungunya fever , West Nile fever (with rash) & Colorado tick fever, sandfly fever, Rift Valley fever, and Ross River fever (without rash)]
- Early stages of malaria
- Mild yellow fever
- Viral hepatitis
- Leptospirosis
- Viral respiratory and influenza like diseases

Outpatient management of a patient with dengue

- Advise bed rest
- Encourage plenty of oral fluid intake (of oral rehydration solution (ORS), fruit juice and other fluids containing electrolytes and sugar)
- Give paracetamol for high fever if the patient is uncomfortable.
- Inform the patient about the warning signs

Indications for hospitalisation

Suspect severe dengue and the need for hospitalisation when patient develops :

- Giddiness
- cooler extremities compared to trunk & extremities

- Oliguria with dark urine
- Rt. hypochondriac pain or severe abdominal pain
- Bleeding from any site
- Persistent vomiting
- Lethargy or irritability/restlessness

Management of a patient with severe Dengue

1) Replacement of plasma losses
2) Recognition & management of hemorrhage
3) Prevention and management of fluid overload
4) Prevention of iatrogenic infections

Initial management

- Establish IV access
- Collect samples for blood group, Hb, PCV and platelets
- Monitor :

- Pulse volume
- Blood pressure
- Abdominal girth
- Urine output

Crystalloids and colloids, normal saline and Ringer Lactate:

Colloids provide volume expansion over and above actual fluid volume infused. Crystalloids have no added volume effect. Major concerns with use of colloids are impact on coagulation and allergic reaction. Hence, crystalloids are ideal for initial resuscitation & colloids better serve in severe shock with undetectable blood pressure.

NS preferred over RL due to risk of worsening tissue acidosis and lactate accumulation when large volumes of RL is infused repeatedly. Large volumes of 0.9% saline may lead to hyperchloraemic acidosis (this may aggravate or be confused with lactic acidosis from prolonged shock). When serum chloride level increase the normal range, it is advisable to change to Ringer's Lactate

Management algorithm for Dengue Haemorrhagic fever Grade 1 and 11

If the PCV rise of the patient is more than 20 % , have to initiate 6ml/kg /hr crystalloid solution for 1-2hours. Then we have to repet haematocrit value. If there is improvement in haematocrit can decrease the dose of crystalloids to 6 ml/kg/hr for 2-4 hours and then to 3ml/kg/hr for 2-4 hrs and 3- 1.5ml/kg/hrfor 2-4hours.

If there is no improvement and PCV rises increase IV crystalloids to 10 ml/kg/hr crystalloid for 2hours. If PCV falls blood transfusion is indicated

Management of Dengue haemorrahgic fever Grade 111

If the PCV rise of the patient is more than 20 % and pulse pressure is <20 if SBP <90 have to start IV therapy with 10-20 ml/kg/hr , and if there is improvement in PCV then decrease infusion rate to 6ml/kg /hr crystalloid solution for 1-2hours. Then we have to repet haematocrit value.

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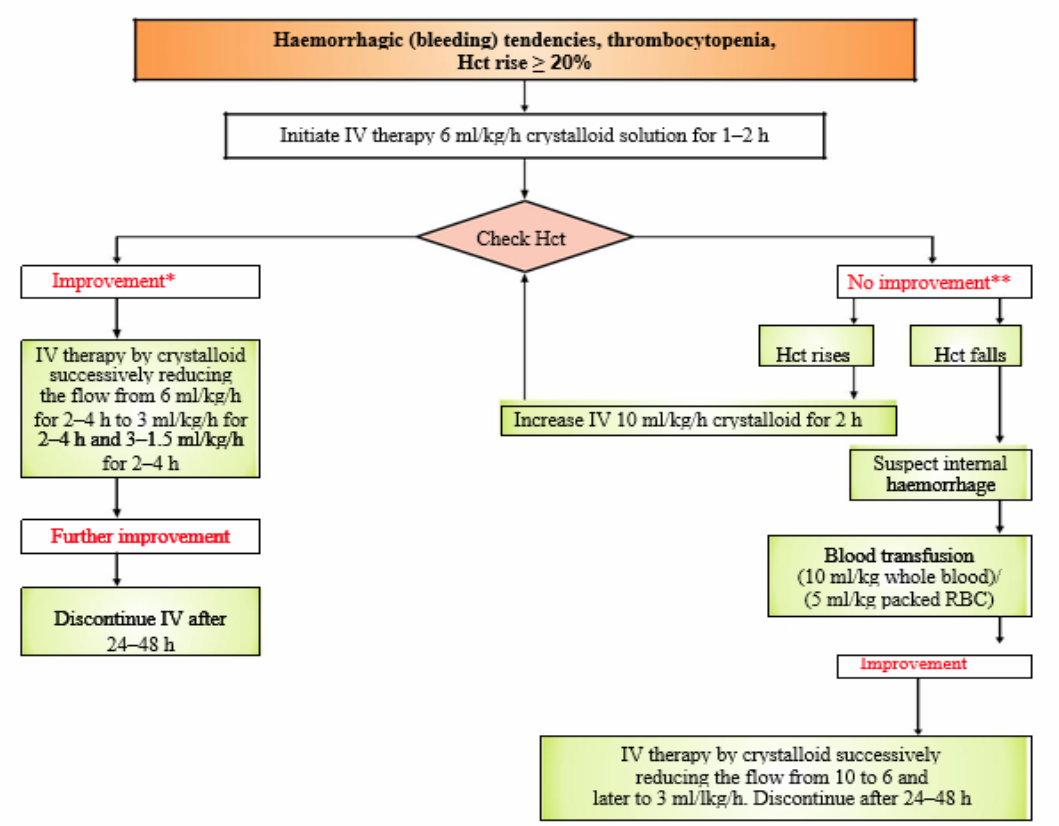

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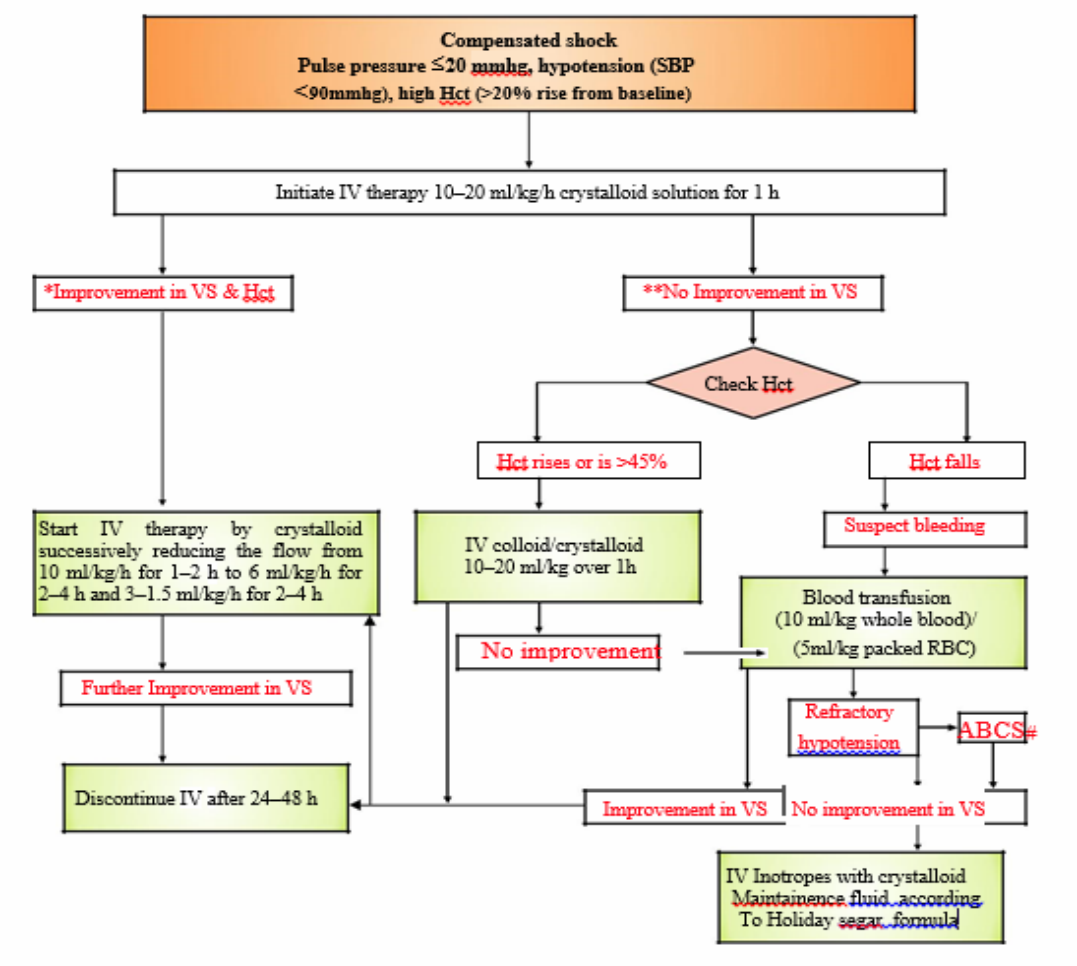


Management of Dengue haemorrahgic fever grade 1V

If there is profound shock or signs of shock undetectable Blood pressure and high PCV (20% rise)

Volume replacement with 10- 20 ml /kg crystlloids over 15- 20 min. If there is improvement can decrease the rate of infusion to 10- 6 ml /kg for 2 hours and

Management of congestive phase

- Change over to hypotonic fluid

- Decrease infusion rate to 3-5 ml/kg BW/hr
- Diuretics & digitalisation needed in patients with cardiac overload due to regurgitant fluid

Management of DF with co-infections

It is difficult to manage Dengue Fever when there are associated infections like HIV, Tuberculosis , chikungunya, malaria, enteric fever and leptospira. Manifestations will be severe in case of coinfections.

HIV:

In HIV and AIDS patients may develop severe complications like Dengue Haemorrhagic Fever and Dengue shock syndrome. Bleeding manifestations and organ involvement may occur in patients with HIV and dengue. In patients with very low CD4 count prognosis of Dengue fever is poor. There is a possibility of multi system involvement in case of HIV coinfection. Expert advise is always required in management of such patients.

Tuberculosis:

Dyspnea and massive hemoptysis can occur as a complication of Dengue fever and Tuberculosis. Pleural effusion and Acute Respiratory Distress Syndrome can occur in Tuberculosis. Close monitoring should be done anticipating the complications.

Enteric Fever:

As Typhoid and gastroenteritis are water born diseases there is a possibility of coinfection with Dengue. In initial phase Dengue Fever, if antibiotic treatment is started late patient may become more complicated. Blood culture should be done as confirmatory test. Widal may be negative initial week.

Malaria:

Malaria is another mosquito born illness that can occur along with Dengue.As the management of malaria is entirely different that of dengue , it is important that early diagnosis of malria should be made.Treatment should be started early for better outcome.

Chikungunya:

Chikungunya is another mosquito born infection that is endemic in Dengue prevalent areas. Acute complications are more if there is coinfection. Chikungunya is characterized by joint pain. So in case of dengue fever if patient has polyarthralgia should suspect chikungunya coinfection.

Pregnancy and Dengue infection

Physiologicaly in pregnancy there is hemodilution , hypercoagulability and changes in cardiovascular status. Manifestations of

Dengue may confuse with complications in pregnancy too. In HELLP syndrome there is thrombocytopenia, elevated liver function test and features of capillary leakage.

Maternal death due to severe bleeding at time of delivery may occur in patients with Dengue haemaorrhagic syndrome. Abortion may occur due to dengue infection during first trimester

Fetal death may occur due to placental insufficiency. Premature birth is another possibility. There can be neural tube defects also

Management of dengue in new born

If the neonate goes into shock septic septic shock or birth trauma is taken as the first differential diagnosis. History of febrile illness in pregnancy may give a clue to the diagnosis of Dengue Shock Syndrome in new born and infants. Close monitoring andsupportive treatment is the mainstay of management.

Management of dengue in infants

Infants without warning signs:

Together with breastfeeding/formula feeding oral rehydration should be advised with oral rehydration solution (ORS), fruit juice and other fluids with electrolytes and sugar. Parents or attenders have to be advised about fever control with paracetamol and tepid sponging. In case of any

warning signs care givers should be advised to bring the child immediately to health care set up.

Infants with warning signs:

If the infant develops any warning sign it is an indication for intravenous rehydration. Volume replacement with intravenous fluid therapy has to be done judiciously. At first isotonic crystalloid solutions like Ringer's lactate, Ringer's acetate, or 0.9% saline solution can be used. In majority of the infants capillary leak resolves sitself after 24-48 hours.

Infants with severe dengue:

Treatment of shock is by volume replacement in dengue shock. It is very challenging issue and hence has to be done judiciously. Every case has to be critically evaluated separately.

Dengue viral hepatitis:

Some patients develop abnormality of liver function test due to dengue viral infection. AST/ALT level may be very high in some and prothrombin time may be prolonged. Liver involvement is usually seen with pre-existing conditions like chronic viral hepatitis, cirrhosis and haepatomegaly due to other causes. Patient may also go for hepatic encephalopathy because of acute liver failure. Liver dysfunction may occur with DF in pregnancy. Low serum albumin in chronic liver disease may be

associated with severe Dengue Haemorrhagic Fever and bleeding manifestations. Gastrointestinal bleeding is may occur in this and there can be severe Dengue shock syndrome. Careful management with hepatic failure regimen and appropriate intravenous fluids and blood transfusion. If there is prothrombin time prolongation IV vitamin K1 may be started in such conditions.

Dengue myocarditis:

Dengue infection can cause acute myocarditis rarely. This may contribute to the development of Dengue Shock Syndome. Cardiac complications are more seen in patients with Coronary artery disease, systemic hypertension, diabetes and valvular heart disease. Management of shock with IV fluid should be done carefully in patients with cardio vascular compromise. Improper management may result in pulmonary edema. Coronary Artery disease patient who are already on Aspirin and other anti-platelet agent may develop severe bleeding if these drugs are not stopped in dengue infection. There should be frequent monitoring of the cardiac status and electrolye balance in these patients. Proper monitoring and treatment should be given for patients with biventricular failure forbetter morbidity and mortality outcome.

