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Original Article

Investigating Laboratory Biochemical Factors in Different Types of Patients With Cardiovascular Diseases

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Abstract

Background: Due to the destructive effect of cardiovascular disease on vital organs, the study of laboratory biochemical factors in the most common heart diseases is essential to accelerate the treatment of cardiovascular patients.

Materials and Methods: This study was cross-sectional and analytical. By referring to the hospital information system of educational hospitals of the Abadan University of Medical Sciences, the necessary information of 565 patients with cardiovascular diseases (e.g., demographic information and laboratory diagnostic markers) from March 21, 2019, to March 19, 2020, was extracted through the hospital information system and completed checklist. Data analysis was performed using SPSS software version 22.

Results: In this study, fasting blood sugar (FBS), international normalized ratio (INR), erythrocyte sedimentation rate (ESR), Serum glutamate pyruvate transaminase (SGPT), serum glutamate oxalate transaminase (SGOT), creatinine, blood urea nitrogen (BUN), total bilirubin, creatine kinase (CK)-MB, and prothrombin time (PT) were higher than normal in patients with cardiovascular diseases. SGOT was significantly different between age groups ($P=0.006$), and the highest value was observed in the age group over 75 years. Moreover, FBS was significantly different between the male and female groups ($P=0.002$).

Conclusion: FBS and some diagnostic markers such as renal markers, liver, coagulation, and inflammatory markers are abnormal in patients with cardiovascular diseases.

Keywords: Cardiovascular diseases, laboratory factors, Abadan

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Introduction

Cardiovascular diseases kill millions of people around the world every year (1). Although in the past, cardiovascular disease was specific to high-income countries, now their age-specific incidence rates are reducing in these countries and increasing in low- and middle-income countries (2). Given the rapid progression of cardiovascular disease in less-developed countries, deaths from cardiovascular disease increased from 25% in 1990 to more than 40% in 2020 (3). The reasons for these high percentages are the large population living in these countries, increased smoking, decreased physical activity, increased obesity, and diabetes (4).

Cardiovascular disease and chronic kidney disease are closely related to the common risk factors for cardiovascular diseases such as hypertension, hyperlipidemia, and diabetes, so the risk of death from cardiovascular disease in people with kidney dysfunction is higher (5-7). Cardiovascular diseases, especially heart attacks, not only affect the function of the heart but also reduce the output of the heart, affecting the function of other surrounding organs, including the kidneys (8, 9). Scientific evidence has shown that myocardial infarction significantly exacerbates mild to acute and chronic renal injury (10). It has recently been reported that the rate of damage to kidney tissue increases after myocardial infarction in type 1 diabetic and unilateral nephrectomy rats (11, 12). Further, acute and chronic damage to kidney tissue function is a risk factor for cardiovascular disease and vice versa. This two-way pathological relationship is

called heart-kidney syndrome (10-13).

So far, the common mechanisms and factors in renal dysfunction after myocardial infarction have not been identified, and it is possible that with the phenomenon of vasoconstriction and reduced blood flow, the cause of oxidative stress in renal tissues be provided. In this regard, it was revealed that by activating the inflammatory pathway and increasing lipid peroxidation in the kidney, myocardial infarction leads to damage to kidney cells and, consequently, reduces the glomerular filtration rate in two to three weeks after myocardial infarction (14, 15). Researchers found that liver dysfunction is a secondary disease to myocardial infarction, and it was observed that hepatitis persists for up to 6 months after myocardial infarction (16). The existence of a high death rate in Iran due to heart diseases led the author to study a group of laboratory diagnostic factors in people with heart diseases and to investigate the destructive effect of these diseases on vital organs such as kidneys and liver.

