CHAPTER 1
PREAMBLE

1.1 Introduction
Liver is the largest organ in the body. It weighs between 1 and 2.3 kg. Liver plays very important role in the regulation of life processes. It is situated in the upper part of the abdominal cavity, right to the epigastric region which then extends to the hypochondriac region. (Anne Waugh and Allison Grant 2001) The morphological and functions of the liver determines the health and the life span of the humans.

In a single liver cell approximately around 500 biochemical functions are ongoing. The major functions of liver include bile production glucose regulation, plasma protein production and the bio transformation. Wanless 2002, found out that an adult liver continue its growth until it gets to a nature size.

There are four different types of cells present in the liver. They are
(a) Hepatocytes
(b) Kupffer cells
(c) Endothelial cells
(d) Hepatic stellate cells.

The main function of hepatocyte includes secreting and synthesizing of various proteins. The Kupffer cell functions as a macrophage and it stores fats and vitamin A. The endothelial cells act as a barrier between the blood and the hepatocytes Liver has a collection or group of acini. Glycogen and proteins are produced in the liver.

Liver and its associated organs
Liver is made up of tiny lobules shaped cells called hepatocytes arranged in pairs of columns radiating from a central vein. In between the columns of cells there are sinusoids which contain mixture of blood from the tiny branches of hepatic and portal artery. Blood passes from the sinusoids to the central veins. All the veins join to from hepatic veins which then flow towards inferior venacava.
Liver diseases can be classified into several types. They are hepatosis (non-inflammatory disorders), hepatitis (inflammation of the liver) and cirrhosis (fibrosis of the liver). The liver diseases are mainly caused by viral infections, immune diseases, toxic chemicals that include antibiotics, peroxidised oil, chlorinated hydrocarbons, carbon tetrachloride, etc, and consumption of excess alcohol. The major functions of liver include metabolism, storage and secretion. Liver also involves many functions of the body so liver diseases are most life-threatening diseases.
Table 1: Liver and its associated organs

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Position</th>
<th>Associated organs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lateral</td>
<td>Lower ribs + Diaphragm</td>
</tr>
<tr>
<td>2</td>
<td>Posterior</td>
<td>Oesophagus, gall bladder, aorta</td>
</tr>
<tr>
<td>3</td>
<td>Inferior</td>
<td>Bile duct, stomach, colour, Kidney (Right)</td>
</tr>
<tr>
<td>4</td>
<td>Superior and anterior</td>
<td>Diaphragm and abdominal wall anterior</td>
</tr>
</tbody>
</table>

Anatomy of liver
Liver in human being is situated below the diaphragm and right upper side of abdomen and the same is lowered with turct capsule of tissue known as Glisson’s capsule. 1.8 kg is the weight of male liver and in females it is 1.4 kg. Liver has a junction of two ducts. They are Right hepatic Duct and Left hepatic Duct and together forms excretoz apparatus. Gall Bladder is the reservoir for bile which enter the cystic duct.

Lobes
Human liver is basically a six lobbed organ and it is sub-classified in to left right Section and slighter left section as exhibited in Fig1.1. Every lobe is sub-classified into lobules and basically those are the actual working units of the liver. Lobe contains 1 million lobules and consists of hexagonal row of Hepatic cells which are known as Hepatocyte. This secreter bide and doing a variety of etabolic functions. Sinusoids which are tiny cavities in each row hepatocytes and are linked with kupffer cells, phagocutic cells which defoxifies body by taking amino acides, sugars, metabolties old and dead red blood cells, debits vand dacterig (Ross and Wilson -2001).
Figure 2 - Lobes of Liver cells.
When viewed from posterior as a result, the round liver, and lobes are separated by the ligamentum venosum and ligamentum teres and divides the caudate from the quadrate lobe. Quadrate lobe is closest to the vena cava and is directly inferior to the ortha hepatis.

Figure 3 - Posterior view of Liver cells
Supply of blood to liver

Liver gets blood supply from two sources. They are

1. **Hepatic Portal vein**
   This is weakly oxygenated venous blood which is rich in nutrients having flow rate of 1000 ml/min, which drains from stomach, small intestines, large intestines, spleen via portal vein and pancreas.

2. **Hepatic Artery**
   It is also weakly oxygenated arterial blood at flow rate of 500 ml/min which drains into sinusoids and into a central vein in each lobule and further into hepatic vein and inferior vena cava. (coruiu EJ, 2000)

**Histogram**

Paranchyma cells (Hepatocytes) in the form of lobules with 0.5 to 2 mm diameter starting from central view to the portal tracts is shown in the histology of liver.
Figure 5 - Portal Triad

Every lobule is lined via sinusoides on two sides where in blood flow from portal space to central vein and portal vein, which are the branches of Dile duct and hepatic artery. Basically liver is classified into three major zones based on supply of oxygen.

Zone No.I
This is a portal with good oxygen and blood supply having the capabilities to burn different forms of toxic injury.

Zone II
This encloses central vein having poor oxygenation and blood supply which is susceptible to hepatic injury.

Zone III
Which is situated between above two areas.
In mitosis and regeneration the hepatocytes and prominent nucleus have significant capability. A hepatocyte has three surfaces.

a. Sinusoids and space of disse
b. Canaliculus
c. Neighbouring hepatocyte.
The tinings of Blood containing sinusoides are formed by the irregular
entothilial and liver macrophage. There is a space among hepatocyte and sinusoidal lining which is known as space of Disse. The bile duct and the liver arteriole have little mononuclear cells known as Glisson's capsule. The biliary system contains Dilecanaliluli (Mohan H-2000).

**Physiology of Liver**

One of the important sites of metabolism in human being is being happened in Liver and it is also a initial role throughout. The fats and proteins in the body of human being is divided in to smaller substances in liver and which is used for the cells of other tissues for energy or for synthosising vital Diomolecules. Liver Synthesises molecules necessary for blood coagulation, movement of fats, providing immunity to infection and various other purposes. Liver is the storage centre of own carbohydrates, fats, protein and as necessity releasing those nutrients into tissues. As such any abnormality to the liver can cause a number of psychological problems having critical consequences. It can be concluded that liver is responsible for a number of activities and details are furnished below. (Tortora GJ, et al, 2003; Guyton AC, 2000, 2006; Corwin EJ 2000; Davidson 1999;).

