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An observational descriptive study of pattern of pathological changes in liver in context of medico-legal autopsy done at J. L.N. Hospital, Ajmer

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Abstract

Background- *Autopsy finding in liver with pathological changes are studied.*

Aim and Objectives- *To correlate histopathological findings in the liver with gross examination in routine medicolegal practice of autopsy.*

To find out the type of liver diseases in relation to age and sex of the studied autopsy cases from the local population.

To assess and compare histopathology of liver among accidental deaths, sudden natural deaths and deaths due to poisonings.

To compare results of this study with other studies.

Suggestion of authenticity of diagnosis from the histopathology findings of liver.

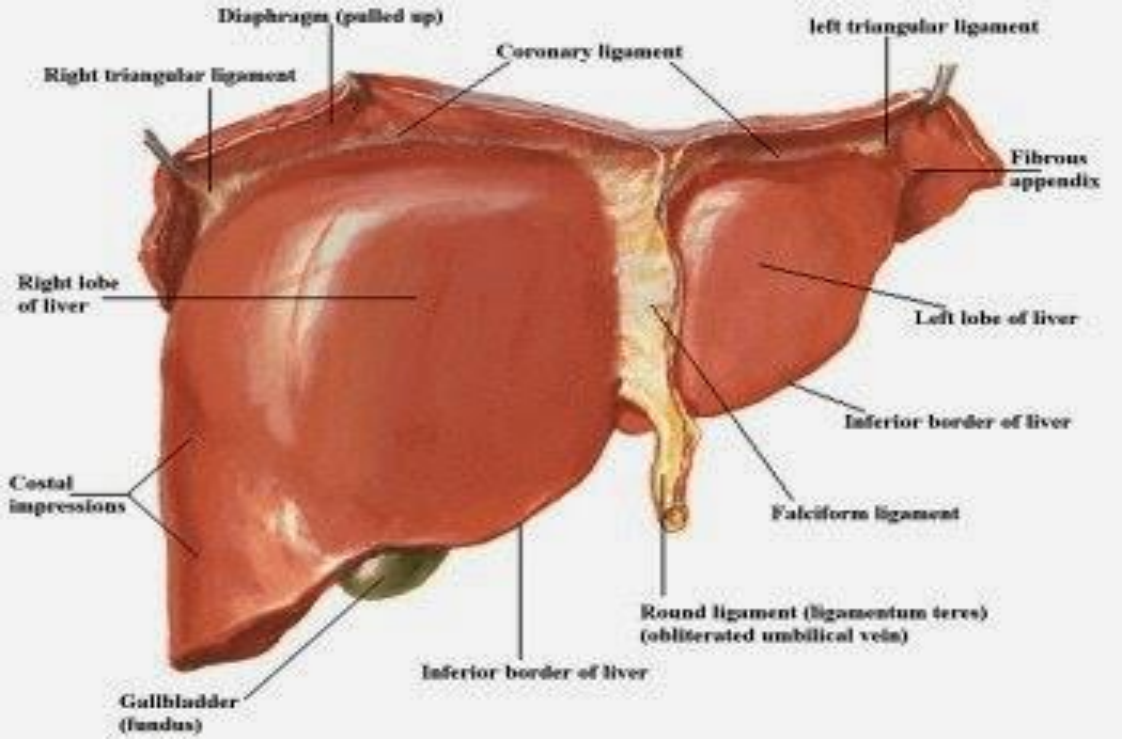
Material and Methods- *This observational cross section study will be carried out in the department of forensic medicine and toxicology on 100 cases in JLN Medical college and attached hospitals with cooperation from the department of pathology after obtaining due permission from the institutional ethical committee.*

Conclusion- *hepatic lesion can present in various forms at autopsy. Non-neoplastic Lesions should be given equal importance as neoplastic. An enlarged liver does not always indicate malignancy. There are many clinical conditions in which liver are affected as secondary phenomenon. Gross and histo-morphological examination of the tissue can diagnose the liver lesions with great accuracy and is beneficial for patient's further survival, in setups where facilities to perform liver biopsies are available. Liver should be investigated as a part of routine autopsy procedure in all post-mortem cases.*

***Keywords*— Liver, neoplastic, Histo morphological.**

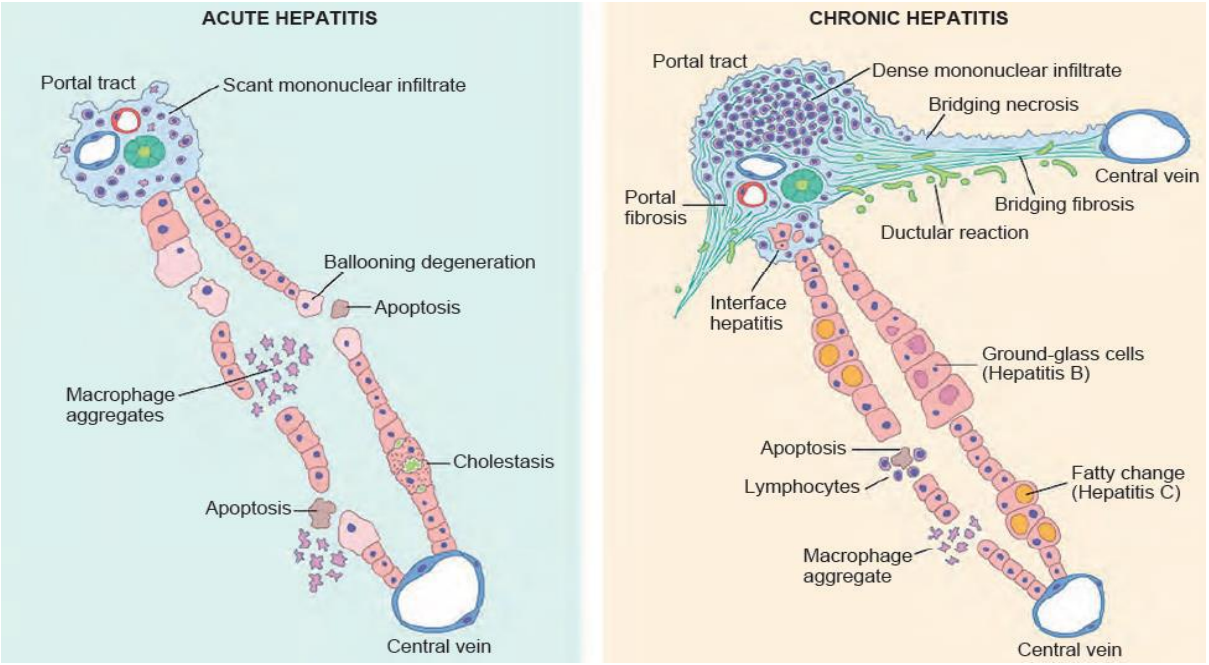
I. INTRODUCTION

Liver is an age-old organ of interest among the communities and culture. It is the vital organ which primarily deals with digestion, storage of nutrientand detoxification, so it is portal of target for any adulterant, pollutant,pathogens and potential toxic hazards of environment. Any particular exposure in form of eating habit, pollutant, adulterant of the particular area of interest is reflected in form of distortion in morphology and architecture of this particular organ "Liver".