Dengue Fever in Diabetes:

Diabetic patients may develop severe complication in Dengue Fever especially when there is micro vascular or macro vascular complications like diabetic retinopathy, nephropathy, neuropathy , cardiomyopathy, vasculopathy and hypertension. There can be uncrontolled blood sugar in Dengue fever requiring treatment with insulin.

Central nervous system involvement in Dengue Fever:

Altered sensorium may develop in dengue patient due to various conditions like shock , electrolyte imbalance because of persistent vomiting, fluid overload leading to dilutional hyponatremia or other electrolyte imbalance, hypoglycemia, hepatic enchalopathy and also due to direct involvement of the Central nervous system by the virus.

There can be disseminated demyelination following dengue infection and cause acute disseminated encephalomyelitis. In some patients there can be acute encephalopathy. Cerebral Malaria and enteric encephalopathy are close differential diagnosis which may also occur in same period . Dengue serology (IgM) in Cerebro spinal fluid sample maybe of help to confirm dengue encephalitis.

Renal involvement in Dengue Fever:

Acute Tubular Necrosis (ATN) may occur in Dengue Shock Syndrome and acute kidney injury (AKI) may develop if fluid therapy is

not given adequately on time. If shock is corrected renal function may be reversible, in short duration. If there is persistent shock there can be renal complications. Monitoring of urine output is very important in dengue infection to assess renal function. Urine routine examination also should be done to look for any microscopic haematuria. Other blood investigations like serum urea,creatinine, electrolytes, Glomerular Filtration Rate, Arterial Blood Gas analysis has to be done in patients with severe dengue and Dengue Haemorrhage Fever. Fluid intake has to monitored closely in case of Acute Kidney Injury so as to avoid volume overload and pulmonary oedema. Patients with diabetic nephropathy , systemic hypertension and connective tissue disorders are at high risk of development of dengue haemorragic fever.

Summary of publications

1) **Title** : Sonography in the diagnosis and assessment of dengue fever

   Journal published :Journal of clinical imaging science 2014 march

   Authors: V R Santhosh, Prasanth G Patil, MG srenath, Ashok kumar, Aditi Jain , M Archana

   Conclusion: Sonographic features of thickened gall bladder wall, pleural effusion, ascites , hepatomegaly and splenomegaly strongly favour the diagnosis of dengue in patients presenting with fever and associated features, especially during an epidemic. The degree of thrombocytopenia showed a direct relationship with ultrasound findings

2) **Title:**Can Radiology play a role in early diagnosis of Dengue fever?

   Journal published : North American Journalof Medical Sciences

   Authors :Sruti Chandak, Ashtosh Kumar

   Conclusion : Ultrasoud features of hepatospleenomegaly , GB wall edema , right sided or bilateral pleural effusion and ascites in patients presenting with signs and symptoms of DF during an epidemic are virtually diagnostic of DF. There have been recent changing trends with hepatospleenomegaly being the more common manifestation in comparison to ascites and GB wall edema. Dengue fever has the

catastrophic effects in pregnancy such as oligohydramnios and intra uterine fetal demise.

3) **Title** : Is ultrasound a useful tool to predict severity of Dengue infection

Journal published : Indian journal of Pediatrics 2016

Authors: Pothapregada S , Kullu, Kamaakkannan , Thulasingam M

Conclusion :Ultrasound can be used as an early predictor as well as an important prognostic sign for severe dengue infection especially during an epidemic

4) **Title** : Role of ultrasound in assessment of dengue fever

Journal published : Indian Journal of scientific study 2016

Authors :K S Vedaraju1, K R Vijay Kumar1, T V Vijayaraghavachari

Conclusion : USG is an important accessory tool for the early diagnosis of plasma leakage signs and for prediction of the disease severity, identifying mild and severe cases of dengue hemorrhagic fever, besides contributing in the differential diagnosis with other causes of febrile disease.

5) **Title :** Ultrasound findings in Dengue fever

Journal published : Internatinal Journal of Recent Trends in Science and Technology 2016

Authors : Omprakash Bhangdia, Suresh Bhattad, Krithi Bhangdia

Conclusion : Abdomoinal ultrasound should be made a routine investigation in cases of Dengue fever as it helps in clinical diagnosis and early detection of complications

6) **Title :** Role of ultrasound in Dengue Fever

Journal published : British Journal of Radiology 2005

Authors : PM Venkitasai B Dev, R Krishnan

Conclusion : Ultrasound abdomen is n impotant adjunct in diagnosis of Dengue and may help to direct further confirmatory investigations

MATERIALS AND METHODS

MATERIALS AND METHODS

STUDY POPULATION:

100 patients with serologically proven Dengue fever more than 13 years of age

STUDY SETTING:

Department of General Medicine, Government Rajaji Hospital & Madurai Medical College, Madurai.

SAMPLE SIZE :

100 IgM positive Dengue patients

Inclusion Criteria

- History of fever
- IgM dengue positive
- Age > 13 years

Exclusion Criteria

- Chronic liver disease
- Cholilithiasis
- Chronic renal failure
- Congestive cardiac failure
- ITP

STUDY TOOL:

A predesigned proforma was used to collect information of the study participants. The proforma had questions to collect information about the socio – demographic details of the participants, clinical history and signs suggestive of Dengue fever. Proforma also had details of estimated lab parameters like Complete Hemogram, basic biochemical investigations ,IGM Dengue and Ultasonographic findings of the patient

ANTICIPATED OUTCOME:

Ultrasound can pick up evidence of plasma leakage early. So that careful monitoring can be done to prevent profound shock

DATA COLLECTION:

Informed consent will be obtained from all patients to be enrolled for the study. In all the patients relevant information will be collected in a predesigned proforma. The patients are selected based on clinical examinations and biochemical tests.

Adult patients aged more than 13 years of age admitted with fever with IgM Dengue positive serology in the Department of Medicine of Government Rajaji Hospital, Madurai will be subjected to ultrasound abdomen, pelvis and chest . Platelet and hematocrit values, and blood pressure monitoring will be done

STATISTICAL ANALYSIS:

The collected data will be entered in Microsoft Excel spreadsheet and analyzed using Statistical Package for Social Sciences (SPSS) version

Patients with a platelet count of less than 1 lakh was considered to have thrombocytopenia. Rise in PCV of 20 % was taken as significant rise in PCV and fall in pulse pressure to less than 20 was taken as significant. And the presence of bleeding manifestation in history too is considered. Each of these 4 parameters – (bleeding manifestations , fall in pulse pressure , rise in PCV and thrombocytopenia) will be compared with each of the described ultrasonographic findings – (thickened gall bladder, pericholecystic fluid,pleural effusion ascites, perinephric edema, hepatomegaly and splenomegaly)

The analysis of data was carried out by entering the coded information and generating tables. Statistical analysis was done using chi square tests and p value was found.

LABORATORY INVESTIGATIONS

a) Complete Hemogram

b) Peripheral blood smear

c) Liver function test

d) Renal function test

e) Fasting and Post prandial blood Sugar

f) IgM Dengue

DESIGN OF STUDY:

Cross sectional study

PERIOD OF STUDY:

3 MONTHS

COLLABORATING DEPARTMENTS:

DEPARTMENT OF BIOCHEMISTRY

DEPARTMENT OF RADIOLOGY

DEPARTMENT OF PATHOLOGY

DEPARTMENT OF MICROBIOLOGY

ETHICAL CLEARANCE: Study proposal accepted by institute ethical committee ,MADURAI MEDICAL COLLEGE

CONSENT: Individual written and informed consent obtained.

ANALYSIS: Statistical analysis will be performed using appropriate tests as required according to data.

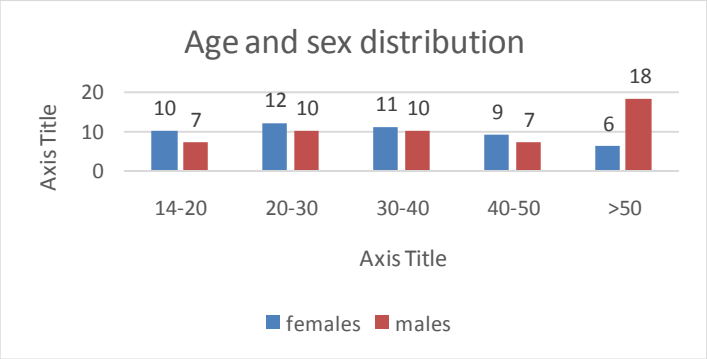
CONFLICT OF INTEREST: NIL

FINANCIAL SUPPORT: self

RESULTS AND INTERPRETATION

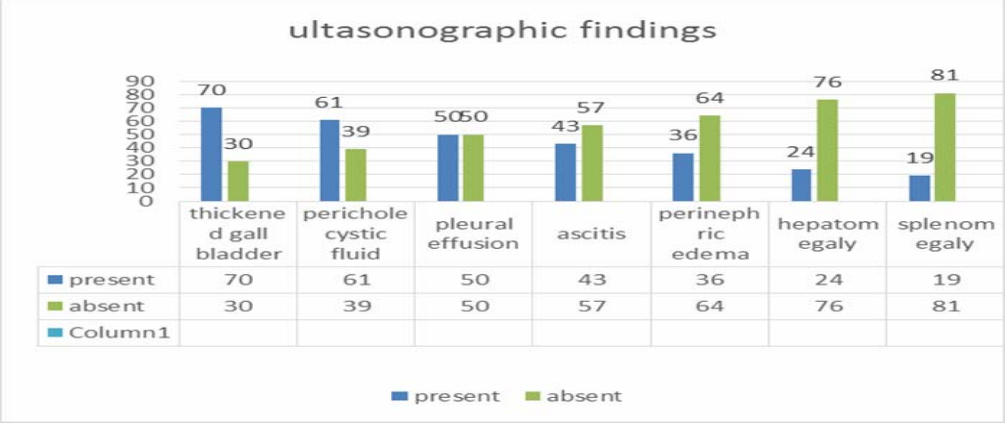
RESULTS AND INTERPRETATION

Age and sex distribution



Study was conducted among 100 serologically proven Dengue fever cases among which 48 were females and 52 were males . The mean age was 37 years. Minimun age was 14 and maximum was 74 years

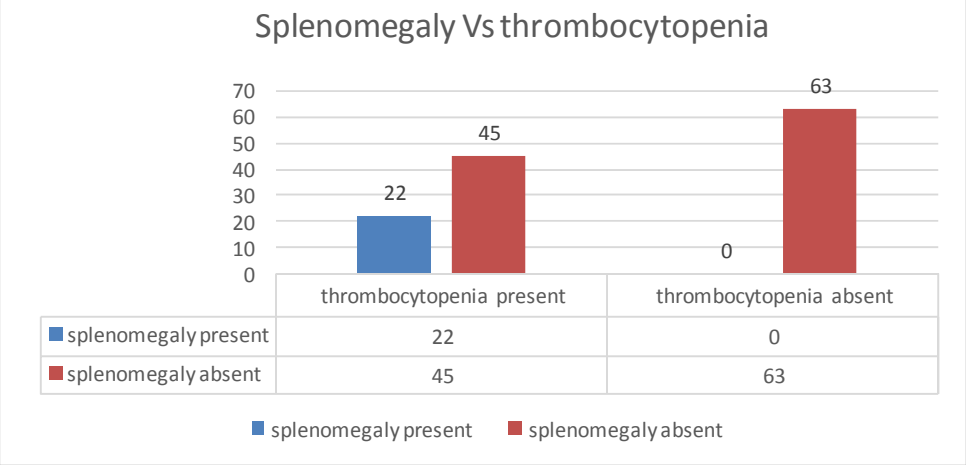
Ultra sonographic findings



Most common ultrasound finding is gall bladder wall thickening. Next common finding is pericholecystic fluid. Least common finding is splenomegaly

Most common laboratory parameter was thrombocytopenia present in 63 of 100 patients. But bleeding manifestations were present only in 27 patients. Rise in PCV was seen in 34 patients33 and a fall in pulse in 33.

Splenomegaly Vs thrombocytopenia

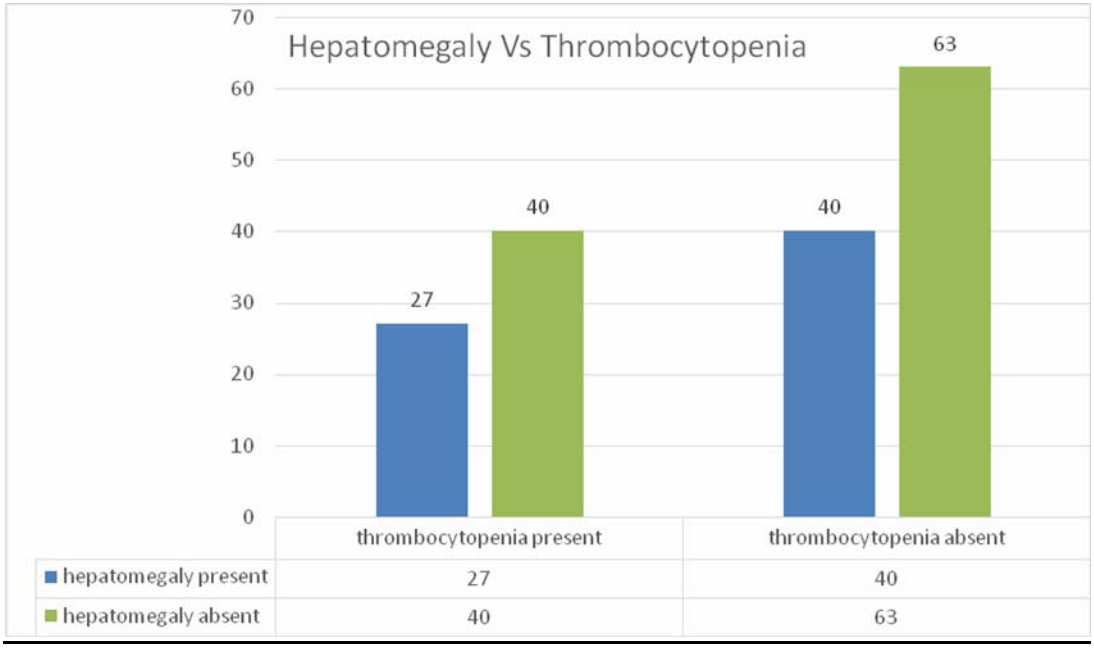


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	24.900[a]	1	.000		
Continuity Correction[b]	22.620	1	.000		
Likelihood Ratio	33.389	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	24.709	1	.000		
N of Valid Cases[b]	130				