- Pile Metabolism
- Lipid Metabolism
- Protein Metabolism
- Carbohydrate Metabolism
- Synthetic functions
- Vitamins
- BileSalts
- Enzymes
- Plasma proteins
- Coagulations factors
- Re ficuloenthelial system
- Secretion
LIVER TOXICITY

Liver is the area in which various activities like metabolism, secretion, storage and detoxification occur in animals. The maximum serious sickness affecting liver are acute or chronic hepatosis and cirrhosis. Different types of autoimmune disorder infection excessive alcohol consumption and different types of chemotherapy and higher doses of antibiotics are the major cause for numbers of liver diseases by oxidation peroxidation cells (smucker RA, 1975). Hepatitis A, B, C, D and E viruses are responsible for almost 90% the acute hepatitis. Many ADR (Adverse Drug Reaction) cause drug induced liver disease and one of the main health challenges to researchers is to overcome of this ADR. One of the major health problems in the world is hepatitis B virus infection or HBV. Approximately around 350 - 450 millions of people are seeking treatment for HBV. HBV infection is the world’s ninth causes that lead to death as per WHO. Even if very effective Vaccines are ready for the prevention and eradication of HBV. (Xing Heetal; 2008); Hepato cellular Carcinoma, Cirrhosis are the leading life threatening problems caused by continuous infection of HBV. (Beasley 1988; Liaw 2002). Some of the direct hepatotoxicity or chemically reactive metabolite which are responsible to DNA damages protein dysfunction, lipid peroxidation and oxidative stress are caused by various drugs. Inspite of the advanced research for effective medicine for diseases, there are no potential hepatoprotective drug available in the market nowadays. From time immemorial many medicinal plants more than 100 phytochemical lurable to hepatic diseases and having hepatoprotective activity are claimed to be present as such it is feasible to have an evaluation of these plants to evaluate their hepatoprotective potentiality.
LIVER DISEASES

Pathophysiological specialities of liver and Liver Disease classification

Liver is often subjected to many diseases affecting liver are classified into primary and secondary are fine latter is more serious than fewer one. Eg: Hepatitis is a primary linear disease, but this spreads into colour this leads to secondary diseases ,ie color cancer. (Mohan H2000)

Liver Disease Classification

The important diseases affecting liner can lee classified into the following:-

1. Portal Hypertension
2. Jaundice
3. Congenital Defects
4. Splenomegaly
5. Hepatitis
6. Cirrhosis
7. Liver Failure
8. Circulatory Disturbances
9. Necrosis
10. Steatosis
11. Liver Cancer

Minute analysis Of Liver Diseases

1. Portal Hypertension

It is defined as the obstruction during flow throughout of the liver and thin flow will lead to the fibrosis and scarring of the live. As far as the portal hypertension is concerned, of the pressure exerted is greater than 9 to 10 mm hg. Blood normally enters liver through a portal vein and this starts to bypass the liver for alternative router which led to low resistance to blood flow and in the end, third spacing ccurs. (Cornwin E J -2000).
Figure 6 - Portal Hypertension

2. Jaundice

This is a sign of abnormal bilirubin metabolism and excretion. Bilirubin usually conjugated in the liver and excreted in the bile. Conjugation makes it water soluble and enhances the removal of which from the blood which is an essential step in excretion. Jaundice develops where there is an abnormality at some stage in the metabolic sequence by one or more factors mentioned below.

a. Excess haemolysis of PBC
b. Abnormal Liver Function
c. Obstruction to the flow of bile from the liver to the duodenum

Hemolytic Jaundice

Increased haemolysis of RBC in the spleen and as a result the amount of bilirubin becomes high and in case hypoxia is developed, the efficiency of hepatocytic activity will come down. In many babies neonatal haemolytic jaundice happens especially in prematurity wherein the normal high haemolysis is mixed with paucity of conjugating enzymes in the hepatocytes.
Obstructive Jaundice
This is a situation in which the obstruction to the flow of bile in the biliary tract will be caused by the following factors. They are
a. Gallstones
b. Pancreatic tumour
c. Bile Duct Fibrosis as a result inflammation or injury by the passage of gallstones.

Hepatocellular Jaundice
This is situation where in the damage to the liver is caused by the following factors. They are
a. Viral infection
b. Amoebiasis
c. Cirrhosis of the liver
d. Toxic substances like drugs

3. Congenital Defects
These defects in the liver are caused even at the time of Birth and then generally affects the Dile ducts and involves the following
a. Biliary artresia
In abnormal form the bile duct are present or absent
b. Choledochal cyst
This happens due to the obstruction of flow of file due to the abnormality of hepatic duct

4. Splenomegaly:
This is a condition in which the enlargement of the spleen is happened. Through the splenic vein the blood flow enters spleen with portal hypertension. The enlargement of the liver happen due to soul additional blood can be stored in the spleen. The non availability of stored blood to the general circulation leading to the occurance of analmia, leucopenia and thrombocutopenia. (Mohan H, 2000, Corwin EJ - 2000)
5. **Cirrhosis:**

This is caused by the scattering of liver and fibrosis by replacing hard and fibrous nodules in space of usual hepatic tissues and as a result the liver structure and fraction are disrupted. Cellular injury which are repeatedly happening in the liver and the related reaction in the liver can cause cirrhosis. The important causes of cirrhosis can be listed as follows:

a. Injection like hepatitis
b. Bile accumulation as a result of bile duct obstruction.

Hepatitis can be of two types they are:

a. Acute hepatitis and
b. Chronic Hepatitis

A) **Acute Hepatitis:**

Acute Hepatitis is the most consequences for all hepatotoxic viruses. All types of hepatitis like A, B, C, D A and C exhibit similar clinical variation and produce same pathological findings. There types are distinguished se logically. The virus enter the liver cells and cause digestive changes by mechanism not understood so far, an inflammatory change happen followed by production of lymphocytes granulocuter and plasma cells. There is reactive cells in the walls of sinusoids. When the groups of cells perish necrotic areas of varying sizes develop and the necrotic maternal is removed by phago cutter and the lobules collapse. The basic lobule framework become disserted and blood vessels develop kinks. These changes interact with circulation of blood to the remaining hepatocytes and the result hypoxia causes further damage.

**Type A virus (Infections Hepatitis)**

This virus has only one known serological type. Injection spreads by hands, water, food and fomiter by inflected faces. 15 to 40 days is the incubation period. And the viruses are excreted through faces for screen to fourteen drugd prior to clinical symptomus. Subclinical deceases may occur but carries doubt develop.
Type B viruses (Serum Hepatitis)
This has a number of sociological types. In adults infection occurs at any stage. The incubation period is 50 to 180 days. The virus enters blood and is spread by blood and its products. Through fluids, ie saliva, semen vaginal secretions and from mother to foetus this virus is spread. Injection usually leads to severe illness lasting two to six weeks followed by a protracted convalescence. In chronic hepatitis live viruses continue to circulate in the blood of other body fluids.

