ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

The Urine Protein/Creatinine Ratio as a Tool for Evaluating Proteinuria in the Risk Assessment of Severe Dengue in a Tertiary Care Hospital

[1]Dr. P. Rajendra Kumar; [2]Dr.V. Sai Avaneesh

Publication Date: 2025/02/11

How to Cite: Dr. P. Rajendra Kumar; Dr. V. Sai Avaneesh. (2025). The Urine Protein/Creatinine Ratio as a Tool for Evaluating Proteinuria in the Risk Assessment of Severe Dengue in a Tertiary Care Hospital. *International Journal of Innovative Science and Research Technology*, 10(1), 1763-1773. https://doi.org/10.5281/zenodo.14854524.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

ABSTRACT

- ***Background:***

Dengue fever, caused by the dengue virus and transmitted primarily by Aedes mosquitoes, can lead to severe complications such as Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS). Early identification of patients at risk for severe disease is crucial for effective management.

- ***Objective:***

This study aims to assess the utility of the urine spot protein/creatinine ratio (PCR) as a prognostic tool for predicting the risk of developing DHF and DSS in patients with dengue fever.

- ***Methods:***

A prospective study was conducted on 100 adult patients diagnosed with dengue fever at Katuri Medical College and Hospital from September 2022 to February 2024. Patients were evaluated for urine spot PCR levels, and clinical outcomes were monitored to determine the incidence of DHF and DSS.

- ***Results:***

The study found that 25% of patients exhibited proteinuria levels greater than 560 mg/g, with a significant correlation to the development of DHF and DSS. The sensitivity of urine spot PCR for predicting severe dengue was 68.7%, while specificity was 95.5%. The positive predictive value was 88%, and the negative predictive value was 86.6%.

- ***Conclusion:***

The urine spot protein/creatinine ratio is a valuable prognostic indicator for identifying patients at risk of developing severe dengue complications. Implementing this simple and non-invasive test in clinical practice can enhance early risk stratification and improve patient management in dengue fever cases. Further research is recommended to validate these findings in larger cohorts.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

TABLE OF CONTENT

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

LIST OF TABLES

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

LIST OF FIGURES

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

LIST OF ABBREVIATIONS

- PCR : Protein creatinine ratio
- DSS : Dengue shock syndrome
- DHF : Dengue haemorrhagic fever
- DF : Dengue fever
- DENV : Dengue virus
- ALT : AIanine transaminase
- AST : Aspartate transaminase
- RANTES : ReguIated on activation, normaI T expressed and secreted
- CD : CIuster of differentiation
- NS1 : Non-structuraI protein 1
- RT-PCR : Reverse transcription poIymerase chain reaction
- NSAIDs : Non-steroidaI anti-infIammatory drugs
- SDS-PAGE : Sodium dodecyI suIphate-poIyacryIamide geI eIectrophoresis
- CKD : Chronic kidney disease
- CVD : Cerebro-vascuIar disease
- CAD : Coronary artery disease
- PT : Prothrombin time
- APTT : Activated partiaI thrombopIastin time
- INR : InternationaI normaIised ratio

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

CHAPTER ONE
INTRODUCTION

Dengue fever is a result of the flavi virus and is mostly transmitted by the aedes mosquito, particularly the aedes aegypti species. The virus has an average incubation period of 2-5 days and tends to manifest as seasonal epidemics.[1]

Dengue fever can manifest with a diverse range of symptoms. From the subtle viral fever illness to the lethal dengue shock syndrome/dengue haemorrhagic fever. There is a requirement for a straightforward prognostic indicator for people who are susceptible to advancing illness.

Dengue patients exhibit several metabolic abnormalities, including heightened liver enzyme levels, decreased sodium and ionised calcium levels, hyponatremia, and raised urine protein levels. Various texts demonstrate the viability of urine spot PCR as a suitable substitute. The typical urine spot PCR value is below 30mg/mmol.[12,13]

The 2009 guidelines from the World Health Organisation categorise dengue illness into three groups: dengue fever, dengue fever with warning signs, and severe dengue fever. Dengue fever is characterised by symptoms such as fever, rash, vomiting, body aches, and a decrease in white blood cell count (leucopenia).

➢ *The Warning Signs in Dengue are :*

- Presence of abdominal pain or sensitivity
- Continual emesis
- Pathological fluid retention
- Haemorrhage from the mucous membranes
- Fatigue, agitation
- Hepatomegaly >2 cm
- Laboratory findings show an elevated hematocrit (HCT) level accompanied by a fast decline in platelet count.

➢ *Severe Dengue is Characterised by Significant Plasma Leakage, Resulting in:*

- Dengue Shock Syndrome (DSS)
- Accumulation of fluid leading to difficulty in breathing
- Profuse haemorrhaging as assessed by a medical professional
- Significant organ impairment

✓ Liver: AST or ALT levels equal to or more than 1000
✓ CNS: Altered state of consciousness, seizures
✓ The heart and various other organs.[18]

The 1997 World health organisation guidelines include a definition for dengue hemorrhagic fever, which includes the presence of certain symptoms such as:

- A positive tourniquet test, the appearance of petechiae, ecchymoses or purpura, bleeding from injection sites or other areas, and the occurrence of malena or hematemesis.
- Additionally, the guidelines specify that the patient should have a platelet count below 1,00,000/mm3.
- Plasma leakage is indicated by a 20% increase in hematocrit from the initial level, a drop in hematocrit of more than 20% after replacing fluids, the presence of pleural effusion and ascites, and low levels of proteins in the blood (hypoproteinemia).3

Dengue shock syndrome is characterised by the presence of tachycardia in patients with dengue hemorrhagic fever. The individual has a pulse pressure of less than 20mmHg, hypotension relative to their age, cold skin, and restlessness.

Confirmation in a laboratory setting is typically achieved by detecting the presence of IgM antibodies.

Vasanwala et al demonstrated a direct association between dengue hemorrhagic fever and dengue shock syndrome.[13]

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

➢ *Aim and Objectives of the Study*

- The objective is to analyse the daily urine spot protein creatinine ratio in patients with dengue fever.
- The aim is to utilise this analysis to identify individuals who are at a higher risk of developing complications of dengue fever.
- To determine the sensitivity and specificity of the prognostic tool.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

CHAPTER TWO
REVIEW OF LITERATURE

Dengue infections are primarily caused by four distinct serotypes of the dengue virus (DENV1, DENV2, DENV3, DENV4), which belong to the Flaviviridae family of arboviruses. These diseases are of utmost significance in terms of their geographical prevalence, morbidity, and fatality rates. Over the past 30 years, the worldwide prevalence of dengue has grown by a factor of at least thirty, resulting in a current population of 2.5 billion individuals who are susceptible to the disease. The annual estimate for symptomatic dengue infections is 50 million, whereas the estimate for asymptomatic infections is approximately 400 million. Approximately 500,000 instances of severe dengue hemorrhagic fever/dengue shock syndrome and 20,000 fatalities are reported, with a majority of these cases affecting children and adolescents. The predominant vector is Aedes aegypti. The clinical presentation of dengue can vary from a moderate febrile sickness referred to as "dengue fever" to a more severe form called "severe dengue," previously known as dengue haemorrhagic fever (DHF). Severe dengue is characterised by leakage of fluids from the capillaries, resulting in hypovolemic shock, organ dysfunction, and bleeding problems.[2]

- *Epidemiology*

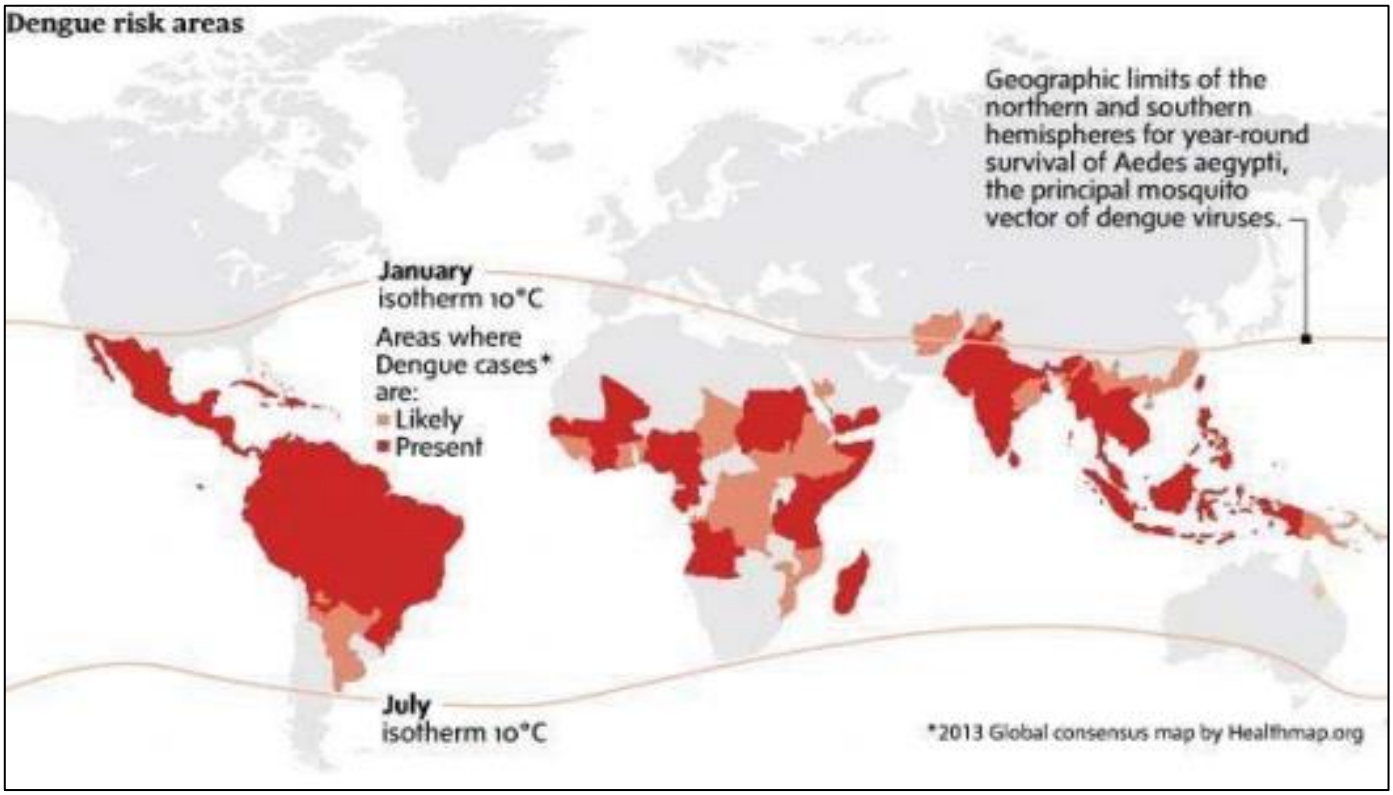

Fig 1: Dengue Global Consensus Map

Dengue is prevalent in regions located between 30°N and 40°S, where the environmental conditions are ideal for Aedes mosquitoes to spread the dengue virus.

Similar to yellow fever, it is probable that the dengue virus was also spread through the slave trade and world wars to many countries. The initial documented occurrence of dengue transpired in Pennsylvania, United states.

Spain also saw a comparable outbreak over the same period. The victims experienced intense agony, resulting in the coining of the term Break bone fever. The subsequent events took place in the mining communities of Australia.

Following the world wars, international trade thrived and travel became widespread, resulting in the expansion of the dengue virus to new territories. In the 1950s, novel manifestations of the disease emerged. The occurrence of Thai hemorrhagic fever, commonly known as Dengue hemorrhagic fever, was observed in neighbouring countries as well. Asia currently accounts for over 70% of global dengue cases, indicating a persistent trend[1].

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

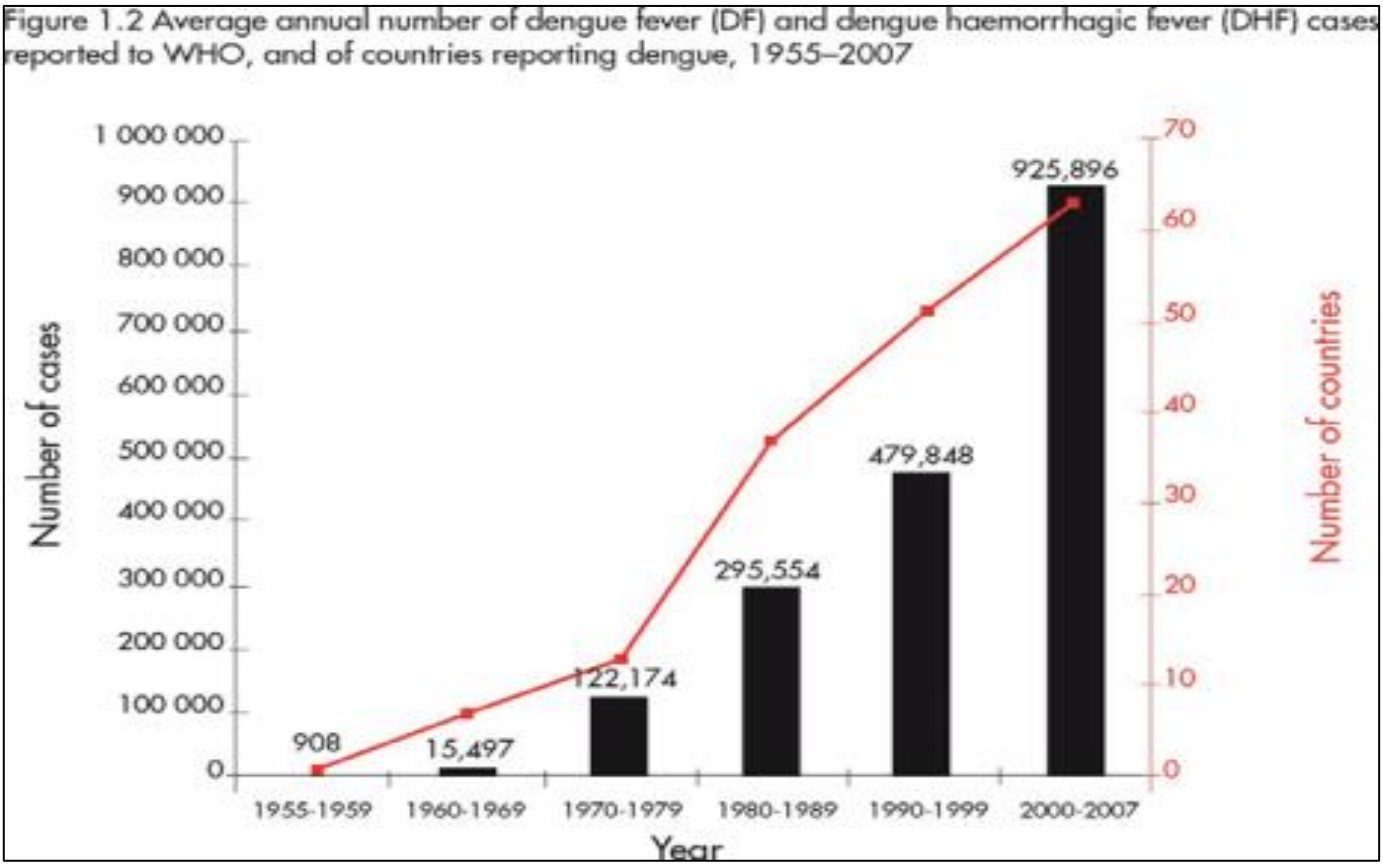

Fig 2: Average Annual Number of Df and Dhf Cases Reported

Dengue transmission is present year-round in endemic tropical regions. Yet, in most nations, there is a clear seasonal trend, with heightened transmission typically linked to the rainy season. Outbreaks commonly happen in regions where there are numerous serotypes of the dengue virus present at the same time or in a sequence of epidemics, and when infections with different kinds of the virus are widespread[18].

Dengue is most prevalent in children aged 2 to 15 years in regions where it is endemic. Severe dengue typically occurs in cases of secondary dengue infection, as well as in infants under the age of 1 who were born to mothers with immunity to dengue[6].

- *Dengue Virus:*

The dengue virus belongs to the Flavivirus genus within the Flaviviridae family. The virus is a single-stranded RNA virus that is enclosed and has a diameter of 30 nm. There exist four serotypes (DENV1–4) that are closely related yet unique from each other. They possess antigens that exhibit cross-reactivity with other members of the same genus, specifically yellow fever, Japanese encephalitis, and West Nile viruses.

All four serotypes of DENV have undergone independent evolution from ancestral sylvatic viruses, resulting in their distinct ecological and evolutionary characteristics. The evolution of the dengue virus differs significantly from other flaviviruses in several critical ways, although sharing similar clinical symptoms such as causing high fever, headache, muscle pain, hepatitis, encephalitis, and haemorrhage[2].

According to Vasilakis (Vasilakis et al., 2010), more comprehensive phylogenetic investigations indicate that the dengue virus originated in Asia, where it undergoes sylvatic cycles between different hosts, non-human primates and Aedes mosquitoes .

Following developments led to the emergence of four serotypes that are unique in terms of both antigenicity and phylogeny: DENV-1, DENV-2, DENV-3, and DENV-4.

Each of these four serotypes evolved autonomously into an endemic cycle of transmission between people and Aedes albopictus mosquitoes. This indigenous cycle is distinct from the wild cycle. Therefore, it is no longer accurate to classify urban cycles of DENV as zoonotic.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

Dengue undergoes continuous evolution at a consistent pace, and previous strains have been circulating among humans for the past century. Genetic variations are evident among dengue viruses, even within the same nations, serving as evidence of their variety. Over the past thirty years, there has been a significant increase in the number of illnesses caused by DENV-2 and DENV- 3. DENV-1 has five recognised genotypes, DENV-2 has five, DENV-3 has four, and DENV-4 has four. Certain subgroups exhibit variations in their pathogenicity and capacity to induce disease[3].

➢ *Transmission*

The transmission of the dengue virus occurs by many types of Aedes mosquitoes from one human to another. Dengue virus (DENV) circulates via two distinct cycles:

- Endemic and epidemic cycles occur between humans and peridomestic mosquitoes, specifically Aedes aegyptiand Aedes albopictus.
- A natural cycle occurring in the wild between non-human primates and several tree-dwelling Aedes species.