While comparing splenomegaly and thrombocytopenia chi square value was found to be 24.9 . with a degree of freedom of one p value was <0.01. Hence there is a statistically significant association between splenomegaly and thrombocytopenia

Hepatomegaly Vs thrombocytopenia

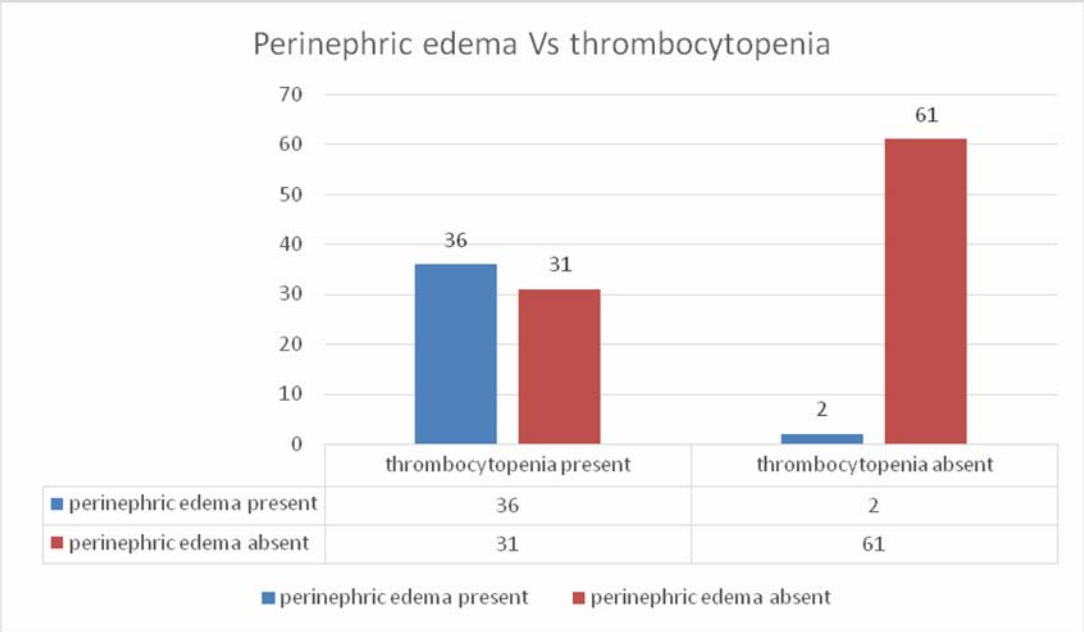


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	32.043[a]	1	.000		
Continuity Correction[b]	29.641	1	.000		
Likelihood Ratio	42.486	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	31.797	1	.000		
N of Valid Cases[b]	130				

While comparing hepatomegaly and thrombocytopenia chi square value was found to be 32.043. With a degree of freedom of one p value was found to be <0.01. Hence there is a statistically significant association between heoatomegaly and thrombocytopenia.

Perinephric edema Vs thrombocytopenia

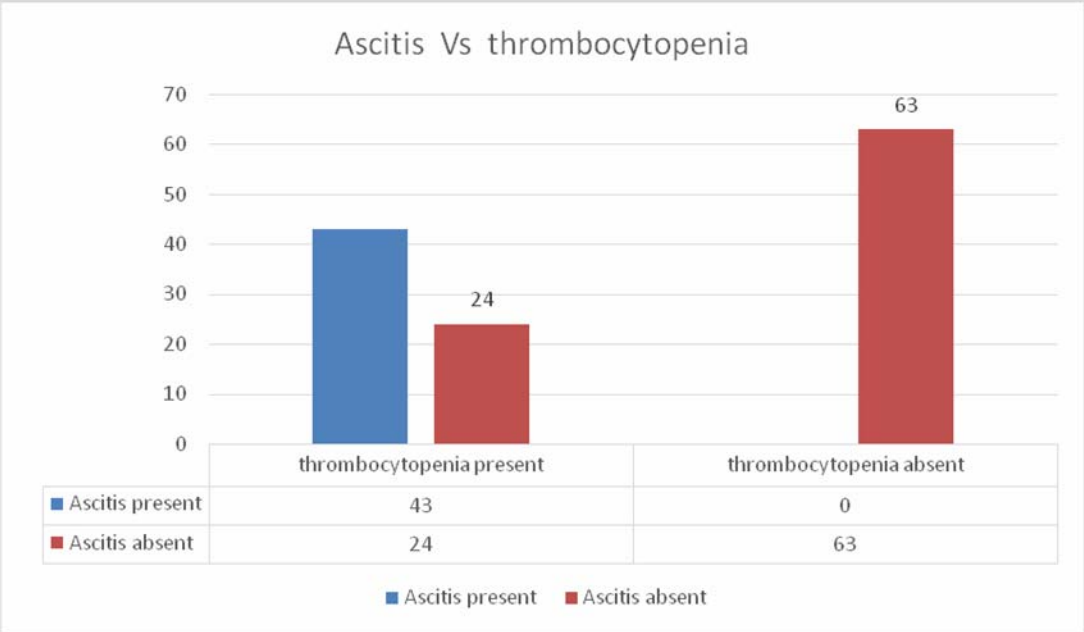


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	40.119[a]	1	.000		
Continuity Correction[b]	37.712	1	.000		
Likelihood Ratio	46.849	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	39.810	1	.000		
N of Valid Cases[b]	130				

While comparing perinephric edema and thrombocytopenia chisquare value was found to be 40.119. With degree of freedom of one P value was found to be <0.01. Hence there is a statistically significant association between between perinepric edema and thrombocytopenia

Ascitis Vs thrombocytopenia

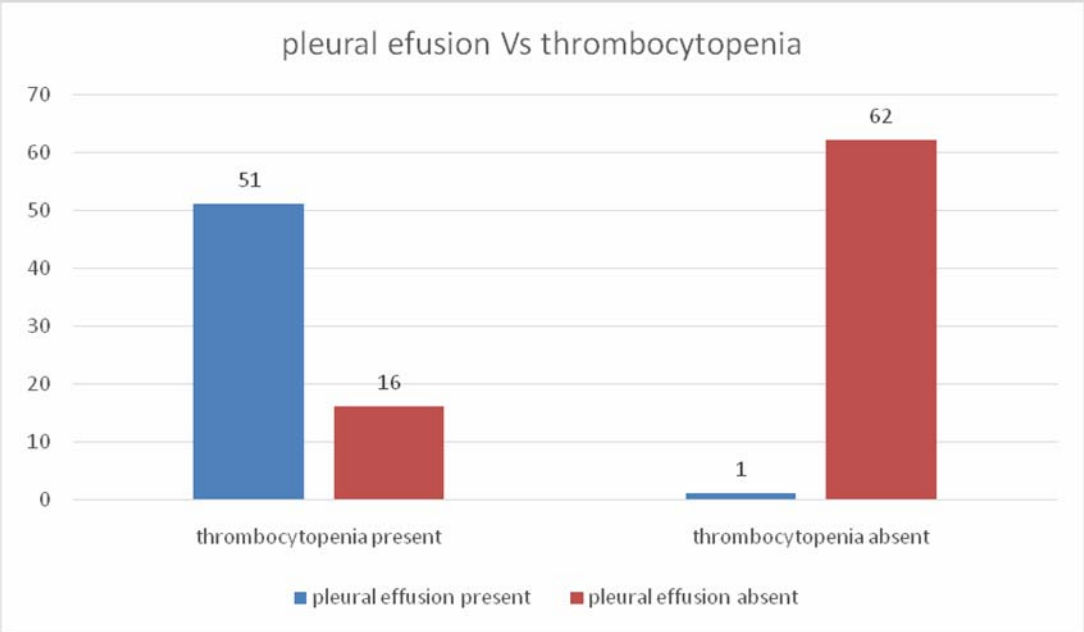


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	60.417[a]	1	.000		
Continuity Correction[b]	57.552	1	.000		
Likelihood Ratio	77.609	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	59.952	1	.000		
N of Valid Cases[b]	130				

While comparing ascites with thrombocytopenia there is a chi square value of 60.417. With a degree of freedom of one P value was found to be <0.01. Hence there is a statistically significant association between ascites and thrombocytopenia.

Pleuraleffusion Vs thrombocytopenia

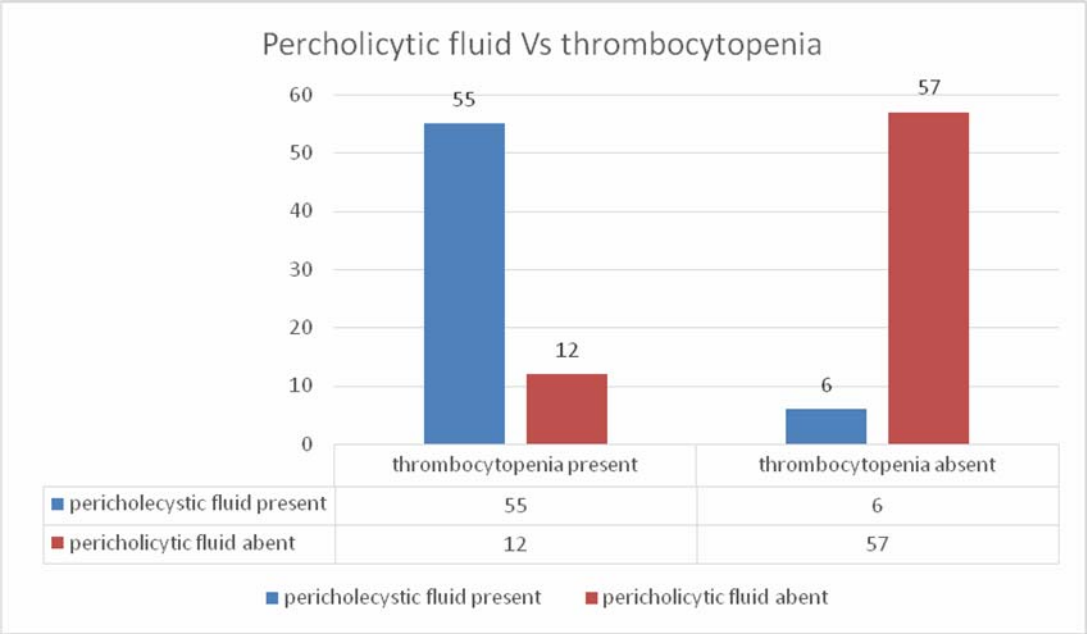


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	75.153[a]	1	.000		
Continuity Correction[b]	72.080	1	.000		
Likelihood Ratio	91.053	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	74.575	1	.000		
N of Valid Cases[b]	130				

While comparing pleural effusion and thrombocytopenia Chi Square value was found to be 75.153. With degree of freedom of one P value was found to be <0.01. Hence there is a statisticaly significant association between pleural effusion and thrombocytopenia.

PericholicyticFuid Vs thrombocytopenia

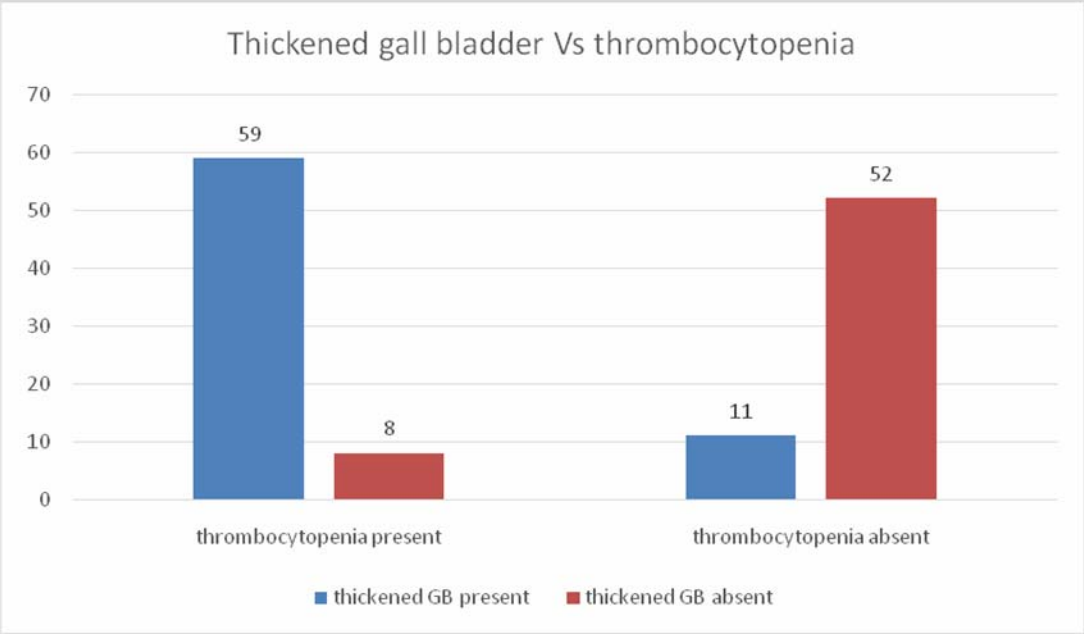


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	68.650[a]	1	.000		
Continuity Correction[b]	65.768	1	.000		
Likelihood Ratio	77.115	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	68.122	1	.000		
N of Valid Cases[b]	130				

While comparing pericholecystic fluid and thrombocytopenia Chi Square value value was found to be 68.650. With a degree of freedom of one P value was found to be <0.01

Thickened gall bladder Vs thrombocytopenia

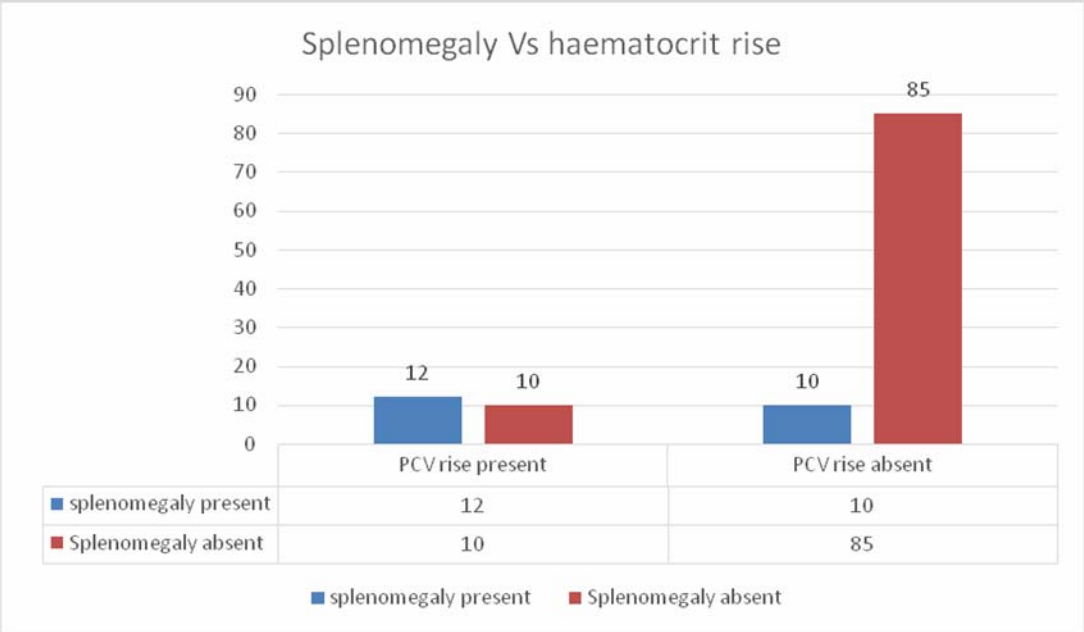


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	65.120[a]	1	.000		
Continuity Correction[b]	62.310	1	.000		
Likelihood Ratio	72.088	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	64.619	1	.000		
N of Valid Cases[b]	130				

While comparing thickening of gall bladder and thrombocytopenia Chi Square value was found to be 65.120. With a degree of freedom of one P value was found to be <0.01. Hence there is a statistically significant association between gall bladder thickening and thrombocytopenia.