Hepatitis C
This is spread by blood and its products. It is present in drug users and also occur as a complication of blood transfusion. The injection can become asymptomatic when hepatitis develop it is often recurrent and may result in chronic liver diseases, mainly cirrhosis.

Chronic Hepatitis
Chronic hepatitis is defined as any form of hepatitis which persists for more than 6 months. It may be caused by viruses or drugs.

(a) Chronic persistent hepatitis
This is a mild persistent inflammation following acute viral hepatitis. Usually there will little or no fibrosis.

(b) Chronic active hepatitis
This is a continuing progressive inflammation as the cell necrosis and formation of fibrous tissue. There is distortion of the liver blood vessels and hypoxia leading to further hepatocyte damage.

Necrosis:
Necrosis means cell death. It is a degenerative process swelling of cell and accumulation of lipids can cause well increases. The increase is indicated by several changes like endoplasmic delatation, edema is the cytoplasm region triglycerine accumulation and after wistochrondrical swelling.
There are three types of necrosis they are

1. Massive type: Here very huge number of liver cells are destroyed
2. Focal type : Only scattering cells of liver are destroyed
3. Zonal type : Within the liver cells are lobules destroyed

(boon et al; 2006)

Disturbances in the circulatory systems :
Here, they are of two types can be, it includes
1. Hepatic venous disturbances
2. Portal venous disturbances

Hepatic venous disturbance:-
It can cause uncommon liver daucagen like hepatic veno acid Budd disrvees . Here distruction or obstrctions in the centrel veins and small other veins

Portal venous obstructions :-
Mainly this occurs in the intrhepatie or extrathpalie spots India hepatic is most common and this reaches to the cirrhosis of liver cells. It occure along with febrosis and tumoure in the liver cells extra hepatic problems causes blocage of abdominel sepesise myeloproter dyfunctions due to the obstruction of astery in the liver cells it may cause common (Boon NA et at; 2006)

Failure of livers
If means dysfunction of the liver and this may cause disease to the liver It is a very coplicated problems and it is followed by dysfunction of various organs in the human body
The liver function can be classified into two
1. Encephalopathy to the hepatice cells
2. Reval hepatic syndrome

Encephalophaty:- Serious disorder of the liver it is charactrised bymemory loss ,fatigue, tremor, tumour, changes in personality etc
Renal hepato syndrome:-Usually this is always associated with this syndrome kidney become unable for the proper function(corwin EJ 2000)It stops forming urine and it stops its function
Cancer to the liver cells

Exposure to chemicals of carcinogenic cause cancer to the liver cells primarily the cancer occurs in the duets (bile) and it is termed as cholangiocarcinoma In the secondary stage of cancer it gets attack by pauerean and intestine, became the transport system usually occure by portel veine due to the driausage of hepatice cells the eauceroun cells metastasize in the outside part of liver and attack with hearth and lungs. It is very difficult to edeulthy the liver cancer the affected person after treatment can survive for 5 years (corwen EJ 2000)

Table 2 :- List of ther apeutic Agents used in Liver diseases

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Mechanism in Liver</th>
<th>Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Change in the lipid metabolism – Fatty liver</td>
<td>Doxycycline, Piprofen, Amiodarone</td>
</tr>
<tr>
<td>2.</td>
<td>Diminished Bile salt clearance-cholestasis</td>
<td>Taurolithocholate glucurinide</td>
</tr>
<tr>
<td>3.</td>
<td>Formation of protein- Immune reaction</td>
<td>Diclofenac, Halothane</td>
</tr>
<tr>
<td>4.</td>
<td>Oxidative stress increase cell injury</td>
<td>Diclofenac, Acetanino Phen sodium</td>
</tr>
<tr>
<td>5.</td>
<td>Diminished mitochondria function- Apoptosis and Necrosis</td>
<td>Amiodarone, Nimesulide, Zidovudine</td>
</tr>
<tr>
<td>6.</td>
<td>Formation of cytotoxic T cells- Cell killing</td>
<td>Carbamazepine, Phenindione</td>
</tr>
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</table>
CHEMICAL MARKERS TO IDENTIFY LIVER DISEASE

Liver controls all the complex functions. Liver function test are very important because liver diseases are life threatening (Vinik et al; 2003). For liver test diagnosis should be accurate and this determines the proper treatment and dispensing of proper therapeutic agents. LFT’s (Liver Function Test) generally determines the actual quantity of enzymes and the level of compounds in the serum (Walker et al; 2003).

Assays of serum enzymes:-
The hepaticellular damage can easily measured by using serum transmininase and alkaline phosphatase analysis.

Alkaline Phosphatase
The enzyme alkaline phosphate is an excretion through bile from many tissues and organ like liver, placenta, intestine and bone. The concentration of these enzymes are bit increased in case of bone or liver diseases.

r-Glutamyl Transpetidase (r-GT)
Liver contains r-glutamyl transpetidase enzyme in rich quantity. The level of Alkaline phosphates and r-GT levels are same in serum. In severe alcoholic patients and persons having hepatocellular problems and cholestasis patients the r-GT level in very high.

Transaminases (Amino tranrase)
Necrosis of liver is usually determine using serum alnine aminotranfrase (ALT) and serum asparte aminotnfrase. Serum alanine amino tranfrase (ALT) is an enzyme which is present in the liver which is called as serum glutmic pyrvate transminase (SGPT) SGPT, that is serum glutmic oxaloaetic tranaminase is also called AST. If any damage is occurring to the tissue the value of the ALT and AST will be altered. That is the levels of both gets increased. AST levels is mainly associated with the liver tissue, increased AST level indicate hepatic cell damage or injury. The increased level of AST level of indicate hepatic cell damage or injury. The increased level of AST cause necrosis myocardium and
cell damage of liver. Viral hepatitis can be easily determined or evaluated using transaminase evaluation. In severe case of viral hepatitis, transaminase level become high. In case of alcoholic disease, the level of transaminase may become moderate.

**Bile Tests:**
The galle bladder is the main centre for the storage of bile. It is secreted by bile ducts present in the duodenum. Bile contains bile acid and phospholipids-biliary.