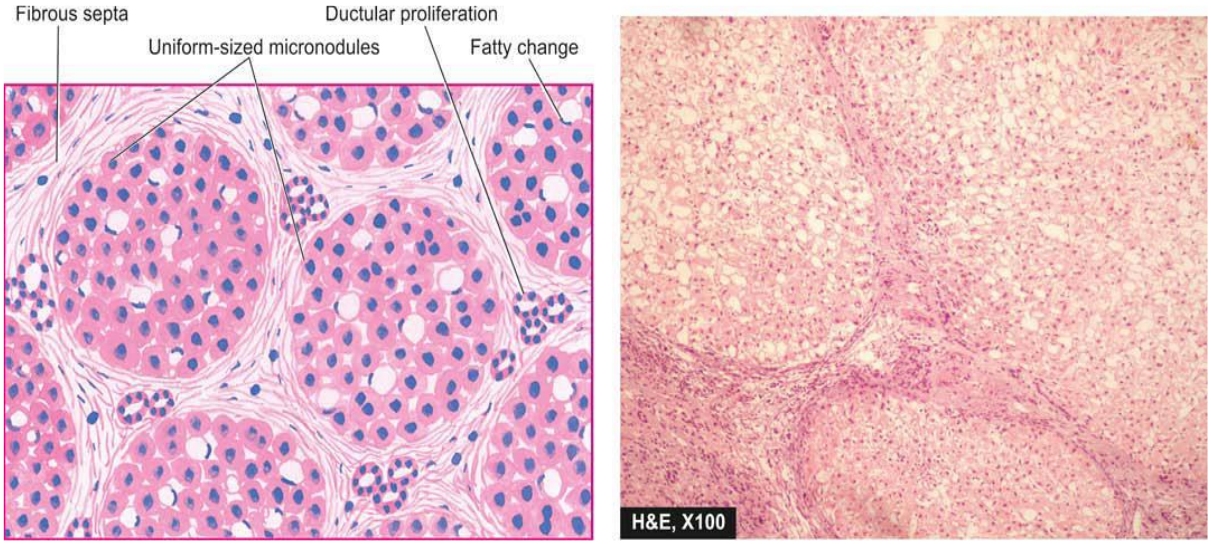


Grossly, **FATTY LIVER**is enlarged, yellow, greasy and soft in consistency while Fibrotic liver is tough and firm. In alcoholic **cirrhosis**, surface of liver is studded with diffuse nodules less than 3 mm (micronodular) while in post-necrotic cirrhosis nodules are more than 3mm (macronodular).

On cut section, **Chronic Venous Congestion** has a red and yellow mottled appearance [nutmeg liver). Amoebic abscess- Usually single, large and confined to the right lobe compared to pyogenic ab/scesses which are multiple.



Morphologic features of acute and chronic hepatitis. There is very little portal mononuclear infiltration in acute hepatitis (or sometimes none at all), while in chronic hepatitis portal infiltrates are dense and prominent—the defining feature of chronic hepatitis. Bridging necrosis and fibrosis are shown only for chronic hepatitis, but bridging necrosis may also occur in more severe acute hepatitis. Ductular reactions in chronic hepatitis are minimal in early stages of scarring, but become extensive in late-stage disease.



Alcoholic cirrhosis, microscopic appearance. It shows nearly uniform-sized micronodules, devoid of central veins and having thickfibrous septa dividing them. There is minimal inflammation and some reactive bile duct proliferation in the septa

II. METHODS AND MATERIAL

Study design: This prospective study was carried out in the department of forensic medicine and toxicology, JLN Medical college and attached hospitals with cooperation from the department of pathology. The ethical clearance wasalready obtained from the institutional ethical committee.

All the particulars like age, sex, history,date and time of incidence and apparent cause of death recorded from police papers, inquest paper, accompanying police person and suitable entrymade inProforma after obtaining written informed consent from next of kin of deceased. Entries of variables and outcome made in case proforma by strictly following standard key definitions.

A bit of 1cm square of liver tissuecollected from grossly visible pathological site using Virchow's and letulle (en mass) method and from right lobe from grossly visible normal liver.

Gross findings such as colour change, consistency change or any other deviation from normal anatomy noted in Performa. Appropriate sections taken for microscopic examination after making vertical slices at 0.5 cm apart to check for lesions.10% formalin used in order to fix the tissue. Paraffin blocks prepared.

Sections taken at 4-5 microns and slides prepared. Slides were stained using Hematoxyline and eosin stain and all microscopic features were noted by using a light microscope.

Final entries as to variables and particulars were noted on proforma after tallying with FSL report and HPE report of concerned autopsy case.

The study was carried outincluding autopsies cases during December 2019 to November 2020 to accommodate a total of 105 cases (in age group of 1 year to 74 years).

INCLUSION CRITERIA: Cases brought for post-mortem which were fresh, non-decomposed and within 24 hours of death reported.

EXCLUSION CRITERIA: Autopsy cases of putrefied dead bodies and in cases where in manner of death is homicidal and undetermined.

The operational definition used for different variables is as follows:

In different conditions	Modes of Death		
	Coma	Shock	Asphyxia
For hospitalized Patient	1. >~6 hours of unconsciousness (EVM score <7)	1.BP reached 90/60mmHg or less 2. Significant blood loss requiring > 2unit blood transfusion	1. Spo2 <90% 2. Blood pH<6.9

For dead on arrival	1.Fatal Head injury revealed as SDH>80ml, EDH> 150ml, SAH and Brain oedema 2. For confirmed poisoning cases of Alcohol & barbiturates. 3.labelled by doctor in his autopsy report.	1. External features of shock a) pallor of lips b) pallor of nails 2.Internal Features of shock a) pale spleen b) pale liver 3.There is 2open fracturesof 2 long bones of limbs in trauma victims 4. labelled by doctor in his autopsy report.	1.External features of asphyxia: a) livid face b) cyanosed nails 2.Internal features of asphyxia: a) congested organs b) Tardieu's spots on serous membrane of any vital organ 3. labelled by doctor in his autopsy report.

Manner of Death		
Suicidal Death A) Mentioned in police papers. B) Revealed after crime scene report/ investigations	**Accidental Death** A) Mentioned in police papers. B) Revealed after crime scene report/ investigations	**Sudden Natural Death** A) A death within 24 hrs of onset of symptoms revealed in history or police papers. B) FSL report showed absence of poisoning C)HPE report or autopsy report confirmed underlying cause of death.

