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Original Research Article

Correlation of Coagulation Profile in Liver Disease Patients in Tertiary Care Hospital

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Abstract:

Introduction: Patients suffering from liver illnesses often exhibit intricate clinical profiles, requiring thorough examinations of demographic variables, disease prevalence, and biochemical indicators. This research investigates the demographic distribution of age and gender among patients who are admitted to the hospital, as well as the occurrence of liver illnesses and the corresponding laboratory test results.

Methods: The study used data from 150 patients who were admitted to the hospital. The data was evaluated to determine the distribution of age, the composition of gender, the prevalence of liver illnesses, and essential biochemical parameters such as Prothrombin Time (PT), Activated Partial Thromboplastin Time (aPTT), serum enzymes (SGOT, SGPT), and platelet counts. Statistical studies were performed to ascertain the proportions of modified and standard values for each parameter across various diagnoses.

Results: The research shows that male patients are the most common in all age categories, accounting for 68% of the cases. The distribution of liver disorders is diverse, with chronic liver disease being the most frequent, accounting for 63% of the cases. Biochemical evaluations reveal notable changes in prothrombin time (PT) (57%), activated partial thromboplastin time (aPTT) (64%), serum glutamic-oxaloacetic transaminase (SGOT) (73.33%), serum glutamic-pyruvic transaminase (SGPT) (43.33%), and platelet counts (50.67%) across various liver illnesses, indicating a wide range of clinical presentations and degrees of severity.

Conclusion: This research highlights the diversity in the characteristics and conditions of liver disease patients who are admitted to the hospital, with a particular focus on the high occurrence of chronic liver disease and significant abnormalities in biochemical markers. Gaining a comprehensive understanding of these patterns is essential for enhancing diagnostic and therapeutic procedures that are customized to the individual profiles of patients in clinical practice.

Keywords: Liver Disease, Biochemical Parameters, Gender Disparities, Platelet Count, Chronic Liver Disease.

Introduction

The liver is a vital organ responsible for ensuring correct blood clotting (hemostasis). The liver functions as a manufacturing facility, generating the majority of proteins that have a role in blood clotting. These proteins include those that encourage clotting (procoagulant factors) as well as those that prevent it (anticoagulant proteins). In addition, the liver aids in the regulation of clotting by eliminating these substances from circulation after they are no longer necessary. Liver illness may cause severe disruption to blood flow in the abdomen and raise the risk of bleeding disorders owing to its highly vascularized network of blood vessels. Impaired liver function may cause aberrant blood clotting, also known as impaired hemostasis, due to many factors. The variables included are Diminished generation of coagulation factors: The impaired liver may have insufficient capacity to produce enough quantities of the proteins necessary for blood clotting. Impaired production of clotting factors: The liver may create clotting factors, but the illness process may compromise their functionality. Elevated consumption of clotting factors: Specific liver conditions may result in an abnormal increase in blood clot formation inside the liver, causing a reduction in the amount of clotting factors accessible in the bloodstream. Impaired hepatic clearance of clotting factors: A sick liver may have challenges in efficiently eliminating used or undesirable clotting factors

from the circulatory system, resulting in imbalances. Medical professionals often assess coagulation problems in liver illness by using diagnostic procedures such as prothrombin time (PT) and activated partial thromboplastin time (aPTT) [1].

The aPTT test measures the duration it takes for platelet-poor plasma to form a clot when combined with substances that activate the intrinsic route (factors XII, pre-kallikrein, and high-molecular-weight kininogen) and phospholipids [1,2]. The primary purpose of PT assessment is to evaluate the activity of clotting factors VII, X, II, V, and fibrinogen, which are reliant on vitamin K [3]. It exhibits greater sensitivity to deficits in factors VIII, IX, XI, XII, and those associated with the contact system [3]. Through comprehending these systems, healthcare providers may enhance their ability to recognize and effectively handle bleeding hazards linked to liver illness.