Splenomegaly Vs haematocrit rise

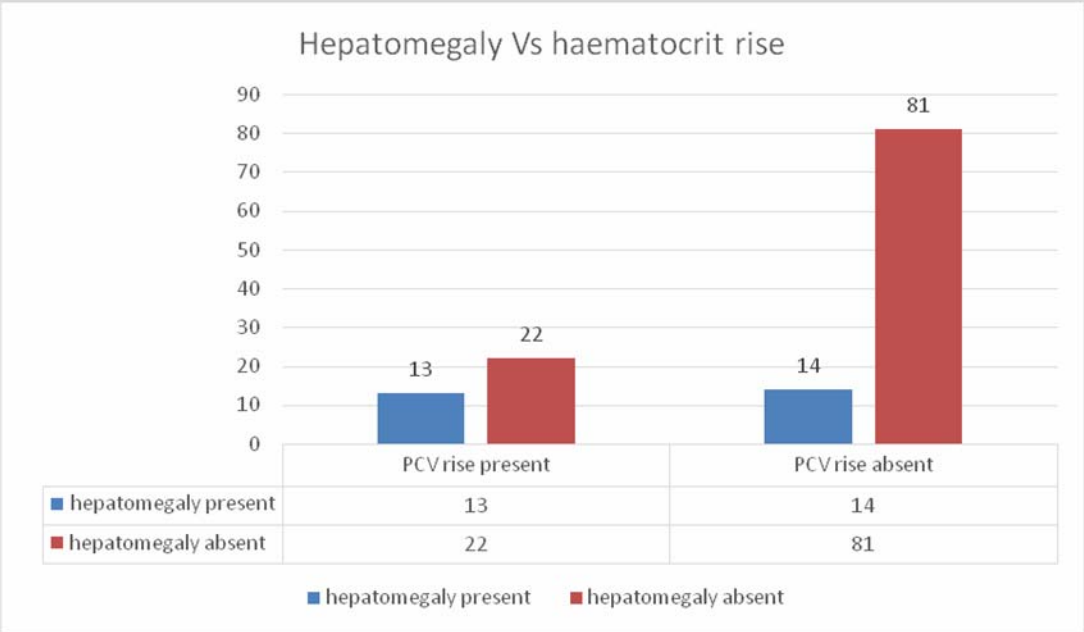


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10.270[a]	1	.001		
Continuity Correction[b]	8.649	1	.003		
Likelihood Ratio	9.275	1	.002		
Fisher's Exact Test				.003	.002
Linear-by-Linear Association	10.191	1	.001		
N of Valid Cases[b]	130				

While comparing splenomegaly and PCV rise Chi square value was found to be 10.270. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between splenomegaly and PCV rise.

Hepatomegaly Vs haematocrit rise

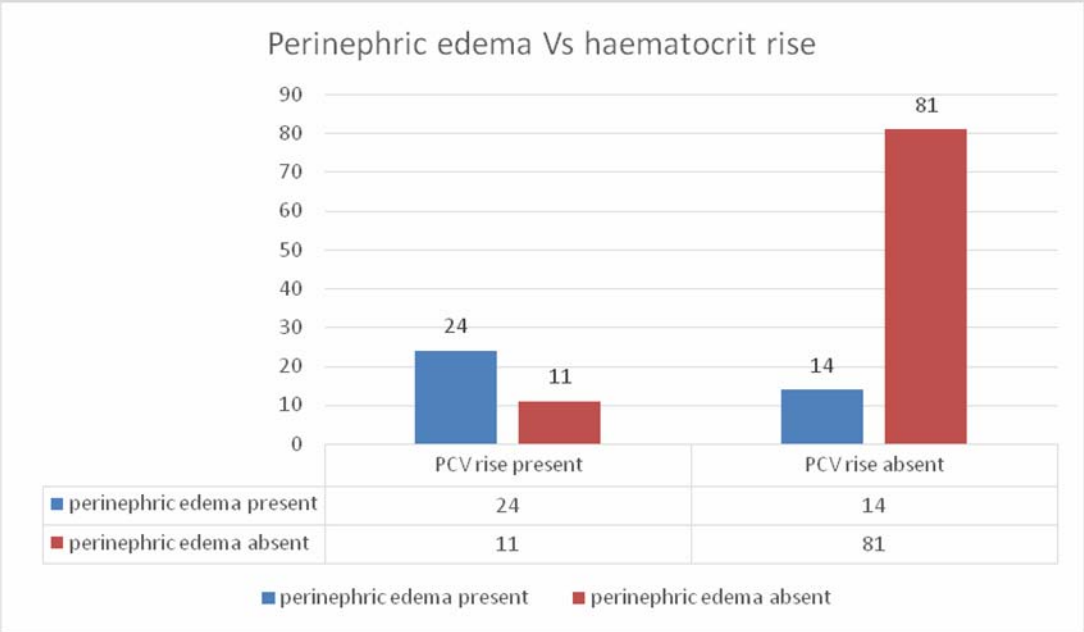


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.803[a]	1	.005		
Continuity Correction[b]	6.501	1	.011		
Likelihood Ratio	7.208	1	.007		
Fisher's Exact Test				.008	.007
Linear-by-Linear Association	7.743	1	.005		
N of Valid Cases[b]	130				

While comparing hepatomegaly and PCV rise Chi square value was found to be 7.803. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between hepatomegaly and PCV rise.

Perinephricedema Vs haematocrit rise

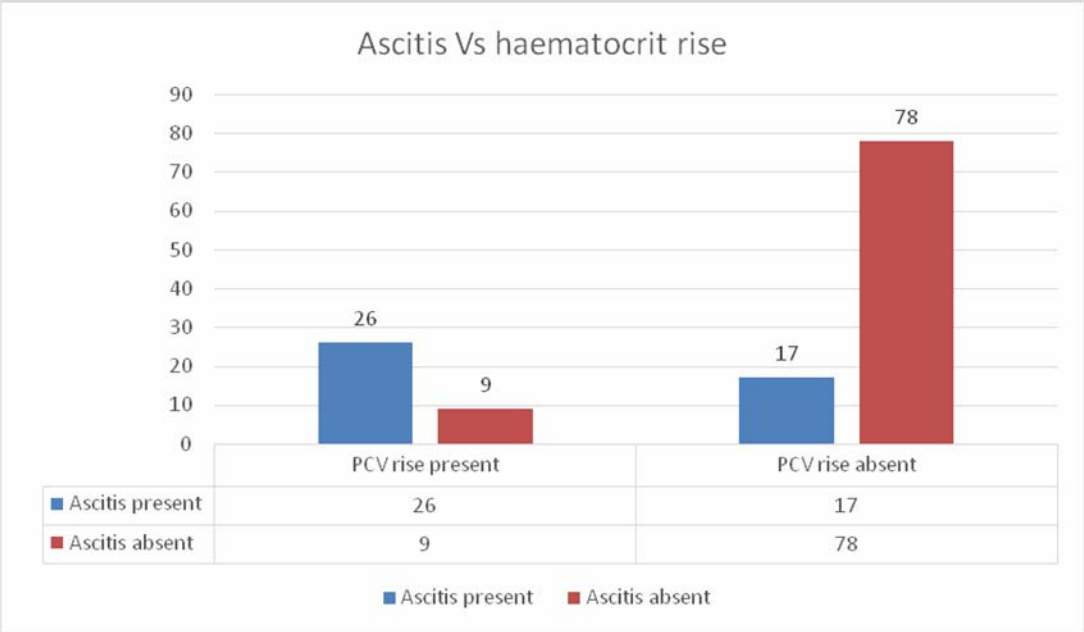


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	35.833[a]	1	.000		
Continuity Correction[b]	33.278	1	.000		
Likelihood Ratio	34.077	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	35.558	1	.000		
N of Valid Cases[b]	130				

While comparing perinephric edema and PCV rise Chi square value was found to be 35.833. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between perinephric edema and PCV rise.

Ascitis Vs haematocrit rise

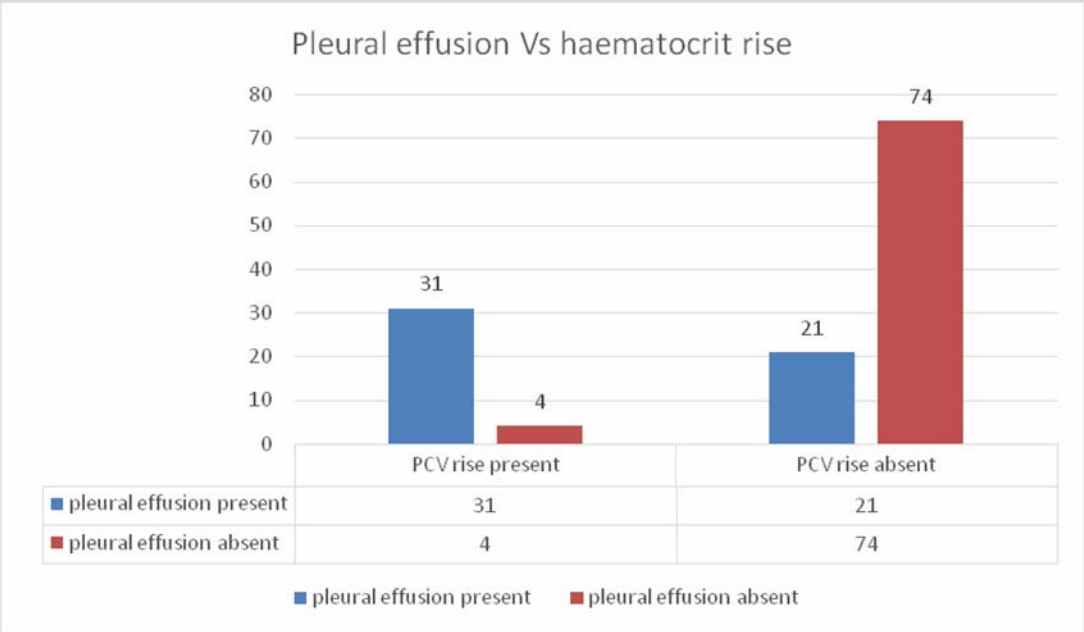


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	36.742[a]	1	.000		
Continuity Correction[b]	34.239	1	.000		
Likelihood Ratio	35.864	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	36.460	1	.000		
N of Valid Cases[b]	130				

While comparing ascitis and PCV rise Chi square value was found to be 36.742. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between ascitis and PCV rise

Pleural effusion Vs haematocrit rise

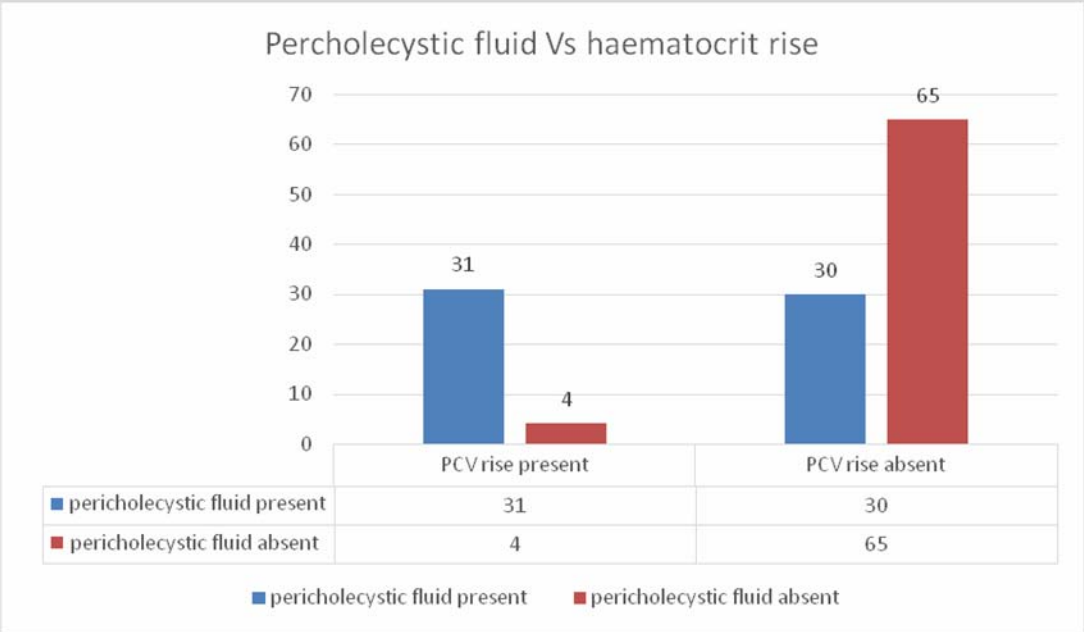


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	47.080[a]	1	.000		
Continuity Correction[b]	44.352	1	.000		
Likelihood Ratio	49.741	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	46.718	1	.000		
N of Valid Cases[b]	130				

While comparing pleural effusion and PCV rise Chi square value was found to be 47.080. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between pleural effusion and PCV rise.

