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BLOOD COAGULATION INDICATORS' CHARACTERISTICS EXAMINED IN PATIENTS WITH LIVER CIRRHOSIS AT TRA VINH GENERAL HOSPITAL, VIETNAM

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Abstract – *The objective of the study is to investigate the characteristics of several coagulation indices in patients with cirrhosis at Tra Vinh General Hospital, Vietnam. The cross-sectional study used retrospective data in the medical records of 171 patients with cirrhosis at Tra Vinh General Hospital from January 2023 to August 2024. The results showed that patients with cirrhosis had an average prothrombin time value of 58.85±19.53%, an average activated partial thromboplastin time of 33.04±8.06 seconds, and an average international normalized ratio of 1.48±0.40. Of which, the rate of prothrombin time reduction < 70% accounted for 74.27%. At the same time, the study found a correlation between prothrombin time reduction < 70%, activated partial thromboplastin time prolongation > 40 seconds, and international normalized ratio > 1.4 with the stage of decompensated cirrhosis. Thus, in the treatment of cirrhosis, clinicians must pay attention to cases with prothrombin time reduction < 70%, activated partial thromboplastin time > 40 seconds, and international normalized ratio > 1.4, because patients with decompensated cirrhosis often have the above blood count characteristics.*

Keywords: blood clotting, blood clotting disorder, cirrhosis, Tra Vinh General Hospital.

I. INTRODUCTION

Cirrhosis is defined as chronic liver damage due to repeated long-term damage from one or more causes. Cirrhosis was responsible for over 1.32 million deaths globally in 2017, accounting for 2.4% of all deaths worldwide [1]. The mortality rate due to cirrhosis is quite significant in the United States, with 12.7 to 25.8 deaths per 100,000 people. In Vietnam, the mortality rate due to cirrhosis in men was 44.5/100,000 people/year and in women was 8.6/100,000 people/year, in 2016 [2].

During the progression of liver disease, complications such as gastrointestinal bleeding, leg edema, ascites, and even serious complications such as coma or death may occur. Among these complications, coagulopathy is considered one of the most serious complications because it makes other minor complications more serious and difficult to treat, so that the patient needs to stay in the hospital longer, thereby increasing the cost of treatment. It should be noted that coagulopathy can also affect the prognosis of the disease [2].

However, the characteristics of the blood clotting index in patients with cirrhosis in Tra Vinh Province have not been delved into. Every year, Tra Vinh General Hospital has thousands of patients coming to examine and treat cirrhosis. Thus, the study expanded the discussion on ethnicity and place of residence to contribute to finding factors related to cirrhosis in Tra Vinh Province. In addition, the study results also showed the relationship between several coagulation characteristics and cirrhosis stage.

II. RESEARCH OVERVIEW

Cirrhosis and other chronic liver diseases are a major cause of morbidity and mortality globally, although the burden and underlying causes differ across locations and demographic groups [1]. Coagulation disorder is a hematological abnormality

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that has attracted the attention of domestic and foreign researchers. Tran Quang Trang et al. [2] surveyed the characteristics of coagulation and hemostasis disorders in patients with cirrhosis at Tien Giang Provincial General Hospital. The results showed that 55.67% of patients had platelet counts < 100 g/l; 66.67% had prothrombin ratio < 70%; 41.67% had activated partial thromboplastin time (APTT) > 40 seconds; 55% had fibrinogen < 1.5g/l; and 43.33% had decreased international normalized ratio (INR). In patients with severe cirrhosis (Child-Pugh C), the prothrombin ratio < 70% accounted for 11.11% in mild cirrhosis, 78.26% in moderate cirrhosis, and 75% in severe cirrhosis patients. Prolongation of thromboplastin time is primarily observed in patients with moderate to severe cirrhosis, whereas patients with mild cirrhosis typically do not exhibit a reduction in thromboplastin activity. Fibrinogen reduction < 1.5 g/l occurred in 33 patients, accounting for 55%. Compared with the mild and moderate cirrhosis group, the severe cirrhosis group had more obvious fibrinogen reduction. In cases where patients had APTT test longer than 40 seconds, 96% of cases had factor V reduction below 70%. The study by Doan Hieu Trung [3] conducted on 106 patients with HBV cirrhosis showed that in Child-Pugh A stage, the average INR index value was 1.17 ± 0.11, while in Child-Pugh B, C stages, the average INR index value was 1.43 ± 0.23. Tran Van Hoa [4], in a study of 72 patients with cirrhosis, showed that 56.9% of patients had a prothrombin time (PT) index reduced < 70%, 12.5% of patients had an APTT prolonged over 40 seconds, and the proportion of patients with reduced fibrinogen was 20.8%. Another study by Pham Cam Phuong et al. [5] on 102 subjects with viral and non-viral cirrhosis showed that the PT index had an average value of $70.5 \pm 22.4\%$. Kremers et al. [6] studied 73 patients with cirrhosis, reduced prothrombin metabolism, and reduced thrombin inactivation, explaining the rebalance of thrombin generation in cirrhosis. The results showed that the INR index in the age group of 54–67 with compensated cirrhosis ranged from 1.02–1.12; from 51 to 66 in decompensated cirrhosis, it ranged from 1.15–1.30; and from 40 to 62 in decompensated cirrhosis, it ranged from 1.25–1.60.