The liver is essential for regulating hemostasis, which is the proper equilibrium of blood components [4]. The organ functions as a versatile entity, responsible for storing vital components necessary for the creation of blood cells (such as iron, vitamin B12, and folic acid) and controlling blood clotting via several processes [4]. The liver synthesizes thrombopoietin, a hormone that stimulates the synthesis of platelets, as well as clotting factors and inhibitors that regulate coagulation [4]. The liver is regarded as the primary controller of hemostasis because of its several roles.

Individuals suffering from chronic liver illness, namely cirrhosis, may encounter irregularities in their blood cell counts, sometimes known as haematological parameters [5]. Multiple causes contribute to the aberrant blood test results, namely the haematological indices (HIs).

These reasons include hypersplenism, which is a condition characterized by the enlargement of the spleen, which causes the spleen to capture and eliminate blood cells [4]. Liver illness may cause disruptions in bone marrow stimulation, leading to changes in the synthesis of substances that promote the generation of blood cells [4]. Bone marrow suppression occurs when toxins linked to certain liver illnesses hinder the bone marrow's capacity to generate blood cells [4]. A liver injury might result in a deficiency or heightened use of coagulation factors [4]. In liver failure, a condition known as "rebalanced hemostasis" develops, characterized by a reduction in both procoagulant and anticoagulant components [4]. Anaemia, a disorder characterized by a shortage of red blood cells, affects around 75% of individuals with chronic liver disease [5].

Normocytic normochromic anaemia is the most common kind of anaemia seen in these instances, and it is commonly associated with chronic inflammation [6]. Multiple other variables may contribute to the development of anaemia in people with chronic liver disease: Haemorrhaging from dilated veins in the oesophagus and rectum (oesophageal and rectal varices), portal hypertensive gastropathy, or antral vascular ectasia may result in iron-deficiency anaemia [6]. Abnormalities in the functional and structural aspects of red blood cell membranes may result in a reduction in their lifetime and give rise to a medical disorder known as acanthocytosis [6].

Material and Methods:

The research included 150 individuals from a hospital's medical clinics who were diagnosed with liver issues by physicians and verified by imaging testing.

Inclusion Criterion: Individuals of all age groups (ranging from 0 to over 70) and diverse backgrounds diagnosed with any kind of liver illness (such as cirrhosis, hepatitis, abscess, etc.) by diagnostic examinations.

Exclusion Criterion: Individuals having a history of bleeding disorders or those who have recently consumed certain drugs such as aspirin, ibuprofen, allergy medications, antibiotics, blood pressure medications, or blood thinners. Invalid blood samples result from errors during collection, such as insufficient quantity, clotting, or improper container use.

Results

Table 1: Represents the age group in years of the patients admitted to the hospital:

Age Group	Female number (N)	Male number (N)	Total no of cases (N)	Total percentage (%)
0-10	1	5	6	4%
11-20	5	3	8	5%
21-30	9	8	17	11%
31-40	6	28	34	23%
41-50	10	22	32	21%
51-60	6	19	25	17%
61-70	7	12	19	13%
More than 70	4	5	9	6%
Total	48	102	150	100%
%	32%	68%	100%	100%

F(N): Number of female cases, M(N): Number of male cases.

Table 1: The data in the table indicates that there is a higher number of male patients in all age categories. Males make up 68% of the total cases, while females account for 32%. The age distribution of patients shows that the most significant proportion of cases, 23% and 21%, respectively, are found within the age ranges of 31-40 and 41-50. This suggests a greater frequency of hospital admissions among those who are in their middle years of adulthood. Age and Gender Interaction: The distribution of gender varies across different age groups, with some groups exhibiting a more equitable or imbalanced ratio of males to females. The 31-40 age groups have a more significant percentage of male patients (82%) in comparison to females (18%).

