

Interesting and Incidental Insights of Pathological Autopsy in a Tertiary Care Hospital.G. Sharmila¹, D. Prem Charles², V.Uma³¹Assistant Professor, Department of Pathology, Government Erode Medical College & Hospital, Erode, Tamil Nadu, India-638057.²Assistant Professor, Department of Pathology Government Erode Medical College & Hospital, Erode, Tamil Nadu, India-638057.³Tutor, Department of Pathology Government Thiruvannamalai Medical College & Hospital, Thiruvannamalai, Tamil Nadu, India-606604

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Conflict of interest: Nil

Abstract:**Background:** Pathological autopsy are performed to diagnose a particular disease or for research and academic purpose. They aim to determine, classify or confirm medical diagnosis that undiagnosed or unrevealed before patient's death.**Aims And Objectives:** The aim of the study is

- To study the different histopathologic findings and highlight the interesting cases.
- To study the demographic and epidemiological parameters in mortality.

Materials and Methods

This study was undertaken in our department of pathology, Government Erode medical college, Perundurai, from November 2021 to December 2022 to determine the unknown cause of mortality which is undiagnosed in clinical autopsy.

Results: A total of 198 studied cases, 18 were autolysed, 50 cases were histopathologically unremarkable. Significant microscopic findings were found in 130 cases. The commonest cause of death is Myocardial infarction and atherosclerosis followed by pulmonary edema and pulmonary Tuberculosis. The incidental and interesting diagnoses we encountered is Leiomyoma larynx, Tuberculous Pericarditis, Myocarditis, Germ cell tumour of testis, Mitral stenosis complicating pregnancy, Acute tubular necrosis of kidney and Chronic Pyelonephritis.**Conclusion:** Current study was carried out with the purpose to establish the importance of Pathologic autopsy, histological examination of viscera to find the cause of death, its use as a tool to study the epidemiology, demographic pattern of mortality statistics in the regional area. Since myocardial infarction and atherosclerosis is the leading cause of mortality in our study, it emphasize the need for strengthening of Preventive medicine for screening of risk factors at Primary health care level. Since pulmonary tuberculosis also ranks among the leading causes of mortality in our study it emphasize the need for addressing the gap in the diagnosis and treatment of the individual for the better society.**Key Words:** Pathologic autopsy, Histopathology, Myocardial infarction.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Medico legal autopsy generates an evidentiary document that forms a basis for opinion rendered in criminal trial and deposition. Pathologist plays a role in clinical autopsy or pathological autopsy useful in determining the cause of death or any underlying undiagnosed pathology in the deceased person [1]. The term Forensic Pathology was founded by Rudolf Virchow, a german pathologist. Forensic pathology was first recognised in the united states by the American Board of pathology in 1959. The incidental findings during pathologic autopsy offers great resource in research and academic purpose. This study emphasize on the different

histopathological findings we encountered in our tertiary care hospital. [2,5]

Material and Methods

The present study is a retrospective study conducted in Pathology Department, GEMCH, Perundurai over a period of one year from November 2021 to November 2022. All those cases received for Pathological autopsy where analysed and included in this study. A total of 198 cases were received in the Department of pathology. The viscera was received in 10% formalin solution along with post-mortem papers containing the personal details of the deceased, postmortem examination report and

suspected cause of death. The tissue was processed after fixation, stained with haematoxylin-eosin stain and viewed under light microscope to outline cause of death.

Results:

A total of 198 cases were received during the period of study along with the Post-mortem details. Of the

198 studied cases, 18 were autolysed, 50 cases were histopathologically unremarkable. Significant microscopic findings were found in 130 cases. Males were more common than females with a ratio of 4:1. Age distribution ranges from 4years-72 years. The most common age group 20-40 years (42%).

Table 1: Age wise distribution of cases

AGE	No of cases	%age
<20 years	13	10%
21-40 years	55	42.30%
41-60 years	47	36.15%
>60years	15	11.53%