Aedes aegypti is the most proficient among mosquito vectors due to its tendency to inhabit home environments. Female mosquitoes exhibit hematophagy by seeking nourishment from people during daylight hours. The female Aedes aegypti mosquito can transmit dengue after feeding on an infected person's blood that carries the virus. Transmission can occur either promptly if the mosquito changes hosts during feeding interruption, or after an incubation period of 8-10 days. During this time, the virus grows in the mosquito's salivary glands. After becoming infected, the mosquito host retains its ability to transmit the infection for the duration of its life, which typically lasts between 30 and 45 days[17] .

Aedes albopictus, Aedes polynesiensis, and many species belonging to the Aedes scutellaris complex are further species of the Aedes genus capable of being transmitted. Each species have a distinct geographical range and, overall, they are less effective vectors compared to Aedes aegypti. Documentation exists for the transovarian transfer of dengue viruses. Their epidemiological significance is undetermined[1].

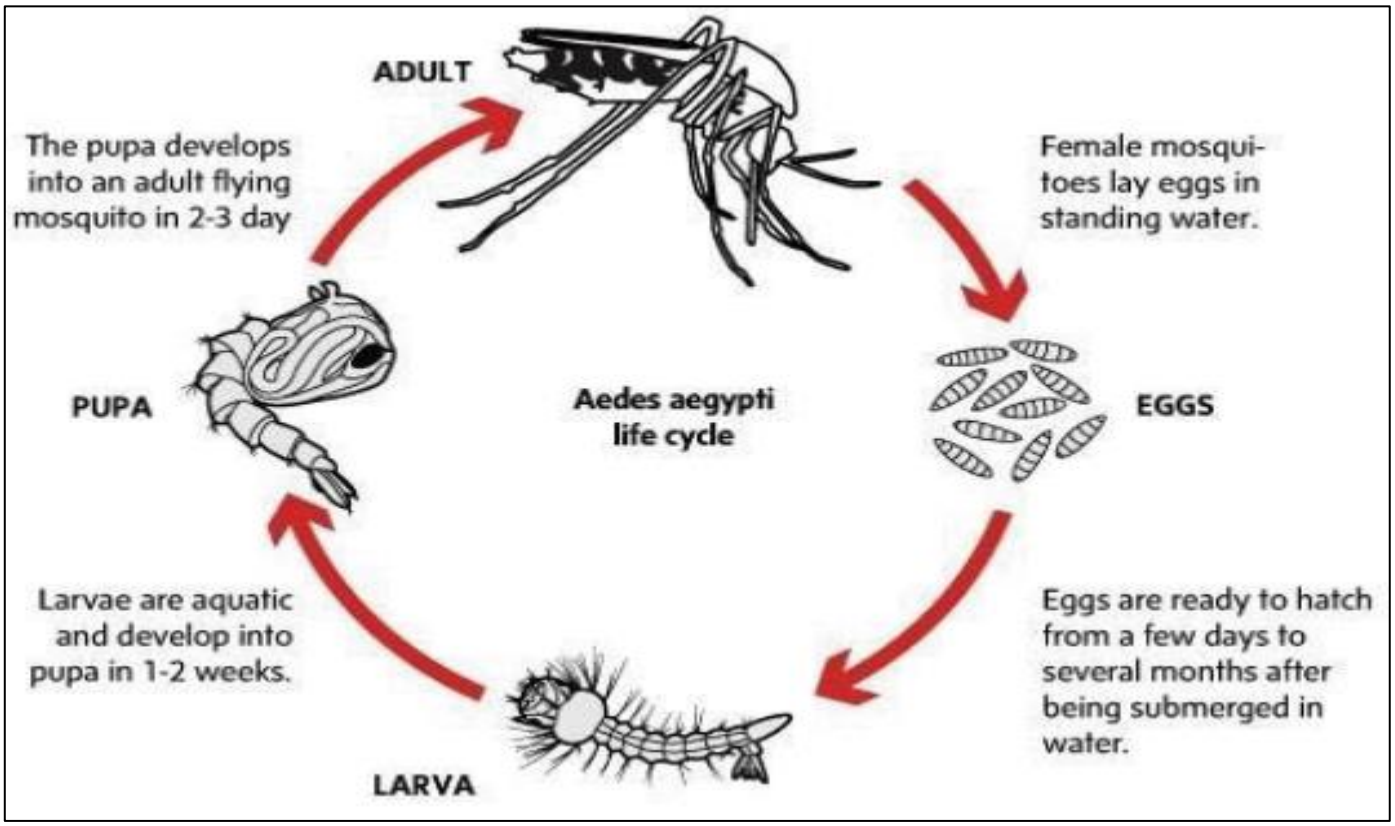

Fig 3: Aedes Mosquito Life Cycle

➢ *Pathogenesis*

The significant correlation between the occurrence of severe disease in secondary dengue and the fact that complications arise during a rapid decrease in the presence of the virus in the bloodstream, has resulted in the proposal that the cause of severe dengue is mediated by the immune system.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

In the 1970s, Halstead introduced the 'antibody dependent immune enhancement theory' (ADE) after conducting investigations in vitro and on primates. The correlation between consecutive dengue infections and the increased likelihood of severe symptoms has been consistently validated in many epidemiological studies conducted across different regions of the globe24.

Furthermore, a certain order of infecting serotypes has been associated with severe illness, and multiple studies indicate that severe dengue is more prevalent in cases of secondary infection with DENV2. During a subsequent infection with a distinct dengue serotype, the antibodies acquired from the initial infection are unable to effectively neutralise the virus. Instead, they may facilitate the entry and multiplication of the virus in mononuclear cells. The correlation between the increased viral load and the severity of the disease has been established.

Other factors that may contribute to the pathogenesis of severe dengue include more aggressive variations of the virus, genetic characteristics of the host, age, and pre-existing medical conditions14.

- *Humoral Immune Response*

Following an intense stage of infection caused by a specific dengue serotype, the body produces antibodies that target all four dengue serotypes. The immune response to the same serotype of the invading strain results in a durable and persistent immunity. Periods ranging from 2 to 12 months after the first infection, a cross-reactive heterotypic immunity to all serotypes has been seen. The decline in cross-reactive heterotypic antibody leads to the development of severe dengue through a process known as 'antibody dependent enhancement'. The antibody obtained from a different infection is unable to neutralise the current infecting serotype. Instead, it promotes the entry of the virus into cells that have Fcy receptors, specifically monocytes and macrophages. ADE, besides enabling viral entry into cells, also enhances viral reproduction within the cells by modifying innate and adaptive intracellular antiviral systems. Subsequent investigations have demonstrated that the antibodies present in high concentrations are ineffective in neutralising the virus[22].

An example of antibody dependent enhancement (ADE) occurs in cases of severe primary dengue in infants born to moms who are immune to dengue. The IgG antibody that is inherited from the mother often remains in the child's bloodstream for a period of 4-12 months until it is no longer detectable. An infection caused by the dengue virus can lead to the severe condition known as dengue hemorrhagic fever, which occurs due to the increase of antibodies[6].

- *Cell-Mediated Immunity*

Cell-mediated immunity is crucial for regulating dengue infections, and recent research has established that it significantly influences the severity of the disease. The severity has been ascribed to the heightened T cell activity, which does not contribute to the control of the virus. Activated and infected monocytes and endothelia discharge their contents through lysis.

Tumour necrosis factor alpha (TNF-α), interleukin-1 (IL-1), plateletactivating factor (PAF), interleukin-8 (IL-8), and regulated on activation, normal T cell expressed and secreted (RANTES) work along with lymphokines, histamine, and virus and immune complex-induced C3a and C5a to synergistically promote transitory malfunction of vascular endothelial cells, resulting in plasma leakage. Activated cells that respond to cross-reactive antigens are more prevalent than primary responses to the infecting antigens[23].

According to the concept of original antigenic sin, these cells are designated for programmed cell death and are not successful in eliminating the virus. Additionally, they may release cytokines that have a detrimental impact on clinical outcomes. An examination of T-cell reactions to the complete dengue proteome revealed that the most significant response occurred towards the non-structural protein 3 (NS3), characterised by elevated cytokine levels and reduced CD107a expression (a marker indicating cell degranulation).

This indicates that in cases of severe dengue, the T cells' limited ability to destroy cells fails to achieve early viral containment. Instead, there is an abundance of cells that produce high levels of cytokines, which leads to an excessive inflammatory response. This, in turn, causes damage to tissues and leakage of plasma. Previous research has established a connection between the severity of a disease and some indicators of cellular activation in the bloodstream, such as interleukin-6 and soluble IL-2 receptor[27].

- *Complement*

Few studies suggest a possible role for complement in the pathogenesis of severe dengue.

Excessive stimulation of local endothelial surfaces leads to increased vascular leakage and immunological modulation, resulting in greater levels of the virus in the bloodstream. Recent animal studies indicate that complements may potentially serve a protective function.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

The c1q and mannose binding lectin are potentially pivotal in the inactivation of DENV2. Patients with decreased Mannose-Binding Lectin (MBL) levels exhibited higher levels of severity[22]

➢ *Histopathology:*

Animal studies have shown that upon injection, the dengue virus enters into the regional lymph nodes via dendritic cells. It then spreads to the reticuloendothelial system, including the spleen and other organs, where it replicates. Subsequently, it enters the bloodstream, leading to secondary viremia. Biopsies were conducted to examine skin lesions in humans with simple dengue infection.

The primary pathology manifested in the vicinity of the tiny blood arteries and involved endothelial enlargement, perivascular edema, and infiltration of mononuclear cells. There was a significant leakage of blood without any signs of inflammation noticed in the petechial lesions[14] .

➢ *The Major Organ Systems Exhibit the Following Significant Changes:*

- Vasodilatation, congestion, perivascular haemorrhage, and edema of arterial walls.
- There is also an observed proliferation of reticuloendothelial cells with increased phagocytic activity.
- The lymphoid tissues display increased activity of B lymphocytes, with proliferation of plasma cells and lymphoblastoid cells.
- In the liver, focal necrosis of hepatocytes and Kupffer cells is observed, along with the formation of Councilman-like bodies.
- Dengue virus antigen is predominantly found in cells of the spleen, thymus, and lymph nodes, as well as in Kupffer cells and the sinusoidal lining cells of the liver and alveolar lining cells of the lung14 .

➢ *Pathophysiology:*

Plasma leakage and impaired haemostasis are the distinguishing characteristics of severe dengue. Plasma leakage is supported by clinical evidence such as a sudden increase in haematocrit, low levels of proteins in the blood, the accumulation of fluid in the pleural cavity and abdominal cavity, and a decrease in plasma volume. These factors can result in compromised blood flow and a state of shock due to low blood volume22 .

The non-invasive technique of strain gauge plethysmography has successfully demonstrated microvascular leakage. An investigation shown that the filtration capacity was greater in patients with dengue hemorrhagic fever (DHF) compared to the control group. However, no disparity in filtration capacity was seen among different severity grades of DHF21. Additionally, they demonstrated that there are age-related alterations in microvascular permeability, where children exhibit greater filtration capability compared to adults. This finding may elucidate the increased prevalence of dengue shock syndrome during childhood6.

The temporary nature of the leakage suggests an elevation in vascular permeability that is related to function. The microvascular leak happens when the virus load decreases, indicating that the immune response is causing harmful effects. Impairment of the endothelium glycocalyx layer has been linked, via the virus or the NS1 antigen can activate immune-mediated processes that target the endothelium layer20.

The NS1 antigen is a glycoprotein that is released by cells infected with dengue virus and is necessary for the replication of the virus. Research has demonstrated that NS1 has the ability to specifically attach to heparan sulphate located in the glycocalyx layer of microvascular endothelial cells. This process facilitates the creation of immune complexes and activates the complement system through antibody-dependent mechanisms, resulting in damage to the endothelial cells and leakage in the microvasculature25.

Proteinuria is connected with vascular leakage and hypoproteinaemia observed in the blood during defervescence. Proteinuria is more common in severe cases of dengue, and the ratio of urine protein to creatinine has been proposed as a predictor of the progression to severe disease12 .

An investigation conducted on Vietnamese children revealed that a decrease in various-sized proteins in the blood plasma was linked to an increase in the fractional urine clearance of those proteins. Proteinuria often subsides throughout the recovery phase, and there is usually no concurrent renal impairment observed, as evidenced by the absence of elevated creatinine levels19.

Evidence has been proposed from renal biopsies, indicating the presence of dengue immune complexes in the glomerular basement membrane. The dengue infections exhibit the following haemotological anomalies:

- Vascular disease
- Thrombopathy (it is a condition characterised by reduced functioning and generation of platelets, resulting in moderate to severe thrombocytopenia).

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

- Coagulopathy occurs as a result of the activation of the coagulation system and fibrinolysis. In the latter stages of severe disease, it can lead to disseminated intravascular coagulation (DIC).
- Bone marrow alterations involve the suppression of all components of the marrow, resulting in the interruption of the development of megakaryocytes, even in the initial stage of the disease. However, this condition is corrected after the period of fever subsides[22] .

The most consistent finding in dengue infections is a transient thrombocytopenia. The exact underlying mechanism still remains unclear. Studies suggest that it may be multifactorial, including:

- Inhibition of megakaryocyte production
- Enhanced elimination of platelets through denv-induced apoptosis
- Antiplatelet antibodies26.

Various investigations have shown that the coagulation system and fibrinolysis are activated, particularly in severe cases. A study shown that consistently high levels of tissue activator inhibitor and an elevated ratio of thrombin-antithrombin to plasmin-antiplasmin were linked to worse outcomes in individuals with dengue[18].

Additional research has demonstrated that a slight extension of prothrombin time and partial thromboplastin time, as well as decreased fibrinogen levels, are also linked to unfavourable results. Elevated amounts of fibrinogen breakdown products are infrequently observed, however they may not reach levels indicative of a typical disseminated intravascular coagulation (DIC) presentation[25].

Possible explanations for these coagulation abnormalities include the loss of coagulation factors due to capillary leakage, which subsequently leads to the observed abnormalities. The extension of the prothrombin time (PT) and activated partial thromboplastin time (APTT) also corresponds with the peak occurrence of vascular leakage and is more evident in these very ill patients.

Laboratory experiments have showed that the virus is capable of attaching to and stimulating plasminogen, a substance involved in blood clotting. Additionally, antibodies that can react with plasminogen have been found in the blood of individuals with both recent and recovering cases of dengue fever[10].

➢ *Clinical Features:*

Dengue fever exhibits a broad range of clinical manifestations, ranging from a mild fever to severe symptoms of plasma leakage such as dengue hemorrhagic fever or Dengue shock syndrome, which can have life threatening effects. In the past, dengue was categorised as dengue fever and dengue haemorrhagic fever (DHF), which had four grades. DHF III and IV were collectively referred to as dengue shock syndrome (DSS).

In 2009, the World Health Organisation (WHO) revised the classification of dengue as a result of challenges encountered in using the previous classification system in clinical settings and an increase in the number of severe cases that did not meet the criteria for Dengue hemorrhagic fever(DHF)18.

➢ *The New Classification Emphasizes Severity with Patients Being Classified Into*

- Dengue with or without warning signs
- Severe dengue

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

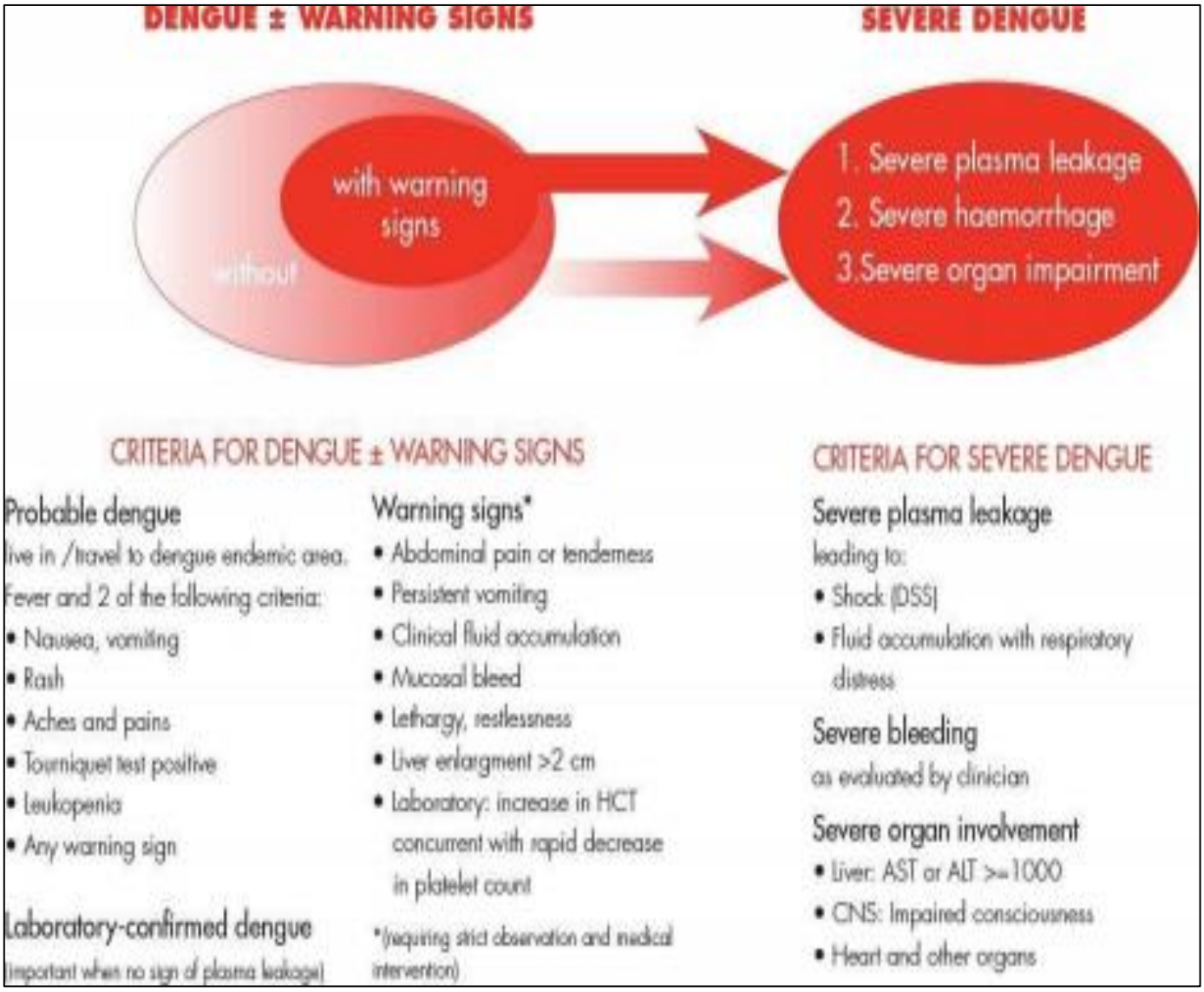

Fig 4: Classification of Dengue Fever

Organ dysfunction can manifest independently of shock or other severe dengue symptoms, such as hepatitis, encephalitis, and myocarditis. While moderate elevations in hepatic transaminases are typically observed, it is uncommon to have ALT values exceeding 1000, which may indicate liver disease.