PericholecyticFuid Vs haematocrit rise

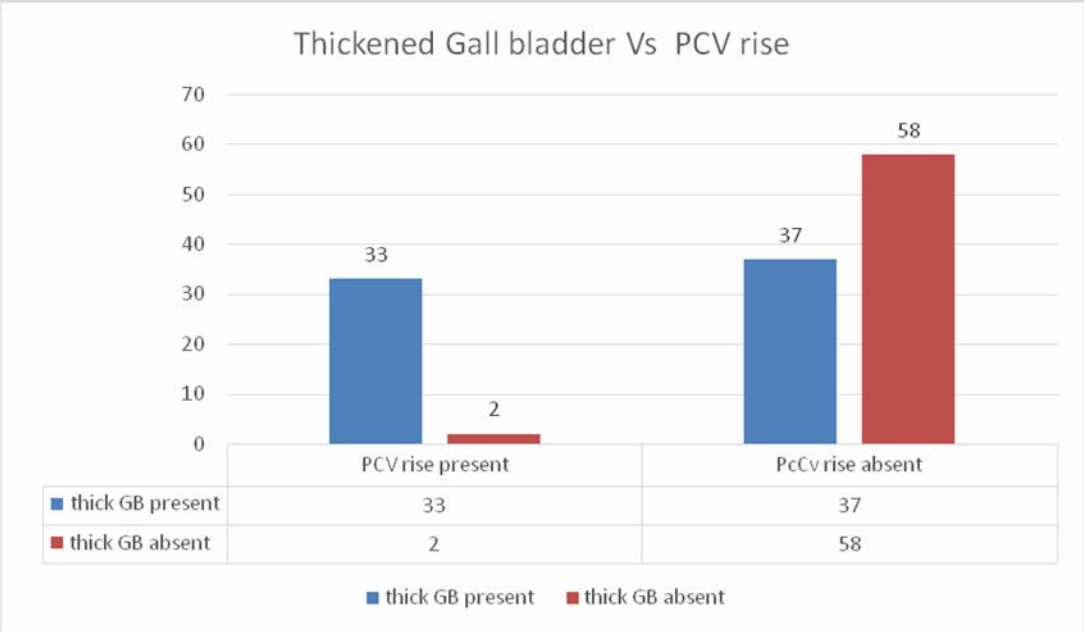


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	33.357[a]	1	.000		
Continuity Correction[b]	31.108	1	.000		
Likelihood Ratio	36.354	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	33.101	1	.000		
N of Valid Cases[b]	130				

While comparing pericholecystic fluid and PCV rise Chi square value was found to be 33.357. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between presence of pericholecystic fluid and PCV rise.

Thickened gall bladder Vs haematocrit rise

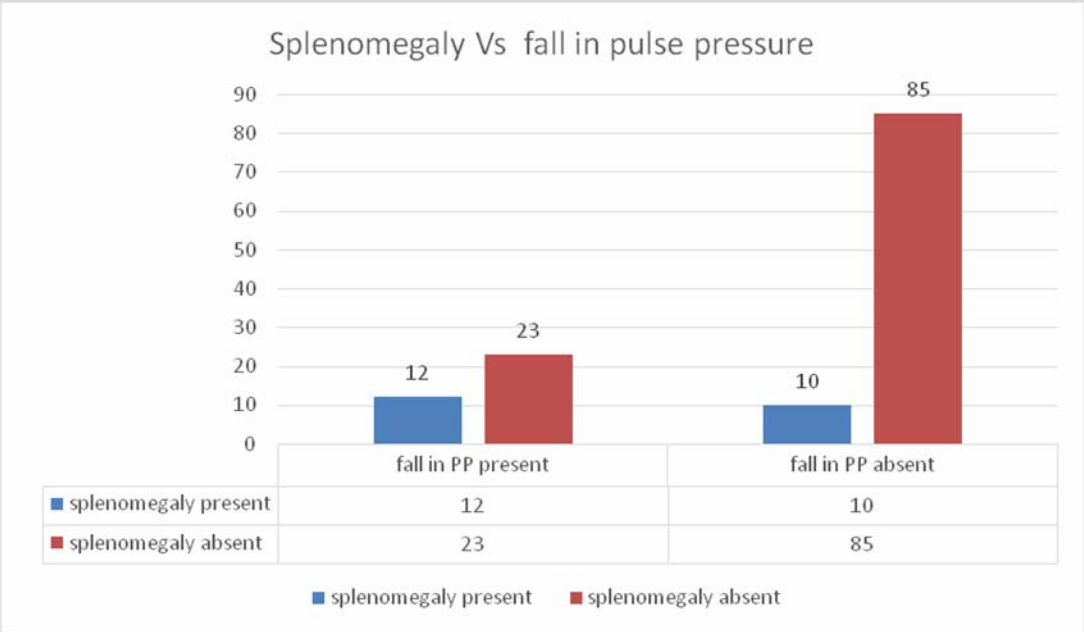


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	31.517[a]	1	.000		
Continuity Correction[b]	29.329	1	.000		
Likelihood Ratio	37.099	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	31.274	1	.000		
N of Valid Cases[b]	130				

While comparing thickened gall bladder and PCV rise Chi square value was found to be 31.517. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between thickened gall bladder and PCV rise.

Splenomegaly Vs fall in pulse pressure

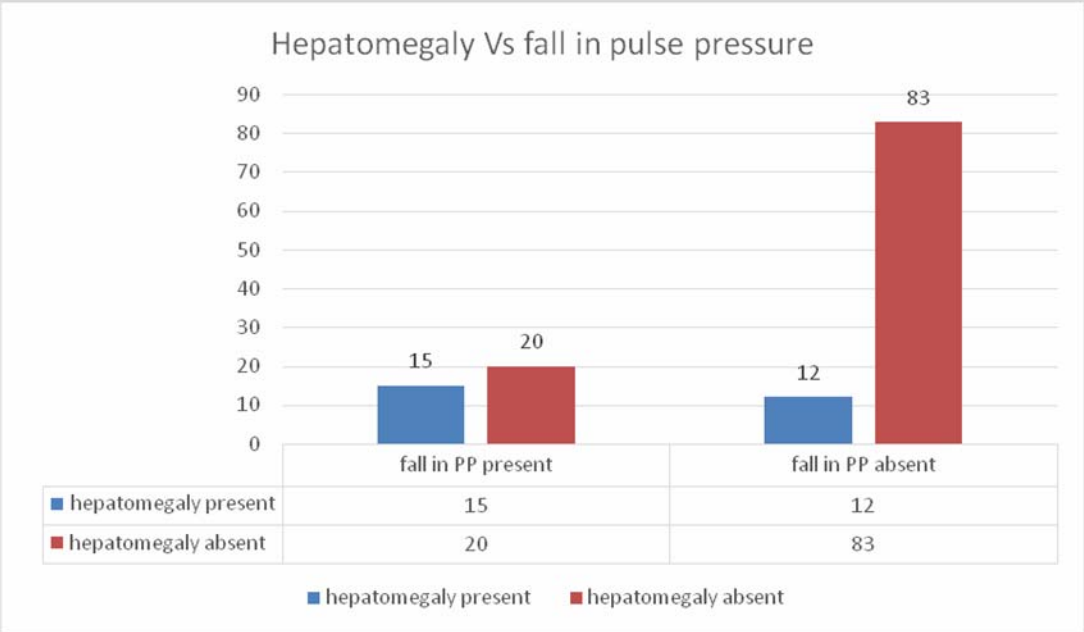


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10.270[a]	1	.001		
Continuity Correction[b]	8.649	1	.003		
Likelihood Ratio	9.275	1	.002		
Fisher's Exact Test				.003	.002
Linear-by-Linear Association	10.191	1	.001		
N of Valid Cases[b]	130				

While comparing splenomegaly and fall in pulse pressure Chi square value was found to be 10.270. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between splenomegaly and fall in pulse pressure.

Hepatomegaly Vs fall in pulse pressure

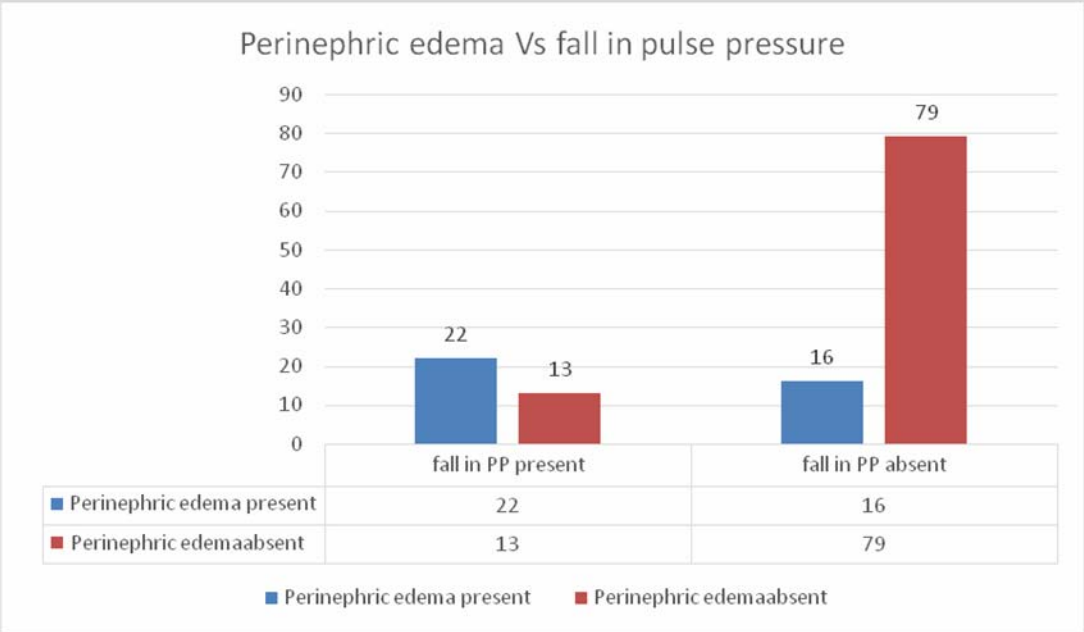


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.200[a]	1	.000		
Continuity Correction[b]	12.422	1	.000		
Likelihood Ratio	12.955	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	14.091	1	.000		
N of Valid Cases[b]	130				

While comparing hepatomegaly and fall in pulse pressure Chi square value was found to be 14.200. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between hepatomegaly and fall in pulse pressure

Perinephricedema Vs fall in pulse pressure

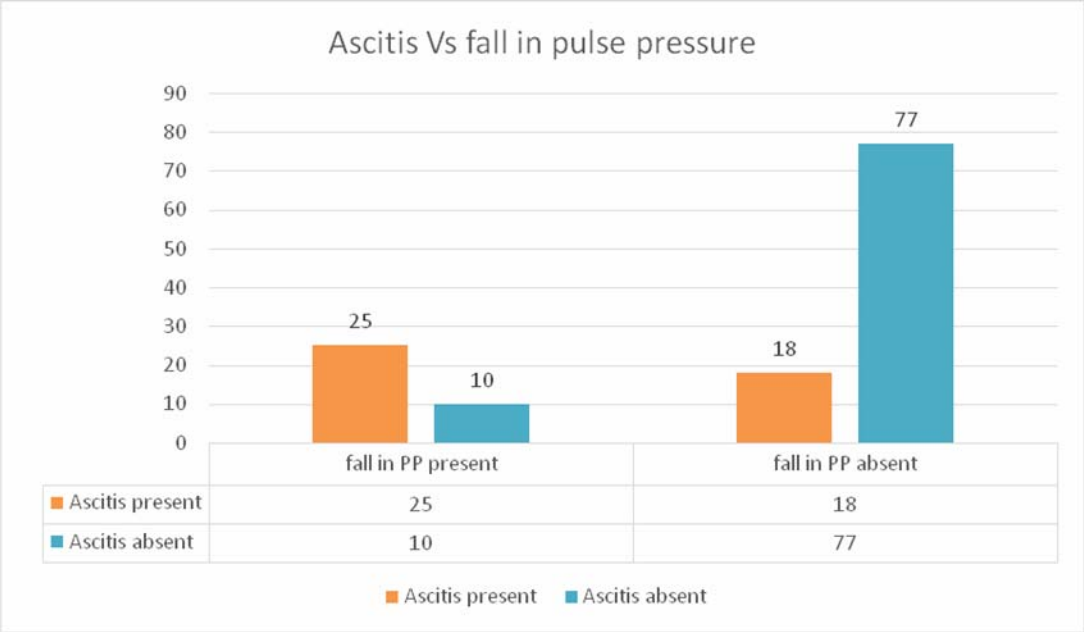


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	26.180[a]	1	.000		
Continuity Correction[b]	24.002	1	.000		
Likelihood Ratio	24.772	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	25.978	1	.000		
N of Valid Cases[b]	130				

While comparing perinephric edema and fall in pulse pressure Chi square value was found to be 26.180. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between perinephric edema and fall in pulse pressure