III. RESULT AND OBSERVATIONS

Table 1: Age distribution of patients

Age distribution (in years)	No. of patients	Percentage
10-20	4	4%
21-30	23	23%
31-40	31	31%
41-50	21	21%
51-60	13	13%
61-70	6	6%
71-80	2	2%

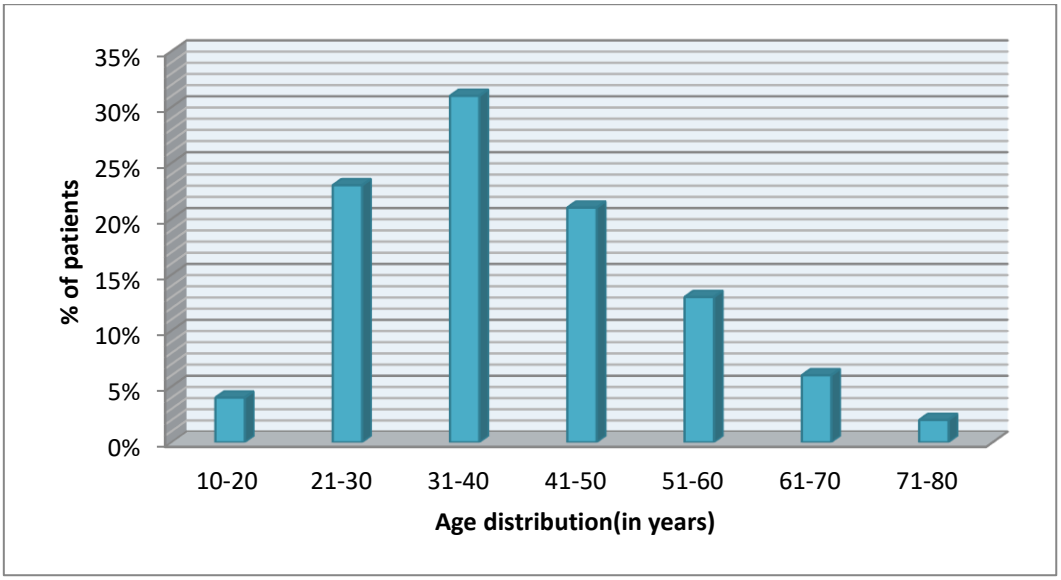


Fig.1: Age distribution of cases

Table 2: Gender distribution of patients		
Gender	No. of patients	Percentage
Male	77	77%
Female	23	23%

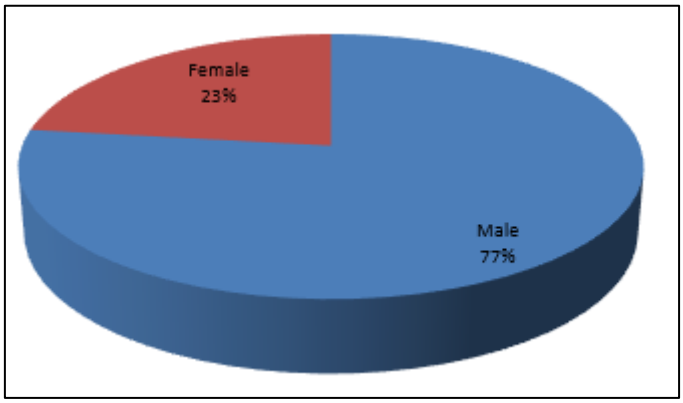


Fig.2: Sex distribution of patients

Table 3: Age-sex distribution of patients				
Age distribution (in years)	Male		Female	
	No. of patients	Percentage	No. of patients	Percentage
10-20	4	100.00%	0	0.00%
21-30	17	73.91%	6	26.09%
31-40	23	74.19%	8	25.81%
41-50	16	76.19%	5	23.81%
51-60	10	76.92%	3	23.08%
61-70	5	83.33%	1	16.67%
71-80	2	100.00%	0	0.00%

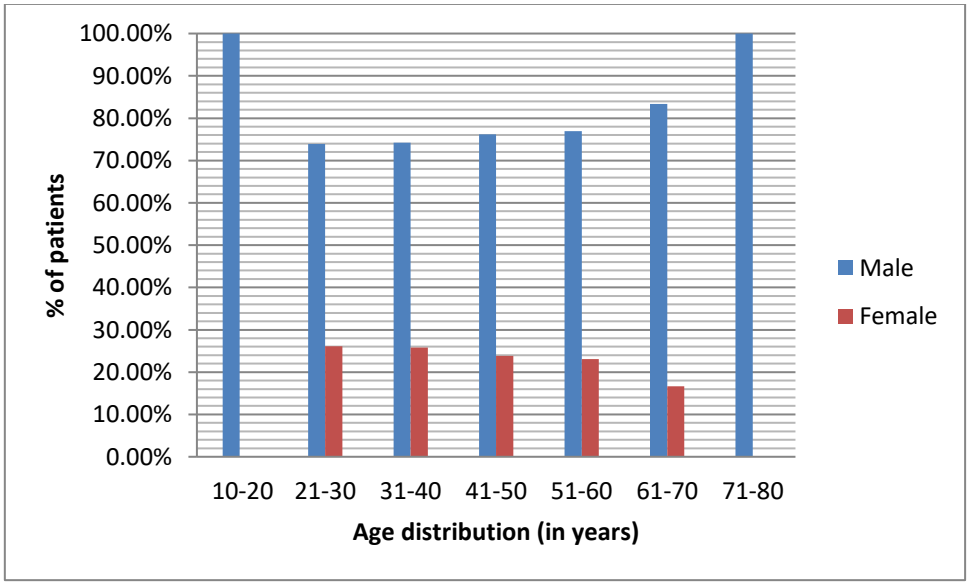


Fig.3: Age-gender distribution of patients

Table-4 Cause of death distribution		
Cause of death	No. of patients	Percentage
Road traffic accident	36	36%
Poison	24	24%
SuddenNatural Death	11	11%
Hanging	6	6%
Homicide	8	8%
Drowning	4	4%
Electric Shock	7	7%
COVID-19	4	4%

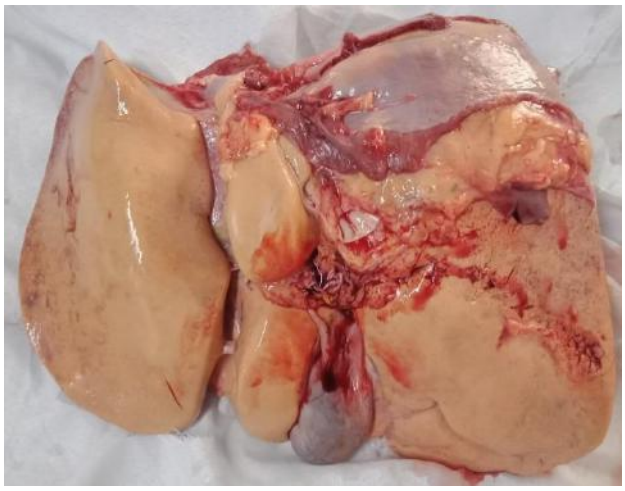
Table 5: Gross findings				
Color	Consistency	Cut surface	No of cases (100)	Percentage (%)
Normal	Soft	Smooth	71	71%
	Soft to firm	Smooth with whitish area at places	10	10%
Yellowish green	Firm	Nodular	4	4%
Reddish brown with alternate pale and dark area	Soft	Nutmeg	1	1%
Yellowish brown	Soft	Greasy	14	14%