In endemic locations, it is becoming more common to observe cases of dengue fever when the only symptom is acute encephalitis syndrome, without any other signs of the disease. Prevalence of this condition is higher among youngsters and while it is seldom lethal, a few individuals are left with neurological consequences.

Dengue patients have exhibited several cardiac symptoms, including acute myocarditis, conduction problems and myocardial depression.

Early identification of these patients is crucial for customising their fluid management[8]. The clinical course comprises three phases: febrile, critical, &recovery.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

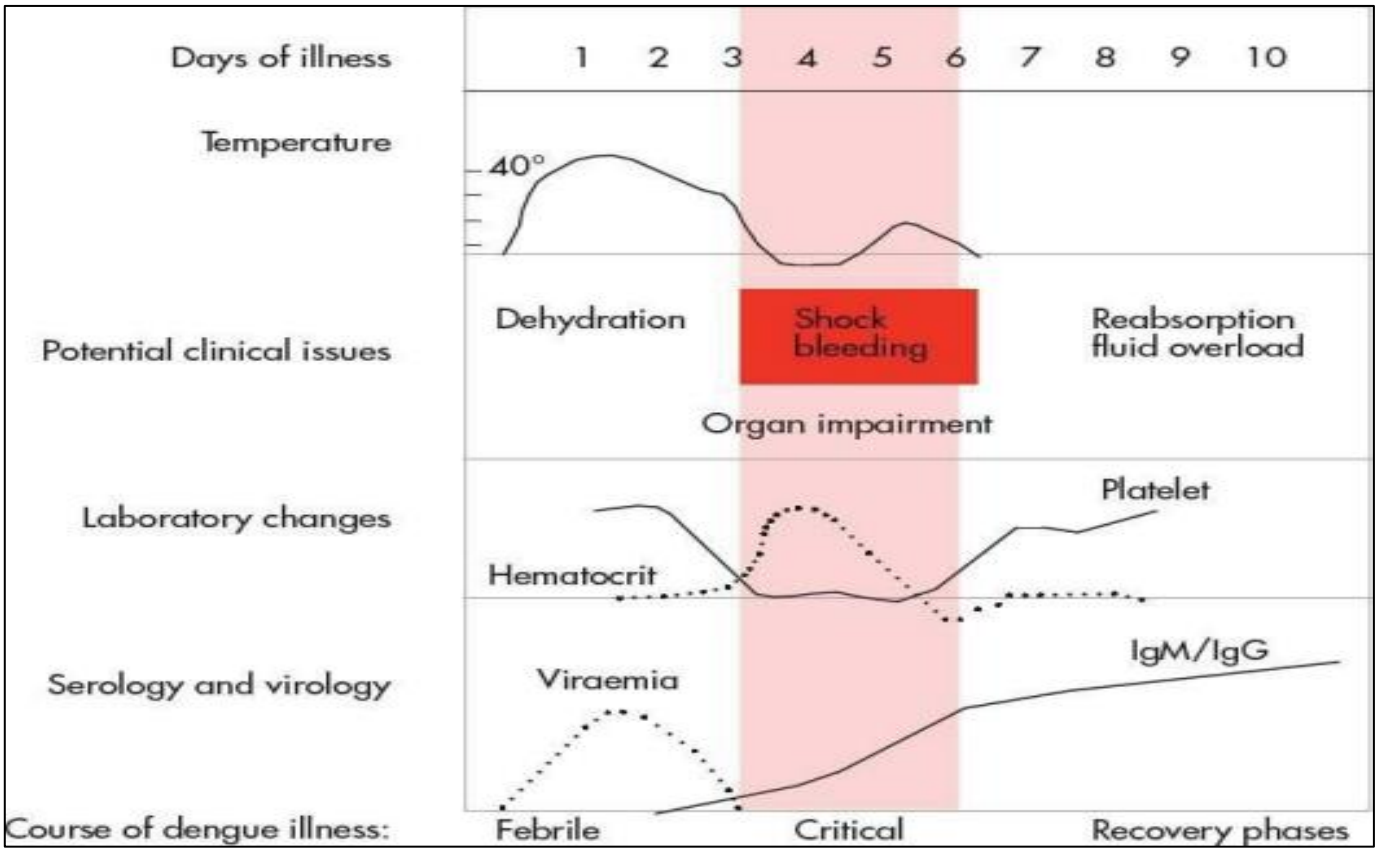

Fig 5: Course of Dengue Illness

➢ *Febrile Phase*

Following an infected mosquito bite, the disease often manifests after an incubation period of 5-8 days. It begins abruptly with the sudden development of fever, accompanied by severe headache, chills, pain behind the eyes (especially while moving the eyes), backache, and muscle, bone, and joint pain.

The manifestation of these symptoms during the Spanish epidemic led to the term "**BREAK BONE FEVER"**

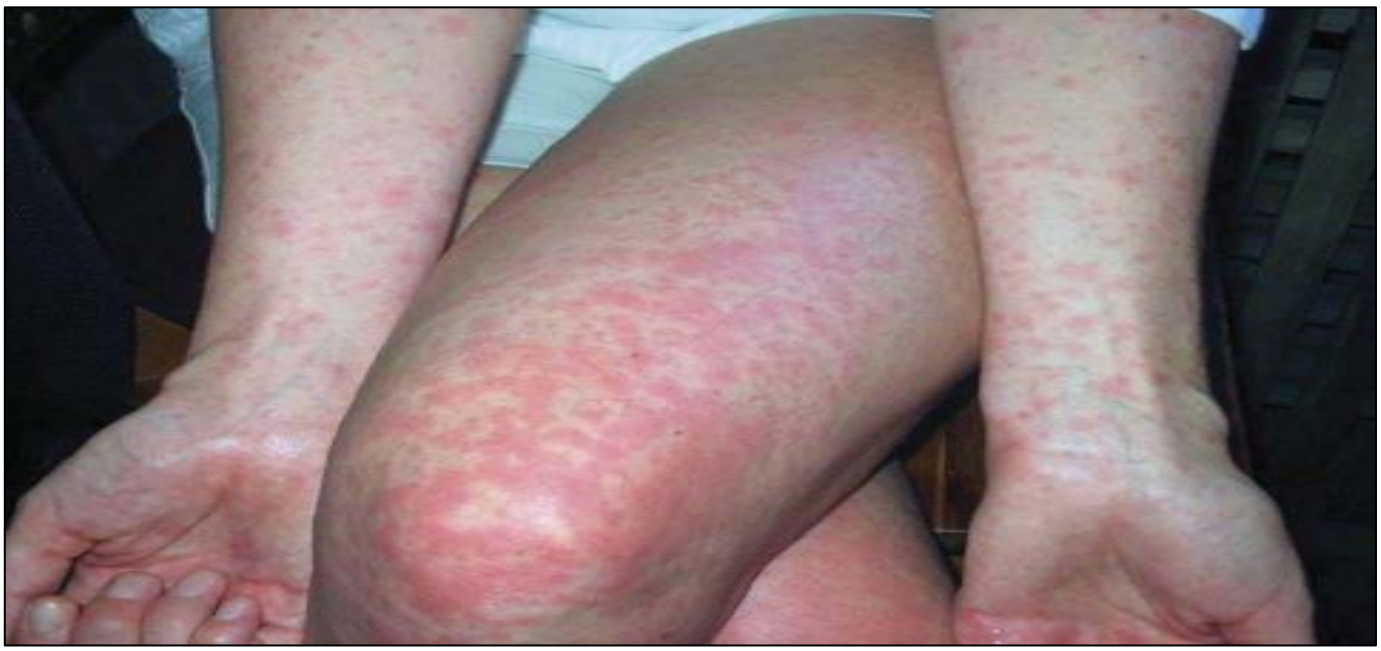

Fig 6: Dengue Rash

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

During the febrile phase, the temperature might rise as high as 40°C and the fever may persist for 5-6 days. In some cases, the fever may have a biphasic course. Additionally, anorexia, emesis, and stomach discomfort are frequently observed.

As the condition advances, the patient experiences toxicity and exhibits significant weakness and exhaustion. Additional documented symptoms encompass a sore throat, modified perception of taste, constipation, and feelings of sadness and hopelessness.

Various forms of dermatitis have been documented. At first, one may notice a spread out reddening, patchiness, or brief little eruptions on the face, neck, and chest. These occurrences are ephemeral and take place on the second day.

Another form of skin rash is a noticeable rash that can be either maculopapular or scarlatiniform. It often emerges around the 3rd or 4th day after the onset of fever. The rash originates on the chest and trunk and extends towards the limbs and face. It may be accompanied by itching and heightened sensitivity of the skin3.

During the later stage of the fever or right after the fever subsides, the widespread rash diminishes and small clusters of petechiae may emerge on the top surface of the feet, as well as on the legs, hands, and arms. This rash is characterised by scattered pale circular areas of normal skin.

During the febrile phase, there are mild haemorrhagic consequences characterised by the presence of scattered petechiae on the limbs, axillae, trunk, and face. Typically, a positive tourniquet test and/or a propensity to bruise at venepuncture sites are observed18.

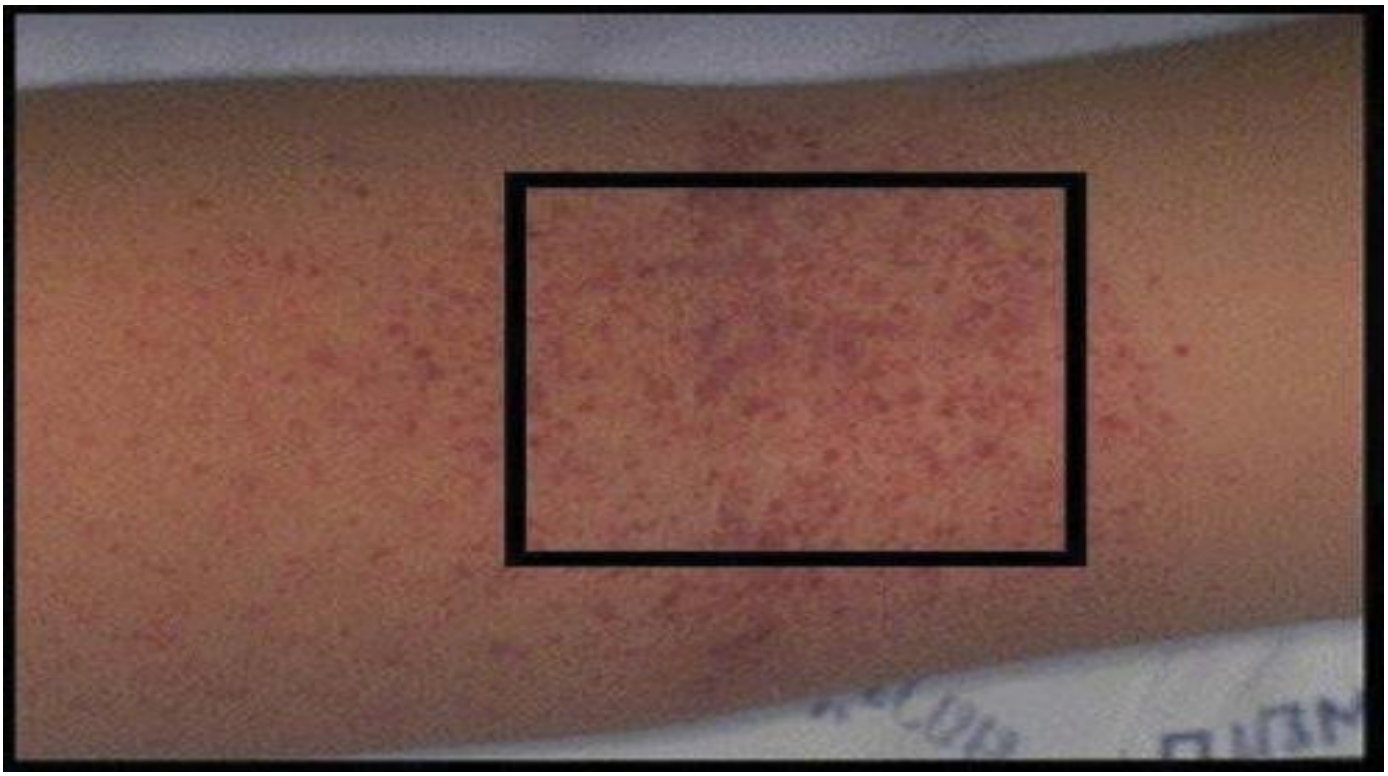

Fig 7: Positive Tourniquet Test

Haemorrhage originating from the nose, gums, and gastrointestinal tract, is a frequent occurrence, although the presence of blood in the urine (hematuria) is infrequent. Liver enlargement is a common occurrence, however jaundice is typically absent except in cases with elevated liver enzymes.

Leucopenia, which refers to a decrease in white blood cell count, is a frequently observed condition. Initially, there may be a predominance of neutrophils. During the later stage of the febrile phase, there is a decrease in the overall count of white blood cells and neutrophils, occurring either just before or at the same time as a relative rise in lymphocytes, including the presence of abnormal lymphocytes. Leucopenia typically reaches its lowest point just before the temperature and platelet levels decrease. This insight is significant in delineating the conclusion of the febrile phase and the commencement of the critical phase.

Additional alterations including hypoproteinemia, hypoalbuminemia, hyponatremia, and slightly higher levels of alanine aminotransferase (ALT) and aspartate aminotransferase (AST)18.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

➢ *Critical Phase*

- Abdominal pain or tenderness
- Persistent vomiting
- Clinical fluid accumulation
- Mucosal bleed
- Lethargy/restlessness
- Liver enlargement >2 cm
- Laboratory increase in HCT concurrent with rapid decrease in platelet count

It is impossible to anticipate which individuals will experience a smooth recovery from fever and which individuals may progress to develop severe dengue. However, it may be able to anticipate danger signs in patients by utilising the WHO warning indicators.

Exercising heightened caution at the critical stage can aid in determining which patients will necessitate more extensive supportive care treatments. The critical phase, typically observed during the decline of fever around the fifth day, is characterised by an elevation in capillary permeability and the potential for plasma leakage. Clinically, this can manifest as either pleural effusion or ascites, depending on the extent of plasma leakage. Once a critical volume is lost, circulatory failure ensues[4, 5].

The skin exhibits a decrease in temperature and becomes moist, while the difference between systolic and diastolic pressure narrows to 20 mmHg due to an increase in diastolic pressure to match the systolic pressure. The constriction of pulse pressure is the early indicator in blood pressure that signals an imminent decline in circulatory function.

The platelet count decreases just prior to or at the same time as the increase in hematocrit (20%), and both changes happen before the fever subsides and before shock sets in. Clotting abnormalities, such as prolonged prothrombin and partial thromboplastin time, as well as reduced fibrinogen, are typically observed. These abnormalities have been found to be associated with the severity of the disease, but not with bleeding[26].

If fluid management is not properly implemented, the patient may progress to a state of severe shock i.e. having a pulse and blood pressure that are difficult to detect.

Extended shock frequently leads to the development of metabolic acidosis, multiple organ dysfunction, and severe haemorrhage, all of which are associated with a grim prognosis. The critical phase typically spans a duration of 24 to 48 hours, during which there is a possibility of clinically substantial plasma leakage. Following this phase, the recovery period commences.

➢ *Recovery Phase*

The extravascular fluid initiates reabsorption within the following 48-72 hours. Continuing intravenous fluids during this period poses a substantial risk of fluid overload, which can lead to respiratory discomfort caused by pleural effusions and/or ascites. There is a general improvement in symptoms, including a return of appetite, stable blood flow, and increased urine production. During this phase, there is an increase in the number of white blood cells, followed by an increase in platelets. The decrease in haematocrit may be attributed to the dilutional effects of the reabsorbed extravascular fluid18.

➢ *Laboratory Diagnosis:*

The diagnosis can be verified through serological testing and virus detection using molecular techniques, or, less commonly, through virus isolation. None of the individual diagnostic tests conducted in isolation possess the sensitivity to determine all the various stages of dengue illness. During the initial 3-5 days of the infection, known as the febrile phase, the most accurate and precise test to identify DENV RNA in the blood is the RT-PCR technique7 . However, as the fever subsides, this method becomes less effective as the presence of the virus in the blood decreases.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

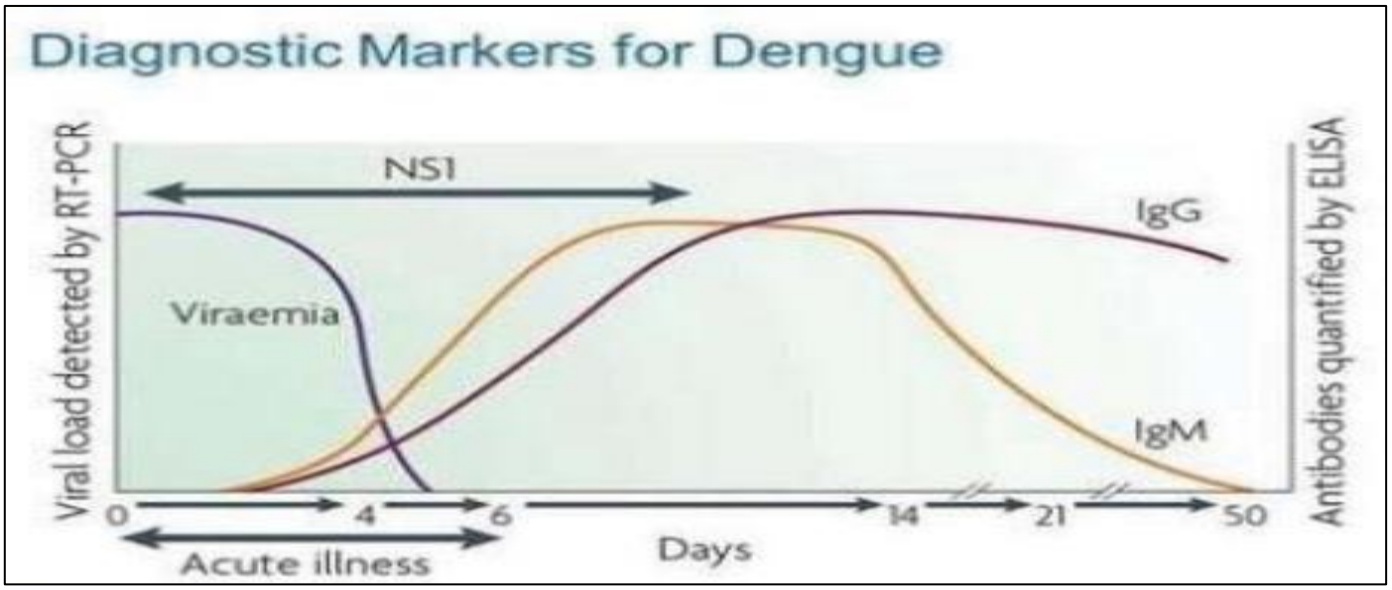

Fig 8: Diagnostic Markers For Dengue

The serological diagnosis of dengue can be achieved by detecting antidengue IgM and IgG using the enzyme-linked immunosorbent test (ELISA). This method is useful for distinguishing between primary and secondary infections. However, it is not very sensitive during the initial phases of the disease.