Ascitis Vs fall in pulse pressure

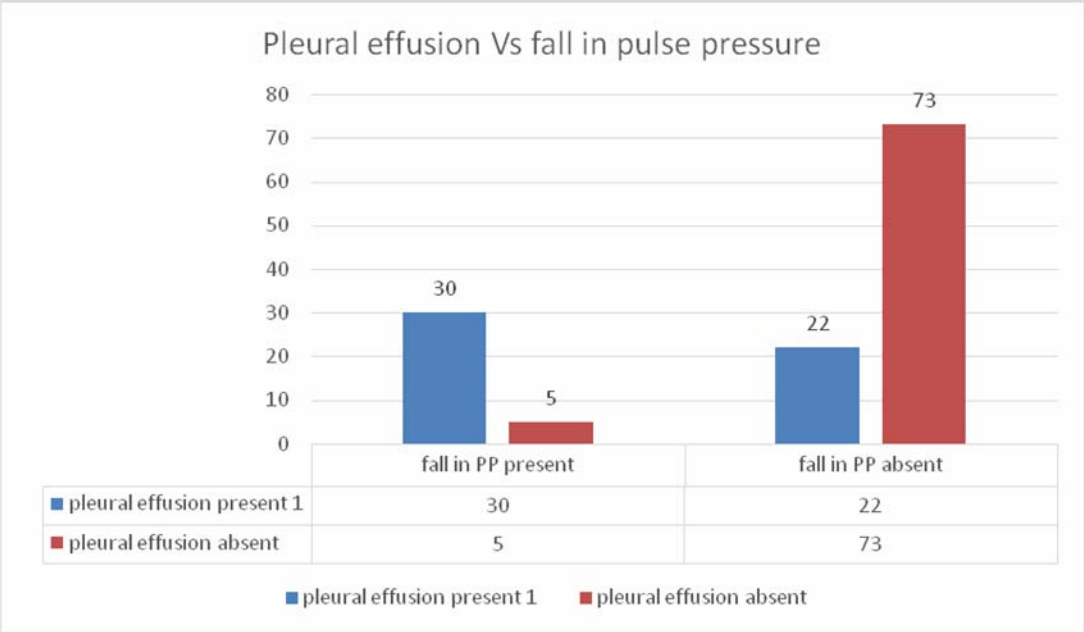


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	31.824[a]	1	.000		
Continuity Correction[b]	29.497	1	.000		
Likelihood Ratio	30.912	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	31.579	1	.000		
N of Valid Cases[b]	130				

While comparing ascitis and fall in pulse pressure Chi square value was found to be 31.824. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between ascitis and fall in pulse pressure**.**

Pleuraleffusion and fall in pulse pressure

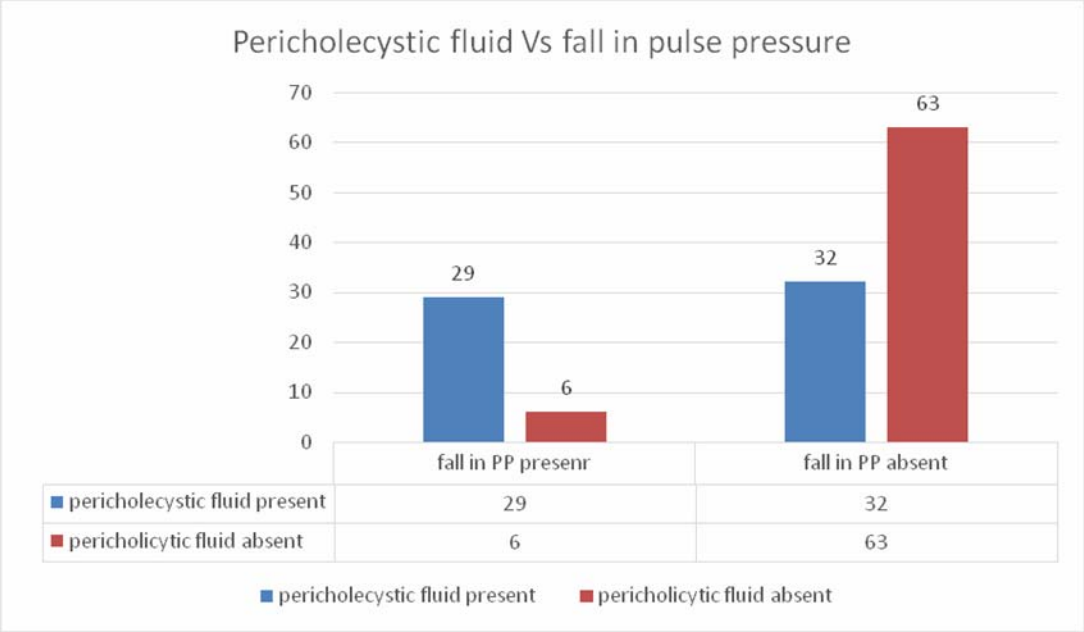


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	41.704[a]	1	.000		
Continuity Correction[b]	39.138	1	.000		
Likelihood Ratio	43.451	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	41.383	1	.000		
N of Valid Cases[b]	130				

While comparing pleural effusion and fall in pulse pressure Chi square value was found to be 41.704. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between pleural effusion and fall in pulse pressure.

PericholecyticFuid Vs fall in pulse pressure

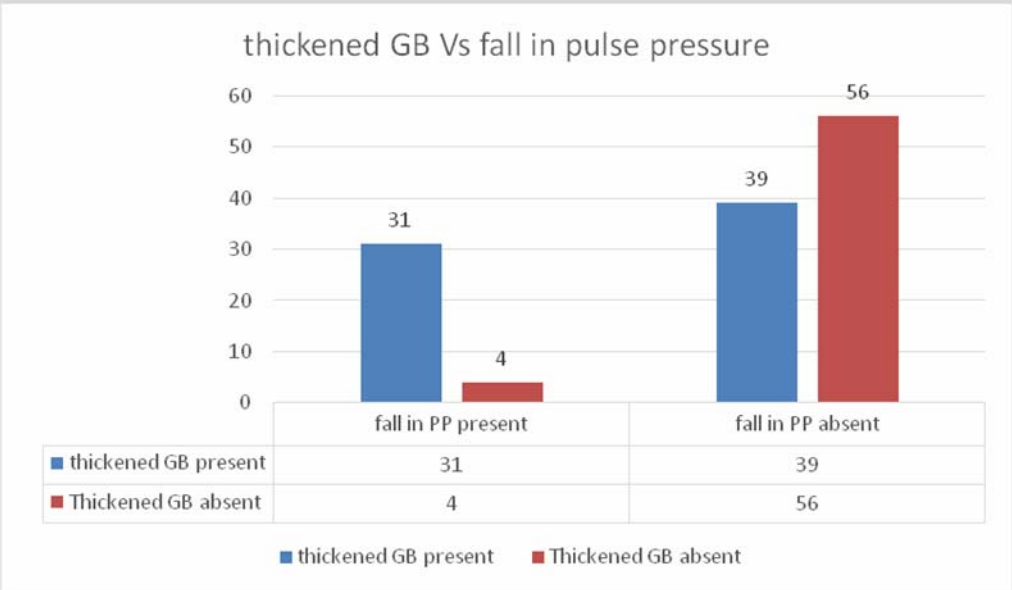


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	24.832[a]	1	.000		
Continuity Correction[b]	22.897	1	.000		
Likelihood Ratio	26.261	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	24.641	1	.000		
N of Valid Cases[b]	130				

While comparing pericholicystic fluid and fall in pulse pressure Chi square value was found to be 24.832. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between pericholicystic fluid collection and fall in pulse pressure.

Thickened gallbladder Vs fall in pulse pressure

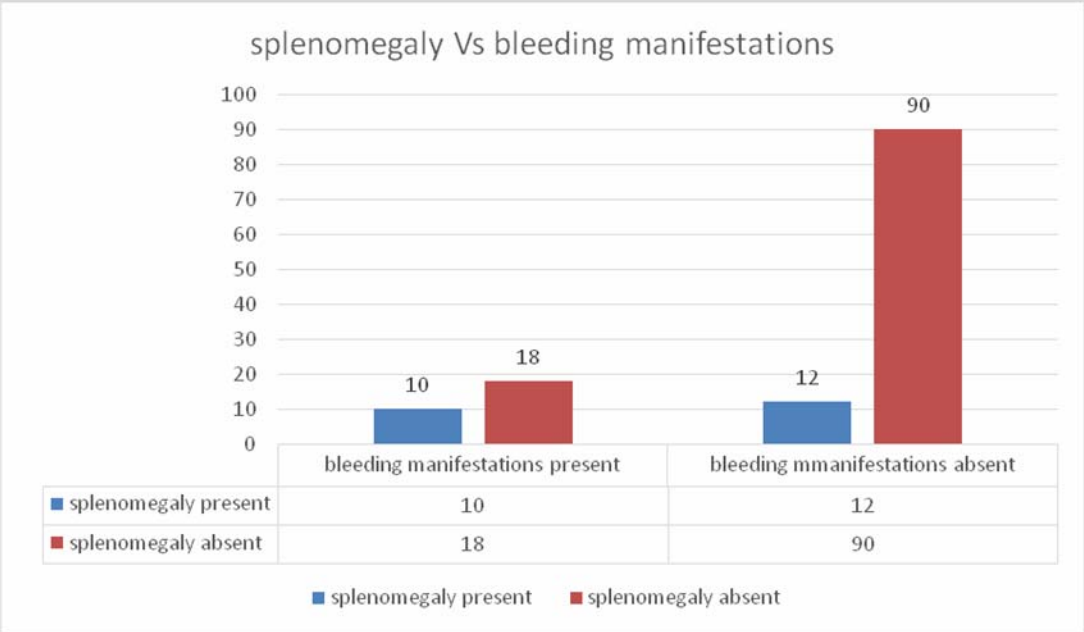


Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	23.239[a]	1	.000		
Continuity Correction[b]	21.366	1	.000		
Likelihood Ratio	25.932	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	23.060	1	.000		
N of Valid Cases[b]	130				

While comparing thickened gall bladder and fall in pulse pressure Chi square value was found to be 23.239. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between the ultrasonographic finding of thickened gall bladder and fall in pulse pressure

Splenomegaly and bleeding manifestations

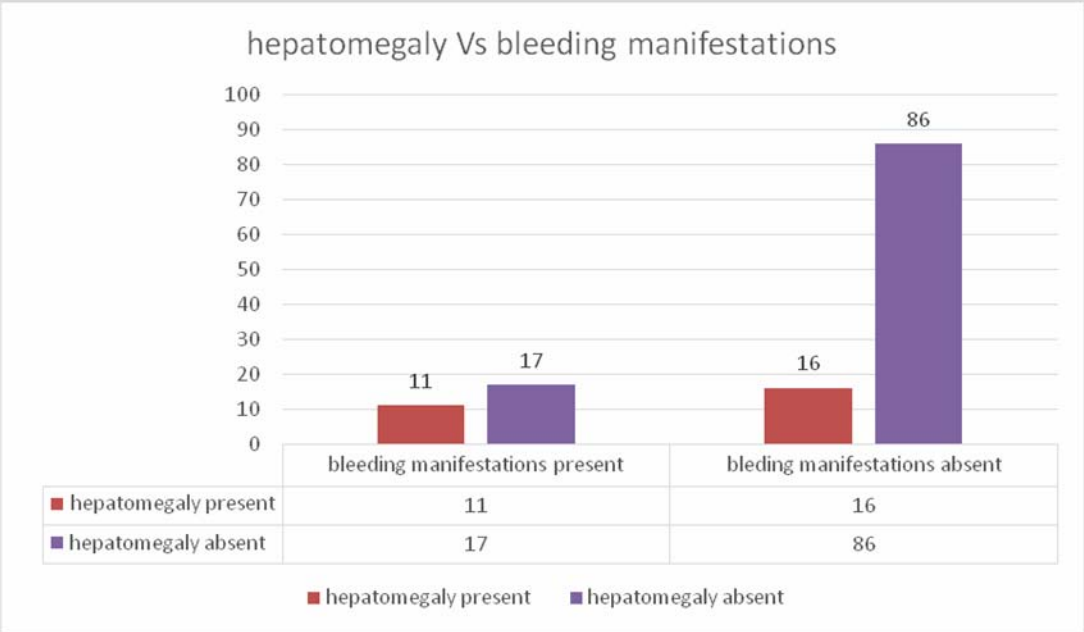


Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.963[a]	1	.003		
Continuity Correction[b]	7.340	1	.007		
Likelihood Ratio	7.823	1	.005		
Fisher's Exact Test				.008	.005
Linear-by-Linear Association	8.894	1	.003		
N of Valid Cases[b]	130				

While comparing splenomegaly and bleeding manifestations Chi square value was found to be 8.963. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between splenomegaly and bleeding manifestations

Hepatomegaly and bleeding manifestations

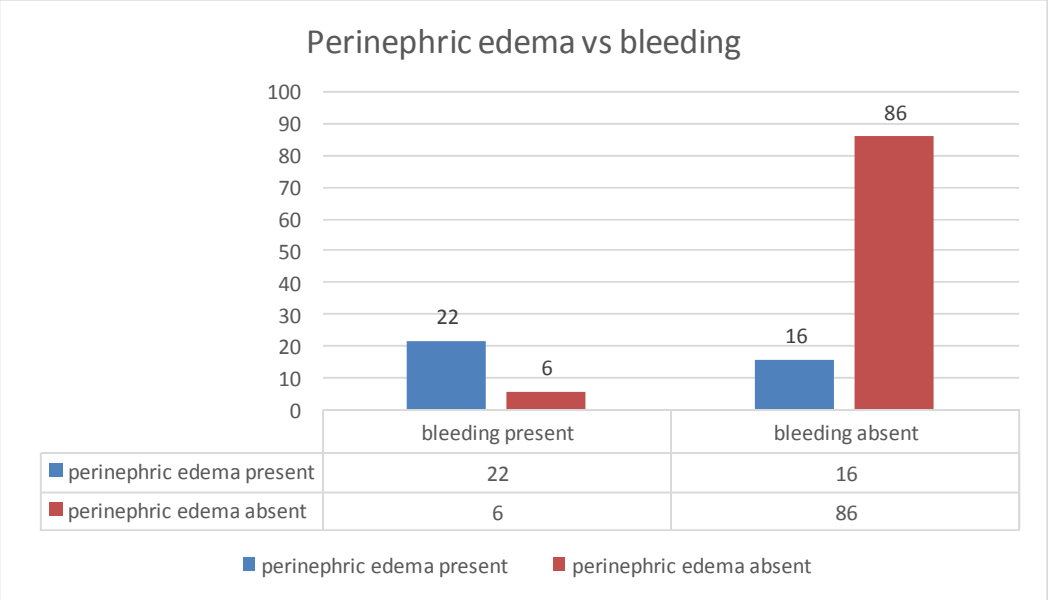


Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.435[a]	1	.006		
Continuity Correction[b]	6.070	1	.014		
Likelihood Ratio	6.685	1	.010		
Fisher's Exact Test				.016	.009
Linear-by-Linear Association	7.378	1	.007		
N of Valid Cases[b]	130				