G1(Gross 1): Anterior view liver with smooth and shiny surface and Congested

G3: Anterior view of liver with yellow and greasy surface

G2: Posterior view of liver with smooth & shiny surface and Congested

G4:Liver with yellow cut surface



G5: Posterior view with yellow greasy surface and hepatomegaly

G6: Hepatomegaly with yellow surface

G7: Hepatomegaly with nutmeg appearance

G8: Liver with smooth surface and white patches

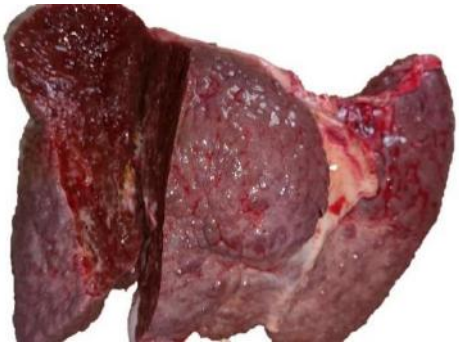
G9: Liver with white patches

G10: Anterior view: Hepatomegaly with yellow and nodular surface(micronodular)

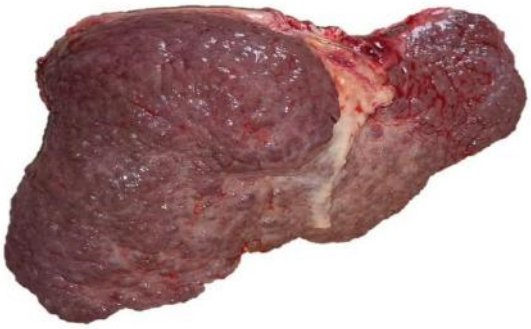
G11: Posterior view of liver with nodular surface

G14: Posterior view with nodular(macronodular) surface and liver mass reduced

G12: Yellow and nodular (micronodule)cut surface



G15: Cut surface is nodular(macronodules) and liver mass shrinked.



G13: Anterior view with nodular(macronodular) surface and liver mass reduced

Table 6: Distribution of liver weight based on gender

Liver weight (grams)	Male		Female		Total	
	No. of patients	Percentage	No. of patients	Percentage	No. of patients	Percentage
<1000	3	3.8%	0	13%	3	3%
1000-1499	41	53.2%	14	52%	55	55%
1500-1999	24	31%	6	22%	30	30%
2000-2499	7	9%	3	13%	10	10%
>=2500	2	3%	0	0%	2	2%

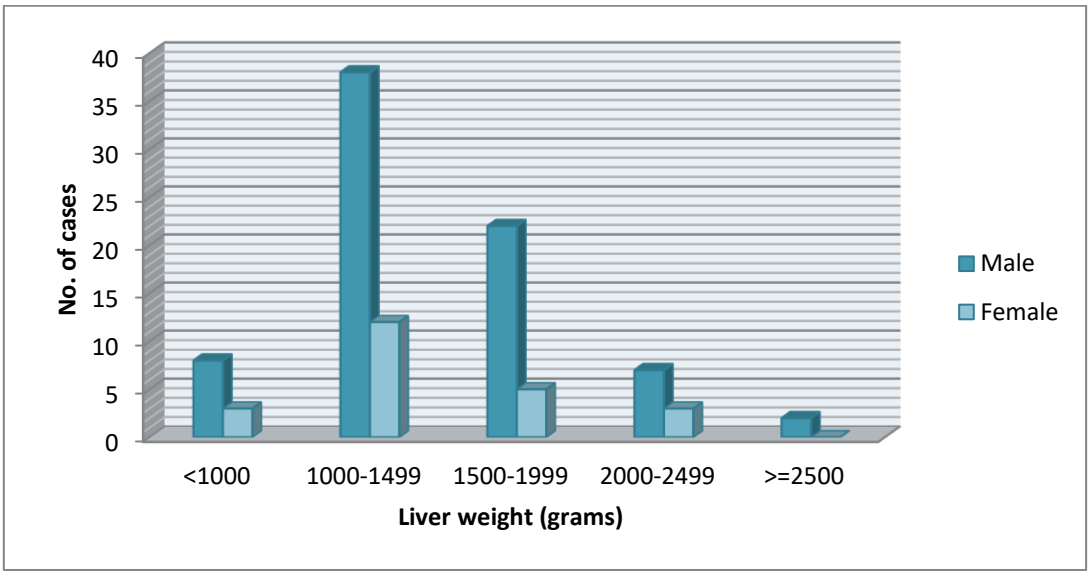


Fig.4

Table 7: Histopathological Findings.

Histopathological Diagnosis	Cases	Percentage
Congestion	58	58%
Fatty changes	21	21%
Cirrhosis	6	6%
Hepatitis	5	5%
Necrosis	3	3%
CVC	3	3%
granulomas	2	2%
cholestasis	2	2%

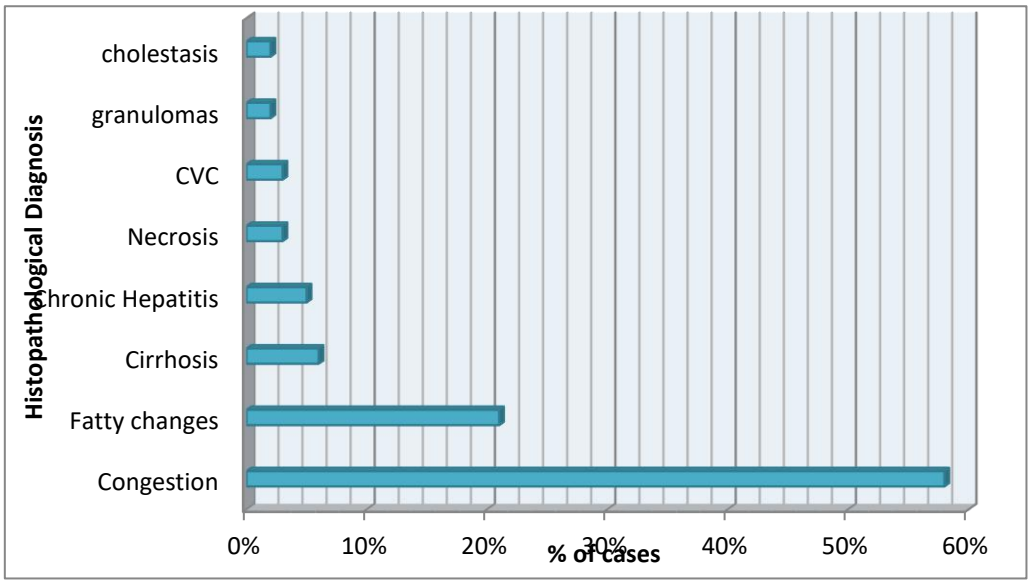
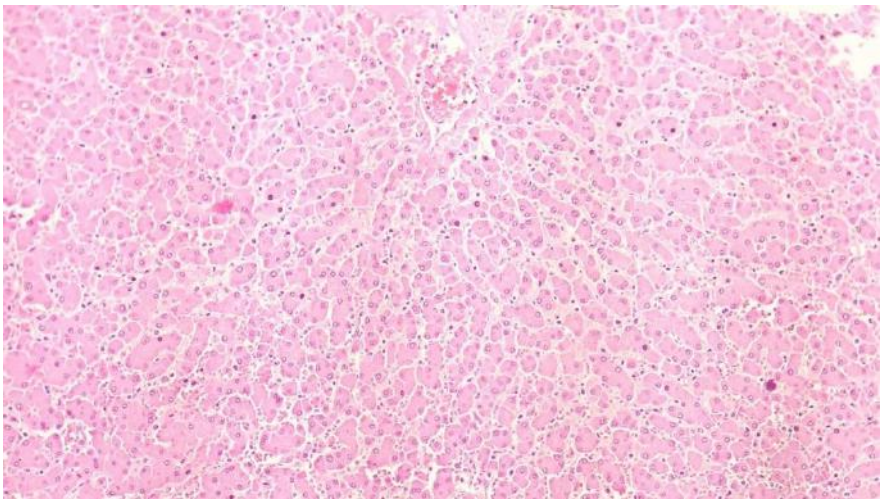
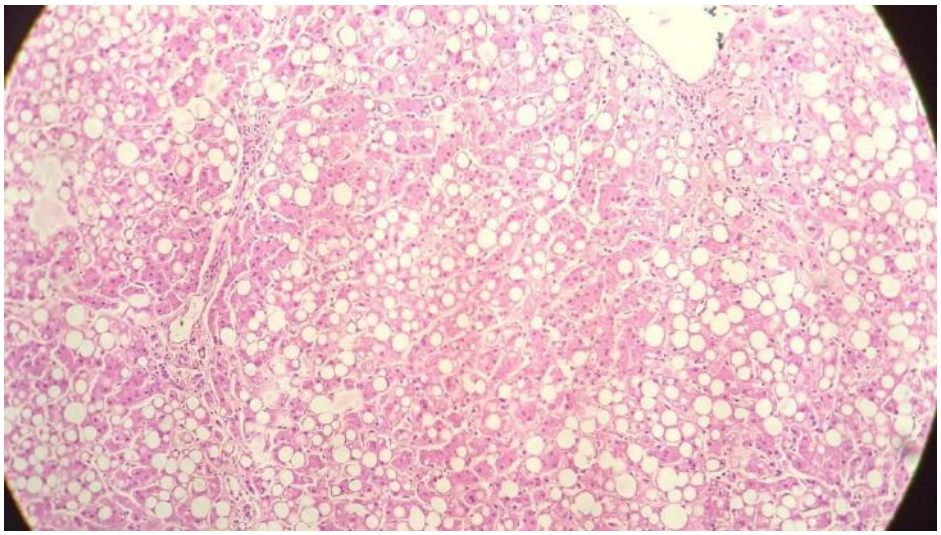