Nguyen Viet Dung et al. [7] studied the hemostatic characteristics and rotational thromboelastometry (ROTEM) testing in patients with cirrhosis at the Central Hospital for Tropical Diseases on 136 patients with cirrhosis treated at the hospital. The study found that a significant proportion of cirrhotic patients exhibited coagulation abnormalities, including prolonged PT, elevated INR, and decreased fibrinogen levels. ROTEM analysis revealed impaired clot formation and reduced clot strength in these patients. These findings suggest that cirrhosis leads to complex coagulation disturbances, which may contribute to an increased risk of bleeding complications. According to Croquet et al. [8], the prothrombin index has a good correlation with the pathological cirrhosis score and a high diagnostic accuracy for severe cirrhosis or cirrhosis, especially due to alcohol, and is not affected by other pathological lesions. The research results show that the prothrombin index $\leq 80\%$ or $\leq 70\%$ diagnoses severe fibrosis or cirrhosis, and the prothrombin index $\geq 105\%$ or $\geq 100\%$ excludes the diagnosis of severe fibrosis or cirrhosis, respectively, at a probability level of 95%.

Vo Duy Thong et al. [9] conducted a cross-sectional study on 92 patients with cirrhosis with hepatic encephalopathy, from December 2019 to July 2020. The results showed that the average age was 55.5 years, with a male/female ratio of 2.7:1. Impaired consciousness (47.8%) and gastrointestinal bleeding (23.9%) were the main causes of hospitalization. Grade III hepatic encephalopathy was the most common, with a rate of 62.0%, followed by grade IV with a rate of 30.4%. Hemoglobin, platelets, and blood albumin were decreased in most patients (77.2%, 89.1%, and 96.7%, respectively). Increased blood NH_3 was the most common in all three levels of hepatic encephalopathy.

Similarly, Hajiabbasi et al. [10] conducted a study on 97 patients with cirrhosis referred to Razi Hospital, Rasht, Iran, from 2008 to 2010.

The patients (55.7% male) had a mean age of 51±13 years and a mean body mass index (BMI) of 22.7 kg/m^2, recruited over two years. The causes of cirrhosis were hepatitis C (40.2%), hepatitis B (26.8%), unknown cause (21.6%), and other causes (11.4%). Regarding the distribution of cirrhosis by age group, the age group $\leq$ 40 years old accounted for 19.6%, the age group 60 years old and above accounted for 26.8%, and the age group 41–60 years old accounted for 53.6%.

Tran Thanh Toan et al. [11] conducted a study on 72 patients diagnosed with cirrhosis with ascites at Can Tho Central General Hospital from May 2021 to May 2022. Results from the cross-sectional study showed that among the patients with cirrhosis with ascites, 56.9% were male, average age of 56.01±13.69. The causes of cirrhosis were distributed as follows: hepatitis B accounted for 31.9%, hepatitis C for 13.9%, alcohol-related cirrhosis for 16.7%, combined alcohol and hepatitis B for 5.6%, alcohol and hepatitis C for 1.4%, combined hepatitis B and C for 4.2%, and unknown causes for 26.4%.

Further highlighting the cirrhosis, Dao Thi Hong Mai et al. [12] studied 204 patients with decompensated cirrhosis at 108 Military Central Hospital from June to December 2022. The results showed that the male/female ratio was 5.17/1. The average age was 57.9±12.1 years. The main causes were alcohol abuse and the hepatitis B virus. Child-Pugh B and C were 56% and 34%, respectively. 85.3% had improved outcomes upon discharge. There was a correlation between age group, history of alcohol use, duration of illness, liver function, and outcomes of care for patients with decompensated cirrhosis ($p < 0.05$).