While comparing hepatomegaly and bleeding manifestations Chi square value was found to be 7.435. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between hepatomegaly and bleeding manifestations

Perinephric edema and bleeding manifestations



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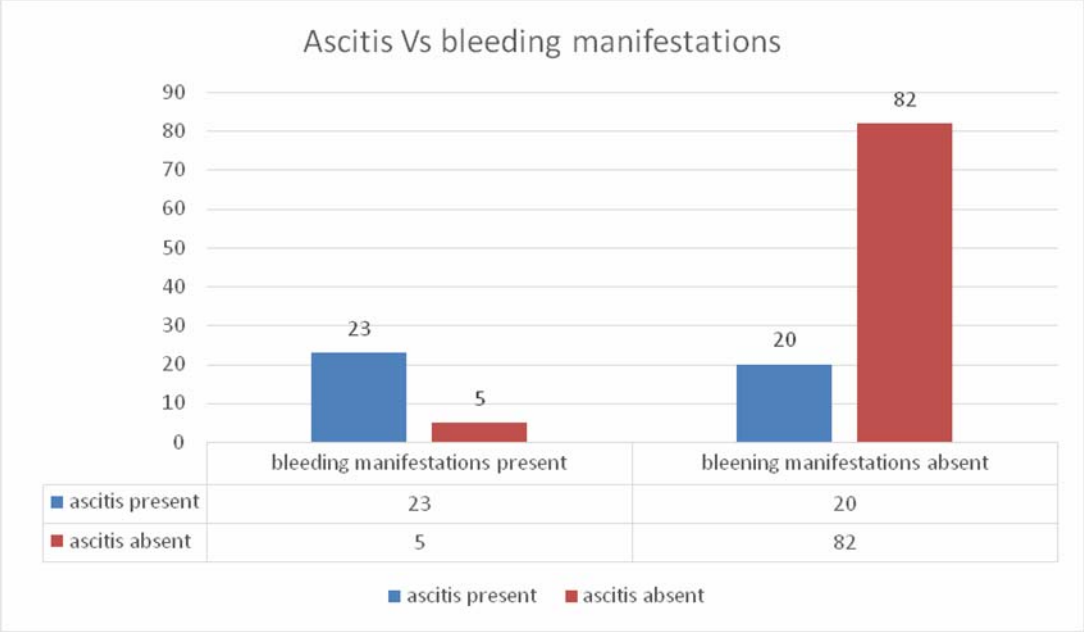
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	41.998[a]	1	.000		
Continuity Correction[b]	39.013	1	.000		
Likelihood Ratio	39.373	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	41.675	1	.000		
N of Valid Cases[b]	130				

While comparing perinephric edema and bleeding manifestations Chi square value was found to be 41.998. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between perinephric edema and bleeding manifestations

Ascites and bleeding manifestations

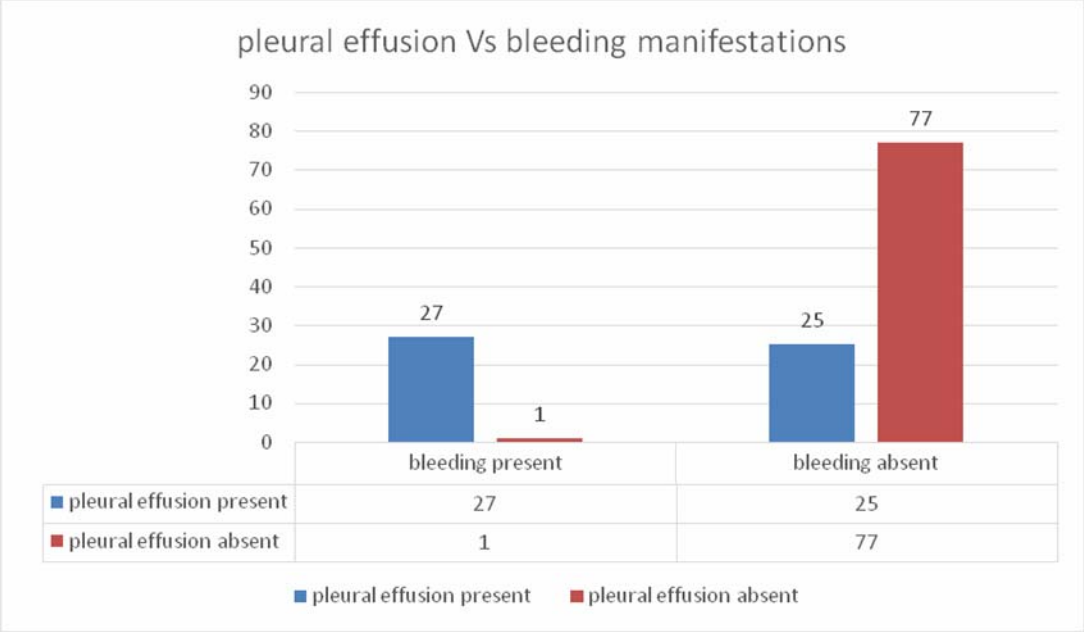


Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	38.811[a]	1	.000		
Continuity Correction[b]	36.038	1	.000		
Likelihood Ratio	37.788	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	38.513	1	.000		
N of Valid Cases[b]	130				

While comparing ascites and bleeding manifestations Chi square value was found to be 38.811. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between ascites and bleeding manifestations

Pleural effusion and bleeding manifestations

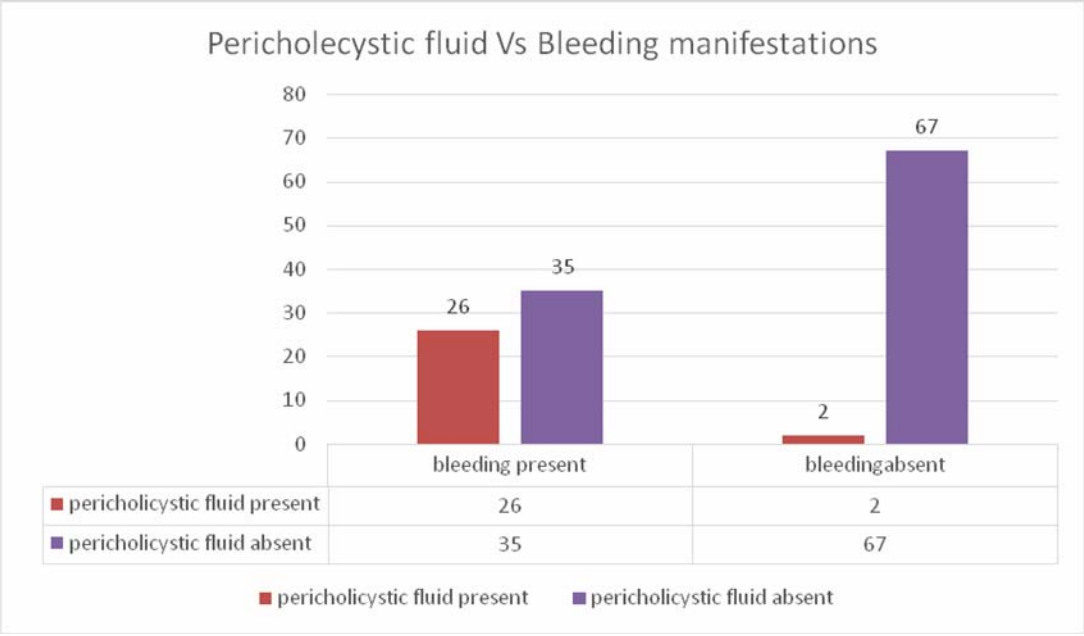


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	47.347[a]	1	.000		
Continuity Correction[b]	44.397	1	.000		
Likelihood Ratio	52.750	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	46.982	1	.000		
N of Valid Cases[b]	130				

While comparing pleural effusion and bleeding manifestations Chi square value was found to be 47.347. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between pleural effusion and bleeding manifestations.

Pericholecytic fluid and bleeding manifestations

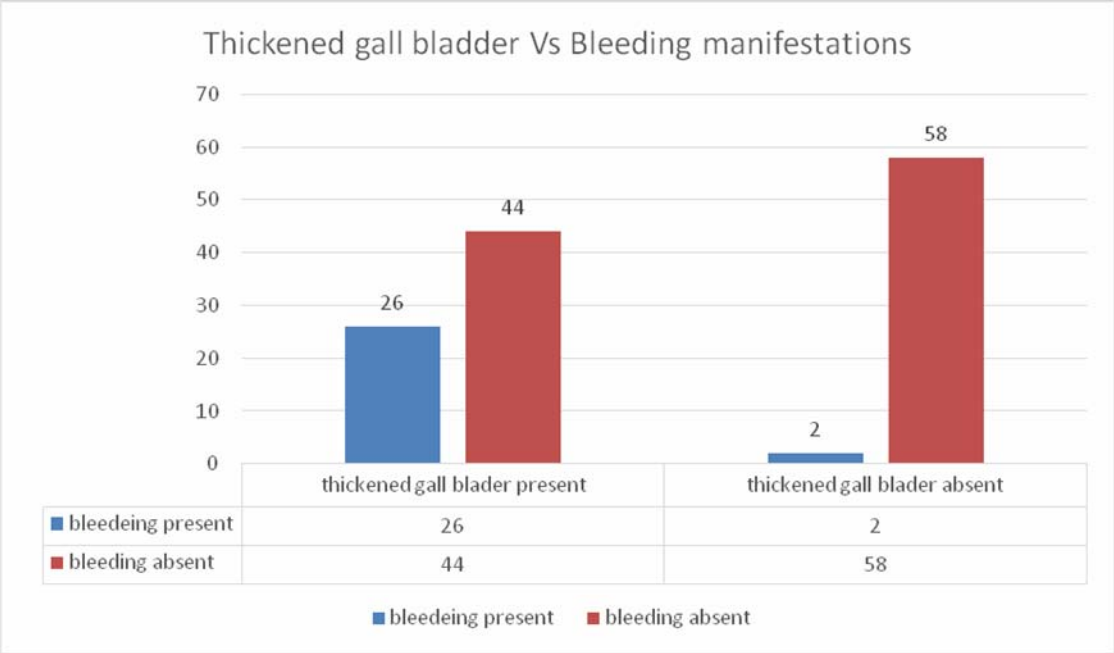


Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	30.233[a]	1	.000		
Continuity Correction[b]	27.928	1	.000		
Likelihood Ratio	34.125	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	30.000	1	.000		
N of Valid Cases[b]	130				

While comparing pericholecystic fluid and bleeding manifestations Chi square value was found to be 30.233. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between pericholecytic fluid and bleeding manifestations.

Thick gall bladder and Bleeding manifestations



Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	21.853[a]	1	.000		
Continuity Correction[b]	19.898	1	.000		
Likelihood Ratio	25.564	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	21.685	1	.000		
N of Valid Cases[b]	130				

While comparing thickened gall bladder and bleeding manifestations Chi square value was found to be 21.853. With a degree of freedom of one P value was found to be < 0.01.Hence there is a statistically significant association between thickened gall bladder and bleeding manifestations.

DISCUSSION

DISCUSSION:

Dengue is at rapidly spreading viral disease in the world. In the last 50 years, thete was a thirty fold increase in the incidence of Dengue . An estimated 50 million dengue infections occur annually. About 2.5 million people live in Dengue endemic areas in the world.

In our study 48 % were females and 52% were males. And the mean age was 37 years. Among the 100 dengue patients studied 63 had thrombocytopenia but only 27 had bleeding manifestations. PCV rise was seen in 34 % and a fall in pulse pressure was seen in 33 %.

Most common ultrasound finding was thickened gall bladder.. that was present in 70 % of the study population. Next common finding was pericholecystic fluid collection seen in 61 %. Pleural effusion was the third common finding. It was present in 50%. Ascitis was present in 43 % and perinephric edema in 36 %. Hepatomegaly was present in 24 % and splenomegaly in 19 percent.

Only 63 % had thrombocytopenia and rise in PCV was seen only in 34 %. But there was an ultrasonographic evidence of plasma leakage in the form of thickened gall bladder in 70 %.

In a similar study conducted during the epidemic in 1997 by Joshi et al., the most common age group affected was 20 to 40 years and right sided pleural effusion was the most common finding, like .In their study,the most common finding was pleural effusion .In their study, ascites was seen in only 50% of cases;

Thickened GB wall was first reported as a fi nding of Dengue Fever by Pramuljo *et al*.[15] It has been found in a lot of studies to be a consistent and common ultrasound finding of Dengue Fever. Venkata Sai *et al*.[1] had found it in hundred percent patients in their study as the most common firstl ultrasound finding. In fact, it has been propagated to be used in children as a reliable criterion to predict the onset.

Similar to the study conducted by Venkata Sai et al our study too found thickened gall bladder as the most common finding .

Javed et al. found hepatomegaly in 35.5% patients and splenomegaly in 28.9% patients. In our study hepatomegaly and splenomegaly was seen only in 24 % and 19 % respectively. That was the least common among the ultrasound parameters studied.

When comparing the statistical association, there was significant statistical association with thrombocytopenia, PCV rise , fall in pulse pressure and all the 7 ultra sound parameters studied.

CONCLUSION

Ultrasound abdomen can be used as a first line investigation modality in dengue fever suspected patients especially in the scenario of an epidemic of Dengue as it can detect early signs suggestive of the disease.

Ultrasonogram of abdomen is useful for early prediction of the severity of dengue fever. Sonographic changes occurs even before a change appears in platelet count or haematocrit. Thus ultasonography of abdomen helps in triage of cases and close monitoring can be done for those patients to prevent a profound dengue haemorragic fever and Dengue shock syndrome

Ultrasound abdomen supported with lab parameters like rising haematocrit and decreasing platelet count predicts the progression to severe form of the disease.