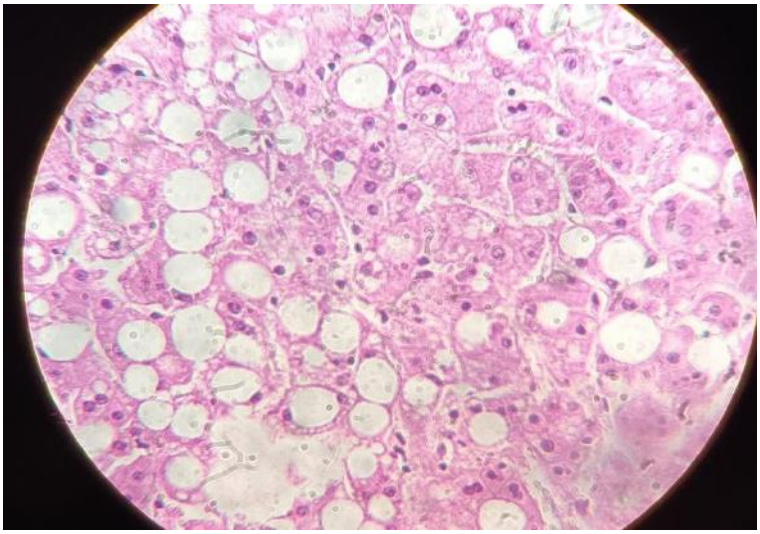
Fig.5



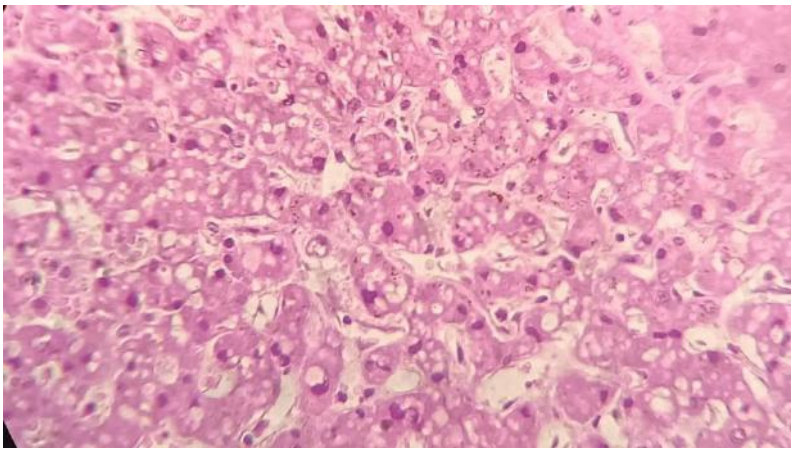
M1(Microscopic view 1): Congestion showing RBC in between hepatocytes and Central vein filled with blood.



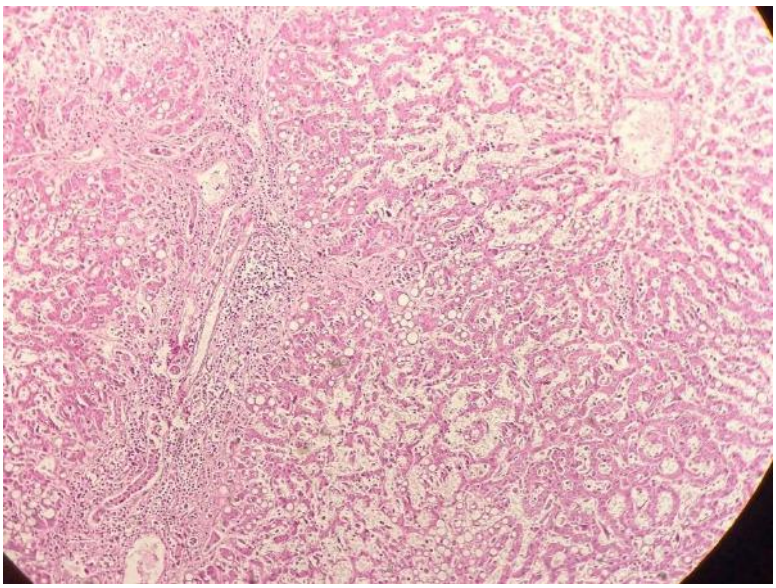
M2: Fatty changes with macrovesicle seen in hepatocytes