Table :2 Genderwise distribution of cases

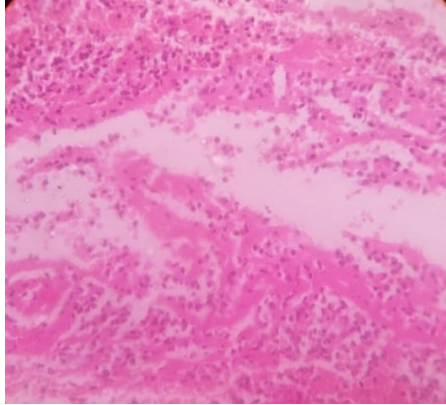
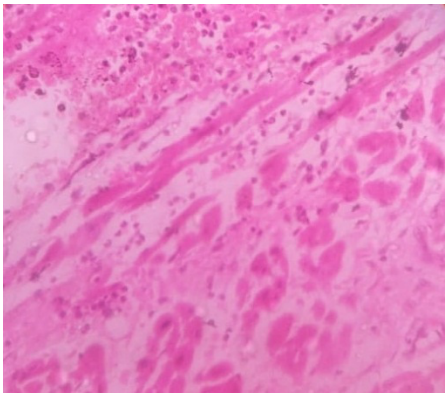
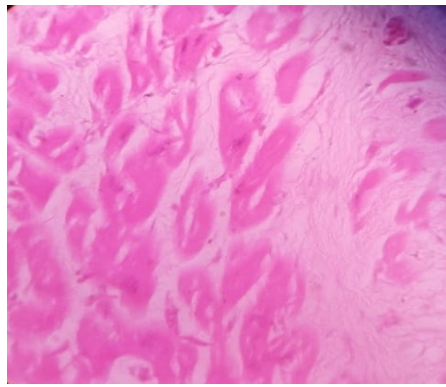
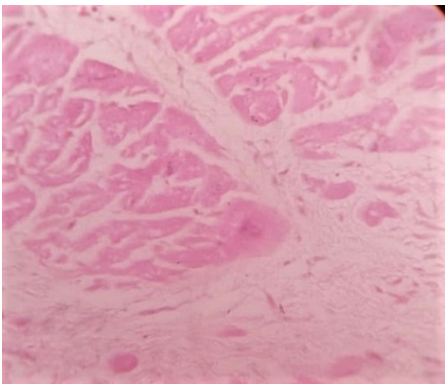
GENDER	No of cases	%age
MALE	105	80.7%
FEMALE	25	19.3%

Table 3: Spectrum of histopathological findings

Histopathological findings	No of cases : 130 (Percentage)
CARDIOVASCULAR SYSTEM	50 (38.46 %)
Myocardial infarction	24 (18.46 %)
Atherosclerosis	22 (16.92 %)
Pericarditis	01 (0.76 %)
Myocarditis	01 (0.76 %)
Hypertrophied Myocardium	01 (0.76 %)
Mitral stenosis	01 (0.76 %)
RESPIRATORY SYSTEM	38 (29.2 %)
Pulmonary congestion	14 (10.76 %)
Pneumonia Lung	08 (6.15%)
Tuberculosis lung	08 (6.15 %)
Pulmonary edema	05 (3.84 %)
Interstitial Lung disease	01 (0.76 %)
Pulmonary emphysema	02 (1.53 %)
HEPATOBIILIARY SYSTEM	20 (15.38 %)
Fatty liver	16 (12.30%)
Cirrhosis liver	02 (1.53 %)
Chronic venous congestion liver	02 (1.53 %)
RENAL SYSTEM	04 (3.07%)
Chronic Pyelonephritis	02 (1.53 %)
cortical cyst	01 (0.76%)
Acute tubular Necrosis	01 (0.76%)
UTERUS	10 (7.69 %)
Endometriosis	01 (0.76%)
Secretory endometrium	04 (3.70 %)
Proliferative Endometrium	03 (2.30 %)
Decidual change with Products of conception	02 (1.53 %)
SKIN (Electrocution, Snake Bite, Hanging)	05 (3.84 %)
LARYNX-LEIOMYOMA	01 (0.76%)
TESTIS TUMOR	01 (0.76%)
ESOPHAGEAL EROSION	01 (0.76%)


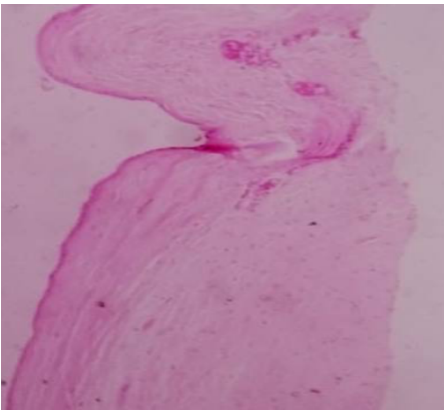
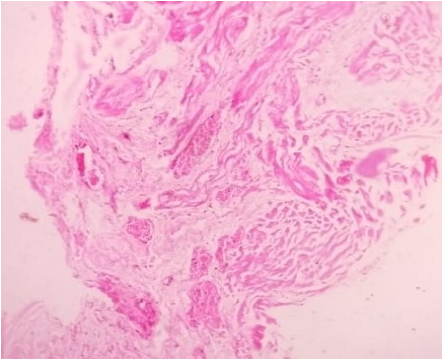
Cardiovascular system (38.46%) was the most common system involved, which shows Myocardial infarction (both acute and healed) (24 cases) as most common histopathologic finding followed by atherosclerosis (22 cases), Myocarditis (1 case), mitral stenosis (1 case), hypertrophied myocardium (1 case) and Pericarditis (1 case). one interesting case was a 40 years male, history of fever