A study conducted by Cao Cong Sang et al. [13] on 130 inpatients diagnosed with cirrhosis at An Giang Provincial General Hospital revealed several notable findings related to coagulation disorders. Among the patients, 31.5% (41 out of 130) exhibited abnormalities in blood clotting. When analyzed by gender, the prevalence was significantly higher in male patients (23.8%) compared to female patients (7.7%), and this difference was statistically significant ($p < 0.05$). Regarding coagulation parameters, patients with an INR greater than 2.5 were found to have a significantly higher risk of coagulation disorders ($p < 0.05$). In terms of specific hematological indices, a reduced fibrinogen level was observed in 24.6% of the patients, while thrombocytopenia (low platelet count) was identified in 2.5% of the cases. According to a study by Paternostro et al. [14] on 242 cirrhosis patients in Australia, the compensated cirrhosis stage accounted for 21.9% of the subjects, the rest were in the decompensated stage, with 78.1% of the study subjects.

Truong Minh Nguyet et al. [15] investigated disseminated intravascular coagulation (DIC) in various liver diseases. The study found that DIC frequently occurs in patients with advanced liver conditions, particularly cirrhosis and acute hepatitis. Key laboratory findings included prolonged PT, reduced fibrinogen levels, increased fibrin degradation products (FDPs), and thrombocytopenia.

Ta Thi Dieu Ngan et al. [16] examined factors associated with acute-on-chronic liver failure (ACLF) in patients with decompensated cirrhosis treated at the National Hospital for Tropical Diseases The study identified that bacterial infections, high model for end-stage liver disease scores, and elevated total bilirubin levels were significantly associated with the development of ACLF. Additionally, hepatic encephalopathy and renal dysfunction were common complications in these patients. Early identification of these risk factors was emphasized as crucial for prognosis and guiding timely clinical interventions. The findings underscore the importance of comprehensive management in decompensated cirrhotic patients to prevent ACLF progression.

The research results report that the PT ratio in patients with cirrhosis is quite large, while the APTT and INR indices are often slightly prolonged. However, the changes and correlation levels between these coagulation indices vary across studies. Therefore, further research is needed to examine the characteristics of coagulation indices in cirrhosis and the correlation between these indices and the stages of cirrhosis

in different groups of subjects, at different times and locations.

III. RESEARCH METHODS

A. Location, participants, and time of research

The study was conducted at the Department of Internal Medicine and the Department of Infectious Diseases, Tra Vinh General Hospital, Vietnam from May to August 2024, with the participants being patients with cirrhosis who came for examination and treatment at Tra Vinh General Hospital in 2023 and 2024. Inclusion criteria were patients diagnosed with cirrhosis and who had coagulation tests performed from January 2023 to August 2024. Exclusion criteria were patients with unclear or missing medical records, pregnant women, patients with blood diseases (leukemia, thalassemia, etc.), and patients using anticoagulants.

B. Methods

The study was designed as a descriptive cross-sectional study, utilizing retrospective data collected from medical records. The sample size was determined based on the Formula (1).

$$n = Z^2_{1-\alpha/2}\frac{p(1-p)}{d^2} \qquad (1)$$

n : sample size to be studied;

$Z^2_{1-\alpha/2}$: Reliability coefficient = $(1.96)^2$;

d: allowable error 8% = 0.08;

p: estimated proportion of cirrhotic patients with PT value reduced < 70% according to the study of Tran Quang Trang et al. [2] with p = 0.66.

Using the above Formula (1) with the corresponding values, the minimum required sample size was calculated to be 134. However, in practice, a total of 171 samples were successfully collected.

Data collection tools

The research medical record information collection form consists of three parts: general information about the research subject, diagnosis, classification of cirrhosis stage, and coagulation test results.

Data collection techniques

Medical records were retrieved from the archives of Tra Vinh General Hospital. Relevant information related to the research topic was collected using a standardized medical records information collection form. This process involved gathering general demographic information about the study subjects, as well as data on the diagnosis and disease staging. Additionally, coagulation test results were collected, focusing on relevant laboratory indices related to blood clotting.