Materials and Methods

This study was cross-sectional analytical. After obtaining the necessary licenses, by referring to the educational hospitals (Valiasr, Shahid Beheshti, and Taleghani hospitals) of the Abadan University of Medical Sciences, the necessary information (e.g., demographic information and laboratory diagnostic markers) was extracted from patients with cardiovascular diseases from March 21, 2019 to March 19, 2020 through the hospital information system and completed checklist. Out of 3162 patients with cardiovascular diseases hospitalized from March 21, 2019 to March 19, 2020, laboratory and demographic information of 565 patients with cardiovascular diseases (e.g., acute ischemic heart disease, unstable angina, supra ventricular tachycardia, heart failure, cardiac arrhythmias, cardiac arrest, acute myocardial infarction, and chronic ischemic heart disease) was studied using a random sampling method. The criteria for inclusion in the study included patients with cardiovascular diseases who were admitted by a cardiologist, and those whose tests were available in the hospital information system. The exclusion criteria in this study were other patients except for patients with cardiovascular diseases and also patients with cardiovascular diseases whose information was incomplete. In order to describe the data, descriptive statistics was used. For qualitative data, the frequency and percentage were reported, and the difference between the groups was analyzed using the chi-square test (Fisher's exact). Moreover, mean and standard deviation were used to describe quantitative data, while independent t-tests and one-way analysis of variance were used to compare the results in groups. The non-parametric equivalents of the tests (Mann-Whitney and Kruskal-Wallis) were used. All analyses were conducted in SPSS version 22 software and at a significance level of 0.05. Then, statistical analyses were performed using IBM SPSS Statistics software version 22.0 (IBM Corp., Armonk, NY, USA).

Results

In this study, 3162 patients with heart diseases were identified, of which 1627 (51%) were male and 1535 (49%) were female. As Table 1 indicates, the highest percentage of patients was related to those with myocardial infarction with 1092 cases (35%). Further, laboratory information of 565 cardiac patients was studied, of which 262 (46.37%) were female and 303 (53.63%) were male (Table 2).

The mean prothrombin time (PT) was higher in men than in women, but this difference was not significant. There was also no significant difference in age groups (Tables 3 and 4). Moreover, the Mean of PT was higher than normal in patients with heart failure, cardiac arrhythmia, and cardiac arrest (Table 5). The mean erythrocyte sedimentation rate (ESR) was not significantly different in both male and female groups, and no significant differences were observed between the age groups (Tables 3 and 4). As observed in Table 5, the mean of ESR was out of the normal range in all disease groups, and the highest rate was observed in patients with

Table 1. Percentage and Frequency of All Patients With Cardiovascular Diseases Hospitalized From March 21, 2019 to March 19, 2020 According to Gender

Disease	Gender				Total	
	Male		Female		Percent	Frequency
	Percent	Frequency	Percent	Frequency		
Acute IHD	54.5	253	45.5	212	14.7	465
Acute MI	51.0	557	49.7	535	34.5	1092
Cardiac arrest	49.7	155	50.3	157	9.9	312
Cardiac arrhythmias	43.0	105	57.0	140	7.7	245
Heart failure	52.0	101	48.0	94	6.2	195
Chronic IHD	43.7	88	56.3	114	6.4	202
Supra ventricular tachycardia	52.0	193	48.0	179	11.8	372
Unstable angina	50.2	140	49.8	139	8.8	279
Total		1627		1535	100.0	3162

Note. IHD: Ischemic heart disease; MI: Myocardial infarction.

Table 2. Percentage and Frequency of Patients With Cardiovascular Diseases According to Gender

Disease	Gender				Total	
	Male		Female		Percent	Frequency
	Percent	Frequency	Percent	Frequency		
Acute IHD	53.5	46	46.5	40	15.2	86
Acute MI	66.3	65	33.7	33	17.3	98
Cardiac arrest	56.4	57	43.6	44	17.9	101
Cardiac arrhythmias	50.8	32	49.2	31	11.2	63
Heart failure	43.9	25	56.1	32	10.1	57
Chronic IHD	26.7	4	73.3	11	2.7	15
Supra ventricular tachycardia	23.9	11	76.1	35	8.1	46
Unstable angina	63.6	63	36.4	36	17.5	99
Total		303		262	100.0	565

Note. IHD: Ischemic heart disease; MI: Myocardial infarction.