and death, we received heart specimen, cut surface left atrium and ventricle shows brownish friable areas, Microscopically sections studied shows cardiac myocytes infiltrated by lymphocytes, plasma cells, few eosinophils and few macrophages, no evidence of granuloma seen, features are suggestive of Myocarditis.

	
<p>Figure . 1 a. 10X View:Myocarditis- Cardiac myocytes are infiltrated by inflammatory cells.</p>	<p>Figure 1b: 40x showing mononuclear Cell infiltration</p>
	
<p>Figure 2a : 40x:Hypertrophic cardiomyopathy- Shows haphazard orientation of Hypertrophic myocytes which gives swirling appearance</p>	<p>Figure 2b : 40x: Shows focal interstitial fibrosis with bizarre shape myocytes.</p>

Another case was a 28 years female, antenatal 32 weeks, admitted in OG department, maternal death, we received whole heart and lung for histopathology examination. Grossly received whole heart. Cut surface shows left atrium appears dilated, mitral valve appears diffusely thickened, fibrotic and distorted measuring 0.4cm thickness, 3cm circumference along free edge and measuring 1cm from free edge to base. Surface of mitral valve leaflet is white to tan, no vegetations noted. chordaetendinae appears to be thickened and shortened. Left ventricular wall thickness is 1.5cm,


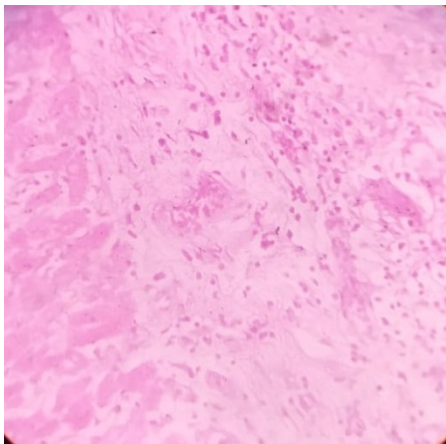
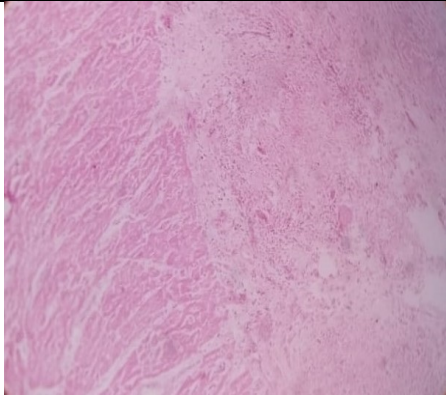
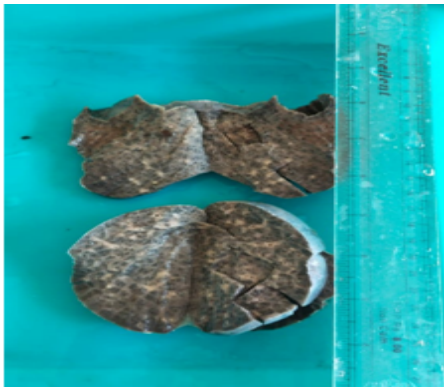
interventricular septum is 1cm, right ventricular wall thickness is 0.8cm. Microscopically the received heart shows myxomatous degeneration, transmural fibrosis and neovascularisation of mitral valve leaflet. Chordaetendinae appears thickened and fibrotic. These features are consistent with mitral valve stenosis. No features of aschoff nodules or vegetations noted in the sections studied. H&E sections studied from the received lung shows features of congestion and heart failure cells, suggestive of chronic pulmonary congestion of both lungs.