Data analysis methods

Data were entered using Microsoft Excel 2016 software and analyzed with Stata 14.0 statistical software. The statistical methods employed in the study included both descriptive and analytical techniques. Descriptive statistics were used to summarize quantitative variables such as PT, APTT, and INR, employing measures of central tendency such as the mean and standard deviation. For qualitative variables, including age group, gender, ethnicity, and area of residence, frequencies and percentages were calculated. The T-test was applied for analytical statistics to compare the mean values of PT, APTT, and INR between different groups.

A chi-square test with p value < 0.05 is considered statistically significant. If more than 20% of the total expected values are less than 5, Fisher's exact test is used instead of the chi-square test. The epidemiological measure of prevalence ratio (PR) with a 95% confidence interval is used to quantify the relationship. The criteria for determining the relationship include p value < 0.05 and a 95% confidence interval not containing the value 1.

C. Ethics in research

The study was approved by the Ethics Council of Tra Vinh University under Decision No. 228/GCT-HDDD dated May 15, 2024. The study only collected information from medical records, did not intervene in patients, or distort the treatment results of patients. Patient information in

the study was kept confidential, and patient identities were not disclosed. The research results were scientific, accurate, honest, and reliable.

IV. RESULTS AND DISCUSSION

A. General characteristics of research subjects

Table 1 shows that patients with cirrhosis had an average age of 59.52±15.16, ranging from 22 to 95 years old.

Table 1: General characteristics of study subjects with cirrhosis (n = 171)

Characteristic		Frequency (%)
Age group	18–40 years old	18 (10.53)
	41–65 years old	92 (53.80)
	> 65 years old	61 (35.67)
Age (years) (Mean ± standard deviation)	59.52±15.16 (22–95)	
Sex	Male	109 (63.74)
	Female	62 (36.26)
Living area	Urban	33 (19.30)
	Countryside	138 (80.70)
Ethnic group	Kinh	126 (73.68)
	Khmer	45 (26.32)

Vo Duy Thong et al. [9] conducted on 92 patients with cirrhosis, the average age of study participants was 55.5. Cirrhosis often develops after a long period of exposure to risk factors. The process of liver damage is slow and gradually accumulates, causing severe symptoms to often appear in middle age. In addition, lifestyle factors and underlying diseases common in the elderly also contribute to the progression of cirrhosis. Regarding the age distribution of cirrhosis, the participants also divided it into three groups and obtained the following results: the age group from 41 to 65 years old accounted for the highest rate with 53.80%, followed by the age group over 65 years old accounting for 35.67% and finally the age group from 18 to 40 years old with 10.53%. Hajiabbasi et al.'s study [10] on the distribution of cirrhosis by age group showed that the age group $\leq$ 40 years old accounted for 19.6%, the age group from 60 years old and above accounted for 26.8%, and the age group from 41–60 years old accounted for 53.6%. The difference between the two studies may be due to differences in sample size as well as pathological characteristics in each region and country. Old age leads to impaired liver function, aging is also a risk factor for cirrhosis progression. The rate of men with cirrhosis in this study was 63.74%, a clear difference compared to the rate of women with the same disease of 36.26%. In this gender subgroup, this research found similarities with the study of Tran Thanh Toan et al. [11] on 72 patients with cirrhosis; the authors noted that men accounted for 56.9%, and women accounted for 43.1%. In the study of Dao Thi Hong Mai et al. [12], the rate of men with cirrhosis was 66.1% while it was 33.9% in women. The explanation for this result may be that men abuse alcohol more than women, and alcohol is one of the causes of cirrhosis. In addition, in Vietnam, the rate of hepatitis B and C is high (10–25%), and the rate of hepatitis B in men is higher than in women, so when it leads to cirrhosis, men are also more likely to get cirrhosis than women. The proportion of the Kinh ethnic group (73.68%) is much more dominant than that of the Khmer ethnic group (26.32%). At the same time, the proportion of patients living in rural areas (80.70%) is significantly higher than that of patients living in urban areas (19.30%). This is completely consistent with the characteristics and population structure of Tra Vinh Province.

B. Characteristics of blood coagulation index in patients with cirrhosis

Table 2 illustrates the distribution of coagulation indices in cirrhosis patients, highlighting normal and abnormal values for PT, APTT, and INR.