LIMITATIONS OF THE STUDY

LIMITATION

- Study did not involve a follow up ultrasound and serial pulse pressure PCV and platelet monitoring. Hence the number of patients with earlier plasma leakage findings in ultrasound who have gone for further plasma leakage and shock could not be found.
- Many patients had diabetes and hypertension which might have already damaged the capillary endothelium. Hence plasmaleakage in this patients may be severe even in early stages of dengue. This was not taken into account.

RECOMMENDATIONS:

1) Patients with clinical history suggestive of Dengue fever should be subjected to an ultrasonogram of abdomen pelvis and chest to look for evidence of any plasma leakage.
2) Patients with evidence of plasma leakage in ultrasound may be admitted and monitored to prevent complications of Dengue shock syndrome
3) Patients with associated comorbidities like Diabetes and Hypertension should be monitored more closely

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BIBLIOGRAPHY

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PROFORMA

PROFORMA

Name:

Age / Sex:

Occupation:

Presenting complaints:

Past History:

H/o DM, HT, CKD, CVD, CLD

Clinical Examination:

General Examination:

Consciousness

Pallor

Jaundice

Clubbing

Lymphadenopathy

Hydration status

Signs suggestive of thrombocytopenia and plasmaleakage:

Petechie/ purpura over skin

Palatal purpura

Gum bleeding

Vitals:

PR

BP

RR

SpO2

Systemic examination:

CVS:

RS:

ABDOMEN:

CNS:

Laboratory investigations:

a) Hemoglobin

b) Hematocrit

c) Peripheral Smear

d) Liver function test

e) Renal function test

f) Random blood sugar

IgM Dengue

Ultrasound abdomen chest and pelvis

CONSENT FORM

ஆராய்ச்சிஒப்புதல்படிவம்

பெயர்: தேதி:

வயது: நோயாளிஎண்:

ஆராய்ச்சிசேர்க்கைஎண்:

இந்தஆராய்ச்சியின்விவரங்களும்அதன்நோக்கங்களும்முழுமையாகஎனக்குவிளக்கபட்டது.

எனக்குவிளக்கபட்டவிஷயங்களைநான்புரிந்துகொண்டுஎனதுமுழுமனதுடன்சம்மதிக்கிறேன்.

இந்தஆராய்ச்சியில்பிறரின்நிர்பந்தமின்றிஎன்சொந்தவிருப்பத்தின்பேரில்தான்பங்குபெறுகிறேன்மற்றும்நான்இந்தஆராய்ச்சியில்இருந்துஎந்தநேரமும்பின்வாங்கலாம்என்றும்அதனால்எந்தபாதிப்பும்எனக்குஏற்படாதுஎன்பதையும்புரிந்துகொண்டேன்.

நான்என்னுடையசுயநினைவுடன்மற்றும்முழுசுதந்திரத்துடன்இந்தமருத்துவஆராய்ச்சியில்பங்குகொள்ளசம்மதிக்கிறேன்.

ABBREVIATIONS

DF – Dengue fever

DHF- Dengue haemorragic fever

DHSS- Dengue shock syndrome

PCV – packed cell volume

HCT – Hematocrit

NS1- Non Structural Protein

PP- pulse pressure

GB – gall bladder

CAD – Coronary artery disease

MASTER CHART

Sl no	Name	Age	Sex	Platelet	PCV percentage rise	Pulse Pressure	Bleeding	Thickened GB	pericholicytic Fuid	pleural effusion	ascitis	pernephric edema	hepatomegaly	splenomegaly
1	subash	19	M	67000	10	40	absent	present	present	present	present	absent	present	present
2	Yugadevi	32	F	120000	8	38	absent	present	present	absent	absent	absent	absent	absent
3	Malathi	32	F	98000	15	36	absent	present	present	present	present	absent	present	present
4	Renold Amirtharaj	25	M	240000	5	40	absent	absent	absent	absent	absent	absent	absent	absent
5	Karthigaiselvi	21	F	45000	22	30	present	present	present	present	present	present	present	present
6	Virumandi	64	M	230000	0	40	absent	absent	absent	absent	absent	absent	absent	absent
7	Lakshmi	26	F	44000	3	32	present	present	present	present	present	present	absent	absent
8	Ambika	23	F	240000	4	38	absent	absent	absent	absent	absent	absent	absent	absent
9	Inan Lollen	28	F	56000	18	36	absent	present	present	present	present	present	absent	absent
10	Mohana	33	F	12000	24	30	present	present	present	present	present	present	present	present
11	Rajeshkanna	38	M	67000	12	42	absent	absent	absent	absent	absent	absent	present	present
12	Lakshmi	40	F	320000	0	38	absent	absent	absent	absent	absent	absent	absent	absent
13	Murugan	50	M	140000	2	40	absent	present	absent	absent	absent	absent	absent	absent
14	Vaishnavi	24	F	66000	12	38	absent	present	present	absent	absent	absent	present	present
15	Jothilekshmi	21	F	362000	2	40	absent	absent	absent	absent	absent	absent	absent	absent
16	Alageswari	24	F	47000	22	30	present	present	present	present	present	present	absent	absent
17	Tamilseivi	47	F	26000	24	20	present	present	present	present	present	present	present	present
18	Arun Pandian	14	M	224000	3	40	absent	absent	absent	absent	absent	absent	absent	absent
19	Vennila	15	F	341000	4	36	absent	absent	absent	absent	absent	absent	absent	absent
20	Jeya	33	F	67000	13	30	absent	present	present	present	present	present	present	present
21	Amutha	28	F	76000	14	34	present	present	present	present	absent	absent	absent	absent
22	Ganeshsn	53	M	34000	16	28	present	present	present	present	present	absent	absent	absent
23	Muniyasami	52	M	48000	15	38	absent	present	absent	absent	absent	absent	present	present
24	Parthasarathy	18	M	315000	11	42	absent	absent	absent	absent	absent	absent	absent	absent
25	Abirami	20	F	270000	5	42	absent	absent	absent	absent	absent	absent	absent	absent
26	Prem kumar	25	M	44000	25	15	present	present	present	present	present	present	absent	absent
27	Karthikaiselvi	14	F	313000	4	40	absent	absent	absent	absent	absent	absent	absent	absent
28	Kanagalatha	20	F	176000	13	38	absent	present	present	absent	absent	absent	absent	absent
29	Prasaana Devi	24	F	61000	13	36	absent	present	present	present	present	absent	absent	absent
30	Pandi	29	M	88000	11	38	absent	present	present	present	absent	absent	absent	absent
31	NagasuryaPrabha	19	F	98000	26	16	present	present	present	present	present	present	absent	absent
32	Vijay	23	M	19000	23	10	present	present	present	present	present	present	present	present
33	Chinnaperumal	55	M	33000	20	18	present	present	present	present	present	present	absent	absent
34	Anusiya	20	F	188000	5	40	absent	present	absent	absent	absent	absent	absent	absent
35	Subbaiah	53	M	55000	16	34	absent	present	present	absent	present	absent	absent	absent
36	Keshavan	36	M	230000	8	38	absent	present	absent	absent	absent	absent	absent	absent
37	Mahadevan	64	M	22000	24	10	present	present	present	present	present	present	present	present
38	Divya	53	F	5000	28	0	present	present	present	present	present	present	present	present
39	Manikandan	23	M	67000	21	20	absent	present	present	present	present	absent	absent	absent
40	Janu	65	F	180000	4	38	absent	absent	absent	absent	absent	absent	absent	absent
41	Markandan	54	M	54000	8	30	absent	present	present	present	absent	present	absent	absent
42	Raju	17	M	250000	6	40	absent	absent	absent	absent	absent	absent	absent	absent
43	Ramakrihnan	35	M	85000	13	26	absent	present	present	absent	absent	absent	absent	absent
44	Devipriya	34	F	240000	2	40	absent	absent	absent	absent	absent	absent	absent	absent
45	Madusoodhann	65	M	77000	21	20	absent	present	present	present	present	absent	absent	absent
46	Chinnammal	45	F	89000	23	18	absent	present	present	present	absent	absent	absent	absent
47	Pilavendran	41	M	41000	22	12	absent	present	present	present	absent	present	present	present
48	Sathasivam	35	M	48000	20	14	present	present	present	absent	absent	present	absent	absent
49	Illavarasi	64	F	66000	17	24	absent	absent	absent	present	absent	present	absent	absent
50	Poomari	32	F	210000	2	34	absent	present	absent	absent	absent	absent	absent	absent
51	Sheik Abdulla	25	M	33000	23	16	present	absent	absent	present	absent	present	present	present
52	Ezhumalai	45	M	316000	3	40	absent	absent	absent	absent	absent	absent	absent	absent
53	Vishnu	34	M	56000	17	22	present	present	present	present	present	present	present	absent
54	Peryayi	42	F	125000	9	36	absent	present	present	absent	absent	present	absent	absent
55	Malliponnu	47	F	153000	10	38	present	present	present	present	absent	absent	absent	absent
56	Sokkalingam	73	M	24000	25	10	present	present	present	present	present	present	present	present
57	Vellachi	45	F	53000	21	12	absent	present	absent	present	absent	present	absent	absent
58	Mani	32	M	130000	6	38	absent	present	present	absent	absent	present	absent	absent
59	Anbu	41	M	25000	24	12	present	present	present	present	present	present	absent	absent

60	Sneha	15	F	237000	3	38	absent	present	absent	absent	absent	absent	absent	absent
61	Kathirvel	54	M	14000	22	14	present	present	present	present	present	absent	absent	present
62	Logesshwaran	51	M	36000	19	18	absent	present	present	present	present	absent	present	absent
63	Anbarasan	34	M	266000	7	40	absent	absent	absent	absent	absent	absent	absent	absent
64	Karuppayee	56	F	178000	6	28	absent	absent	absent	absent	absent	absent	absent	absent
65	Vellaiappan	62	M	18000	24	10	present	present	present	present	present	absent	absent	absent
66	Sakthivel	74	M	32000	21	16	absent	present	present	present	present	absent	present	absent
67	Rajammal	34	F	89000	9	32	absent	present	absent	absent	present	absent	absent	absent
68	Elizabeth	23	F	47000	26	10	present	present	present	present	present	present	absent	absent
69	Paul	35	M	2000	27	6	present	present	present	present	present	present	absent	absent
70	Pandi	64	M	39000	22	12	absent	present	present	present	present	present	present	present
71	Sriram	19	F	290000	6	40	absent	absent	absent	absent	absent	absent	absent	absent
72	Roopeswari	20	F	317000	6	36	absent	absent	absent	absent	absent	absent	absent	absent
73	Kanmani	28	F	28000	16	22	absent	present	present	present	present	present	absent	absent
74	Pandian	50	M	67000	15	24	absent	present	present	absent	absent	absent	present	present
75	Raji	32	F	97000	8	30	absent	present	present	present	present	absent	present	absent
76	Raj kumar	40	M	34000	16	32	absent	present	present	present	present	present	absent	absent
77	Pandiselvi	43	F	194000	8	36	absent	present	present	absent	absent	absent	absent	absent
78	Chinnammal	45	F	213000	8	34	absent	absent	absent	absent	absent	absent	absent	absent
79	Selvaraj	63	M	32000	14	30	absent	present	present	present	present	present	absent	absent
80	Arun Pandian	23	M	56000	19	18	absent	absent	absent	absent	absent	absent	present	present
81	Chandran	19	M	35000	23	10	present	present	present	present	present	present	absent	absent
82	Shakthivel	30	M	66000	20	20	absent	present	present	present	present	present	absent	absent
83	Pothum Ponnu	45	F	84000	21	18	absent	present	absent	absent	absent	absent	absent	absent
84	Uma Bharathi	57	F	178000	4	40	absent	absent	absent	absent	absent	absent	absent	absent
85	Manoj kumar	63	M	231000	7	40	absent	absent	absent	absent	absent	absent	absent	absent
86	Meenu	54	F	56000	21	20	present	present	present	present	present	absent	absent	absent
87	Keertahna	32	F	78000	16	22	absent	present	present	absent	absent	absent	absent	absent
88	Aswath	15	M	243000	8	46	absent	absent	absent	absent	absent	absent	absent	absent
89	Sivarenjini	18	F	3000	22	14	present	present	present	present	present	present	present	absent
90	Arokiyarajan	28	M	31000	18	16	absent	present	present	present	present	present	present	absent
91	Murali	22	M	86000	22	18	absent	present	present	absent	absent	absent	absent	absent
92	Sevakaraj	65	M	213000	7	40	absent	absent	absent	absent	absent	absent	absent	absent
93	John	44	M	49000	21	22	absent	present	present	absent	absent	absent	absent	absent
94	Kaaliammal	31	F	88000	20	20	absent	present	present	present	present	absent	absent	absent
95	Sasikala	44	F	4000	26	8	present	present	present	present	present	present	absent	absent
96	Kandhasamy	53	M	235000	9	40	absent	absent	absent	absent	absent	absent	absent	absent
97	Krishnasamy	42	M	324000	9	42	absent	absent	absent	absent	absent	absent	absent	absent
98	Soumya	23	F	65000	16	28	absent	present	present	absent	absent	absent	absent	absent
99	Karuppusamy	17	M	47000	15	34	absent	present	present	present	present	present	absent	absent
100	Jeeva	34	M	231000	6	40	absent	absent	absent	absent	absent	absent	absent	absent

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This is to certify that this dissertation titled "**PROGNOSTIC VALUE OF ULTRASONOGRAPHY IN DENGUE FEVER, COMPARED WITH CLINICAL AND LABORATORY PARAMETERS**" of the candidate **Dr.KIRAN TRESA KURUVILLA** with registration number 201611109 for the award of **M.D degree in the branch of GENERAL MEDICINE**. I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows 24 **percentage** of plagiarism in the dissertation.

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Name of the Candidate	:	Dr.Kiran tresa kuruvilla
Course	:	PG in MD., General Medicine
Period of Study	:	2016-2019
College	:	MADURAI MEDICAL COLLEGE
Research Topic	:	Prognostic value of ultrasonography in dengue fever, compared with clinical and laboratory parameters
Ethical Committee as on	:	13.04.2018

The Ethics Committee, Madurai Medical College has decided to inform that your Research proposal is accepted.

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