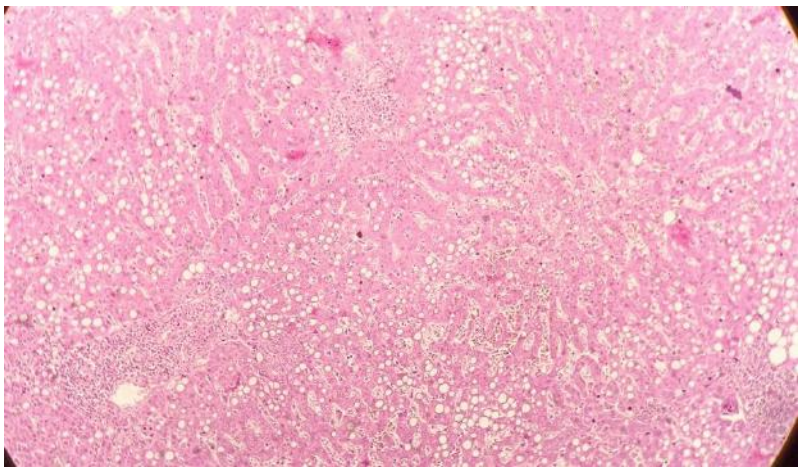
M3: Fatty changes with mixed macrovesicles and microvesicles seen in hepatocytes and nucleus shifted to periphery of hepatocytes with macrovesicle



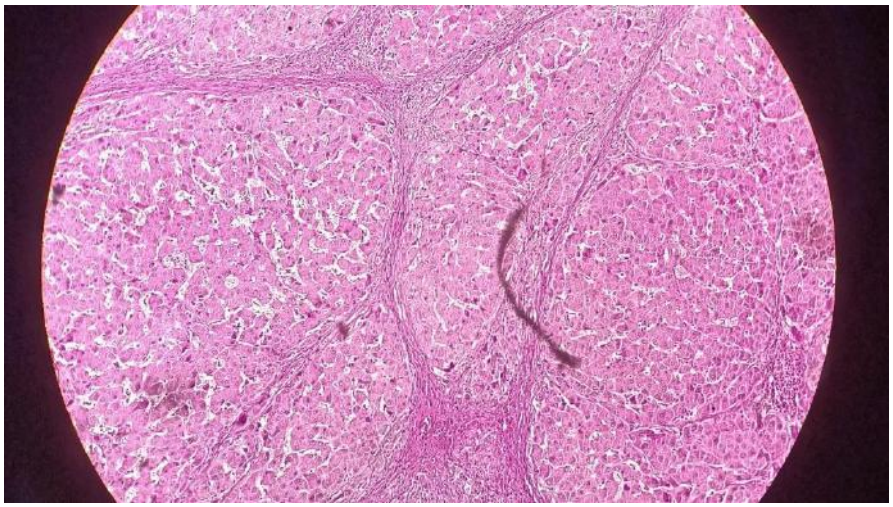
M4: Fatty changes with microvesicles in hepatocytes



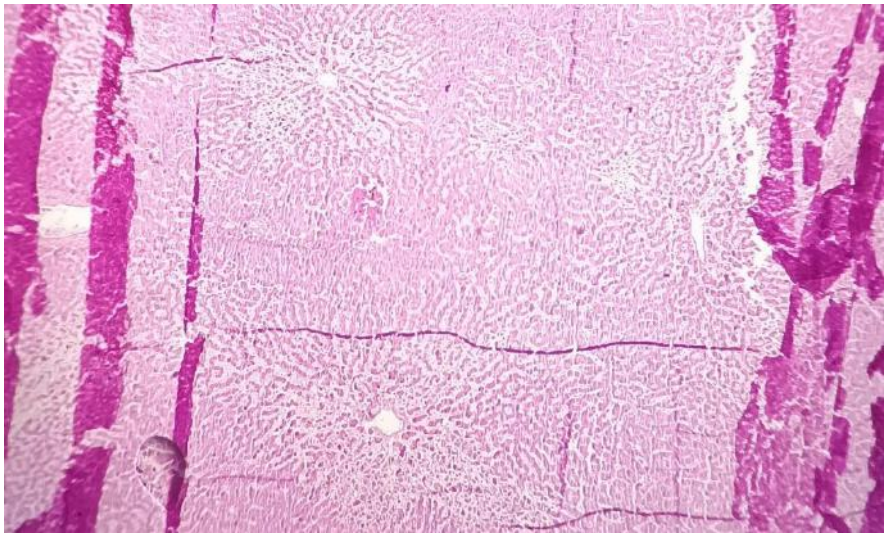
M5: Hepatitis with inflammatory infiltrate in periportal region and also band connecting portal to portal region seen with fatty changes



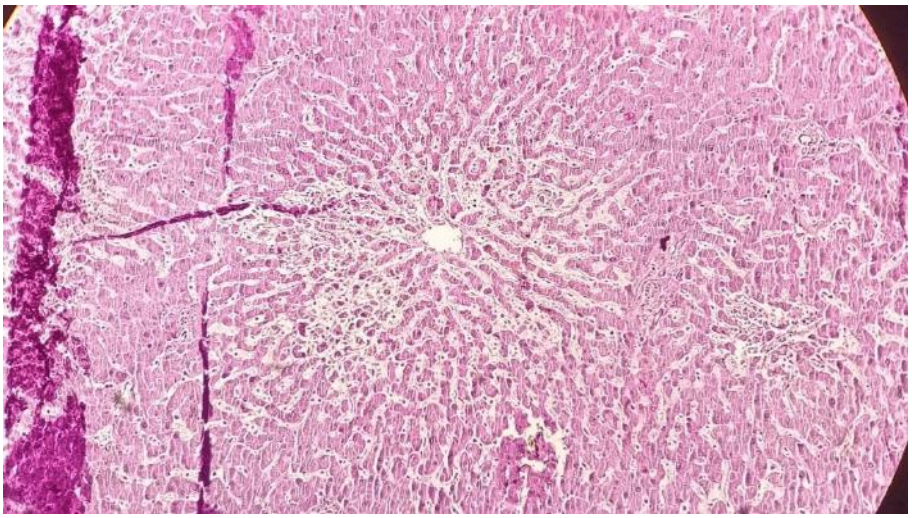
M6: Inflammatory infiltrate with fatty changes and congestion seen



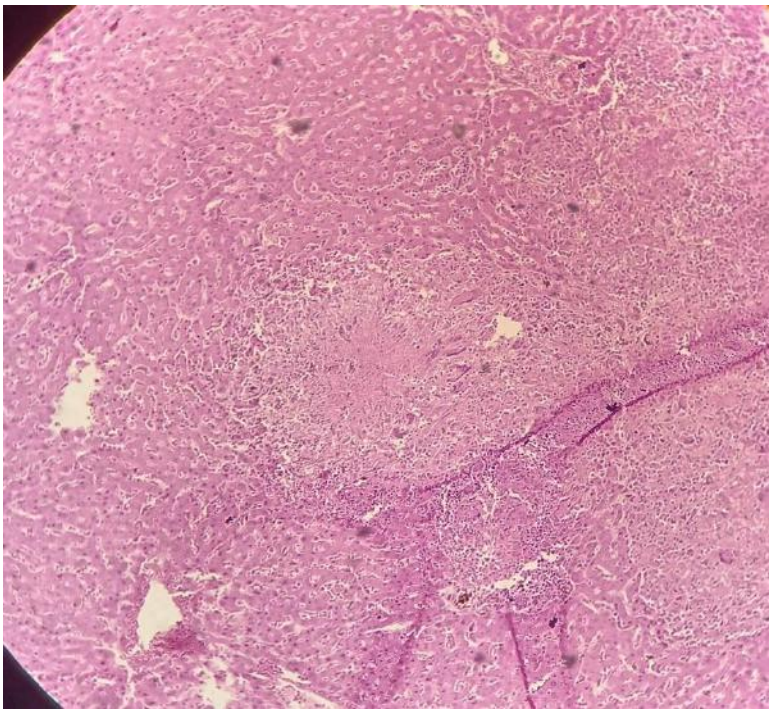
M7:Cirrhosis: Parenchymal nodules with surrounding fibrosis, bridging fibrous septa and disruption of normal architecture.