	
<p>Figure 3.a. Gross picture of stenotic Mitral valve.</p>	<p>Figure 3b: Mitral leaflet showing increased Interstitial fibrosis and neovascularisation.</p>
	
<p>Figure. 3c: Showing moderate endocardial fibrosis.</p>	

Another interesting case was a 20 years male, history of chest pain and sudden death, we received heart showing hypertrophied left ventricular wall on grossing, microscopy shows disarray bundles of hypertrophied cardiac myocytes and bizarre shaped hypertrophied myocytes and interstitial fibrosis. Features are suggestive of Hypertrophic cardiomyopathy.

30 years male, history of fever and death, we received heart and lungs. Received heart on grossing

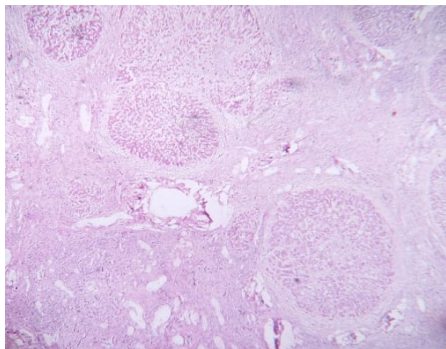
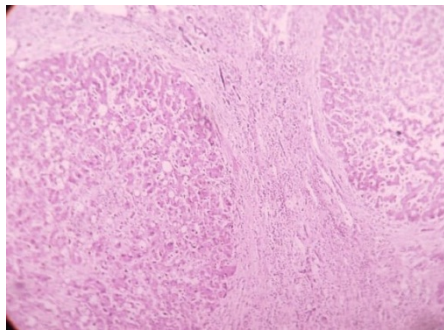


revealed thickened and fibrosed pericardium with exudates on surface. Microscopically received heart shows features of Granulomatous pericarditis. Received portion of lung on sectioning shows diffusely scattered nodular grey white areas. Microscopically received lung sections studied also shows features of Caseating necrotising Granulomatous inflammation.

	
<p>Figure 4a: Gross picture of heart showing thickened and fibrosed Pericardium.</p>	<p>Figure 4b: 40X-Showing pericardium with lymphocytes and giant cells</p>
	
<p>Figure 4c: Showing Granulomatous pericardial inflammation.</p>	<p>Figure 4d: Showing gross image of lung of the same Patient showing dispersed grey white areas.</p>

In Respiratory system, pulmonary congestion (14 cases) is the most common histopathological finding followed by pneumonia lung (8 cases), pulmonary tuberculosis (8 cases), pulmonary edema(5 cases),pulmonary Emphysema (2 cases),Interstitial lung disease (1 case).Interesting case is a 46 years female with complaints of difficulty in breathing followed by sudden death we received lung specimen-external aspect hilar nodes seen, cut surface shows grey white, firm areas, Microscopically lung sections studied shows


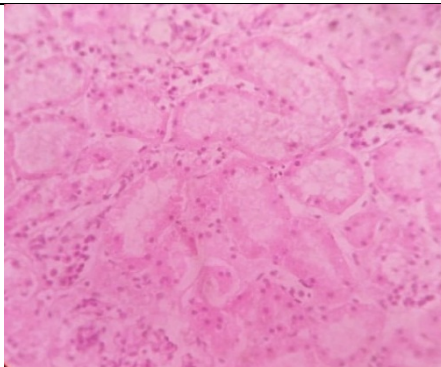
features of Usual interstitial pneumonia and reactive hyperplasia of hilar nodes.

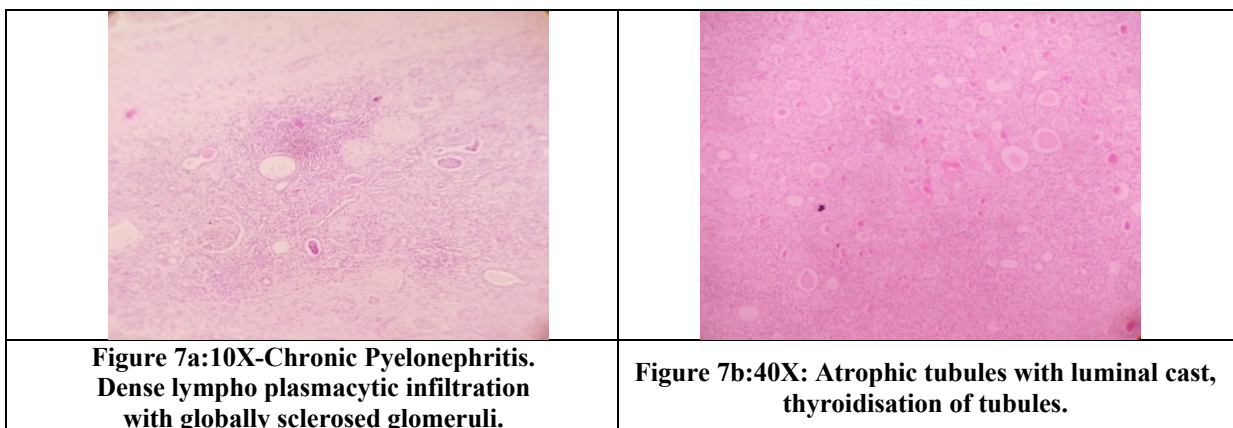
In Hepatobiliary system apart from Fatty liver (16 cases),we encountered chronic hepatitis (2 cases), cirrhosis liver (2 cases). Interesting case is a 60 year old alcoholic male admitted with complaints of jaundice and liver failure, died. We received specimen of liver. External surface and cut surface showing nodules of varying sizes. Microscopically shows disruption of liver parenchyma, multiple regenerative nodules with bridging fibrosis.