The average PT index value in the group of patients with cirrhosis was 58.85±19.53%. Specifically, the group with reduced PT (< 70%) accounted for 74.27%, nearly three times higher than the group with normal PT value ($\geq$ 70%) at 25.73%. According to Tran Quang Trang et al. [2], 40 out of 60 patients with cirrhosis in their study had a PT index reduced by < 70%, accounting for 66.67%. In addition, Tran Van Hoa's study [4] revealed that among 72 patients

Table 2: Characteristics of coagulation indices in patients with cirrhosis (n = 171)

Index		Frequency (Ratio)
PT (%)	Normal ≥ 70% Discount < 70%	44 (25.73) 127 (74.27)
APTT (seconds)	Normal ≤ 40 seconds Lasts > 40 seconds	150 (87.72) 21 (12.28)
INR	Normal ≤ 1.4 Length > 1.4	91 (53.22) 80 (46.78)

with cirrhosis, 56.9% of patients had a PT index reduced by < 70%. This is completely similar to the current study, when the percentage of reduced PT was higher than normal PT. The explanation for this result is that the prothrombin ratio is a test used to study the blood clotting process in the extrinsic pathway (II, V, VII, X). A decreased prothrombin ratio indicates a reduced activity of factors involved in the extrinsic pathway of blood clotting, indicating a state of hypocoagulation. The liver is the main organ that produces essential blood clotting factors. When liver cells are impaired in function, the ability to produce these factors is reduced, leading to a decrease in blood clotting ability. Therefore, severe liver damage can increase the risk of bleeding and problems in the blood clotting process.

The APTT index in this study had an average value of 33.04±8.06 seconds. Of which, the normal APTT index (≤ 40 seconds) was more dominant with 87.72%, in contrast, the prolonged APTT index in patients with cirrhosis accounted for only 12.28%. Also, Tran Van Hoa [4] said that only 12.5% of patients had an APTT prolonged over 40 seconds. However, Cao Cong Sang et al. [13] showed that the prolonged APTT index accounted for 36.9%, higher than our study. In patients with cirrhosis, the levels of factor VIII and von Willebrand factor were significantly elevated, resulting in a lesser impact on the APTT test compared to PT. APTT abnormalities were primarily observed in patients with severe cirrhosis.

The average INR value in this study was 1.48±0.40. With a normal INR ≤ 1.4, there were 91 people, accounting for 53.22%, the remaining 80 people, accounting for 46.78% of patients, had an increased INR >1.4. Overall, the difference in proportion between the two groups of values in the study was not too large. The research results of Tran Quang Trang et al. [2] had an INR rate above 1.4 of 43.33%, which shares similarities with this current study. In cirrhosis, the INR index often increases because the liver is no longer able to produce exogenous clotting factors such as prothrombin, factors VII, X, and V. When liver function is impaired, the production of these factors is reduced, leading to prolonged clotting time and increased INR.

C. Distribution of subjects by stage of cirrhosis

The distribution of cirrhosis subjects by disease stage shows that the group of subjects with decompensated cirrhosis is more dominant than the group of subjects with compensated cirrhosis, with rates of 85.38% and 14.62%, respectively (Figure 1).

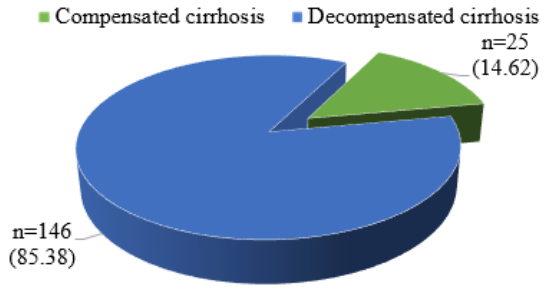

Fig. 1: Distribution of subjects by stage of cirrhosis (n = 171)

In a study conducted by Paternostro et al. [14] on 242 cirrhosis patients in Australia, the compensated cirrhosis stage accounted for 21.9% of the subjects, the rest were in the decompensated stage, with 78.1% of the study subjects. Decompensated cirrhosis is a severe stage of cirrhosis. This condition occurs when the scarring of the organ has become severe, hindering the normal function of the liver. Any damage to the liver can lead to scarring, which eventually progresses

to decompensated cirrhosis. Decompensated cirrhosis represents a severe stage of liver disease. In the early stages, patients may be unaware of their condition, and this lack of recognition, coupled with unintentional detrimental behaviors, can contribute to the progression of the disease to the decompensated stage. On the other hand, decompensated cirrhosis was more common than compensated cirrhosis in this study, possibly due to the difference in the population living in rural areas compared to urban areas. In rural areas, difficult living conditions and a lack of medical services make it difficult for people to have regular health check-ups. Late detection of the disease, when symptoms are already severe, often leads to a higher rate of decompensated cirrhosis. Lack of awareness of the disease, coupled with limited access to medical care, means that many cases of cirrhosis go undiagnosed and untreated.