**Bile Salts:**
The Colic acid and cheno-d-oxycolic acid synthesis from the cholesterol present in the liver cells is called as primary acids. The bile acids get absorbed by hepatoentro circulation. Approximately 10-15% of the bile acid get excreted through the faeces. The increased levels of these acids will produce biliary disease in liver and this may cause pruritus. In Dipstick method (Mohan H, 2000) which is excreted by the process of passive and active diffusion can be detected easily.

**Urobilinogens:**
The excreotor pathway of urobelinogen is urine. The determination can be done by dipstick estimation method. In the case of disorders like malignancy of liver, cirrhosis and alcoholic disorders, the level of urobilinogen level in is very high. In case of enlestatic jaundice and increases and this is because of the disfunction of biliary glands.

**Bilirubin:**
The bilirubin content increaser in the condition of liver damage. Bilirubin is mainly metabolised by the hepatic centres. The bilirubin content is estimation from the urine and serum. Spectrophotomery is used to detect the bilirubin content. Van Berg diazo method is used for the detection of bilirubin content. The estimator of bilirubin in faeces is done by checking stools. The patients gets bilinurinea before causing jaundice.
Other Serum Enzyme Test:-

Other Serum enzyme which is occurring in the liver is 5-Nucleotidase, this is a phosphate origin. The determination of 5- nucleotidase is beneficial for the hepatic disease. The level of lactic dehydrogenase is increases with metastatic liver disorder. In case of malnutrition and liver cell damages the synthesis of choline esterase is least

Immunology Test

Immunological problems are usual accompanied with liver diseases. They act against agents that cause immunological problem or any unknown immunological problems.

Problems Associated with immunological problems

Related with necrosis of liver, a component from the muscle as an antibodies. The proteins present in the hepatocytes are very similar to action component and they are immunologically very stable.

- The patients who are suffering with the biliary cirrhosis primary. They develop an antibody called mitochondrial. Antinuclear type antibody is resent in patient who are suffering with hepatitis and is of chronic stage. Etiologic specific antibodies are format

- The patients having serum hepatitis shows hepatitis B Antigen (Hbsag). This indicate positive value to hepatitis B.

- Hepatitis-B autibody (HBeAG) is found in hepatitis B in chronic state.
HEPATOTOXICITY
Liver plays important role in the metabolism. The drug metabolism is one of the important way to get toxicity to the liver. Many of the toxic chemicals gets metabolised by the liver and this causes toxicity to the liver and finally hepatotoxicity. The chemicals that causes hepatic damage is called hepatotoxins. The overdose or overusage of drugs, few herbal drugs and chemicals may also cause hepatotoxicity. As per the research many drugs were call back from the market due to its hepatotoxicity (Friedman et; 2003)

Drugs Producing Hepatotoxicity:-
The overdose or over usage of most of the drug causes hepatotoxicity.

![Figure 7- Drug Induced toxicity](image_url)
Steatosis of liver cells
Triglycerides gets accumulated within the liver this abnormal condition is termed as steatosis. They are of two types
- Steatosis that causing macro vesicular problems.
- Steatosis that causing micro vesicular problems.

Bilirubin interference and conjugation:-
Hyperbilirubinaemia is a condition in which bilirubin transport is hindered and this may lead to production of Plasma bilirubin (Breen Kj etal 1973) An example of drug that get conjugated and in conjugate the dose applied is rifampicin.

Cytotoxic damages
Several drugs damages the hepatic cells, and its mechanisms. The overdose of Paracetamol may cause hepatic necrosis (James O et al 1975). Cytotoxic damages are seen in hydrazine derivatives.

Cholestasis:
It is a condition in which impaired secretion of the bile which results in the ineffect release of bile (Poper H, 1968)

Steatosis or Fatty Liver
The toxicity of fatty liver is reported commonly in males and females by the intravenous administration of antibiotic called tetracycline in the dose of 1.5 g/day. But tetracycline is safe for oral administration. The toxicity may head to oxidation of fatty acids and also increase in triglyceride levels etc.. (Breen Kj et al; 1973)

Cirrhosis and chronic hepatitis
Hepatitis is chronic and cirrhosis is always related certain drugs like methyldopa isoniazed nitrofurantin etc.. isoniazid is a anti tuberculose drug, its continuous use may lead to hepatic problem or liver disease like jaundicein about 20% of the total population. It act by production of metabolites like acetyl isoniazid from the parent isoniazid, which is hepatotoxic in nature and this may produce necrosis to the hepatic cells (Mitchell JR et al , 1975).
Phospholipidosis
This is a syndrome which is produced by various drugs and it gives severe adverse effect to organs. This causes explosion of the duct, liver cell accretion and finally inflammation. The list of other agents that causes injury are listed below.

TOXICITY BY CHEMICALS:
Ethanol:
It is commonly known as ethyl alcohol. It is a volatile liquid. Its nature is highly inflammable. It has a melting point of -114°C and boiling point of 78.37°C. Density is reported as 0.7890 and is completely soluble in water. The vapour density is 1.49 gm/cl and a specific gravity of 0.79. The molecular weights of ethanol was reported as 46.080 g/mol.

![Ethanol Mechanism](Image)

**Figure 8 - Ethanol Mechanism**
Ethanol consumption in excess quantity leads to increase in the reactive oxygen species. They include H₂O₂, feryl species, superoxide radical etc.. The toxicity can be inactivated by the oxygen species (reactive). The ethanol intake increases the endotoxin release from the bacteria that remains in the gut, this enhances the cells of kupfer finally leads to the output of eicosanoids, TNF - X. This intern produces a condition called hypoxia and hypermetabolism in the liver. It also damages the tissues which are present in the liver. (Thurman RU et al, 1999)

Figure 9 - Alcohol Mechanism

**Ethyl Alcohol**

- Ethanol - Ethyl alcohol
- Nature - Highly Inflammable
- Melting Point - -114°C
- Boiling Point - 78.37°C
- Density - 0.7890
- Solubility - Soluble in water
- Vapour Density - 1.049 g/Cl
- Specific gravity - 0.79
- Molecular Weight - 46.080.
CARBON TETRA CHLORIDE

It is a colourless clear liquid and is not flammable in nature. It has a sweetish smell. Properties of Carbon tetra chloride is explained as Caron tetra chloride has a melting point of 23°C. The molecular weight was reported as soluble in water. The specific gravity was reported as 1.54 and vapour density is 5.32. Carbon tetra chloride got a vapour pressure of 91.3 mm Hg and it is at 20°C. The studies revealed that carbon tetra chloride produce toxicity to the liver. This is done usually by producing cell damage and this can be estimated or evaluated by chemical parameters. The major characters of CCl₄ are

- Carbon tetra chloride is cheap and easily available
- The injury which is produced by triacyl glycosol produces necrosis, Cirhosis and also cancer to the liver cells.
- Carbon tetra chloride is capable of producing liver damages in rabbits, rats and mouse
- Necrosis and fatty liver can be treated. The liver can also be protected by pre-treatment using various liver protecting agents (Slator TF, 1984)

![Figure 10 - Carbon tetra chloride toxicity](image-url)
Carbon tetra chloride

- Nature - Non - Inflammable
- Odour - Sweetish Odour
- Melting Point - 23°C
- Solubility - Soluble in water
- Specific gravity - 1.54
- Vapour density - 5.32
- Vapour Pressure - 91.3 Hg @ 20°C.