The sensitivity of IgG serology is limited during the initial phases of the disease and necessitates the use of paired serum samples. Additionally, its specificity is compromised by cross-reactivity with other flaviviruses.

The IgM antibody capture (MAC) - ELISA test is highly specific in differentiating dengue from other flavivirus infections. It offers an advantage over the haemagglutination test by allowing a definite diagnosis to be made solely from an acute blood sample. The test has a sensitivity of approximately 78% when using acute blood specimens, and a sensitivity of 97% when using convalescent sera.

The levels of IgG antibodies against dengue viral antigens exhibit a rapid increase in individuals who have contracted dengue for a second time. A significant (fourfold) rise in dengue antibody levels can be detected using the haemagglutination inhibition test when comparing paired sera collected during the early febrile phase or upon admission and 3-5 days later. An additional sample taken 2-3 weeks after the start of symptoms is necessary to definitively confirm a diagnosis of primary dengue infection27 .

A novel ELISA technique has been recently developed for the detection of dengue non-structural protein 1 (NS1), and commercial test kits are currently accessible. These additions are valuable for diagnosing dengue in the early stages of the disease, as they have high sensitivity and specificity. However, their effectiveness decreases as the disease progresses and in those who have an ongoing humoral immune response15.

- *Treatment:*

The management of dengue encompasses all facets of the illness. In the initial stage, prioritize lowering the temperature. In the defervescence phase, concentrate on managing fluids optimally and closely monitor for any indications of bleeding, administering transfusions as necessary. During the resolution phase, attention is directed towards addressing the issues related to volume overload that occur when the fluid that has leaked out of blood vessels reenters the bloodstream.

- *Early Febrile Phase:*

Patients should be advised to maintain proper hydration and consume ample amounts of juice. Oral rehydration solutions may be recommended as a medical prescription. Fever can be managed with the application of tepid sponging and the utilisation of Acetaminophen. Avoiding the use of NSAIDs such as aspirin and ibuprofen is recommended due to its potential to irritate the gastrointestinal system, worsen vomiting, and elevate the risk of gastrointestinal bleeding.

Additionally, NSAIDs impede platelet functions, which can further increase the risks of thrombocytopenia during the defervescence phase18.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

➢ *Critical Phase:*

The critical phase mostly entails the administration of fluid. The many causes outlined above contribute to endothelial degradation, vasodilation and increase in vascular permeability leading to loss of intravascular volume. It is crucial to classify patients into groups A-C during this phase.

Patients in Group A are recommended to consume oral fluids freely, with a minimum intake of at least 2-3 litres. These patients are asymptomatic and ambulatory.

The subsequent cohort B, characterised by cautionary indicators yet exhibiting a stable haematological condition, are administered intravenous maintenance fluids, primarily consisting of ringer lactate solution at a rate of 2-3 millilitres per kilogram per hour. These individuals should be continuously watched for any indication of worsening to severe dengue. Urine output, vital signs, and fluid intake should be checked every 6 hours18.

Table 1: Classification of Dengue Critical Phase

Parameters	Stable circulation	Compensated shock	Hypotensive shock
Hypotensive shock	Clear and lucid	Clear and lucid (shock can be missed if you do not touch the patient)	Change of mental state (restless, combative)
Capillary refill time	Brisk (<2 sec)	Prolonged (>2 sec)	Very prolonged, mottled skin
Extremities	Warm and pink extremities	Cool peripheries	Cold, clammy extremities
Peripheral pulse volume	Good volume	Weak and thready	Feeble or absent
Heart rate	Normal for age	Tachycardia	Severe tachycardia with bradycardia in late shock
Blood pressure	Normal for age Normal pulse pressure for age	Normal systolic pressure but rising diastolic pressure Narrowing pulse pressure Postural hypotension	Narrowed pulse pressure (<20 mmHg) Hypotension (see definition below) Unrecordable blood pressure
Respiratory rate	Normal for age	Tachypnoea	Metabolic acidosis hyperpnoea/ Kussmaul's breathing

Group C consists of people with severe dengue. These patients should be treated at a tertiary care centre equipped with the necessary resources for administering blood product transfusions.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

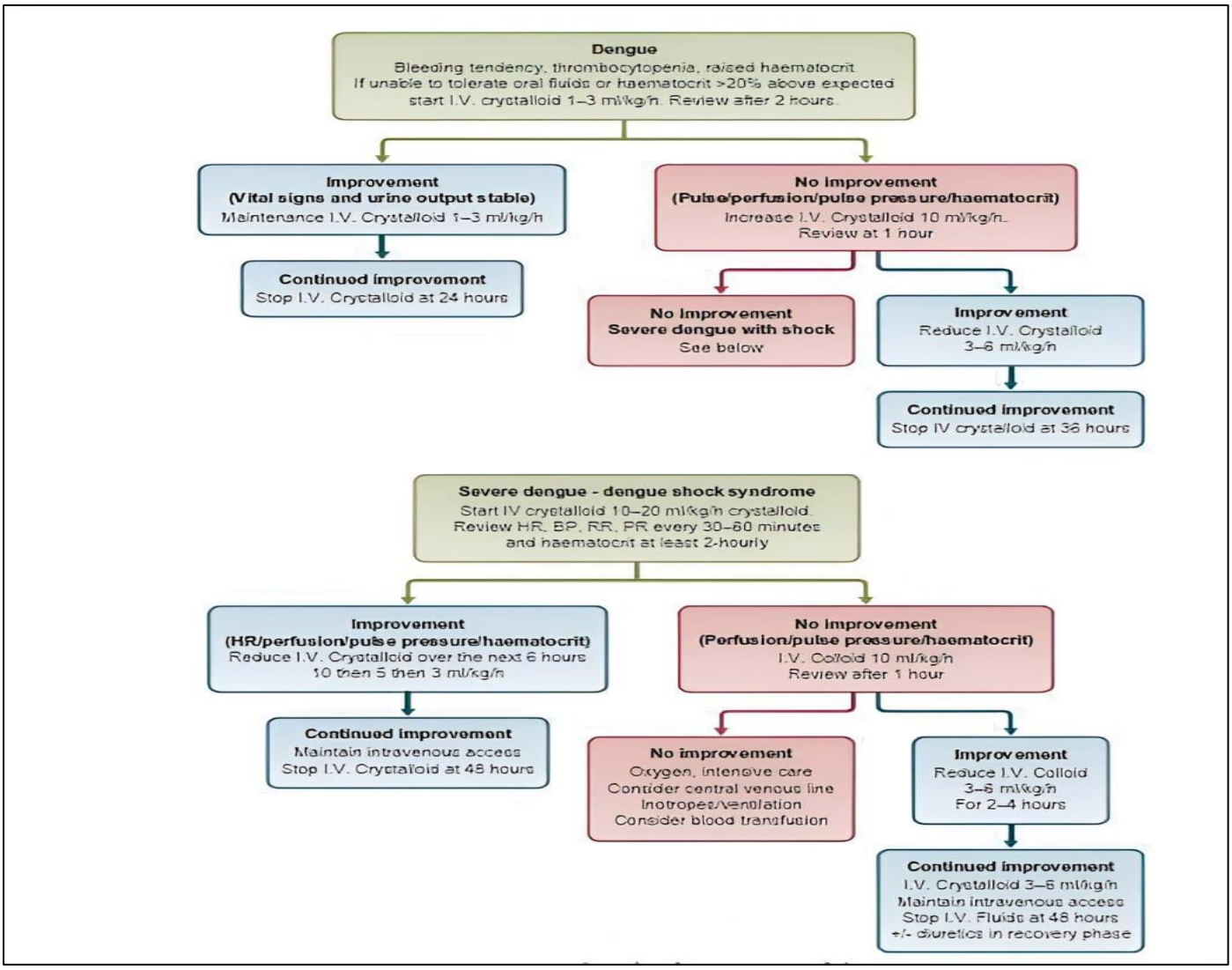

Fig 9: Algorithm Utilised for Patients Who Present With Shock

➢ *Individuals that are Susceptible to Significant Haemorrhage are those who Possess the Following Characteristics:*

- Persistent or resistant shock
- Experiencing hypotensive shock and renal or hepatic failure, and/or severe and chronic metabolic acidosis.
- Administered non-steroidal anti-inflammatory drugs.
- Preexisting peptic ulcer condition.
- Receiving treatment with anticoagulant medication.
- Any type of physical injury, such as an injection into the muscle.

➢ *A Suitable Criterion for the Transfusion of Platelets is :*

- When the platelet count is below 10,000.
- Bleeding that is clinically significant regardless of the platelet count

Patients experiencing blood loss should undergo packed cell replacement, since clinical improvement is observed when sufficient volume is restored. Patients who have a decrease in hematocrit of more than 20% from their initial level are suitable candidates for receiving a transfusion of packed red blood cells, at a dosage of roughly 10-20ml per kilogram of body weight.

It is recommended to transfuse fresh packed cells instead of stored ones since the latter have a reduced level of 2-3DPG, which leads to an increased affinity for oxygen. Freshly packed red blood cells exhibit a low concentration of 2,3-diphosphoglycerate (2-3 DPG), which is ideal for promoting tissue perfusion[18].

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

Table 2: Differential Diagnosis of Dengue

Conditions that mimic the febrile phase of dengue infection	
Flu-like syndromes	Influenza, measles, Chikungunya, infectious mononucleosis , HIV seroconversion illness
Illnesses with a rash	Rubella, measles, scarlet fever, meningococcal infection, Chikungunya, drug reactions
Diarrhoeal diseases	Rotavirus, other enteric infections
Illnesses with neurological manifestations	Meningo/encephalitis Febrile seizures
Conditions that mimic the critical phase of dengue infection	
Infectious	Acute gastroenteritis, malaria, leptospirosis, typhoid, typhus, viral hepatitis, acute HIV seroconversion illness, bacterial sepsis, septic shock
Malignancies	Acute leukaemia and other malignancies
Other clinical pictures	Acute abdomen – acute appendicitis – acute cholecystitis – perforated viscus Diabetic ketoacidosis Lactic acidosis Leukopenia and thrombocytopaenia ± bleeding Platelet disorders Renal failure Respiratory distress (Kussmaul's breathing) Systemic Lupus Erythematosus

- *Proteinuria*

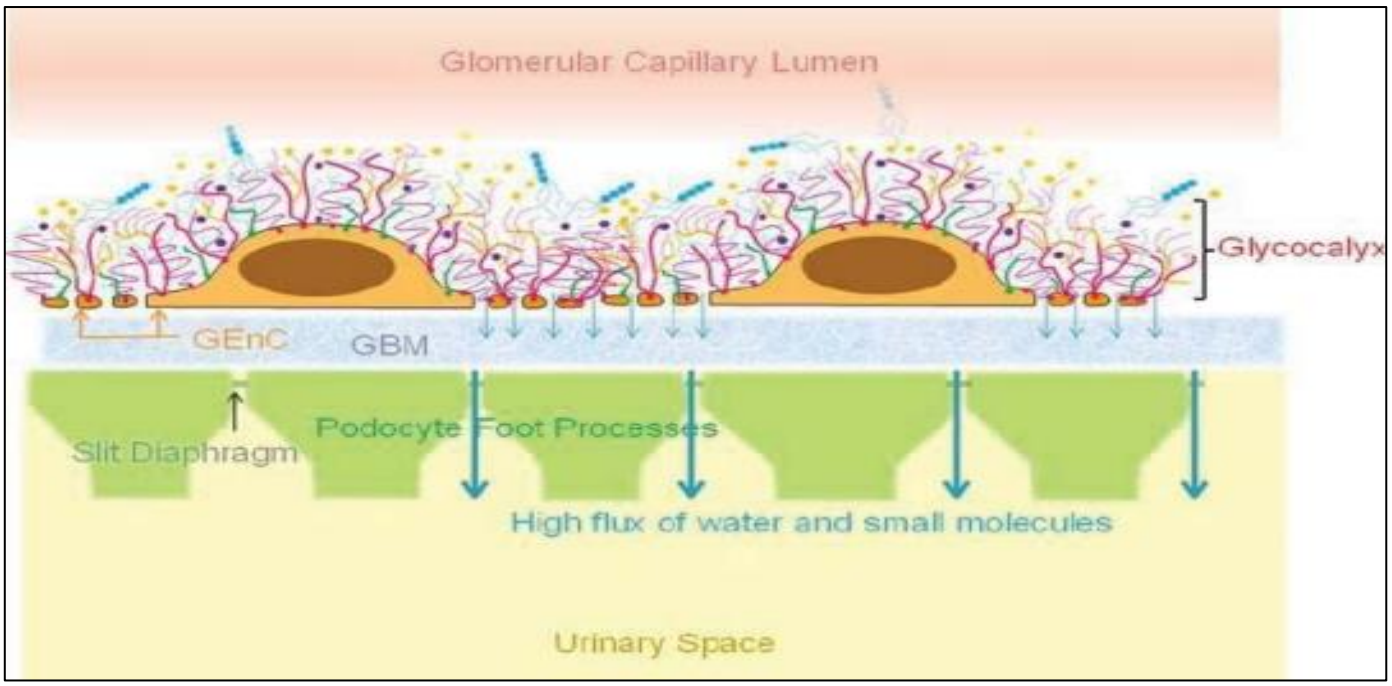

Fig 10: Glomerular Filtration

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

In a healthy kidney, significant amounts of high-molecular-weight (HMW) proteins pass through the glomerular capillaries and mesangium without being filtered into the urine. The capillary wall, which is both charge and size selective, effectively blocks the majority of these proteins from entering the tubules. However, a minute proportion of albumin and other proteins are able to pass through.

Proteins with a molecular weight of less than 20,000 Daltons can easily traverse the capillary wall. The plasma contains a minimal amount of these proteins, resulting in a correspondingly modest volume of these proteins in the urine. The proximal tubule reabsorbs these proteins with low molecular weight. Proteins such as a2-microglobulin, apoproteins, enzymes, and other peptide hormones are eliminated in urine in minimal quantities9.

The typical range for protein excretion in healthy individuals is 30 to 130 mg per day. The accepted upper threshold for total protein excretion in urine for adults is typically stated as 150 to 200 mg per day11.

Typically, the maximum acceptable level of albumin excretion in urine is 30 mg per day.

Typically, a minute quantity of protein is present in urine due to regular tubular secretion. Tamm-Horsfall protein is a glycoprotein with a high molecular weight that is produced on the surface of the epithelial cells in the thick ascending limb of the loop of Henle and the early distal convoluted tubule. Tamm-Horsfall protein, also referred to as uromodulin, has the ability to attach to and render inactive the cytokines IL-1 and tumour necrosis factor16.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

CHAPTER THREE
METHODS FOR MEASURING URINARY PROTEINS

➢ *Dipstick Method*

This method is based on the idea that the presence of protein in a buffer solution leads to a pH shift in the solution that is directly proportional to the protein content. The dipstick is equipped with a pH indicator dye and a buffer solution. The indicator colour transitions from a light green hue to green and finally to blue when the stick is immersed in urine that contains proteins. The test exhibits greater sensitivity towards albumin and lower sensitivity towards immunoglobulin light chains and other globulins. The test is highly sensitive, capable of detecting as little as 20mg/dl of protein in urine. However, it fails to consider the urine volume.

When there is a high urine volume and the urine is highly diluted, a significant quantity of protein may remain undetectable. If the urine production is as high as 10L/day, it is possible that a total protein excretion of around 1 g/day may go undetected, since the concentration of urine protein falls below 20mg/dl16.