	
<p>Fig 5a:10X-Liver showing nodules of varying sizes</p>	<p>Fig5b-40X View showing cirrhotic regenerative nodule with fibrosis inbetween.</p>
	
<p>Figure 5c. Liver 1</p>	<p>Figure 5d. Liver 2</p>
<p>Figure 5c &5d: Showing gross image of liver with cirrhotic nodules of varying sizes.</p>	

In Renal system, we encountered chronic pyelonephritis (2 cases), simple renal cyst (1 case), Acute tubular necrosis (1 case). Incidental case is a 54years female, found dead, brought for post-mortem. On grossing kidneys shows scarring on external aspect, cut section shows grey white pus pointing areas. Microscopically, shows diffuse lymphoplasmacytic infiltration and thyroidisation of tubules suggestive of Chronic

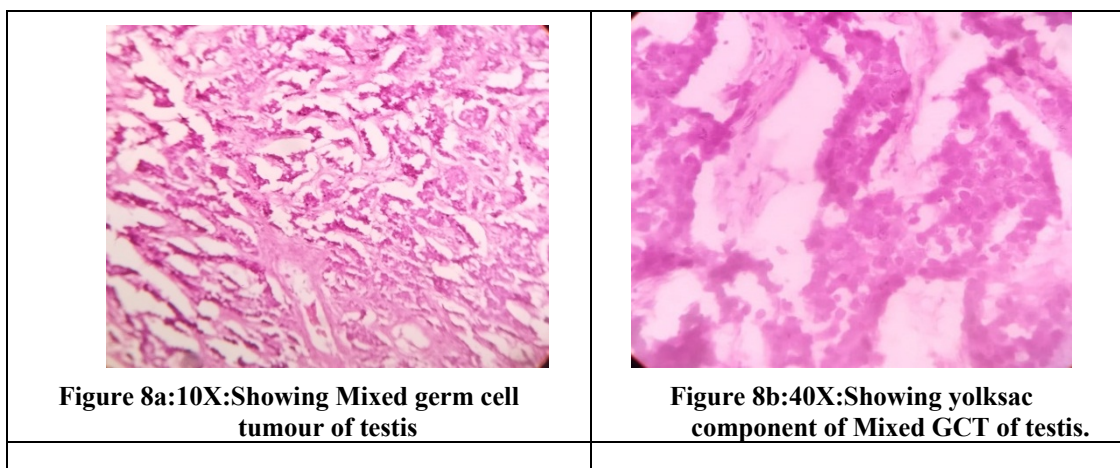
pyelonephritis. Another one, a case of 21 years female, maternal death, we received both kidneys and other organs. Grossly, External surface-appears pale, microscopically both kidneys shows attenuation of tubules, loss of brush borders, increase eosinophilic staining of tubules, hyaline / fibrin casts , features suggestive of Acute tubular necrosis.

	
<p>Figure 6a: Showing Gross picture of Acute tubular necrosis.</p>	<p>Figure 6b: Showing attenuation, loss of brush border and increased eosinophilic staining, lumen filled with hyaline/fibrin casts. (40x)</p>