Mechanism of Actions:
Lipid peroxidation can be done using free radicals, which may cause liver toxicity. The radicals damages the membrane of cells and this enhances the formation of lipid peroxides in the lipid membranes. The result of lipid peroxide produces hemo-status of calcium and also increase in the inter cellular calcium levels which leads to cytotoxicity. (Mary et al; 2007). The radicals which formed (ie, trichloro methyl radical and tri chloro methyl perox radicals) are very reactive. The bind by covalent bonding and result in the formation of nucleic acid, lipids and protein (Recknagel and Glende, 1973). For the development or formation of strands in DNA, and MDA - DNA carbon tetra chloride is the main cause and this is dose dependant also. (Beddowes et al; 2003) In certain conditions like when oxygen level increase, the tri chloro methyl radical is transferred to crichloromethyl perox radical which is highly reactive. The fatty gets attacked by these radicals and results in the development of free fatty acid radicals. This in turn helps or enhance lipid peroxidation and this happens usually by chin reaction (Slater 1981). The cell will loss the membranes integrity, it may also major damages to the lipid membranes all these because of the cell membrane disruption (Comporti 1985 and 1984).
The calcium transport of $\text{CCl}_4$ across the membranes of mitochondria, plasma and the liver of rats and plasmatic reticulum get decreased (Hemmingset al; 2002). The calcium transportation of $\text{CCl}_4$ is rapid and very effective, it was confirmed by invivo evaluation (Hemming et al; 2002). The cytosolic and lysosomal enzymes were activated by the disruption of homeostasis of calcium. The nearby cells gets attached from necrotic or apoptotic cells when the enzyme level increases.

**Paracetamol or Acetaminophen toxicity**

Paracetamol is an effective anesthetics and antipytic drug. The drug can make liver damage above its therapeautic level. Continuous or constant use of paracetamol may lead to dysfunction of liver. For inducing liver damage in experimental studies paracetamol is used.

**Toxicity of thioacetamide**

Thioacetamide produce Necrosis in animals. It is also used as a model to evaluate the hepatotoxic effect in herbal drugs. Oxidative stress is accompanied with thioacetamide toxicity.

**Hepatic Infections caused by fungal and parasite Schistosomiasis**

S. Mansoni is the parasite which causes the disease schistosomiasis and it mainly produce fibrosis in the liver cells. A soluble antigen of egg or egg schistosome get deep into the liver cells and start functioning of T-cells and results in the production of granuloma (Mahmod MR et al; 2002).

**Paspalum Scrobiculums**

Millet is the common food on North India, and is very common in north India. Aspergillus infects the food. This results in the production of cyclopiazonic acid and fumigaclavin A which causes Kodo Poison. The cyclopiazonic acid is a toxic and it produce necrosis (Antony M et; 2003)
Aflatoxins is a toxin produced by the fungi called Aspergillus flavus and A parasitcus. P450 enzyme is formed from hepatic chrome which is formed by the stimulation by AFB1, it produce reactive AFB1-8,9 epoxide which gets converts and produces carcinoma in the hepatic ces (Preeta SP et al; 2006).

**Mechanism of cells in the liver toxicity**

The biochemistry and the texture of hepatic cells gets changed because of the influence of toxic chemicals and metabolites of the drug. All the organs are affected by the chemicals and metabolites of the drug. The organs includes cytoskeleton, endoplasmic reticulam, mitochondria etc.. The toxic effects of cytokines produce necrosis. The biochemical problems of the unwanted drug metabolites may cause cell death(Zimmerman HJ, 1999, Kaplowitz N, 2001). Immune system gets targeted and it forms a protein of complex class - I and metabolites of drug, this may lead to sensitization of Gepatic Cells (Robin M et; 1997) Drug produced or induced liver injury (DIILI) and cells damage in the parenchymatal cell is due to the activation of immune systems.
CURATIVE TO LIVER DAMAGE AND DISEASES:-

Pharmacognosy in a Subject that deals with the study of Crude drugs and animal origin. The word “Pharmarcognosy” means Pharmaco – drug and Gnosy – Knowledge. According to Trease and wallis it in defined an a science that fulfills the knowledge about Crude drugs of vegetable or mineral nature. It also given an idea about the sources of the drug, their preparation, history, property, cultivation, harvesting etc. It given a direct link to the Subject like Pharmacology and Phyto Chemistry or medicinal chemistry. The knowledge about Pharmacology is very important in knowing the facts of the action of drugs in the systems of human beings and animals. It also given an idea about the preparation of galericals (Kokate et al.; 1999)

A Survey done by Indian researchers about the Indian medicinal plants regarding about its lognisitical natures and its phyto Constituents like gums, Skroids, alkaloids etc. In the reviews the researches have described about variety of drugs and its adulterants. For Standardising drug, the methods like anatomical, morphological, phytochemical, physic chemical and ehromatographic techniques were used Morphological analysis play remarkable role in the Standardisation of crude drugs. Morphological analysis means size, verification, surface characters, texture and hardness of the drugs. The Morphological analysis is very important in the identify of medicinal drugs, febres etc. It also give an idea about the adultrcation and Substituteuxian of the drugs. The Seetional views that in longitudinal and transverse details gives vital role in the identification also.