D. Correlation between several general characteristics of the study subjects and the stage of cirrhosis

The relationship between some general characteristics of the study subjects and the stages of cirrhosis is presented in Table 3.

The study did not find any correlation between the stages of cirrhosis progression and the general characteristics of the study subjects. Unlike this study, Dao Thi Hong Mai et al. [12] noted that in patients with decompensated cirrhosis at the 108 Military Central Hospital, men accounted for the majority (80.67%), with a male/female ratio of 4.17/1. The explanation for this difference may be due to different biological and lifestyle factors between the two sexes. Women may have more decompensated cirrhosis due to hormonal differences, the influence of estrogen, etc., or at the time and location of this study, the rate of women coming for examination and treatment was simply higher than that of men.

E. Relationship between several coagulation indices and stages of cirrhosis progression

Table 4 presents a statistically significant correlation between selected coagulation parameters and cirrhosis stages. Reduced platelet proportion, prolonged APTT, and elevated international normalized ratio (INR) were significantly associated with the decompensated stage, indicating progressive deterioration of hemostatic function with advancing liver disease ($p < 0.05$).

The study found a statistically significant correlation between the PT index, APTT index, and INR index with the stage of decompensated cirrhosis. Specifically, the group of patients with a PT index < 70% was 1.34 times higher (95% CI: 1.09–1.65, $p < 0.001$) than the group of patients with a normal PT index $\geq$ 70%. Tran Quang Trang et al. [2] noted that 66.67% of the subjects participating in their study had a PT reduction rate of less than 70%. Concerning medical literature in cirrhosis, there is a close correlation between the PT reduction rate and the severity of cirrhosis. Normally, prothrombin has a ratio of 70 to 100%; below 70% means a decrease. In patients with cirrhosis, poor nutrition and reduced fat absorption reduce the concentration of bile salts in the intestine, causing poor absorption of vitamin K, thereby reducing the activity of vitamin K-dependent coagulation factors such as II, VII, and X. At the same time, these coagulation factors are synthesized in the liver. When liver cells are damaged by cirrhosis, these factors are synthesized less and less, so the prothrombin ratio in the blood decreases more and more. According to the stages of compensated and decompensated cirrhosis, it is noted that in the compensated stage, only 8.66% of patients had a PT reduction of < 70%, while in the decompensated stage, up to 91.34% of patients had a PT reduction of < 70% (Table 3). This is a very significant correlation between the reduced PT index and the stage of decompensated cirrhosis, posing a major challenge in the treatment of decompensated cirrhosis in current medicine.

The study also found a statistically significant correlation between APTT index and the stage of decompensated cirrhosis. According to the analysis, the group of patients with a prolonged APTT index > 40 seconds was 1.2 times higher

Table 3: Correlation between general characteristics of the research subjects and cirrhosis stage (n = 171)

Characteristic	Stages of cirrhosis		Public relations (95% CI)	P
	Compensation	Decompensation		
Age group				
18–40 years old	6 (33.33)	12 (66.67)	1	0.122
41–65 years old	12 (13.04)	80 (86.96)	1.30 (0.93-1.83)	0.102
> 65 years old	7 (11.48)	54 (88.52)	1.38 (0.95-1.87)	
Sex				
Male	18 (16.51)	91 (83.49)	1	0.353
Female	7 (11.29)	55 (88.71)	1.06 (0.94-1.20)	
Living area				
Urban	3 (9.09)	30 (90,91)	1	0.418
Countryside	22 (15.94)	116 (84.06)	0.92 (0.81-1.05)	
Ethnic group				
Kinh	20 (15.87)	106 (84.13)	1	0.438
Khmer	5 (11,11)	40 (88.89)	1.06 (0.93-1.20)	

Table 4: Correlation between some coagulation indices and stages of progression in patients with cirrhosis (n = 171)