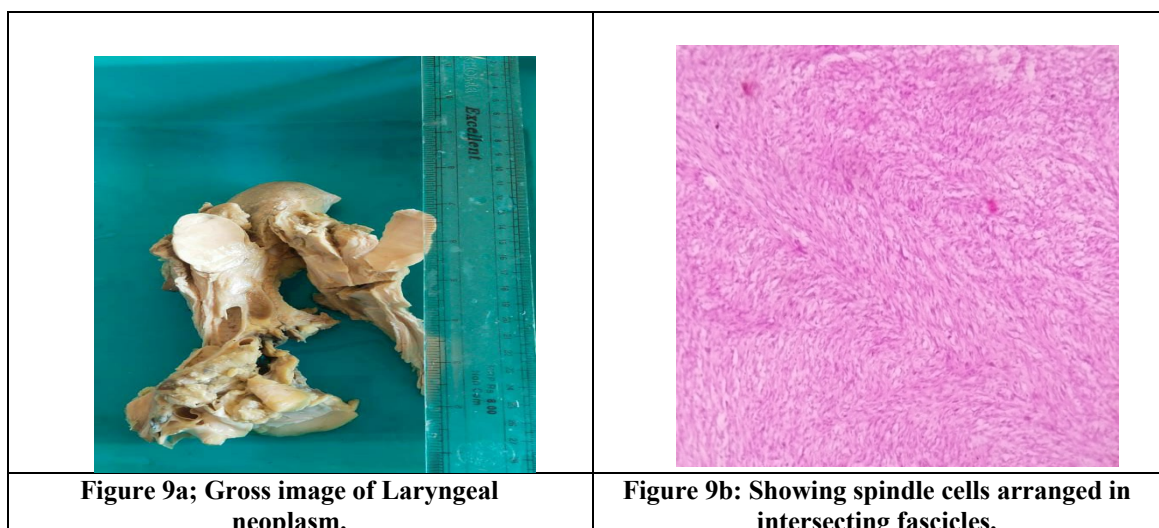
Another incidental case was a 26 years male, migrant worker, history of scrotal swelling, died, we received testicular mass .External surface-nodular, cut surface shows grey white and grey brown hemorrhagic areas replacing entire testicular

parenchyma, rim of testis noted in periphery. Microscopically sections studied shows features suggestive of Mixed germ cell tumour-Embryonal carcinoma (60%), seminoma (20%), yolk sac component (20%).



Another one ,a case of 35 years female with history of difficulty in breathing past one month and history of sudden death. we received heart, lungs and larynx with trachea specimen grossing revealed grey white, firm, soft tissue mass seen arising from aryepiglottic

fold measuring 5x3x3cm.three lymphnodes are seen on the surrounding paralaryngeal soft tissue, Microscopy shows well circumscribed, unencapslated benign spindle cell neoplasm, suggestive of Leiomyoma of larynx.



Discussion:

According to our study the most common organ involved is cardiovascular system (38%) followed by respiratory system (31.5%). This finding is similar to study done by Pathak et al [2]. In cardiovascular system atherosclerosis and Myocardial infarction was the most common causes. These findings are similar to study conducted by Arunalatha et al [6]. Most of the individuals with atherosclerosis were at the age group 30-50 years age group, which indicates the risk factors for Myocardial infarction are at increase. [3-5]

Another highlighting case is Mitral stenosis. Rheumatic heart disease (RHD), an important cause of cardiac morbidity and mortality among children and young adults affecting an estimated 15.6 million people yearly and annually responsible for 300,000 deaths worldwide [10]. Heart valve shows marked inflammatory cellular infiltrates. These cells and macrophages produce cytokines and inflammatory mediators that are implicated in interstitial and extracellular matrix fibrosis. According to study by Sarch et al Rheumatic mitral stenosis is the most common cardiac disease found during pregnancy. Increased workload due to increased volume are not well tolerated in pregnancy. Close follow up during pregnancy will allow early recognition of symptoms and timely intervention to avoid unfavourable maternal or fatal outcome. [8]

Myocarditis is a diverse group of pathologic entities in which infectious microorganism or primary inflammatory process cause myocardial injury. Grossly, the heart in myocarditis may appear normal or dilated. Active myocarditis is characterised by interstitial inflammatory infiltrate associated with focal myocyte necrosis. According to study done by Cooper et al [9], the incidence of Myocarditis in India is 0.05%. Usual presentation of Myocarditis is sudden cardiac death, acute coronary syndrome, cardiac failure. [11,12]

In a study done by Prashant et al he reported 3 cases of Hypertrophic cardiomyopathy with history of sudden death [19]. Hypertrophic cardiomyopathy is a clinically heterogenous disorder characterised by myocardial hypertrophy, poorly compliant left ventricular myocardium [7]. The heart is thick walled, heavy and hyper contracting involves disproportionate thickening of ventricular septum. Microscopically, characterised by myocyte hypertrophy, myofibre disarray >10%, interstitial fibrosis. Early identification of these individuals and screening of family members is essential.