➢ *The Dipstick Reports are Interpreted as follows:*

1. Negative	**<15mg %**
2. 1+	30-10mg/dl
3. 2+	100-300mg/dl
4.3+	300-1000mg/dl
5. 4+	>1000 mg/dl

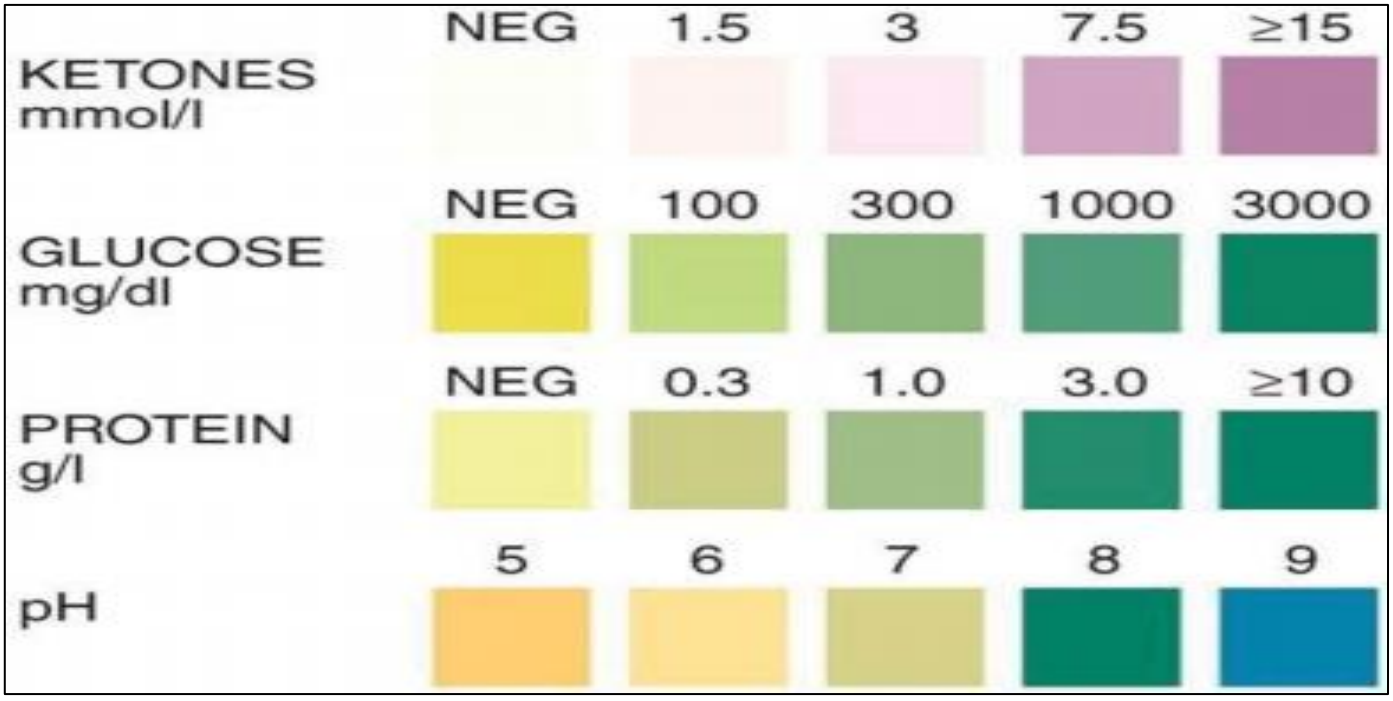

Fig 11: Urine Dipstick (Above)

Urine with a pH greater than 7, which is highly alkaline, might lead to a false positive result. Currently, there are albumin-specific dipsticks that can be utilised to effectively identify low levels of albuminuria. Certain test strips are capable of measuring the albumin-to-creatinine ratio.

➢ *Sulfosalicylic Acid Method:*

In this widely employed technique, sulfosalicylic acid is introduced into a urine sample, and the resulting cloudiness is quantified using a photometer or nephelometer. The quantification of protein can be achieved by comparing the turbidity of the sample with that of a standard. This approach is imprecise, with a variation as high as 20%. This approach can detect a wide range of proteins, including y-globulin light chains and albumin. This approach exhibits greater sensitivity towards albumin compared to globulins. Trichloroacetic acid can serve as a substitute for sulfosalicylic acid, hence enhancing the sensitivity to y-globulin. High amounts of certain substances might also lead to false-positive results.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

The substances mentioned include tolmetin sodium, tolbutamide, a variety of antibiotics, and radio-contrast agents[16].

➢ *Hour Urinary Protein Excretion:*

The method provides the mean fluctuation in protein excretion caused by the circadian rhythm and is considered the most precise approach for monitoring proteinuria. This technique identifies albumins, globulins, and immunoglobulin light chains. This approach measures the overall amount of protein, including albumin, and hence allows for the detection of light chains.

➢ *Protein Creatinine Ratio*

The spot PCR is calculated by dividing the urine protein excretion (measured using either 24-Hour Protein excretion or a spot urine sample) by the creatinine excretion, and is represented as either mg/mg or mg/mmol. Spot PCR offers a convenient substitute for the 24-hour urine collection method since it is more easily obtained and not affected by fluctuations in water consumption or urine production. Furthermore, the identical specimen can also be utilised for microscopic examinations16.

A strong correlation has been shown between the polymerase chain reaction (PCR) in a random urine sample and the amount of protein excreted in a 24- hour period. This correlation has been observed in a diverse group of patients, including those with various forms of glomerulonephritis (GN), who were assessed throughout time during their therapy. Nevertheless, the outcomes could be affected by fluctuations in creatinine excretion due to its reliance on muscle mass. In older and female patients, the polymerase chain reaction (PCR) readings may exhibit higher levels compared to those observed in young men.

Another important element to consider is the timing of the sample, which may be affected by the diurnal fluctuations in protein excretion, while creatinine excretion remains relatively stable. The most accurate estimations are likely those collected during the early morning hours.

While some believe that a regular PCR test is enough to exclude pathological proteinuria, it is recommended to verify and measure an increased PCR result using a 24-hour urine collection7.

➢ *Spot PCR has Several Advantages, Including:*

- Not burdensome
- Unaffected to diuretics or fluctuations in water intake.
- The sample is suitable for microbiological examination.

➢ *Specific Protein Assays*

Similar to electrophoresis, SDS-PAGE is a more advanced and precise technique for protein measurement, offering increased sensitivity and accuracy. The latter method employs molecular weight analysis to identify various proteins present in the urine, and it is also valuable for determining the proteinuria pattern.

Suspected immunoglobulin light chain excretion occurs when the dipstick protein test yields a negative result, but there is an elevation in the 24-hour urine protein levels. Immunofixation is employed for the purpose of Verification7 .

➢ *Grading of Spot PCR:*

- Normal or mildly increased - <150mg/g Moderately increased - 150-500mg/g Severely increased - >500mg/g

➢ *Proteinuria and Dengue Fever:*

The correlation between dengue and proteinuria primarily relies on the underlying pathophysiology of all dengue-related diseases. After the initial phase of viremia, the dengue virus infiltrates macrophages, leading to a further phase of viremia known as secondary viremia. Subsequently, the immune system of the host generates antibodies in response to the dengue virus. The antibodies attach to the dengue virus and create a complex. The viremia is characterised by a high concentration of NS1 antigens in the bloodstream. This particular NS1 protein modifies the glycocalyx within the glomerulus, resulting in a decrease in its negative charge. Mere reduction in negative charge is insufficient to cause proteinuria. Endothelial damage is caused by the deposition of antigen-antibody complexes, leading to proteinuria20,12,13 .

Dengue fever can potentially induce kidney damage through multiple pathways. There have been reports of dengue patients experiencing acute endocapillary glomerulonephritis, characterised by the deposition of IgG, IgM, and C3, along with symptoms of hematuria, proteinuria, and renal failure.

The renal manifestations of dengue fever encompass acute kidney injury (AKI), proteinuria (sometimes nephrotic), glomerulonephritis (GN), and hemolytic uremic syndrome (HUS). It has been proposed that peak proteinuria may be able to predict the occurrence of dengue hemorrhagic fever (DHF) in patients with dengue.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

The prevalence of dengue-related acute Kidney Injury varies greatly, ranging from 1% to over 30%. However, the development of acute kidney injury is indicative of a negative prognosis2.

➢ *Dengue-Induced AKI is Usually Associated with :*

- Hypovolemic shock
- Hemolysis,
- Rhabdomyolysis [muscle breakdown]
- DHF [dengue hemorrhagic fever] grade IV and Obesity in children
- DSS [dengue shock syndrome] in adults.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

CHAPTER FOUR
MATERIALS AND METHODS

A. Study Population:

The study will be conducted on 100 adult dengue fever patients admitted in medicine wards of Katuri medical college and hospital during the study period from September 2022 to February 2024.

➢ *Inclusion Criteria:*

- Patients admitted for fever with thrombocytopenia
- IgM dengue card test positive
- Normal serum urea/creatinine at presentation

➢ *Exclusion Criteria:*

- Fever with thrombocytopenia other than dengue
- Pre existing CKD/nephrotic/nephritic syndrome
- Diabetes [type 1&2]
- Hypertensives
- Urinary tract infections [UTI] with sepsis

B. Anticipated Outcome:

The urine spot protein creatinine test measures the ratio of protein to creatinine in urine. The ratio can be used to forecast people who are at risk of developing severe dengue.

C. Data Collection

Patients admitted with suspected dengue will get a detailed explanation of the purpose and method of the study, and written informed consent will be obtained in the Telugu language. The chosen patients will be assessed according to a standardised document. Only individuals who have been diagnosed with dengue through IgM card testing will be eligible for inclusion.

The urine sample collected will be the first void of the morning, ensuring it is clean and obtained mid-stream. This sample will be sent for examination. Complete blood counts are taken every morning on a daily basis.

D. Laboratory Investigations

- Complete blood picture
- Random Blood sugar
- blood urea
- Serum creatinine
- Daily morning first void mid stream urine spot protein creatinine Ratio
- IgM card test for dengue
- Ultra sonogram of abdomen
- PT/INR,APTT
- **DESIGN OF STUDY:** PROSPECTIVE STUDY.
- **PERIOD OF STUDY:** 18MONTHS (SEPTEMBER 2022 TO FEBRUARY 2024)
- **SAMPLE SIZE :** 100

E. Collaborating Departments:

- DEPARTMENT OF GENERAL MEDICINE
- DEPARTMENT OF BIOCHEMISTRY
- DEPARTMENT OF RADIOLOGY
- **ETHICAL CLEARANCE**: OBTAINED
- **CONSENT:** INDIVIDUAL WRITTEN AND INFORMED CONSENT
- **CONFLICT OF INTEREST**: NIL
- **FINANCIAL SUPPORT**: SELF

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

F. Data Analysis

The process of inputting data was carried out using Excel spreadsheets, while statistical analysis was conducted via the SigmaStat programme. The investigation utilised the chi-square test to determine the p-value between spot PCR and the occurrence of DHF/DSS. Data analysis was conducted by inputting the encoded information and generating tables. The data will be displayed utilising descriptive statistics in the form of tables and graphs. The results are shown as proportions along with a 95% confidence interval. The univariate analysis was conducted using the non-parametric Mann Whitney Test to compare the different parameters between the two groups.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

CHAPTER FIVE
RESULTS AND INTERPRETATION

Table 3: Age Distribution Among Study Population

DISTRIBUTION IN AGE	
AGE IN YEARS	NO OF CASES
≤ 20	21
20-40	49
≥40	30

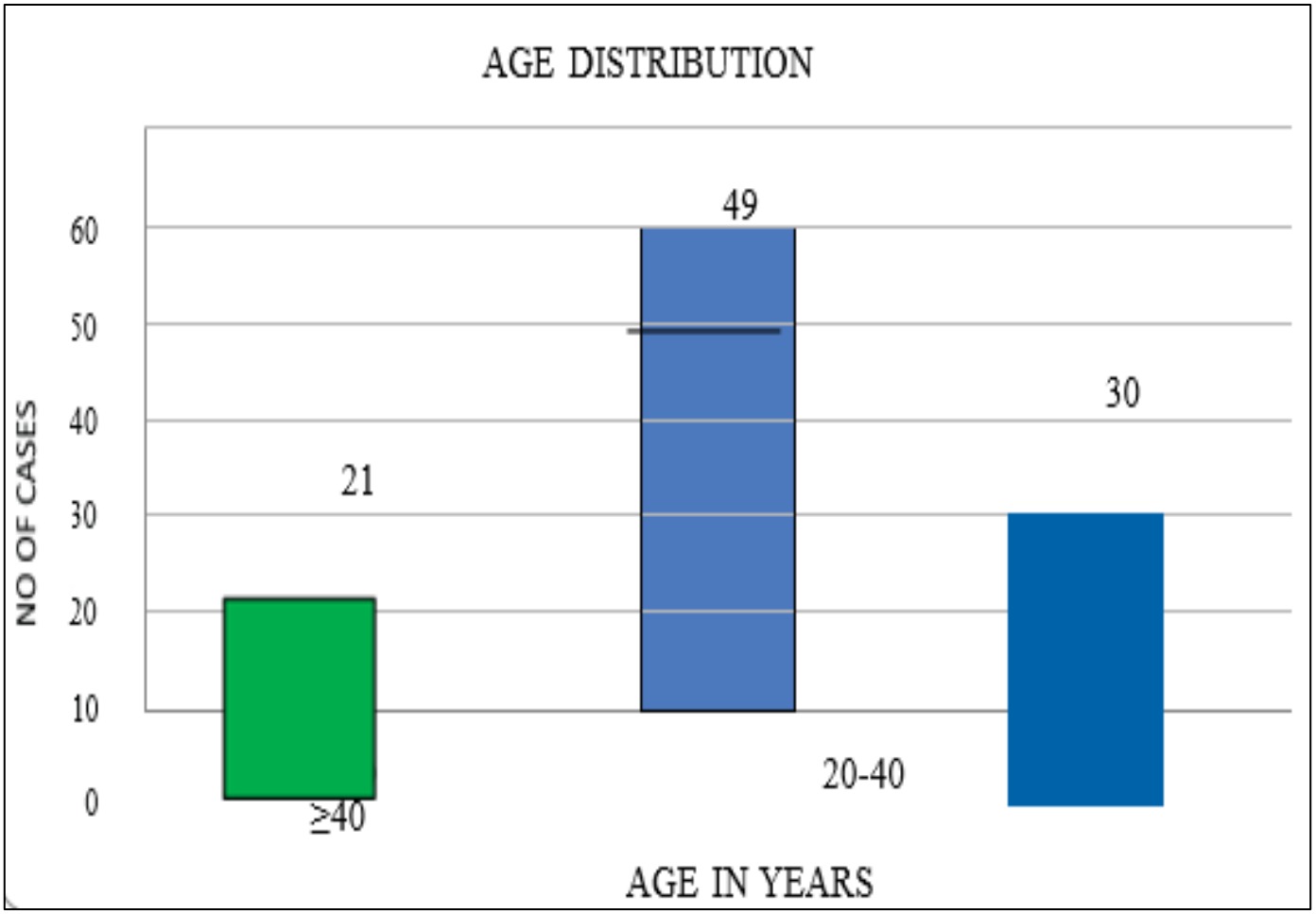

Fig 12: Age Distribution

Out of the entire group of 100 patients, there were 21 individuals below the age of 20, 49 individuals between the ages of 20 and 40, and 30 individuals above the age of 40.

Table 4: Sex Distribution Among Study Population

DIST OF SEX	
SEX	**NO OF CASES**
MALE	57
FEMALE	43
TOTAL	100

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

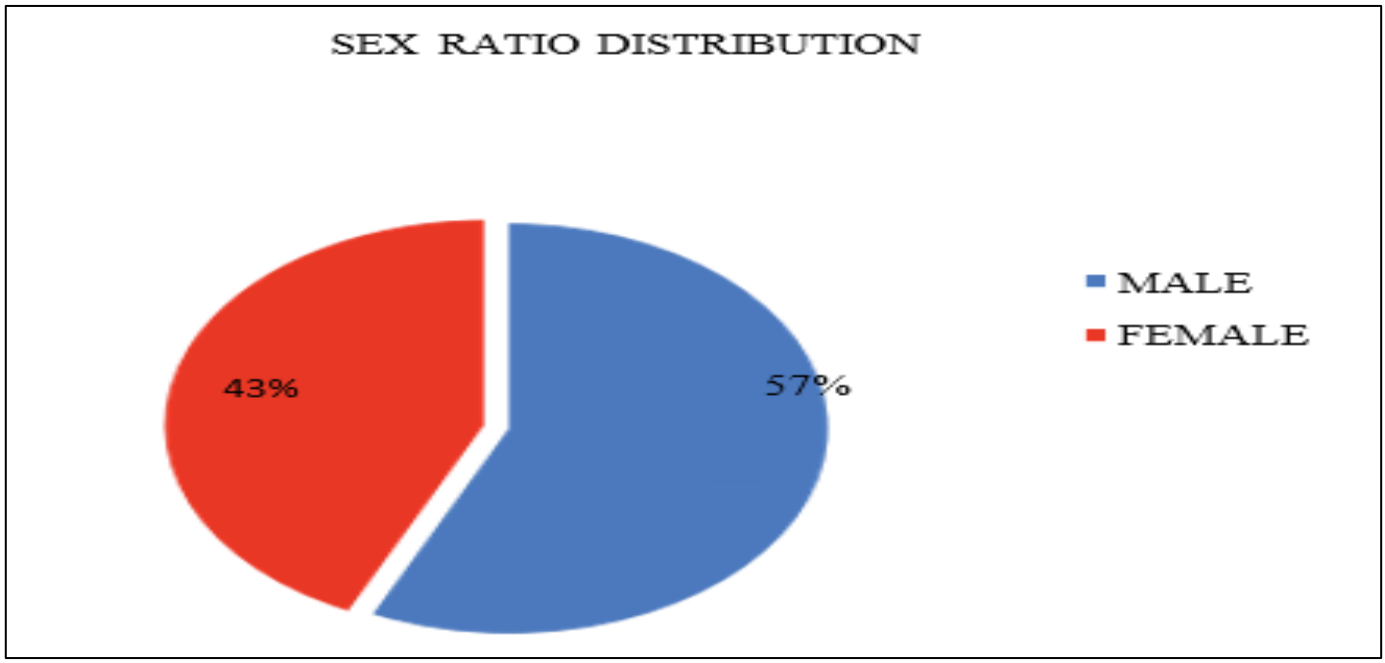

Fig 13: Sex Distribution

The total number of men accounted for 57, while the number of women accounted for 43 among the subjects.