Organoleptic analysis means the identification of drugs. It involves the ealour, teate, small etc of the drug. Physiochemical and Phyto chemical analysis include ash value, solubility Studies, qualitative and quantitative techniques of phytochemicals the extraction techniques etc. Quantitative analysis means determination of phytochemical Constituents.
There are many plants and polyherbal formulations are having its hepato protective activity. Approximately 150 phytochemical constitutnts isolated from 102 plants claimed to have hepatoprotective activity. In India nearly 89 medicinal plants, its Combinations and around 35 planted formulations are available (Handa at al; There are 12 plants in herbal formulation are used They are,

- **Andrographis Paniculata** (29)
- **Boerhavia deffusa** (11)
- **Eclipta alba** (9)
- **Picrorrhiza kurroa** (11)
- **Oldenlandia Corymbasa** (9)
- **Asteracanta longifolia** (8)
- **Apium graveolens** (7)
- **Cassia Occidentalis** (9)
- **Cichorium intybus** (8)
- **Embelia ribes** (9)
- **Tinospora Cordifoka** (9)
- **Trachyspermum ammi** (7)

There are lot of plants were reported having hepatoprotective activity against liver damage in animals. (Subramoniam et al;1999) Most of the hepatoprotective plants contain phenyl compounds, as phytoconstitent, and other include gils, triterpenoido, alkalrds, nitrogen lompourds etc.
Conventional dosage forms for treatment or curation:–
Conventional medicines are not available for most of severe liver diseases. For the management of liver diseases the role of herbal medicines are very important. In Ayurveda, Siddha and folklore medicines there are many plants and poly herbal formulations are used to treat liver diseases. The hepatoprotective activities of most traditional hepatoprotective plants were evaluated by pharmacological studies using experimental animal models. The most accepted or proven remedy for hepatoprotective plant in milk thistle (silybum marianum). The plants such as Andrographis paniculate Glycyrrhiza glora, picrorrhiza kurroa and phyllanthusamarus and Elipta alba have promising activity for the development of drug few preparations of these plants are readily available to treat liver diseases. Subramoniam and pushpangadan 1999). Out of the above plants Glycyrrhiza glabra and phyllanthus amarus are well known to have anti-hepatitis viral activity (Subramoniam and Pushpangadan 1999).

In these study first we have selected Cicer arie species (*Desi and Kabuli type) and the seed coat were removed based upon the ethno botanical information. It was then screened (using carbon tectra chloride - induced liver damage in rats) to determine promising liver protective properties. The screening of both species of Cicer arie revealed that the Bengal gram (Desi type) seed coat in very effective to develop as a drug. After that different extracts were prepared from the selected part (seed coat) and were tested for their activity. Then activity guided isolation of an active phenolic fraction (active component) which was isolated from active fraction of ethyl acetate using chromatography in its pure form.

Cultured cells and Animal models were used for the determination of anti hepato toxic property and anti viral activity. The active component that is isolated from the seed coat of Desi type Cicer arietinum performed anti hepato toxic activity. It also exhibited anti hepatit B virus activity in cell line producing hepatitis B virus. Anti oxidant, anti inflammatory properties also exhibited by the phenolic fraction of active ethyl acetate fraction.
The active fraction is free from sub-acute toxicity in rats also thus for the first time the activity of the seed coat for the development of a commercially viable and valuable medicine is established for the treatment of liver diseases. Therefore it is very essential that safe and effective drugs having less side effect or no side effect. It was reported that the herbals or plant drugs are very effective in the development of an effective drugs to cure liver damages (ScottCuper, 1998).
LIVER DISEASES AND HERBS

The science of life is Ayurveds. Almost 81- plants are enlisted in Ayurveda which is having therapeutie efficacy related with liver diseases. In A dharvavveds approximately lists around 290 plants which having therepeutie values while in ayurveds lists around 746 medicinal plants which having therapeutic utilities.

Preliminary Ayurveda deals with eight subjects having the characteristics of art of healing.

a. Oral medicine (kavya chikilsa)
b. Toxicology (salya tantra)
c. Head & neck disease treatmentary (salakavya tantra)
d. Aguda tantra
e. The convulsive disorder management by evil spirit ( Bhuta vidya)
f. Paediatrics (Bala tantra)
g. Eniatries (Rasayava tantra)
h. Aphrdisiacs art (Vajikarana tantra)

What is the spine Ancient medical science of India can be vejerred to nothing but Ayurveda describrt many theru peutie and Rasa,Gvua, Virga,Vipuka specialities are various variety of medicinal plants through many shlokas. The basic text of Ayurveda Charaka Samhitha deals with the mode of administration of drugs while Sushrutha samhitha deals with various surgical methods by way of various surgical equipments.

In the liver, various physiological process such as secretice metabolism de toxification and storage happen and foure of the diseases affecting liver are chrome or acute (inflammatory hepatosis and cirrhosis degenerative ) diseases are amongst various illness. Excess of alcohol consumption autoimmune disorders higher dose of antibiotics various types of Chemotherapy and difference types of infections are responsible for a number of diseases of the liver by peroxidation and oxidation of cells.
For more than health care, from older days, medicinal plants were used in various tribal areas, in India more than 7000 medicinal plants are being used. Their wide raising therapeutic effect are rarely used for strong, safety, efficacy and quality are needed for the use of plants in the form of extracts powder or tinctures and also that is in paste form. In this background it has been decided to have search such therapeutically vital plants and to establish their scientific values. Plants or Herbs play an important place in maintain the health of in the earth. Approximately around 80-95 percentage of the population believes in the herbal medicines or traditional drugs, which are mainly depend on the plants(WHO,1993). Increasing exposure to toxic chemicals increases the risk of toxication in liver. One of the major health problems that occurs in the present scenario is liver diseases. For the management of threatening liver diseases, the role of herbal drugs are very important than conventional drugs. Earlier civilization on the earth, mainly depended on herbal products and drugs to treat diseases and to maintain their health. This include many serious diseases like carcinoma and liver diseases (Subramoniam and Pusphpangadan, 1999: , Myagmar et; al 2004, Bei et; al;2004).

The herbs and the drugs develop from it are very popular recently because of the strong belief on the plant drug of its safe and no side effects when compared with the usual conventional dosage forms(Subramonian,2003) Enormous rich plant wealth is well-known. In India variety of herbal plants with its medicinal value are available with the local related with the tribal people in the villages of remote areas most of the herbal plants which is having medicinal values and kept secrets and this was used by the folk lores in rural villages to treat many diseases(Subramonian and pushpagathan 1995). Many traditional medicinal plants or indigenous plant examined by researchers for its therapeutic efficacy in nearest years researchers found the efficacy (therapeutic) of most of the plants or its extracts an many animal model and have flinal
evaluation also all the studies where done to verify their therapeutic claims. Most of the researches were done on focusing the mechanism how the drug/plant act and its efficacy, so that the traditional or therapeutic claims can be evaluated or confirmed. Various medicinal plants are used to cure liver damages in traditional system of medicines. All the plants belongs to various genus also. Herbal drugs only give relief to the persons who have liver diseases or damage, this is usually is absence of allopathic medicines. Trusting up on the medicinal and traditional usage, thousands of herbal plants have evaluated for its efficiency in liver damages, but only few of them were done with experimental procedure and have found its therapeutic activities.