Table 2: Different types of prevalent disease conditions in the patients:

Diagnosis of the diseased condition	Female number	Male number	Total percentage N (%)
Acute liver failure	1	2	3 (2%)
Acute viral hepatitis	4	4	8 (5%)
Alcoholic fatty liver	3	7	10 (7%)
Alcoholic hepatitis	2	5	7 (5%)
Chronic liver disease	28	66	94 (63%)
Liver sol	4	11	15 (10%)
Non-alcoholic fatty acid liver disease	2	3	5 (3%)
Others	4	4	8 (5%)
Total	48	102	150 (100%)
%	32%	68%	100%

F(N): Number of female cases, M(N): Number of male cases.

Table 2: Gender Distribution: The data indicates a greater prevalence of male patients across all illness categories, with men accounting for 68% of the total cases, while females make up 32%. The ailment with the highest prevalence among the patients is chronic liver disease, which accounts for 63% of all cases. Subsequently, there is a prevalence of hepatic sol (10%) and alcoholic fatty liver (7%). Gender and Disease: Disease prevalence varies across genders. Chronic liver disease and alcoholic hepatitis, for example, have a greater prevalence among males than females, indicating possible disparities in disease vulnerability or exposure depending on gender.

Table 3: Parameter values as observed and recorded in the patient samples:

Parameter	Range of Parameter	Mean ± SD	Altered Value %	Normal Value %	Total %
aPTT (In seconds)	25.2-120	48.9 ± 19.36	95 (63.34%)	55 (36.67%)	150 (100%)
PT (In seconds)	9.2-120	21 ± 15.02	85 (56.67%)	65 (43.34%)	150 (100%)
Platelet Count	13-669	177.8 ± 121.24	76 (50.67%)	74 (49.34%)	150 (100%)
SGOT (IU/ml)	7.1-1800	123 ± 177.62	110 (73.34%)	40 (26.67%)	150 (100%)
SGPT (IU/ml)	8.1-1615	124.6 ± 228.25	65 (43.34%)	85 (56.67%)	150 00%)

aPTT: Activated Partial Thromboplastin Time, PT: Prothrombin Time, SGOT: Serum Glutamic Oxaloacetic Transaminase, SGPT: Serum Glutamic Pyruvic Transaminase

Table 3: The aPTT and PT tests revealed that a higher proportion of values were changed in aPTT (63.34%) and PT (56.67%), suggesting the presence of probable coagulation disorders or deficits in clotting factors among the patients. The platelet count distribution shows a roughly equal balance between altered (50.67%) and normal (49.34%) platelet counts, indicating diversity in platelet function across the patients. The liver enzymes SGOT and SGPT exhibit varying proportions of abnormal results, with SGOT showing a greater percentage (73.34%) compared to SGPT (43.34%). This discrepancy suggests potential differences in the severity of liver damage or malfunction.

Table 4: Percentage of the patient cases with a specific disease and liver function test:

Diagnosis	Total cases (n) number	Altered SGOT (n) levels number of patients	Altered SGPT (n) levels number of patients
Acute liver failure	3	3	1
Acute viral hepatitis	8	6	5
Alcoholic fatty liver	10	8	4

Alcoholic hepatitis	7	5	3
Chronic liver disease	94	65	41
Liver sol	15	13	5
NAFLD	5	4	1
Others	8	6	5
TOTAL	150 (100%)	110 (73.33%)	65 (43.33%)

Table 4: Disease Distribution: The table displays the number of cases for each diagnosis, as well as the quantity and percentage of patients with modified SGOT and SGPT values. Liver function test abnormalities refer to deviations from normal levels of SGOT and SGPT, which are diagnostic tests used to evaluate the overall condition of the liver. The presence of elevated levels of SGOT (73.33%) and SGPT (43.33%) suggests a substantial occurrence of liver dysfunction or damage among the patients. Disease variability: Liver function test abnormalities vary across different disorders. Chronic liver illness has the most significant incidence of modified SGOT (65 cases) and SGPT (41 instances), indicating the severity and frequency of liver damage in these circumstances.