Table 5: Distribution of Urine Spot PCR among Study Population

Distribution of urine Spot PCR among study population	
SPOT PCR	NO OF CASES
≤ 560 mg/g	75
≥ 560 mg/g	25
Total	100

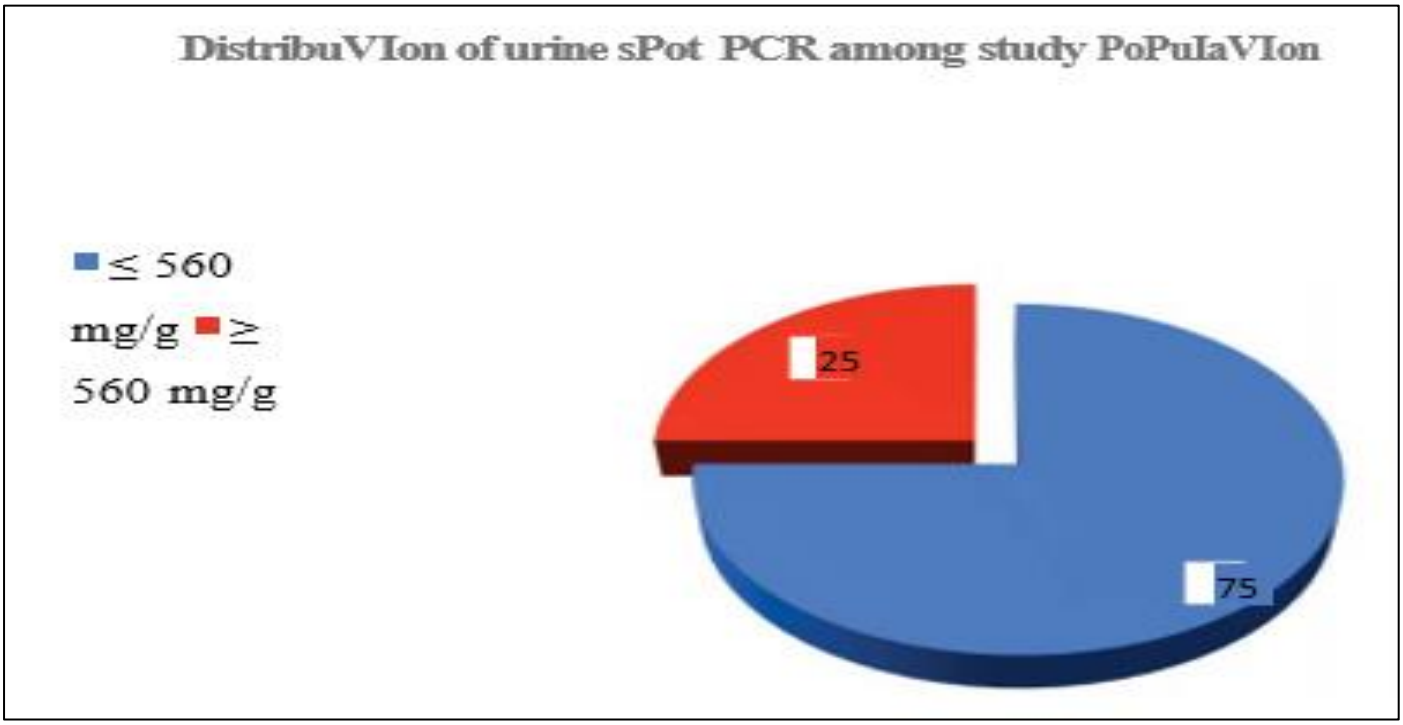

Fig 14: Distribution of Urine Spot PCR

Out of the 100 patients, 25 had a urine Spot PCR level greater than 560 mg/g, while 75 had a urine Spot PCR level less than 560 mg/g.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

Table 6: Age Wise Distribution among DHF Patients

Age Wise Distribution among DHF Patients			
AGE VS DHF	**TRANSFUSION DHF**		**TOTAL**
	YES	**NO**	
≤ 20 (21)	10	11	21
20-40 (49)	7	42	49
≥40 (30)	5	25	30
TOTAL	22	78	100

Percent of DHF Cases for each age category.	≤ 20	48%
	20-40	14%
	≥40	20%

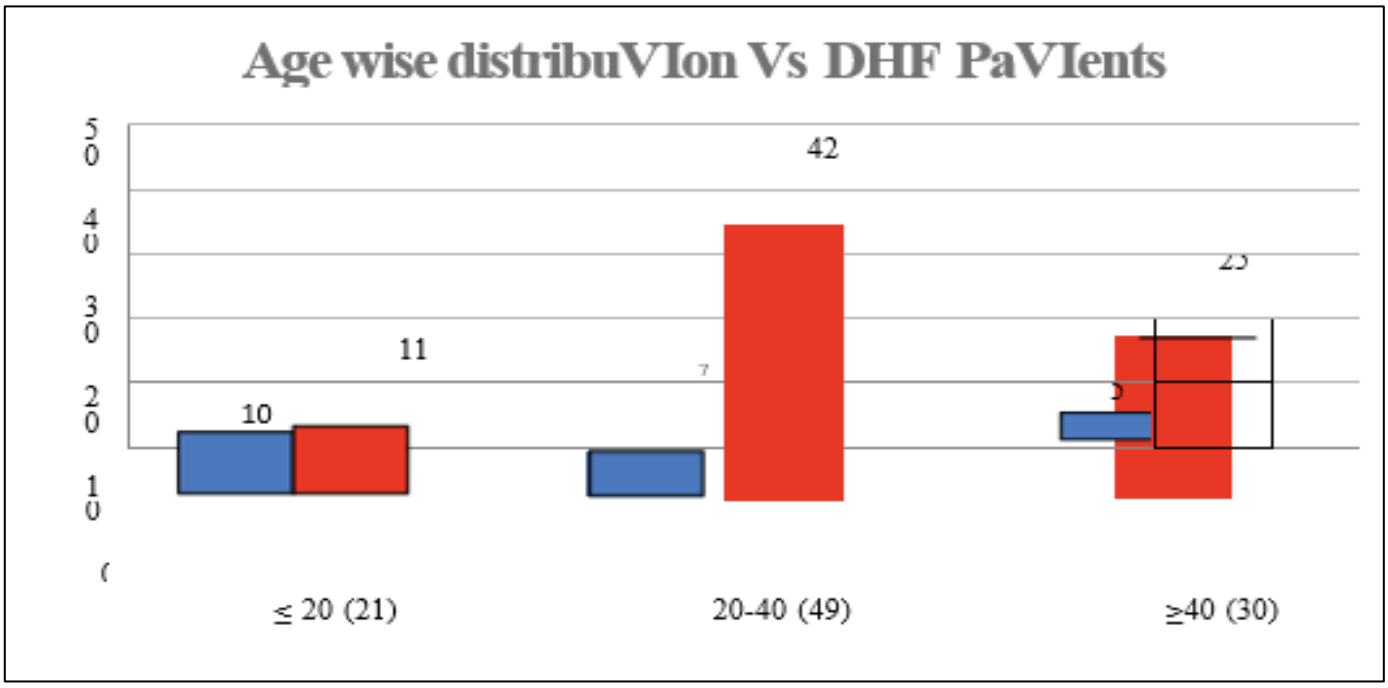

Fig 15: Age Wise Distribution Vs DHF

Table 7: Age Wise Distribution among DSS Patients

Age wise distribution among DSS patients			
AGE VS DSS	**DSS**		**TOTAL**
	YES	**NO**	
≤ 20 (21)	10	11	21
20-40 (49)	5	44	49
≥40 (30)	6	24	30
TOTAL	21	79	100

Percent of DSS	≤ 20	48%
	20-40	10%
Cases for each age category.	≥40	20%

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

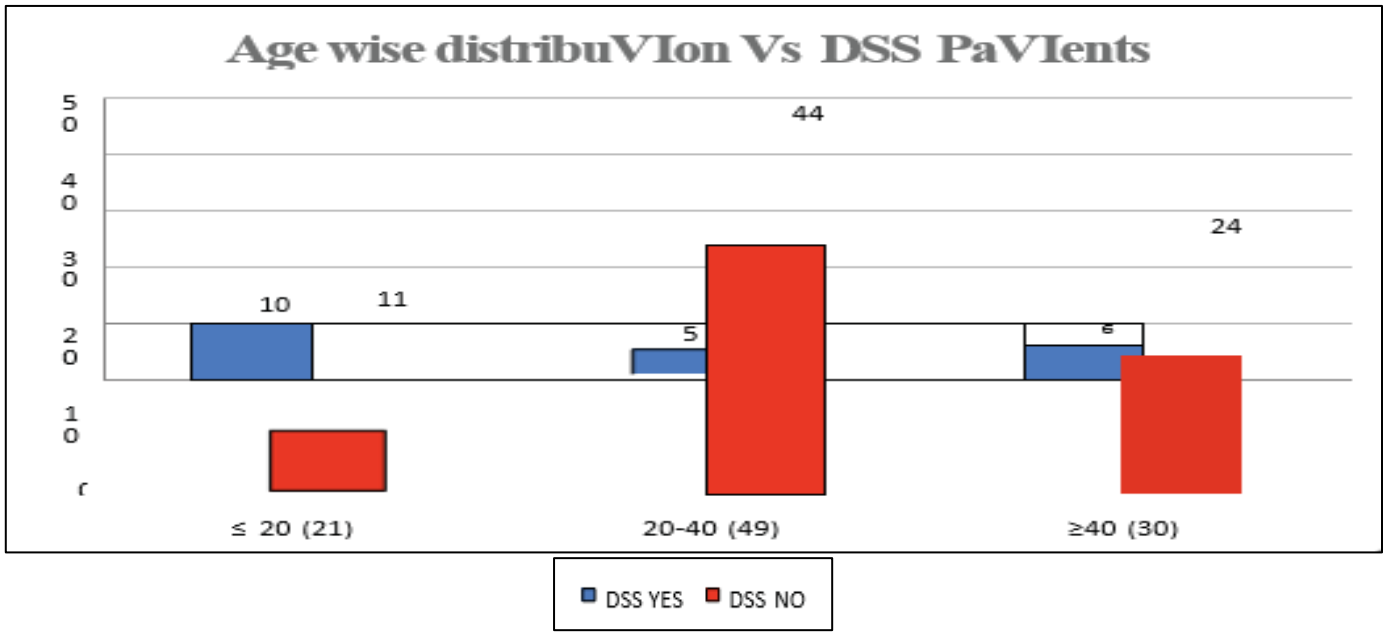

Fig 16: Age Wise Distribution Vs DSS

Table 8: Sex Distribution among DHF Patients

SEX	TRANSFUSION DHF	
	YES	NO
MALE (57)	11	46
FEMALE (43)	11	32
TOTAL(100)	22	78

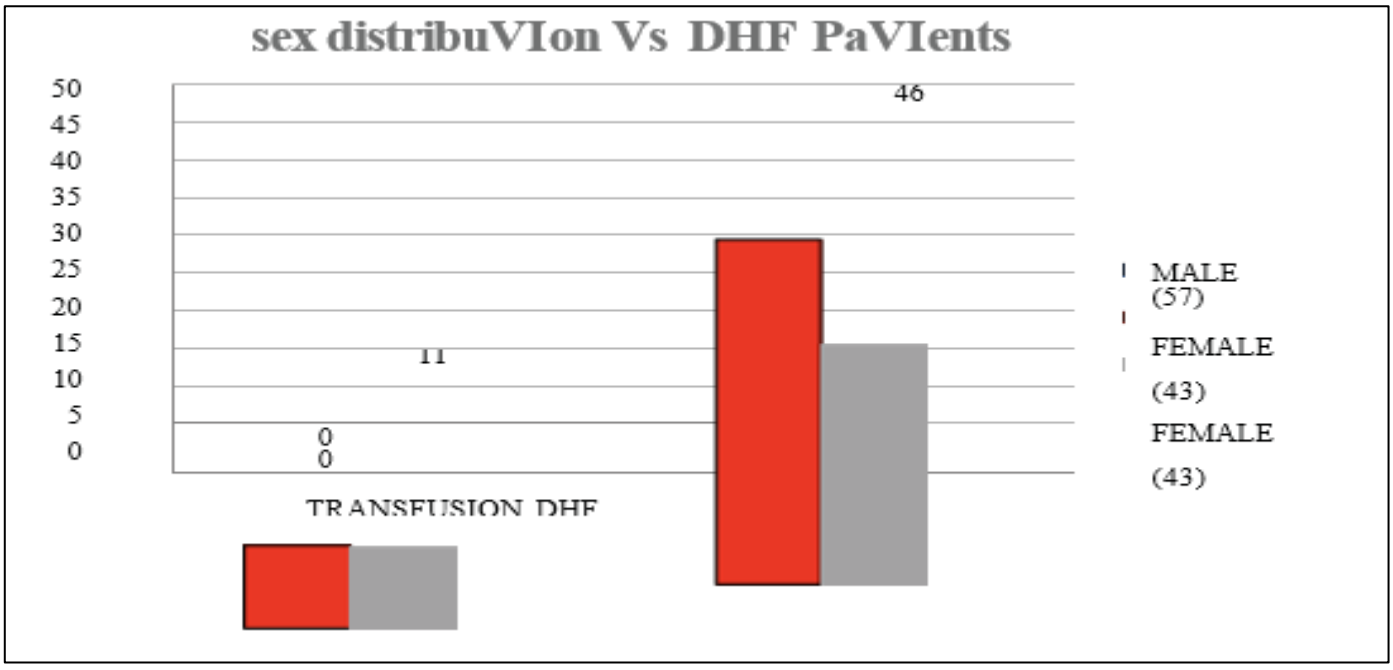

Fig 17: Sex Distribution Vs DHF

Table 9: Sex Distribution Among DSS Patients

Sex distribution among DSS patients		
SEX	DSS	
	YES	NO
MALE (57)	11	46
FEMALE (43)	10	33
TOTAL(100)	21	79

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

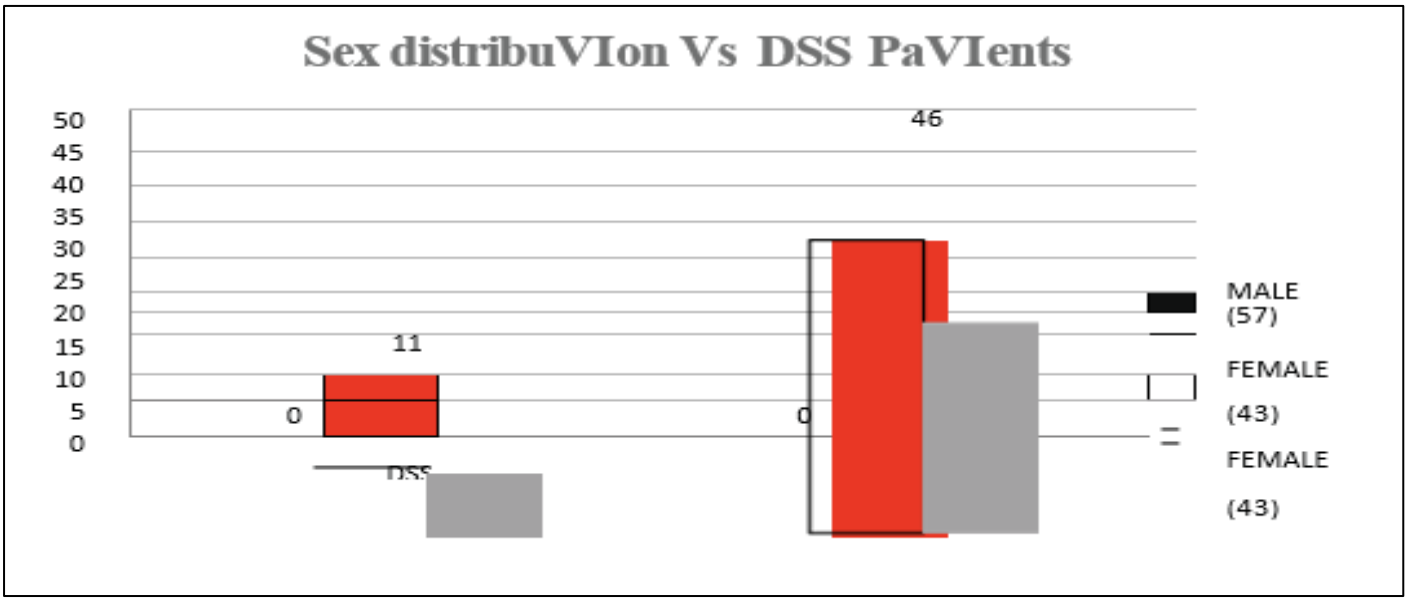

Fig 18: Sex Distribution Vs DSS

Out of the entire group of 21 individuals diagnosed with DSS, 11 were male and 10 were female.

Table 10: Patients with Proteinuria >560 Mg/G with DHF

DHF in patients with proteinuria >560 mg/g	
YES	17
NO	8
TOTAL	25

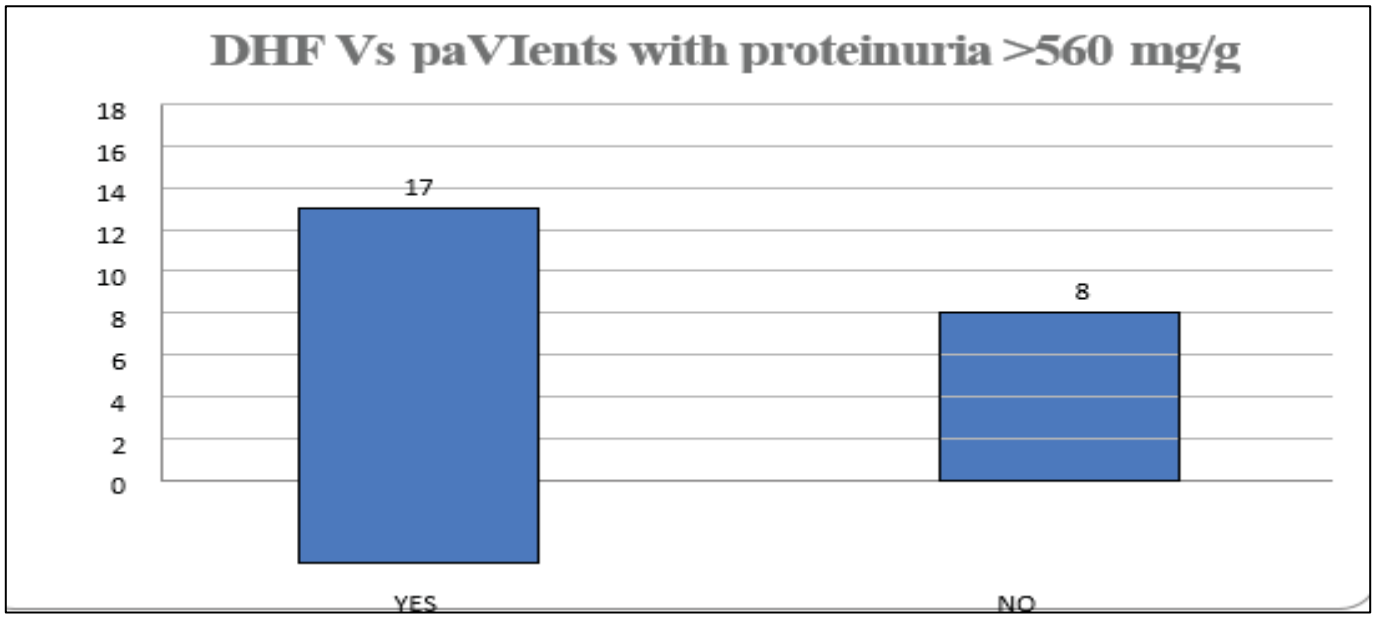

Fig 19: DHF in Patients with Proteinuria >560 Mg/G

Out of the 25 patients who had proteinuria levels over 560 mg/g, 17 were diagnosed with DHF and 8 did not have DHF.