According to our study Tuberculous pericarditis is 0.76% of total cases, which is similar to study by Dybowska et al. In their study, Tuberculous pericarditis (TBP) accounts for 1% of all forms of tuberculosis and for 1-2% of extra pulmonary tuberculosis. In endemic regions, TBP accounts for

50-90% of effusive pericarditis; in non-endemic, it only accounts for 4%. In the absence of prompt and effective treatment. [14] TBP can lead to very serious sequelae, such as cardiac tamponade, constrictive pericarditis, and death. Early diagnosis of TBP is a cornerstone of effective treatment. Early diagnosis of TBP by microbiological methods is very difficult due to the fact that the number of mycobacteria in the pericardial fluid is low. The progress in TBP recognition is based on molecular methods. Caseating granulomas are confirmed in 10-70% of cases with tuberculous pericarditis; however, molecular testing of pericardial biopsy samples is characterised by a greater sensitivity and specificity (80 and 100%, respectively). Tuberculosis is still considered to be one of the major burden of health industry. In spite of WHO's post-2015 End TB strategy, which aims to end the global TB epidemic, still tuberculosis remains as leading cause of death by infectious diseases. The strategy is not a 'One size fits all' approach and its success depends on adaptation for diverse country settings. Study done by Sangma et al [13] also says that, increased cases of tuberculosis at autopsy without previous history indicates that they are undiagnosed or some gap in diagnosing and treating of the individual, which should be addressed promptly which includes creating awareness among the community regarding treatment and cure. Drug resistant strains of tuberculosis have also emerged creating a growing sense of urgency to control the spread of disease. We have to address the key gap along diagnosing and treating infection.

In respiratory system, most common finding is Pulmonary congestion. This finding is similar to study done by Sulegon et al [3]. Second most common finding is tuberculosis lung followed by pneumonia lung. This finding is similar to study by Garg et al which shows increase in cases of pulmonary TB in autopsy findings and contrast with study by Mohanvir et al which shows decreased incidence of Pulmonary Tuberculosis.

In our study, another incidental case is Usual Interstitial Pneumonia (1 case). ARAKI et al. [23] reported a consecutive post mortem series of 86 elderly patient with IPF in whom the most common causes of death included: bacterial pneumonia (23%), progressive IPF (20%), lung cancer (17.4%) or an acute exacerbation of IPF (10.5%). Daniels et al [24] study identified nine (21%) patients who did not have IPF diagnosed ante mortem. In five of these undiagnosed cases, IPF was the immediate cause of death and in four of the subjects the initial presentation of IPF was acute exacerbation of IPF with DAD on UIP at post mortem. This finding confirms that suggested acute exacerbation of IPF may be the initial presentation in some patients with IPF who have minimal symptoms and have not previously presented for a medical evaluation.

In Hepatobiliary system, most common diagnosis was Fatty liver (16 cases) followed by Cirrhosis (2 cases). This finding is similar to study conducted by Arunalatha et al [6] and Alagarsamy et al [8] who also says fatty liver as the most common lesion. As liver is the major organ involved in metabolism it bears the brunt of the works done such as circulatory, toxic and microbial injury. Fatty liver is the initial and reversible manifestation of liver injury. Cirrhosis is the burnt out end stage liver disease occurs due to chronic alcohol abuse and chronic hepatitis. Diffuse nodulation of liver due to fibrous bands sub divides liver into regenerative nodules. Microscopically, characterized by disruption in architecture of the liver, Bridging fibrous septa and Rounded parenchymal nodules of regenerating hepatocytes. Sub classification: Laennec fibrosis scoring system -4A: mild cirrhosis; marked septation with rounded contours or visible nodules; most septa are thin (1 broad septum allowed), 4B: moderate cirrhosis with at least 2 broad septa, 4C: severe cirrhosis with at least 1 very broad septum or many minute nodules. Our case falls into category 4B according to Laennec classification.

In renal system, Chronic pyelonephritis is the most common histopathological finding we encountered (2 cases), contrast to that of study by Schrier et al [17]. Chronic pyelonephritis is diffuse or patchy tubulointerstitial inflammation and scarring accompanied by blunting of calyces and the renal pelvis. Chronic inflammation and infection leading to deformed and atrophic calyces with fibrosis and scarring of the renal parenchyma. Recurrent damage and scarring leads to renal insufficiency and end stage renal disease (ESRD). Microscopically, characterized by Patchy interstitial lymphoplasmacytic inflammation with occasional, focal neutrophilic infiltration. Tubular atrophy with thyroid type tubular atrophy and interstitial and periglomerular fibrosis. Secondary segmental glomerulosclerosis seen.