*Eg:* *Phyllanthys amarun, Eclipta alba, silybu mariannum.* From the above plants phyllan am and eclipted alba have shown promising activity against viral hepatitis (subramoniam and pushpagathan 1995; Thyagarahjan etal 2001) In conventional or allopathic medicinal system, now silymarin is used to treat liver diseases, this is because of the absence of chemical entry. Table:2 indicate the list of eighty herbal plants having hepato protection against some toxicity producing chemicals and inducing liver dysfunction. A comparative evaluation will be very useful to select the activity (therapeutic) among the list and thus to prepare herbal formulation including one or more plant drug (poly-herbs) to treat liver damage or diseases.

In traditional system like ayurveda, so many herbal formulations are used to cure damage of liver (subramoniam and pushpagathan 1995). Cell death is the main problem associated with serious conditions of liver diseases. In this condition regeneration of liver cells are required. Oxidation and that creating stress is also one of the main problem associating with the liver diseases.
In such cases the formulations that is polyherbal formulation or plant drug from single origin should be able to produce cell regeneration and antioxidation property. Almost all types of liver damages are caused due to virus. Viral efficacy is very required in these cases. The drug form single plant will be difficult to case all these problems. So the herbal formulation with more than high drug will have promising activity. Single substance efficacy in not giving full promising efficacy when compared with poly drug formulation poly drug formulation. Phytomedicines poly an important role in the formulation of its poly herbal formulations. The efficacies and the batch to batch variations are the major problems encountered with crude plant drugs. The reasons for these are mainly due to nutritional status, variations in the season and genetic and differences found in soil and climatic conditions.

Human body is considered to be a very complex process, this process can be less toxic effect by low dose drug combination from a pure chemical property of a drug. This type given a great importance to the development of phycodrugs. It is very cheap and comparatively easy for the development of when compared with allopathic dosage forms. The folklore use many drugs which are not known to the main population stream. These drugs are not to the knowledge of science world and its evaluations were also not performed seed coat of the cicer arietinum species family fabacase is such a type of medicinal drug which was used to cure liver damages by the traditional who were living in the rural places in Kerala. Haemorrhage of the gastro instinal tract and ulceration are the most common side effects of NSAID's (Balsamo et al; 2002).

Fibrosis and cell necrosis are the final result of Hepatotoxicity by CCl₄. This may lead to the formation of trichloromethyl, and trichloromethyl Peroxy/radicals (Kadiska et al; 200, Recknagel et. Al:). Many antioxidants help to reduce liver damage from oxidative stress due to the induced liver damages. (Peck, 1994; Halliwell, 1994) There are so many toxins reported in many ordinary food items. For example many fruit seed contains
Cyanogenic glycosides, Brassica vegetables contain thiocyanates and alkaloids are present in solanaceace, pulses contain tectins ie, soya beans and red kidney beans. All these are considered as safe, even when it is used in limited quantities. The drugs which are used in Ayurvedic and Siddha medicines are very safe. In most case of conventional dosage forms evaluation of drug safety were not carried out. Depending upon the dose level of medicinal plants, the toxic effect can be identified.

Examples are *Stychnos nux vomica croton tiglum, Glorisa Superba, papaver somniferum, Abrus precatrius, plumbago rosea, Aconitum ferox, Semecarpus auacardicus and Aconitum heterophyllum* (Harier - 1994)

Hepatotoxins causes the changes in pathological lesions and specific biochemical changes and this depends on the concentration and mode of action .The chemical induced liver injury are mainly caused by oxidative stress, inflammatory responses damage to cellular organelles and molecules. Viral infections, auto immunity and hyper immunity are one of the major reasons of liver damage.
<table>
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<th>Sl.No</th>
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<th>Common Name</th>
<th>Family</th>
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<td>Adhatoda vasica</td>
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<td>Eulali</td>
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<td>Buttom hrass</td>
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<td>Boldo</td>
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<td>Cracked cap</td>
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<td>46.</td>
<td>Zingiber officinale</td>
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1.2 Problem on hand

In animals liver is one of largest gland. It is involved in the metabolism. Liver plays a very important role in the life processes. Because of these deceases that affects the liver very serious and are dangerous to life also. The liver diseases include hepatitis, hepatosis and cirrhosis. The liver diseases are mainly caused by viral infections; defect to the immune mechanism, and due to some chemicals that include chemotherapeutic drug, some antibiotics, acetaminophens, carbonteta chloride and excess usage of alcohols. Various infections, doses of antibiotics and other drugs in their higher dose than its therapeutic levels, chemotherapy, and alcohol consumption are the main reasons for liver diseases. This happens by peroxidation and oxidation. Approximately 99% of liver diseases originate through viral infections. A lot of research work was done to establishment synthetic hepato protective drugs. But there was no potent liver protective drug was available in the market from last decades. But medicinal plants with more than 100 phytoconstituents was available that cure hepatic disease and was claimed for its activity. Therefore it was necessary to evaluate the plants to determine its activity.

In conventional dosage forms or medicines the treatment for liver diseases are not satisfactory. But the role of herbal medicines are very important in the treatment of the liver diseases. In traditional system like Ayurveda, siddha, and in Ethano medical use there are some plants which are used as polyherbal formulations for the treatment of liver diseases. But the worst thing is that readily available medicine to treat liver diseases are not available. Most of the hepatoprotective folk lore medicines showed some hepatoprotective efficacy on pharmacological estimation for example silymarin or milk thistle it is the standard drug used for the treatment of liver diseases. Anti hepatitis activity was reported in herbal plants like Glycyrrhiza glabra and phyllanthus amarus (Subramoniam and pushpangadan 1999)
Folklore medicines which are used in the village of remote areas and tribals were not undergone any pharmacological estimations. Many of the practitioners medicines do not know many medicinal plants and their usage by the tribals and in remote villagers. Therefore the search of a hepatoprotective medicine from among these medicinal plants will be worthy and this will result in a new nivel and fruitful liver protective medicines. Mainly the study focus to evaluate the ability of *cicerarietinum* species for its hepatoprotective activity, due to the phytoconstituents presents in it. This will have a future scope to replace or reduce the use of allopathic medicines, there by reducing the sideeffects of the drug and cost acceptable and to enhance patients compliances also. In this study certain medico-botanical investigation were done in selected villages in Pathanamthitta, kerala. From the conversation with the people they agreed that patients who have taken suspension of seed of cicer arietinum species got cured from liver disease. The information related to the seed coat of cicer arietinum prompted on a elaborated study on the seed coat to confirm its use and if to develop a internationally acceptable and lost effective medicines for treating liver damage.
1.3 RESEARCH OBJECTIVES