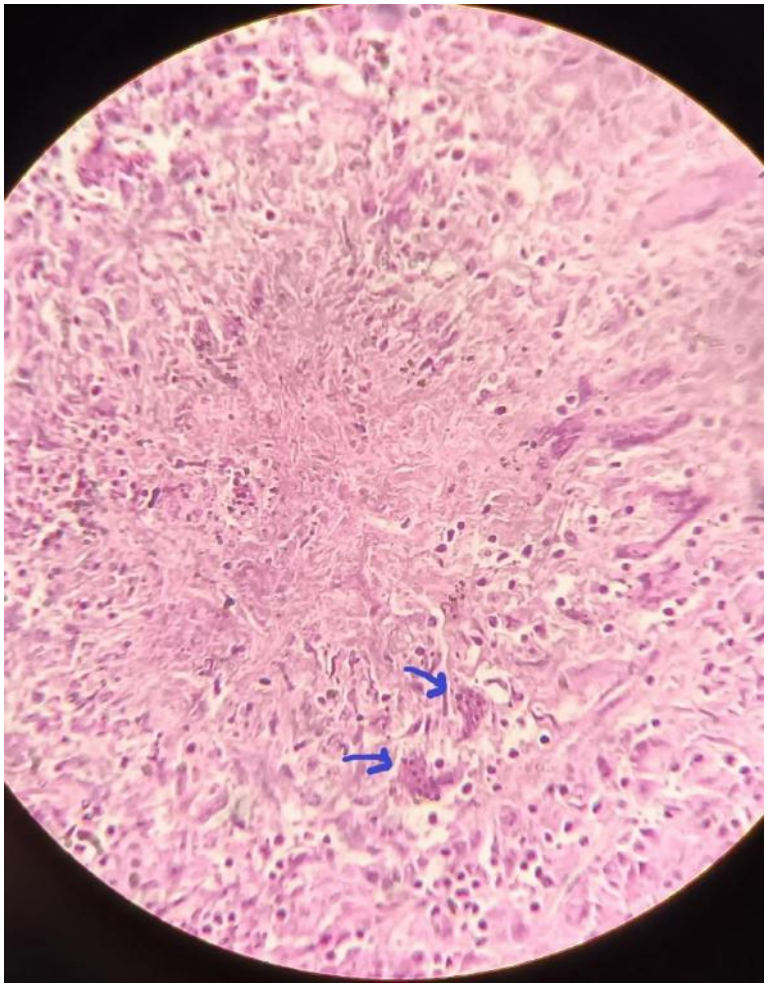
M8: CVC: Centrilobular necrosis and congestion



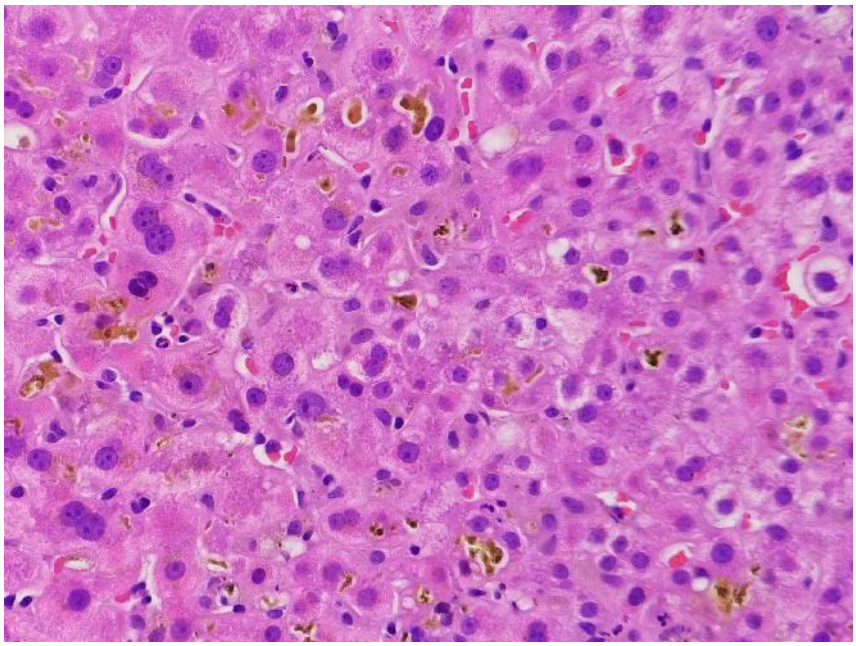
M9: Centrilobular necrosis and congestion around central vein



M10: Granulomatous lesion with necrosis in centre and surrounding infiltrate



M11: Granuloma with necrosis in centre surrounded with giant cell(arrow) and lymphocytic infiltrate



M 12: Cholestasis with bile stain in between hepatocytes

Table 8: Frequency Distribution of Congestion by Age and Sex

Age distribution (in years)	Male		Female		Total	
	No. of patients	Percentage	No. of patients	Percentage	No. of patients	Percentage
10-20	2	4.26%	0	0.00%	2	3.45%
21-30	10	21.28%	2	18.18%	12	20.69%
31-40	16	34.04%	4	36.36%	20	34.48%
41-50	9	19.15%	3	27.27%	12	20.69%
51-60	5	10.64%	1	9.09%	6	10.34%
61-70	3	6.38%	1	9.09%	4	6.90%
71-80	2	4.26%	0	0.00%	2	3.45%

Table 9: Frequency Distribution of Fatty changes by Age and Sex

Age distribution (in years)	Male		Female		Total	
	No. of patients	Percentage	No. of patients	Percentage	No. of patients	Percentage
10-20	0	0.00%	0	0.00%	0	0%
21-30	3	17.65%	1	25.00%	4	19%
31-40	6	35.29%	1	25.00%	7	33%
41-50	5	29.41%	1	25.00%	6	29%
51-60	2	11.76%	1	25.00%	3	14%
61-70	1	5.88%	0	0.00%	1	5%
71-80	0	0.00%	0	0.00%	0	0%

Table 10: Frequency Distribution of Cirrhosis by Age and Sex

Age distribution (in years)	Male		Female		Total	
	No. of patients	Percentage	No. of patients	Percentage	No. of patients	Percentage
10-20	0	0.00%	0	0.00%	0	0%
21-30	0	0.00%	0	0.00%	0	0%
31-40	1	16.66%	0	0.00%	1	17%
41-50	3	50%	0	0.00%	3	50%
51-60	2	33.33%	0	0.00%	2	33%
61-70	0	0.00%	0	0.00%	0	0%
71-80	0	0.00%	0	0.00%	0	0%