Table 11: DSS in Patients with Proteinuria >560mg/G

DSS in patients with proteinuria >560 mg/g	
YES	14
NO	11
TOTAL	25

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

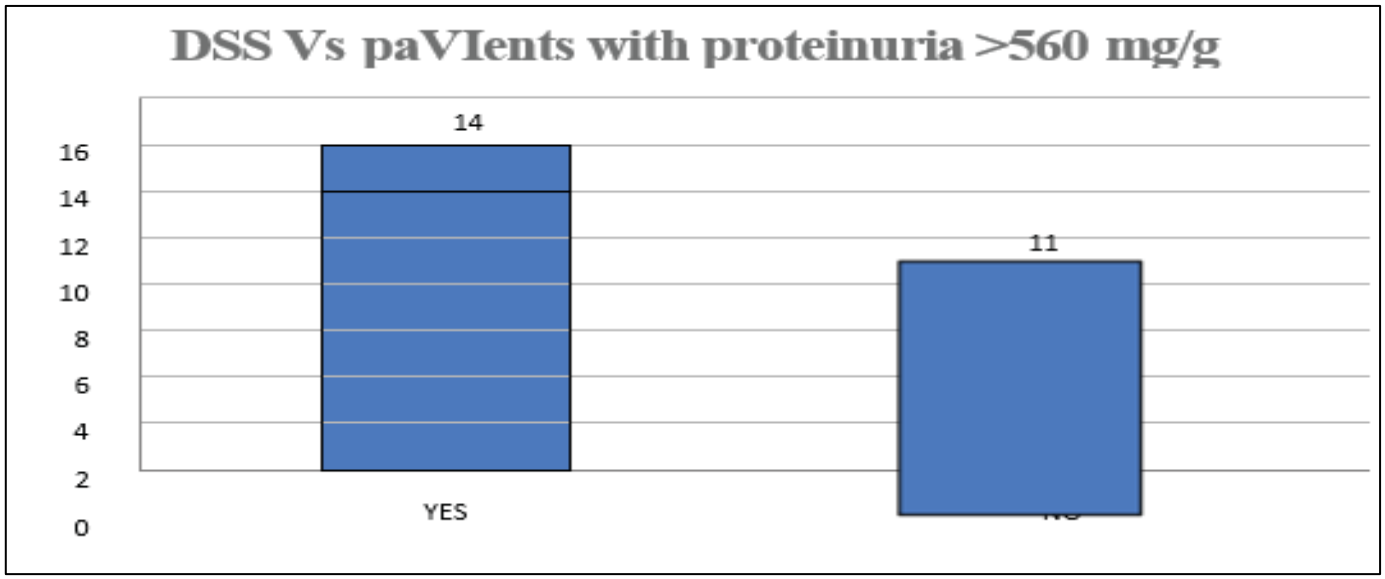

Fig 20: DSS in Patients with Proteinuria >560mg/G

Out of the 25 patients who had proteinuria levels over 560 mg/g, 14 of them opted for DSS.

Table 12: Platelet Count in Patients with Proteinuria < 560mg/g

Platelet Count	MEAN	SD
Day -1	93387	21713.19
0	73147	20417.73
1	61613	24905.17
Day 2	80351	39409.61

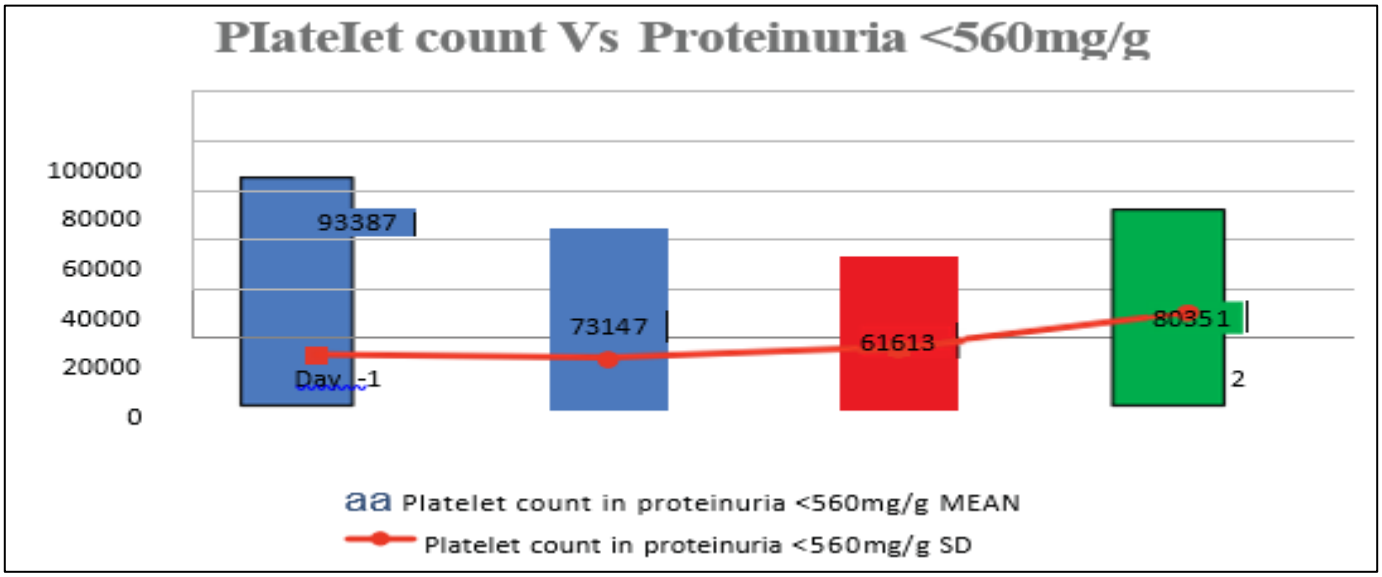

Fig 21: Platelet Count Vs Proteinuria <560 Mg/G

Table 13: Platelet Count in Patients with Proteinuria >560mg/G

Platelet Count	MEAN	SD
Day -1	68520	21800.46
0	39400	17986.11
1	19360	18069.03
Day 2	21200	20092.58

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

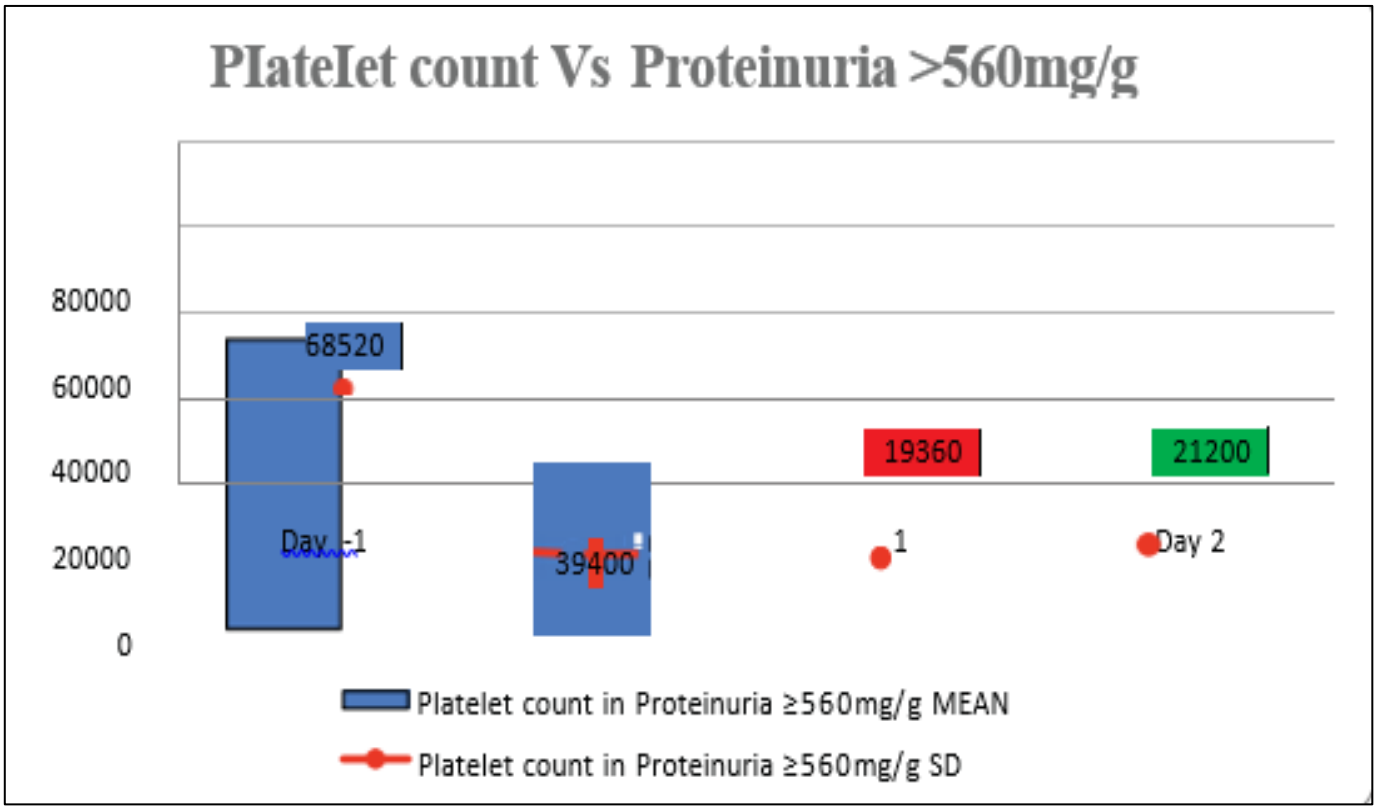

Fig 22: Platelet Count Vs Proteinuria >560mg/G

Table 14: Significance of Proteinuria Vs DHF/DSS

Proteinuria	DHF / DSS	NO DHF / DSS
> 560 mg/g (25)	22	3
< 560 mg/g (75)	10	65
P VALUE	<0.001	SIGNIFICANT

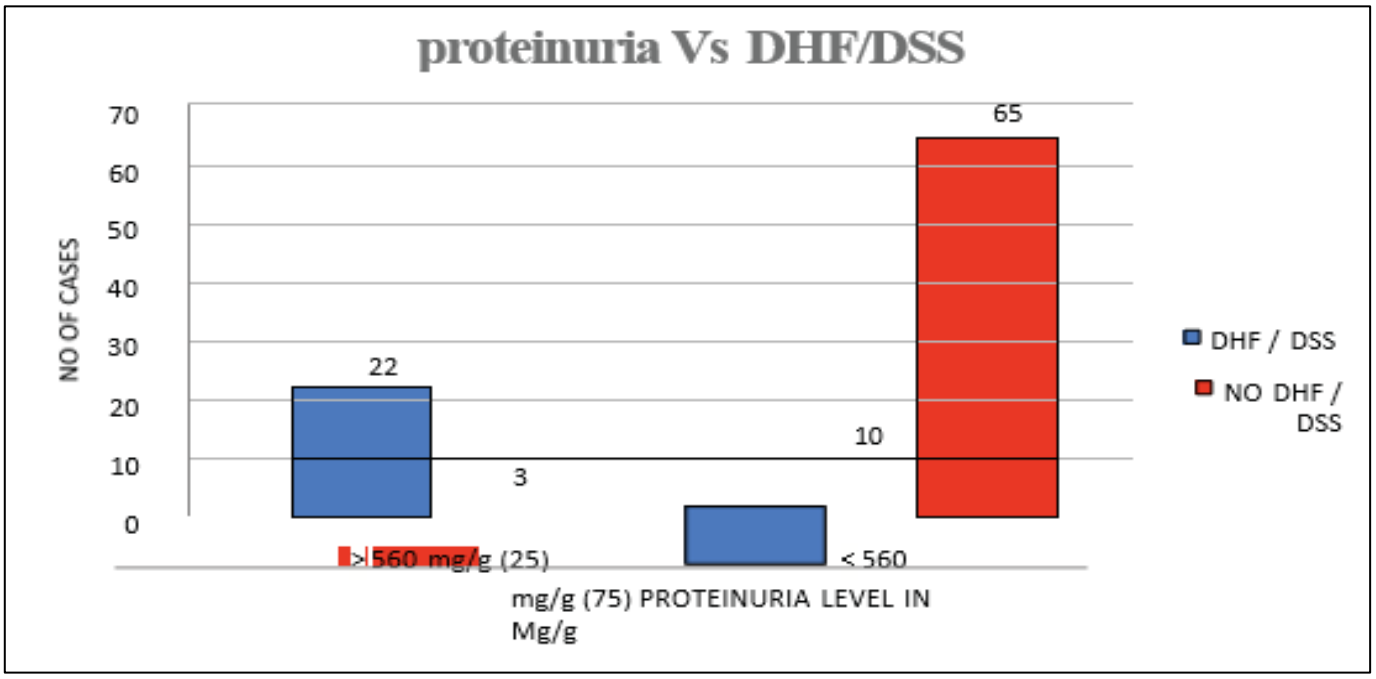

Fig 23: Proteinuria Vs DHF/DSS

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

Table : Summary of F-Test Two Sample of Variances

F-Test Two-Sample for Variances	***DHF / DSS***	***NO DHF / DSS***
Mean	**16**	**34**
Variance	72	1922
Observations	2	2
df	1	1
F	0.037460978	
P(F<=f) one-tail	0.121711807	
F Critical one-tail	2.46741E-06	
SIGNIFICANT AT <0.001		

Among the patients with proteinuria levels over 560 mg/g, 22 individuals developed DHF/DSS, while only three did not have any further deterioration. Out of the entire 75 individuals, only 10 of them who had proteinuria levels below 560 mg/g developed DHF/DSS. The p-value is statistically significant at a 95% confidence level.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

CHAPTER SIX
DISCUSSION

The occurrence rate of dengue hemorrhagic fever in our study was 22%, while the rate of dengue shock syndrome was 21%. Proteinuria above 560 mg/g was observed in 25 patients, of whom 88% were diagnosed with either dengue hemorrhagic fever or dengue shock syndrome. There were 11 patients who exhibited symptoms of both dengue shock syndrome and dengue hemorrhagic fever. The Urine spot PCR method was employed as a means of quantifying proteinuria, as the available commercial kit for albuminuria only measured albumin and quantifying protein levels using a 24-hour urine collection would be inconvenient.

Urine spot PCR levels over 560 mg/g showed a highly significant connection with the occurrence of DHF/DSS. The specificity was almost 95.5%. And a sensitivity of 68.7%. The test had a positive predictive value of 88% and a negative predictive value of 86.6%.

A study conducted by Vasanwala et al. in 2014 utilised a cutoff value of 29mg/mmol of Spot PCR. The study found that this cutoff value had a sensitivity of 76% and a specificity of 77%.

When it was amalgamated with platelet values and age modification the sensivity increased to 90% and the specificity increased to 80%. The utilisation of a higher Spot PCR cut off in our investigation may account for the observed increase in specificity and decrease in sensitivity.

In their investigation, the lowest point of the platelet levels occurred within a 2- day period around the time of defervescence. The maximum value in the study conducted by Vasanwala et al occurred about on the day of defervescence. This study utilised the Spot PCR technique on the day after the fever subsided. A separate investigation conducted by Andries et al. in Cambodia revealed that the urine diptick test was ineffective in categorising dengue patients. Our findings aligns with the previous study, since it found that individuals with DHF and DSS had elevated levels of urine proteinuria. The study conducted by Andries et al. focused on youngsters. The study proceeded to conduct urine protein electrophoresis and found that 51.9% of the analysed samples exhibited patterns consistent with tubular proteinuria, 22.2% exhibited patterns consistent with selective glomerular proteinuria, and 14.8% exhibited patterns consistent with nonselective glomerular proteinuria.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

CHAPTER SEVEN
SUMMARY

- Out of the entire 100 patients, 21 were below the age of 20, 49 were between the ages of 20 and 40, and 30 were above the age of 40.
- The total number of men accounted for 57, while the number of women accounted for 43 among the subjects.
- Out of the 100 patients, 25 had a urine Spot PCR level exceeding 560 mg/g, while 75 had a urine Spot PCR level below 560 mg/g.
- The incidence of DHF was 48% among individuals under 20 years old, 14% among those aged 20-40 years, and 20% among individuals over 40 years old.
- The prevalence of DSS among individuals under 20 years of age was 48%, whereas it was 10% among those aged 20-40 years, and 20% among those over 40 years old.
- • DHF was seen in 11 male individuals in the context of sex-related distribution. There are 11 women. The prevalence was 19.2% in males and 25.5% in females.
- Out of the 25 patients who had proteinuria levels over 560 mg/g, 17 were diagnosed with DHF (Dengue Hemorrhagic Fever) and 8 did not have DHF.
- Out of the 25 patients who had proteinuria levels over 560 mg/g, 14 of them opted for DSS treatment.
- Out of the 22 patients with proteinuria levels over 560 mg/g, all of them had DHF/DSS except for three who did not show any further
- deterioration. Out of the entire 75 individuals, only 10 of them who had proteinuria levels below 560 mg/g developed DHF/DSS.
- • Our investigation found that urine spot PCR levels greater than 560 mg/g had a specificity of around 95.5%. With a sensitivity of 68.7%. The test exhibited an 88% positive predictive value and an 86.6% negative predictive value.
- Out of the 22 patients with proteinuria levels over 560 mg/g, all of them had DHF/DSS except for three who did not show any further
- deterioration. Out of the entire 75 individuals, only 10 of them who had proteinuria levels below 560 mg/g developed DHF/DSS.
- • Our investigation found that urine spot PCR levels greater than 560 mg/g had a specificity of around 95.5%. With a sensitivity of 68.7%. The test exhibited an 88% positive predictive value and an 86.6% negative predictive value.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

CHAPTER EIGHT
CONCLUSION

- Urine proteinuria measured by spot PCR can serve as an additional indicator for early risk prediction of both dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) in patients diagnosed with dengue fever.
- The incidence of DHF/DSS in dengue patients is more in young females below 20 years of age .
- Urine spot PCR levels over 560 mg/g showed a highly significant connection with the occurrence of DHF/DSS. The specificity was almost 95.5%. and a sensitivity of 68.7%.
- The test has both a high positive predictive value and a high overall predictive value

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

REFERENCES

[1]. Maria G. Guzman, Scott B. Halstead, Harvey Artsob, Philippe Buchy, Jeremy Farrar, Duane J. Gubler et al.,Dengue: a continuing global threat.Nat Rev Microbiol. 2010;8: S7–S16.