Table 5: Prothrombin time in samples of patients with different diseases as analyzed:

Diagnosis	Mean ± Standard deviation	Altered Prothrombin time (N, %)	Average Prothrombin time (N, %)	Total Cases percentage (N, %)
NAFLD	17.98 ± 6.26	3 (60%)	2 (40%)	5 (100%)
Alcoholic fatty liver	20.86 ± 8.06	7 (70%)	3 (30%)	10 (100%)
Acute viral hepatitis	16.65 ± 7.88	3 (38%)	5 (62%)	8 (100%)
Alcoholic hepatitis	23.91 ± 7.35	5 (72%)	2 (28%)	7 (100%)
Acute liver failure	74.07 ± 40.24	3 (100%)	0 (0%)	3 (100%)
Chronic liver disease	20.6 ± 14.25	54 (58%)	40 (42%)	94 (100%)
Liver sol	14.95 ± 3.22	4 (27%)	11 (73%)	15 (100%)
Others	19.75 ± 8.85	6 (75%)	2 (25%)	8 (100%)
Total	-	85 (57%)	65 (43%)	150 00%)

Notes: Mean ± SD: Mean and Standard Deviation of Prothrombin Time (PT). **Altered PT (N, %)**: Number and percentage of patients with altered PT. **Normal PT (N, %)**: Number and percentage of patients with normal PT. **Total Cases (N, %)**: Total number and percentage of cases for each diagnosis category.

Table 5: The table presents the mean ± standard deviation of PT for each diagnosis, representing the average prothrombin time detected in patient samples. Altered vs. Normal PT: This data displays the count and proportion of patients with PT values that fall outside the normal range (altered) and within the normal range (normal). For instance, in the case of non-alcoholic fatty liver disease (NAFLD), 60% of patients had abnormal prothrombin time (PT) values, whilst 40% had PT values within the normal range. PT levels exhibit variations among various disorders.

Acute liver failure is characterized by a notably extended Prothrombin Time (PT) of 74.07 ± 40.24 seconds, which is much longer than in other circumstances. This indicates the presence of severe coagulopathy in these individuals.

Table 6: aPTT table: Activated Partial Thromboplastin Time analysis in the patient samples:

Diagnosis	Mean ± Standard deviation	Altered aPTT percentage N (%)	Normal aPTT percentage N (%)	Total N percentage (%)
NAFLD	37.24 ± 6.26	1 (20%)	4 (80%)	5 (100%)
Alcoholic fatty liver	38.72 ± 8.06	3 (30%)	7 (70%)	10 (100%)
Acute viral hepatitis	33.7 ± 7.88	2 (25%)	6 (75%)	8 (100%)
Alcoholic hepatitis	35.4 ± 7.35	1 (15%)	6 (85%)	7 (100%)
Acute liver failure	80.27 ± 40.24	3 (100%)	0 (0%)	3 (100%)
Chronic liver disease	54.62 ± 14.25	77 (82%)	17 (18%)	94 (100%)
Liver sol	34.87 ± 3.22	3 (20%)	12 (80%)	15 (100%)
Others	41.8 ± 8.85	5 (63%)	3 (37%)	8 (100%)
Total	-	95 (64%)	55 (36%)	150 (100%)

Table 6: The table displays the mean ± standard deviation of aPTT values for each diagnosis, representing the average activated partial thromboplastin time seen in patient samples. The comparison between altered and normal aPTT readings indicates the proportion and percentage of patients whose aPTT values fall outside the normal range and within the normal range, respectively. In the case of Chronic liver disease, 82% of patients had abnormal aPTT readings, whilst 18% had normal aPTT values. Variability in activated partial thromboplastin time (aPTT) levels is seen across various liver disorders. Acute liver failure is characterized by a significantly extended activated partial thromboplastin time (aPTT) of 80.27 ± 40.24 seconds, which indicates the presence of severe coagulation problems.