Table 11: Frequency Distribution of Hepatitis by Age and Sex

Age distribution (in years)	Male		Female		Total	
	No. of patients	Percentage	No. of patients	Percentage	No. of patients	Percentage
10-20	0	0.00%	0	0.00%	0	0%
21-30	0	20.00%	0	0.00%	0	0%
31-40	2	40.00%	1	20.00%	3	60%
41-50	2	40.00%	0	0.00%	2	40%
51-60	0	0.00%	0	0.00%	0	0%
61-70	0	0.00%	0	0.00%	0	0%
71-80	0	0.00%	0	0.00%	0	0%

IV. DISCUSSION

Histopathology of organs plays an important role in autopsy, as in many cases on gross internal and external examination of body, there are no significant abnormality found and to come to final opinion for cause of death, commonly viscera are being taken and preserved for chemical and histopathological examination. Many of these cases can be sudden, unexpected, clinically unexplained or obscure. In such cases histopathological and chemical examination in combination differentiates natural and unnatural death, which is most important objective of medicolegal autopsy. In cases where chemical examination report is negative, role of histopathology becomes more important.

Gross findings during autopsy that give some clue about underlying diseases can be correlated with findings of histopathology. Histopathological examination report becomes documentary proof about any pathological conditions of deceased which was unknown during his/her life time to relatives and also to police.

Autopsy surgeon, sometimes has to come across some alleged homicidal cases where person has died following an inflicted injury but gravity of that injury does not explain about death of that person. A person suffering from a fatal illness, any trauma can aggravate or precipitates a disease condition that can lead to death. It is not necessary that the trauma be an aetiological condition. Death may occur from a slight injury inflicted on a previously diseased organ. Here histopathology gives an aid in determining about the death, whether it is homicidal or due to precipitation of pre-existing pathological condition.

One of important organs preserved for histopathological examination is liver. Liver has vital role in maintaining metabolic homeostasis and a site for first pass metabolism. It is exposed to wide variety of insults as metabolic, toxic, infections, circulatory, etc, that can lead to large number of diseases, most of them are symptomatic and some remain undiagnosed and found on autopsy and histopathology. This study also gives some idea about prevalence of liver diseases in that region. Silent liver diseases are very common in apparently healthy individual.

In this study, total 100 liver specimens were examined grossly in terms of color, weight, surface and consistency and later slides were prepared for histological examination. Distribution of cases is between 10 year and 80 year, with maximum number 31 cases are in the age

group of 31-40 years followed by 23 cases in 21-30 year, then 21 cases in 41-50 years shown in Table 1 and Figure 1. In this study, the incidence of liver disease was maximum in the 3rd and 4th decade of life with male predominance, which is similar to the observations of Pathak A, et al.

Males predominated in number compared to female i.e.77% male and 23% female and male:female ratio of 3.3:1 [Table 2 and Figure 2]. In all age groups males are predominant [Table 3]. It is due to the fact that male are more involved in outside activities related to work, makes them more vulnerable to RTA which is most common cause of unnatural death in autopsies and also men are more involved in abuse such as alcohol and smoking.

In this study most common cause of death is due to RTA occurred in 36% cases followed by poison in 24% cases and then 11% sudden natural deaths. 4 cases of COVID-19 are also reported. [Table 4].

On gross examination of liver, maximum number of liver i.e. 71 out of 100 are normal with reddish brown color, soft and smooth surface, followed by 14 yellow and greasy liver. 10 liver has white patches on surface, in 4 case surface is nodular and 1 case has nutmeg appearance. Most common gross pathological finding is yellow greasy liver which is also seen in study of Bal MS et all[1], Umesh BR [3] et all & and Rathod D[13] et all while in study of Alagarsamy J et all [9] nutmeg was most common finding after normal smooth liver.

55 (maximum number) livers weighed normal, followed by 30 liver weighted between 1500 to 2000 grams, 7 between 2000 to 2500 grams and 3 were less than 1000 grams; 2 specimen was more than 2550 grams in weight (Table 6) with male dominance in every category (Figure 4).

On histology of liver specimen, venous congestion of liver is seen in most cases 58 %, which is a common phenomenon at time of death. Most common liver lesion found is fatty change in 21% followed by cirrhosis 6%, hepatitis 5%, necrosis 3%, CVC 3%, granulomatous lesion 2% and cholestasis in 2% depicted in Table 7 and Figure 5. Maximum no. of fatty changes among all pathological liver lesion in present study was comparable to findings observed in all studies by Bal MS et all[1], Porwal et all[6] , Umesh R et all [3], Alagarsamy J et all [9] and Patel PR et all [2].

Age and Sex wise distribution of fatty change including macrovesicle and micro-vesicle showed maximum number in age group 31-40y and 41-50y with male predominance as male in these age groups are more involved in alcohol consumption which is a major cause of fatty liver (steatosis) depicted in Table 9. In study conducted by Devi Ph M et all [5], highest number of cases was in the age group of 21-30 years with a male: female ratio of 3:1.

In present study, frequency distribution of Cirrhosis by age and sex is 6% and all cases fall under male category shown in Table 10. which is comparable to Sameer et al (7.3%). Out of 6 cases, 5 subjects had history of Chronic alcohol intake. In other studies, cirrhosis frequency are high in Devi Ph M et all 25% [5], Bal MS et all 14% [1], Alagarsamy J et all 16% [9] and in comparison to this study found low in Porwal et all 3.4% [6], Patel PR et all 2% [2], Umesh R et all 1.9% [3].

Hepatitis was found in 5 cases out of 100 in present study. In the study conducted by Bal et all they observed hepatitis in 3% of cases, while Prashant, et al reported 1% cases of hepatitis.

Chronic venous congestion with features of centrilobular necrosis, fatty changes and congestion was found in 3% cases while 9% was observed in Bal MS et all [1] and 1.22 % in Patel PR et all[2].

2% cases showed granulomas under microscope with feature of necrosis and epithelioid cells or giant multinucleated cells (Langerhans) surrounded by lymphocytes was found in this study similar to that observed in Porwal et all (2.05%) [6] and Umesh R et all [3] observed hepatic granulomas in 4 cases out of 100 that is double the no. to that of current study.

Covid 19 positive cases of this study did not have any significant finding other than congestion. In 2% cases cholestasis was found in current study with feature of bile stain in hepatocytes.

In this study, no case of malignancy of liver is found while in other studies where cases of malignancy was observed are Bal MS et all (3%) [1], Sameer MA et all (1.33%) [7], Patel PR et all (0.48%) [2] and Dewangan T et all [10] found malignancy in 2.5% of cases.

V. CONCLUSION

In this study most common liver pathology was Steatosis followed by hepatitis. The use of autopsy findings in conjunction with other scientific methods and investigative techniques is valuable in daily practice and for research purpose. Silent liver diseases are very common in apparently healthy individual and if not detected early some of this condition may lead to serious outcome. Histopathology plays a vital role in medico-legal autopsy cases in which cause of death is not known after autopsy because of no significant finding found. This study does not reflect the actual pattern of liver diseases in population but emphasizes the need of further studies for early detection and treatment of vulnerable groups.

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