[2]. Simmons CP, Farrar JJ, van Vinh Chau N, Wills B Dengue. 2012 Apr 12;366(15):1423-32. doi: 10.1056/NEJMra1110265

[3]. World Health Organization Dengue Haemorrhagic Fever: Diagnosis, Treatment, Prevention and Control. Geneva: World Health Organization.1997

[4]. Vernon J. Lee,David C.B. Lye,Yan Sun,Gina fernandez,Adrian Ong,Yee Sin Leo, Decision tree algorithm in deciding hospitalization for adult patients with dengue haemorrhagic fever in Singapore. Trop Med Int Health 2009; 14:1154–9

[5]. Thein TL, Leo YS, Lee VJ, Sun Y, Lye DC Validation of probability equation and decision tree in predicting subsequent dengue hemorrhagic Fever in adult dengue inpatients in singapore. 2011 Nov;85(5):942-5.

[6]. James A. Potts, Robert V. Gibbons, Alan L. Rothman, Anon Srikiatkhachorn, Stephen J. Thomas, Pra-on Supradish, Stephenie C.Lemon,Daniel H. Libraty, Sharone Green, Prediction of dengue severity among patients using Early clinical Laboratory Indicators. PLoSNegl Trop Dis 2010; 4(8) : e769.

[7]. Lai YL, Chung YK, Tan HC, Yap HF, Yap G, et al. Cost- effective realtime reverse transcriptase PCR (RT-PCR) to screen for Dengue virus followed by rapid single-tube multiplex RT-PCR for serotyping of the virus. J Clin Microbiol 2007; 45:935–41. 8. Keane WF, EknoyanG Proteinuria, albuminuria, risk, assessment, detection, elimination (PARADE): a position paper of the National Kidney Foundation. Am J Kidney D is 1999;33:1004–10.

[8]. LeoYS, GanVC, NgEL, HaoY, NgLC, et al.,Utility of warning signs in guiding admission and predicting severe disease in adult dengue. BMC Infect Dis 2013;13: 498.

[9]. Wills BA, Oragui EE, Dung NM, Loan HT, Chau NV, Farrar JJ, Levin M. Size and charge characteristics of the protein leak in dengue shock syndrome. Journal of Infectious Diseases. 2004 Aug 15;190(4):810-8

[10]. Chen Y, Maguire T, Hileman RE, Fromm JR, Esko JD, Linhardt RJ, Marks RM. Dengue virus infectivity depends on envelope protein binding to target cell heparan sulfate. Nature medicine. 1997 Aug 1;3(8):866-71.

[11]. Bridget A. Wills, Emmanuelle E. Oragui, Nguyen Minh Dung, HaThiLoan, Nguyen Vinh Chau, Jeremy J. Farrar, and Michael Levin Size and charge characteristics of the protein leak in dengue shock syndrome J Infect Dis; 2004; 190 (4): 810-8.

[12]. Hanh Tien NT, Lam PK, Duyen HTL, Ngoc TV, Ha PTT, et al. Assessment of Microalbuminuria for Early Diagnosis and Risk Prediction in Dengue Infections. PLoS ONE. 2013; 8(1): e54538

[13]. Vasanwala FF, Thein TL, Leo YS, Gan VC, Hao. Y, Lee LK, Lye DC. Predictive value of proteinuria in adult dengue severity. PLoS Negl Trop Dis. 2014 Feb 20;8(2):e2712.

[14]. C. Andries et al. / International Journal of Infectious Diseases 55 (2017)38–44

[15]. Pok KY, Lai YL, Sng J, Ng LC (2010) Evaluation of nonstructural 1 antigen assays for the diagnosis and surveillance of dengue in Singapore. Vector Borne Zoonotic Dis 10: 1009–1016.

[16]. Keane WF, Eknoyan G (1999) Proteinuria, albuminuria, risk, assessment, detection, elimination (PARADE): a position paper of the National Kidney Foundation. Am J Kidney Dis 33: 1004–1010.

[17]. Lunn D, Spiegelhalter D, Thomas A, Best N (2009) The BUGS project: Evolution, critique and future directions. Stat Med 28: 3049–3067.

[18]. World Health Organization (2009) Dengue: guidelines for diagnosis, treatment, prevention and control. Geneva: World Health Organization.

[19]. Wills BA, Oragui EE, Dung NM, Loan HT, Chau NV, et al. (2004) Size and charge characteristics of the protein leak in dengue shock syndrome. J Infect Dis190: 810–818.

[20]. Avirutnan P, Zhang L, Punyadee N, Manuyakorn A, Puttikhunt C, et al. (2007) Secreted NS1 of dengue virus attaches to the surface of cells via interactions with heparan sulfate and chondroitin sulfate E. PLoS Pathog 3: e183.

[21]. Blacksell SD (2012) Commercial Dengue Rapid Diagnostic Tests for Point-of- Care Application: Recent Evaluations and Future Needs? J Biomed Biotechnol 2012: 151967.

[22]. Green S, Vaughn DW, Kalayanarooj S, Nimmannitya S, Suntayakorn S, et al. (1999) Early immune activation in acute dengue illness is related to development of plasma leakage and disease severity. J Infect Dis 179: 755 – 762

[23]. Bethell DB, Flobbe K, Cao XT, Day NP, Pham TP, et al. (1998) Pathophysiologic and prognostic role of cytokines in dengue hemorrhagic fever.J Infect Dis 177: 778–782.

[24]. Wang WK, Chen HL, Yang CF, Hsieh SC, Juan CC, et al. (2006) Slower rates of clearance of viral load and virus- containing immune complexes in patients with dengue hemorrhagic fever. Clin Infect Dis 43: 1023–1030.

[25]. Libraty DH, Young PR, Pickering D, Endy TP, Kalayanarooj S, et al. (2002) High circulating levels of the dengue virus nonstructural protein NS1 early in dengue illness correlate with the development of dengue hemorrhagic fever. J Infect Dis 186: 1165–1168.

[26]. Saito M, Oishi K, Inoue S, Dimaano EM, Alera MT, et al. (2004) Association of increased platelet-associated immunoglobulins with thrombocytopenia and the severity of disease in secondary dengue virus infections. Clin Exp Immunol 138:299–303.

[27]. Kumar Y, Liang C, Bo Z, Rajapakse JC, Ooi EE, et al. (2012) Serum Proteome and Cytokine Analysis in a Longitudinal Cohort of Adults with Primary Dengue Infection Reveals Predictive Markers of DHF. PLoS Negl Trop Dis 6: e1887.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

PROFORMA

Name:

Age / Sex:

Residence: Rural / Urban

Occupation:

Total duration of illness: Presenting complaints:

PAST HISTORY:

H/o Diabetes mellitus, HT, CKD, CVD, CAD, Thyroid disorders, Alcohol intake

MENSTRUAL HISTORY:

CLINICAL EXAMINATION:

GENERAL EXAMINATION:

Consciousness,

Pallor, Cyanosis Jaundice, Clubbing,
Lymphadenopathy, Pedal oedema

VITALS:

TEMPERATURE

PULSE RATE

BLOOD PRESSURE

RESPIRATORY RATE

SpO2 (Oxygen saturation)

ANTHROPOMETRIC MEASURES:

Height (cm) :

Weight (kg) :

BODY MASS INDEX :

SYSTEMIC EXAMINATION:

CARDIO VASCULAR SYSTEM:

RESPIRATORY SYSTEM :

ABDOMEN:

CENTRAL NERVOUS SYSTEM:

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

PATIENT INFORM CONSENT FORM

Patient I.D. No.

Principal Investigator Name: Dr.P.Rajendra kumar

Information Sheet: I have read the information sheet carefully/ explained in the language I understand, and I fully understand the contents. I confirm that I have had an opportunity to askquestions. I have been explained in detail about the nature and purpose of the study and its potential risks/benefits, and the expected duration of the study and other related details of the study. I understand that my participation is voluntary and i am free to withdraw at any time without giving any reason, without any reason, without any reason, my medical care and legalrights. I agree to participate in the study.

.....
(signature / left)
Date: Place:
Name of the participant:.....
Son/ Daughter/ Spouse of:.....
Complete postal address: .....

This certifies that the above consent has been taken in my presence.

.....
(Signature of principal investigator)
Date: .....
Place: .....
1) witness- I..... 2) Witness - II .....

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

MASTER CHART

S.no	Patient	AGE	SEX	SPOT PCR	-1	0	1	2	Transfusion (DHF)	DSS	PT (sec)	INR
1	ANUSHA	17	female	1250	65000	21000	8000	34000	yes	no	35	3
2	BHAVANA	18	female	103	47000	43000	58000	86000	no	no	15.5	1
3	FATHIMA	45	female	2261	24000	21000	15000	11000	no	yes	27.5	1.5
4	MALLESWARI	26	female	350	63000	24000	13000	17000	yes	no	30.5	1.9
5	MANISHA	19	female	1091	62000	47000	21000	19000	yes	yes	33	2.4
6	ROOPA	20	female	444	48000	24000	21000	23000	no	no	23	1.2
7	VINEETHA	21	female	667	48000	40000	26000	45000	no	no	18.5	1
8	ANJANA	18	female	656	58000	39000	15000	9000	yes	yes	38.5	3.3
9	DEEPTHI	20	female	643	24000	14000	9000	21000	yes	no	32	2.5
10	SUNDAR	19	male	968	56000	20000	11000	19000	no	yes	22	1.4
11	IMRAN	25	male	1470	78000	39000	21000	19000	yes	no	34	2.2
12	GIRIDHAR	16	male	1435	64000	22000	6000	1000	yes	yes	40.5	3.8
13	VEERAYYA	45	male	1144	85000	65000	45000	44000	yes	no	29	1.8
14	SRIKAR	18	male	960	96000	92000	95000	111000	no	yes	19	1.2
15	SRINIVAS	24	male	1605	35000	21000	11000	27000	no	no	18	1
16	POTHURAJU	43	male	1308	66000	35000	21000	17000	yes	yes	27.5	2
17	VEERAYYA	32	male	1647	113000	56000	19000	26000	yes	no	25.5	1.7
18	ANILREDDY	18	male	1501	78000	32000	11000	6000	yes	yes	35.5	2.8
19	GOPAYYA	33	male	1350	92000	40000	9000	16000	no	no	22	1.3
20	NOORJAHAN	33	female	829	69000	30000	6000	13000	no	yes	27	1.4
21	RAGHAVENDRA	50	male	1659	91000	63000	23000	9000	yes	no	33.5	2.1
22	SATYANARAYANA	55	male	1337	96000	52000	10000	15000	yes	yes	34	1.9
23	MOHITH	16	male	1853	58000	32000	11000	6000	yes	yes	36.5	2.5
24	KHAN VALI	47	male	1567	86000	56000	22000	19000	no	yes	22	1.2
25	SUMATHI	34	female	922	63000	54000	25000	21000	yes	no	32	1.7
26	VINDHYA SRI	29	female	1260	77000	36000	5000	9000	yes	no	31.5	1.9
27	SUBBAMMA	52	female	1742	65000	26000	15000	8000	yes	yes	38.5	2.7
28	SUJATHA	54	female	256	70000	56000	30000	48000	no	no	17.5	1.2
29	LAKSHMI	26	female	192	105000	90000	88000	112000	no	no	13.5	1
30	KUMARI	35	female	229	62000	50000	36000	60000	no	no	14.5	1.1
31	VARSHINI	20	female	462	62000	36000	21000	43000	no	no	15	1.3
32	NAGEENA	36	female	197	78000	70000	98000	152000	no	no	11.5	1
33	GEETHARANI	49	female	378	125000	90000	140000	210000	no	no	10	1
34	RAVANAMMA	48	female	234	63000	51000	78000	130000	no	no	12.5	1.1
35	MANGAMMA	43	female	460	61000	42000	25000	39000	no	no	18	1.3
36	BEGUM	34	female	377	130000	96000	82000	98000	no	no	16.5	1.2
37	LALITHA	28	female	378	98000	89000	72000	83000	no	no	13	1
38	SUNEETHA	50	female	367	68000	37000	22000	56000	no	no	17	1.3
39	VANISRI	43	female	467	76000	70000	52000	58000	no	no	16.5	1.1
40	SREELATHA	39	female	396	64000	58000	54000	69000	no	no	15.5	1
41	POLAMMA	44	female	130	94000	85000	80000	120000	no	no	12	1
42	DURGA	27	female	235	70000	52000	35000	68000	no	no	13	1.1
43	GOPI	27	male	445	71000	60000	62000	88000	no	no	11.5	1
44	KRANTHI	25	male	389	92000	90000	96000	152000	no	no	12	1.1
45	SREEDHAR	40	male	318	77000	86000	94000	148000	no	no	12	1.2
46	AKHILESH	25	male	211	109000	87000	46000	98000	no	no	11	1.1
47	HARSHA	20	male	518	76000	32000	16000	24000	no	yes	20.5	1.4
48	VENKAT RAO	35	male	257	62000	58000	49000	55000	no	no	13	1.2
49	GOPALREDDY	38	male	416	114000	92000	90000	140000	no	no	11	1.2
50	MASTAN RAO	55	male	481	130000	110000	88000	96000	no	no	13	1
51	MADHU LATHA	22	female	332	122000	95000	60000	88000	no	no	14	1.2
52	RANGIAH	46	male	340	65000	53000	31000	45000	no	yes	18.5	1.4
53	BALU	21	male	123	88000	74000	62000	98000	no	no	12	1.1
54	RAMA KRISHNA	35	male	322	75000	52000	60000	92000	no	no	13	1.1
55	SUDHAKAR	51	male	394	90000	78000	70000	86000	no	no	14.5	1.2
56	PRABHAKAR	51	male	204	124000	95000	84000	110000	no	no	10.5	1

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14854524

57	PHANI BABU	22	male	381	77000	54000	80000	130000	no	no	11	1.1
58	MURTHY	34	male	300	100000	85000	98000	130000	no	no	13	1
59	PRANAY	18	male	385	118000	99000	80000	94000	no	no	14	1.1
60	VEERENDRA	19	male	310	71000	68000	78000	95000	no	no	14.5	1.3
61	SURYA RAO	38	male	460	130000	99000	65000	80000	no	no	16.5	1.3
62	RAJASHEKAR	23	male	415	97000	82000	65000	70000	no	no	18	1.2
63	RAJEEV	22	male	508	105000	80000	56000	62000	no	no	21.5	1.3
64	KOTESWAR RAO	54	male	492	109000	98000	82000	86000	no	no	12.5	1.4
65	KARTHIK	17	male	311	121000	94000	92000	13300	yes	no	32.5	2.9
66	SHANKAR	22	male	246	102000	78000	82000	91000	no	no	13	1.1
67	SOMESWARARAO	53	male	348	130000	94000	82000	98000	no	no	14	1
68	GANGIAH	52	male	187	108000	93000	70000	81000	no	no	15.5	1.3
69	MAHESH	23	male	166	77000	54000	36000	40000	no	no	19.5	1.5
70	NAVEEN	32	male	118	74000	62000	54000	68000	no	no	17.5	1.4
71	KAMALESH	39	male	425	95000	90000	71000	120000	no	no	12	1.1
72	GOPIAH	47	male	152	112000	82000	86000	94000	no	no	11	1.2
73	SURAYYA	48	male	130	94000	72000	63000	85000	no	no	11.5	1.1
74	AKHIL	30	male	372	102000	85000	61000	75000	no	no	13	1
75	SIVA KUMAR	52	male	150	94000	82000	56000	72000	no	no	18	1.3
76	VIJAY	33	male	541	118000	89000	71000	82000	no	no	15	1.2
77	SANDEEP	33	male	366	99000	75000	32000	45000	no	no	20.5	1.4
78	DURGESH	20	male	211	94000	82000	45000	54000	no	no	19	1.3
79	KRUPAKAR	17	male	281	77000	54000	25000	13000	yes	no	28.5	1.8
80	VICTOR RAJU	19	male	493	101000	79000	45000	30000	no	yes	26	1.5
81	BHASKER	43	male	186	114000	85000	45000	62000	no	no	17	1.3
82	MANEESH	28	male	202	76000	89000	96000	165000	no	no	11	1
83	GOVIND RAO	42	male	451	86000	72000	61000	78000	no	no	14.5	1.2
84	PRAVEEN	16	male	321	122000	94000	64000	82000	no	no	12	1.1
85	BHARATHI	21	female	421	85000	50000	22000	16000	no	yes	22	1.4
86	SRIDEVI	40	female	166	118000	97000	90000	130000	no	no	13	1.3
87	SANDHYA	31	female	518	103000	60000	51000	31000	no	yes	19	1.4
88	TANUJA	36	female	541	62000	54000	31000	12000	yes	yes	33	2.8
89	GOVINDAMMA	41	female	211	87000	61000	46000	51000	no	no	16.5	1.3
90	SUVARNA	35	female	1608	64000	32000	24000	5000	yes	yes	35.5	3
91	KANTHAMMA	30	female	143	114000	87000	54000	68000	no	no	13	1.3
92	VEERAMMA	26	female	276	101000	89000	63000	87000	no	no	12.5	1.2
93	APARNA	27	female	423	130000	110000	85000	99000	no	no	11.5	1
94	KARUNAMMA	46	female	531	89000	71000	95000	131000	no	no	10	1.1
95	SPANDANA	28	female	140	118000	65000	72000	89000	no	no	13	1.2
96	BHULAKSHMI	49	female	319	126000	75000	52000	84000	no	no	15	1.1
97	KOMALI	37	female	124	115000	99000	81000	94000	no	no	14	1.2
98	RAVI RAJU	45	male	105	116000	65000	55000	75000	no	no	15.5	1.2
99	SAGAR	24	male	98	96000	54000	39000	60000	no	no	17	1.3
100	PRIYANKA	17	female	541	62000	54000	31000	12000	yes	yes	29.5	2.2