Characteristic	Stages of cirrhosis		Public relations (95% CI)	P
	Compensation	Decompensation		
PT (%)				
≥ 70	14 (31.82)	30 (68.18)	1	
< 70	11 (8.66)	116 (91.34)	**1.34 (1.09–1.65)**	< **0.001**
APTT (seconds)				
≤ 40	25 (16.67)	125 (83.33)	1	
> 40	0 (0)	21 (100)	**1.2 (1.12–1.29)**	**0.046***
INR				
≤ 1.4	18 (19.78)	73 (80.22)	1	
>1.4	7 (8.75)	73 (91.25)	**1.14 (1.01–1.27)**	**0.042**

(95% CI: 1.12–1.29, p = 0.046 < 0.05) than the group of patients with normal APTT values. APTT is considered a test to evaluate the coagulation status of the intrinsic pathway. In cirrhosis, APTT is prolonged due to a fall in the ability to synthesize coagulation factors (VII, IX, XI, XII). Prolonged APTT is also due to the patient having intravascular coagulation or gastrointestinal bleeding, which also causes the patient's APTT to be prolonged, according to the amount of blood lost. In the study of Truong Minh Nguyet et al. [15], the prolonged APTT index accounted for nearly 50% of the subjects [15]. Tran Quang Trang et al. [2] pointed out that 41.67% of patients in their study had a prolonged APTT rate, and this was statistically significant (p < 0.05). The two studies mentioned had a lower prolonged APTT rate than the prolonged APTT rate in this study, possibly due to the difference in sample size at the time of the study, but this study and the two studies had a prolonged APTT index higher than the normal APTT index. Thus, like PT, prolonged APTT is related to the decompensated stage of cirrhosis, or in other words, APTT depends a lot on the degree of cirrhosis. In patients with severe cirrhosis, the ability to synthesize coagulation factors and reduce coagulation factors causing hypocoagulation is lower, independent of vitamin K.

On the other hand, the INR index is also related to the decompensated stage of cirrhosis, and this relationship is statistically significant. The group of subjects with an INR index > 1.4 is 1.14 times higher (95% CI: 1.01–1.27, p = 0.042 < 0.05) than the group with a normal INR index $\leq$ 1.4. Compared with the study of Doan Hieu Trung [3], the results showed that the mean value of INR index in the decompensated stage was 1.43$\pm$0.23 and was statistically significant with p < 0.001. According to Ta Thi Dieu Ngan et al. [16], up to 90.3% of patients with decompensated cirrhosis had an INR > 1.23, and this was also statistically significant (p < 0.05).

V. CONCLUSION AND RECOMMENDATIONS

Based on the analysis of 171 medical records of cirrhosis patients treated at Tra Vinh General Hospital between January 1, 2023, and July 31, 2024, the study drew the following conclusions. The characteristics of coagulation indices in patients with cirrhosis were analyzed in this study. The mean values of PT and INR were significantly altered compared to normal levels, with PT decreasing to 58.85$\pm$19.53% and INR increasing to 1.48$\pm$0.40. Notably, a PT decrease below 70% was observed in 74.27% of the patients, while 46.78% of patients exhibited an INR greater than 1.4. In contrast, the APTT remained within normal limits, with a mean value of 33.04$\pm$8.06 seconds. Prolonged APTT (> 40 seconds) was observed in 12.28% of the cases.

This study explored the relationship between coagulation indices and the progression of cirrhosis. The results revealed a statistically significant correlation between PT, APTT, and INR with the stage of decompensated cirrhosis, with p-values of 0.001, 0.046, and 0.042, respectively.

From the findings of this study, several key recommendations for clinical practice and future research can be made. In managing cirrhosis, particular attention should be given to coagulation indices such as PT, APTT, and INR, as patients with liver disease often experience coagulation disorders due to impaired hepatic function, which results in reduced synthesis of coagulation factors. Therefore, regular monitoring of PT, APTT, and INR is essential for early detection of abnormalities and timely adjustment of treatment strategies.

Additionally, future studies involving larger sample sizes are necessary to further elucidate the relationship between liver disease and coagulation abnormalities, especially regarding parameters like PT and APTT. Research should focus on identifying specific coagulation factors affected by cirrhosis, such as factor VII, and improving diagnostic methods for their detection. These investigations are expected to provide valuable insights for clinical practice, enhancing the understanding and management of coagulopathy in liver disease patients.

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