Table 7: Platelet analysis in patients suffering from liver disease:

Diagnosis	Mean Platelet Count ± Standard deviation	Altered Platelet count percentage N (%)	Normal Platelet count percentage N (%)	Total percentage N (%)
NAFLD	126.4 ± 149.54	4 (80%)	1 (20%)	5 (100%)
Alcoholic fatty liver	204 ± 112.66	3 (30%)	7 (70%)	10 (100%)
Acute viral hepatitis	253.75 ± 221.04	5 (63%)	3 (37%)	8 (100%)
Alcoholic hepatitis	126.71 ± 89.48	4 (58%)	3 (42%)	7 (100%)
Acute liver failure	163.67 ± 68.5	1 (34%)	2 (66%)	3 (100%)
Chronic liver disease	161.35 ± 106.38	51 (55%)	43 (45%)	94 (100%)
Liver sol	256.8 ± 127.66	4 (27%)	11 (73%)	15 (100%)
Others	195.63 ± 119.18	4 (50%)	4 (50%)	8 (100%)
Total	-	76 (50.67%)	74 (49.34%)	150 (100%)

Table 7: The table presents the mean ± standard deviation of platelet counts for each diagnosis, offering an average measurement of platelet levels in patient samples. Comparison of Altered and Normal Platelet Counts: This data displays the quantity and proportion of patients with platelet counts that are either below or above the normal range, as well as those with platelet counts within the normal range. For instance, NAFLD exhibits decreased platelet counts in 80% of patients, showing either thrombocytopenia or thrombocytosis.

Discussion

This research examined haematological anomalies in individuals diagnosed with alcoholic liver disease [7,8,9]. The prevailing kind of anaemia seen was normocytic normochromic anaemia, characterized by red blood cells that are of normal size and colour [7,9]. Iron overload occurs when iron is not used efficiently and instead retained in ferritin, leading to a decrease in the amount of functioning red blood cells [7]. Alcohol use decreases the absorption of folic acid, which may result in megaloblastic anaemia (a condition characterized by the presence of big, immature red blood cells) in some individuals [8].

Macrocytosis, characterized by bigger red blood cells, has been shown to be associated with a higher MELD score, which is indicative of more severe liver disease [10,12]. Anaemia and prognosis: The presence of lower levels of haemoglobin was shown to be linked to higher MELD scores, indicating that anaemia has a detrimental effect on the course of the illness [10,11].White blood cells: The presence of leukocytosis (elevated white blood cell count) was probably caused by infections [13]. Leukopenia, which refers to a low amount of white blood cells, may be attributed to several reasons, such as the impact of alcohol on bone marrow, inflammation, or problems with the spleen [13]. Platelets: Thrombocytopenia, characterized by a low platelet count, was seen in more than half (58.9%) of the patients. This condition may be attributed to impaired spleen function, decreased platelet generation, or other underlying factors [13,14,15].

Further research investigated the symptoms and characteristics of individuals diagnosed with different liver disorders [16,17,18]. Patients presented a variety of grievances, including Jaundice, a condition characterized by the yellowing of the skin, which is most often seen in individuals with hepatitis and cirrhosis [16,17]. Tiredness, Pyrexia Anorexia, or loss of appetite, Reduction in body weight, Enlarged extremities (oedema), Abdominal discomfort, Abdominal fluid accumulation (ascites) and Hemorrhaging are common signs and symptoms (as described by some individuals) Significantly, jaundice was the predominant symptom seen in people who have hepatitis and cirrhosis, although weariness was more prevalent in individuals with other liver illnesses [16,17]. Age: The study included people aged between 30 and 70, with the 40-50 age group being the most common [16,17]. These results align with previous studies conducted by Bhatia et al. [16] and Shah and Jansari et al. [17]. Gender:

The research found a greater incidence of liver illness in men compared to females, which is consistent with findings from previous studies such as Tarun Kotadiya et al. [18] and Bhatia et al. [16].

Conclusion:

The data demonstrates substantial variation in prothrombin time, thromboplastin time, and platelet counts across various liver disorders, underscoring possible consequences for treatment. Chronic liver illness and acute viral hepatitis often cause changes in platelet counts, which indicate their effect on liver function. Comprehending these differences is essential for customized treatment approaches aimed at maximizing patient care and results in the management of liver disease.

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