Acute tubular necrosis is characterised clinically as acute renal failure. The critical events are believed to be tubular injury and persistent and severe disturbances in blood flow. Sudden decline in renal function, secondary to ischemic or toxic damage to renal tubular epithelial cell. Ischemia leads to vasoconstriction and decreased renal perfusion, causing damage and dysfunction of renal tubular endothelial cells that in turn leads to damage and dysfunction of renal tubular epithelial cells. Nephrotoxins are a direct cause of renal tubular epithelial cell damage and dysfunction. Apoptotic sloughed off tubular cells and eosinophilic and granular casts, comprised mainly of Tamm-Horsfall protein, obstruct the lumen leading to a decrease in glomerular filtration rate (GFR) and oliguria. Microscopically, characterized by Attenuation of tubular epithelium with loss of brush border and blebbing of apical cytoplasm

with increased eosinophilic staining. Tubular lumens filled with sloughed off necrotic tubular epithelial cells, fibrin debris or hyaline casts.

One of the incidental and interesting case encountered during autopsy is laryngeal leiomyoma. Study done by Farman observed incidence of 0.001% in a series of 7748 cases he studied. Laryngeal leiomyoma are submucosal pedunculated or sessile tumors, majority arise in the supraglottic region followed by glottis. In our study the lesion was found in supraglottic region. Histologically Leiomyoma may be classified as simple, epitheloid, vascular leiomyoma. Cause of death in this case is due to dyspnea and stridor. Benign laryngeal neoplasm are very rare. It includes papillomas, oncocytic tumour, pleomorphic adenoma, lymphangioma, neurofibroma, paraganglioma, leiomyoma, and rhabdomyoma. Leiomyoma is non epithelial benign tumour. It is composed of intersecting bundles of mature smooth muscle cells. Leiomyoma of the head and neck region accounts for less than 1% and it is rarely seen in the larynx (20). Adults are more affected than children whereby the male to female ratio is 2:1.

Another highlighting case was mixed germ cell tumor of testis. According to study by Steele et al, who offered several explanations for late presentation, may be lack of awareness, embarrassment in seeking medical attention. Delay in diagnosis leads to more extensive disease and metastasis. Although relatively rare (1% of male neoplasms and 5% of urological tumors), testicular cancer (TC) is the most common malignancy in males aged 15–40 years with an increasing incidence during recent decades. Histologically, around 95–98% of all testicular cancers are testicular germ cell tumors (TGCT). Primary germ cell tumours arise by the malignant transformation of Primordial germ cells. Primary GCT of testis constitute 95% of all testicular tumours. It can be either seminomatous GCT or Non seminomatous GCT. Non seminomatous GCT represents 50% of all GCTs. Most frequently present in third decade of life. Most tumours show mixed histopathologic cell types; consisting of two or more cell lines. Mixed germ cell tumors (GCT), by definition, contain more than one germ cell component. They account for one-third of all GCTs and about 70% of all non-seminomatous GCTs. The most frequent combinations are embryonal carcinoma with seminoma, teratoma, or yolk sac tumor [22]. However, any combination can be seen. Tumors often contain more than two components. Embryonal carcinoma is the most undifferentiated type of NSGCT. It consists of epitheloid cells or poly gonal cells arranged in the form of nests or tubuloglandular structures or as sheets, necrosis and hemorrhage are observed. Yolk sac tumour is most common germ cell tumour in children, where it occurs in pure form, but in adults is found approx 50% of mixed germ cell tumours.

Histologically characterised by presence of schiller duval bodies, pleomorphism, hyaline globules.

Limitation

Present study does not focus on single individual system in depth and cases pertaining to that in detail, aims only to highlight the spectrum and interesting cases.

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Nil.

Ethical statement

Institutional ethical committee approved (Ref no:IEC/001/GEMC&H/2022 dated 30.08.2022) this study. **Conflicts of interest**

There are no conflicts of interest.

Author's contribution

Dr. G.Sharmila - conceptualization, data curation, investigation, methodology, project administration, visualization, writing—original draft, writing—review and editing; **Dr. D. Prem Charles** - conceptualization, methodology, writing—original draft, writing—review and editing; **Dr. V.Uma** - conceptualization, visualization, supervision, methodology, writing—original draft, writing, review and editing. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. All authors have read and agreed to the published version of the manuscript.

Data Availability

All datasets generated or analyzed during this study are included in the manuscript.

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