The objectives of the present work is focused on the following

The liver damages or intoxication occurs due to increasing contact or exposure to toxins and chemotherapeutics. Liver diseases are one of the major causes of increasing the death rates in many countries. This is because liver is an important or main centre for metabolism. Conventional medicines are not satisfactory for treating the liver diseases. The traditional hepatoprotective medicinal plants are promising for the establishment for a new therapeutic agents or a drug to treat prevent or to protect liver damages. Various sources also reported about the use of herbal drug for the control of liver diseases. This initiated the need or use of a new moiety of drug from the herbal source, the drug of choice was species of Bengal gram or *cicer arietinum*.

There are two types of

1. Desi type (Wrinkled seeds)
2. Kabuli type (round seeds)

Bengal grams belong to the family fabiaceae. It is a winter crop, specially cultivated in the northern states of India. The folklore claims that it has been using by the tribal or folks for the treatment of liver diseases or liver related damages. Here the present study focus on the screening of seed coat of *cicer arietinum* species using CCl₄ induced liver damages using rats as models. The screening of *cicer arietinum* revealed that the efficacy of seed coat of Bengal gram got very promising activity against liver damages. It can also be used to develop as a drug to treat liver related problems. Then different extracts were prepared and were screened for its activity and isolation of active component or principles were also done.
Objectives mainly focus on

1. **Identification, collection and authentification of seeds;**
   Cicer arietinum species (Desi and kabuli type) were obtained from the local market and was authenticated. The collected seeds were then dried under shade and the seed coats were removed and it is peeled for its seed coat. The seed coats were dried until all the maximum amount of moisture is gone. It is then powdered into its finest form and was stored for further analysis.

2. **Phytochemical Analysis**
   Trease of Evans and Harborne method was used to identify the phytochemical constituents in cicer arietinum. This gives a primary idea about the compounds and its nature and can be used further studies.

3. **Preparation of water suspension**
   The fine dried seed coat powder of cicer arietinum species were taken and it is ground with gum acacia. 10% suspension is prepared, from this, a 2% suspension of gum acacia was used for further experimental studies.

4. **Preparation of extracts**
   N-hexane, Water and Ethanol are used as solvents in the extracts preparation. The finally powdered seed coat were extracted individually is the above solvents, for drying these extracts rotary evaporator was used under very reduced pressure of 40 °C. Percentage yield of each extracts were evaluated.

5. **Fraction preparation**
   Aqueous fraction, n-butanol fraction and Ethyl acetate fractions were prepared. The percentage yield of each fractions were evaluated.

**Chromatographic techniques**
   The number and types of components present in the extracts (selected) were done using TLC. Chromatographic techniques was used in the selected fraction and isolation of active constituents were done. Column chromatographic techniques was used to isolate the pure form of active component in sufficient quantities.
HPLC Analysis

HPLC analysis were done to get details on active component Pharmacological studies screening of seed coat of species of cicer arietinum (Bengal species) were done for obtaining it’s hepato protection action against carbon tetrachloride toxicity

a. Experimental animal’s procurement
b. Following OECD guidelines for toxicity evaluation
c. Screening of seed coats of Bengal gram species (cicer arietinum) Desi and Kabuli type against CCl₄ toxicity for its hepatoprotective activity:

d. Isolation of active component from the seed coat of Cicer arietinum and its chemical characterisation.
e. Anti hepatotoxic studies of the isolated component from cicer arietinum seed coat
f. The activity of active component on Anti-hepatitis B virus using Hep G 2. 2. 15 cell line.
g. Studies related to the influence on inflammation, oxidative stress, level of cytokinase and Mechanism of action of C.arietinum
h. Preliminary evaluation of toxicity of Active component of Cicer arietinum in rats
Biochemical evaluations

- SGOT
- SGPT
- Alkaline phosphatase (ALP)
- Aspartate amino transaminase (AST)
- Alkaline transaminase (ALT)
- Total bilirubin
- Direct bilirubin
- Total protein
- Serum triglycerides
- Reduced glutathione
- Catalase
- Lipid peroxides
- Uric acid
- Urea
- Creatinine
- Glutamic transferases etc were evaluated
1.4 SCOPE OF THE STUDY

Liver is the largest organ which help in the regulation of life processes. Metabolic functions are mainly done by the liver. Many of the toxins which are present in the environment like herbicides, fungicides, certain trugs, and chemotherapeutics drug cause toxicity to the liver. The risk of causing toxicity to the liver from the above cases are increasing very rapidly. Hepatotoxins actions. Hepatotoxins causes the changes in pathological lesions and specific biochemical changes and this depends on the concentration and mode of action. Oxidative stress, inflammatory responses of the cells and themolecules are the main cause of chemical causing liver injury. Besides these the viral infections and the immunity problems, like hypo immunity and hyper immunity associated with the total immune systems are also affect the liver cells. These are the major causes or reasons that cause liver damage.

The present study of Cicer arietinum AC showed remarkable and significant hepatoprotective activity against toxic chemicals like CCl₄, acetaminophen and thioacetamide. The study also reveals its activity on anti-HBV activity under invitro HBV cell line. Cicer arietinum also exhibited anti-oxidant and anti-inflammatory activities. The cytokines levels in the mice studies were also in favorable levels. Due to the lack of availability of conventional dosage forms to treat the liver diseases, the herbal formulations and herbal drugs are used to treat liver damages. There are number of herbal formulations and herbal plants which having medicinal values are identified and this can be used for the detoxification of toxic chemicals and viral induced liver damages. The hepatoprotective traditional medicinal plants are used to develop the therapeutic agents which plays a very important role in preventing or curing liver
diseases. Chronic, acute, cirrhosis, fatty liver are the common liver diseases which are life threatening also.

The planned study is likely to provide one or more promising active fractions or active principles from indigenous plant for the development of safe and effective hepatoprotective medicine. The liver damages and the non availability of conventional medicines initiated the need or use of new moiety of drugs from the herbal source. This can lead to multi dimensional socio-economical growth. This study and its development will also determin the value of folklore claim.