Table 3. Mean and Standard Deviation of Factors Studied in Patients With Cardiovascular Diseases by Gender

Factors	Gender		*P* value[a]
	Female	Male	
FBS (mg/dL)	184.97 ± 109.55	157.86 ± 84.73	0.002*
BUN (mg/dL)	24.29 ± 19.44	20.73 ± 14.52	0.017*
Cr (mg/dL)	1.53 ± 1.45	1.43 ± 1.20	0.395
Na (mmol/L)	141.89 ± 4.44	141.28 ± 4.67	0.127
K (mmol/L)	4.33 ± 0.59	4.18 ± 0.59	0.004*
CK-MB (IU/L)	40.72 ± 25.10	40.84 ± 50.65	0.976
Total bilirubin (mg/dL)	1.47 ± 1.74	1.41 ± 1.27	0.838
Direct bilirubin (mg/dL)	0.60 ± 0.73	0.54 ± 0.53	0.635
SGOT (IU/L)	59.44 ± 89.52	98.42 ± 239.29	0.151
SGPT (IU/L)	43.78 ± 89.07	82.26 ± 233.13	0.147
PT (s)	13.40 ± 4.75	13.88 ± 6.71	0.471
PTT (s)	37.35 ± 15.83	37.52 ± 14.77	0.907
INR	1.17 ± 0.54	1.24 ± 0.80	0.299
ESR (mm/hr)	45.07 ± 37.59	34.44 ± 34.82	0.150
WBC (/mm3)	11.45 ± 6.74	10.45 ± 4.87	0.046*
RBC (million/mm3)	4.52 ± 0.83	4.73 ± 0.91	0.006*
MCV (μm³)	86.34 ± 8.59	87.01 ± 9.44	0.386
HCT %	37.69 ± 6.26	40.60 ± 7.74	<0.001*
MCH (pg/cell)	28.39 ± 3.98	29.18 ± 3.86	0.019*
HB (g/dL)	11.97 ± 2.25	12.92 ± 2.63	<0.001*
MCHC (Hb/cell)	30.62 ± 3.36	31.40 ± 2.88	0.004*
RDW-SD (fL)	47.23 ± 7.14	46.74 ± 6.65	0.406
PLT (mm³)	250.66 ± 91.66	234.07 ± 86.88	0.031*
Neutrophil %	70.16 ± 13.79	69.66 ± 14.58	0.685
Lymphocyte %	29.84 ± 13.79	30.45 ± 14.57	0.619

Note. FBS: Fasting blood sugar; BUN: Blood urea nitrogen; Cr: Creatinine; Na: Sodium; K: Potassium; CK-MB: Creatine kinase-MB; SGOT: Serum Glutamate oxalate transaminase; SGPT: Serum glutamate pyruvate transaminase; PT: Prothrombin time; PTT: Partial thromboplastin time; INR: International normalized ratio; ESR: Erythrocyte sedimentation rate; WBC: White blood cell; RBC: Red blood cell; MCV: Mean corpuscular volume; HCT: Hematocrit; MCH: Mean corpuscular hemoglobin; HB: Hemoglobin; MCHC: Mean corpuscular hemoglobin concentration; RDW: Red cell distribution width; PLT: Platelet.

[a] *P* value conducted from independent *t* test.

unstable angina.

In addition, the highest amount of serum glutamate pyruvate transaminase (SGPT) was observed in the age group over 75 years. The mean SGPT was not significantly different between male and female groups, and no significant difference was observed between age groups (Tables 3 and 4). The mean SGPT in patients with cardiac arrest, heart failure, and ventricular tachycardia was higher than normal, so it was highest in patients with cardiac arrest symptoms (Table 5). The data also showed that serum glutamate oxalate transaminase (SGOT) was significantly different between age groups ($P=0.006$), and the highest value was observed in the age group of over 75 years, while there was no significant difference in both male and female groups (Tables 3 and 4). According to Table 5, the mean of SGOT was higher than normal in all subgroups of cardiac patients, and the highest value was observed in patients with cardiac arrest.

There was no significant difference in the mean of total bilirubin in either male or female groups, and also no significant difference was observed between the age groups, but the highest value was observed in the age group over 75 years (Tables 3 and 4). The mean of total bilirubin in patients with myocardial infarction, cardiac arrhythmia, and cardiac arrest was higher than normal (Table 5). However, the mean of creatine kinase (CK)-MB was not significantly different in male and female groups, and no significant difference was observed in age groups (Tables 3 and 4); moreover, the mean of CK-MB was out of normal in seven subgroups of cardiac patients (Table 5).

There was no significant difference in blood urea nitrogen (BUN) levels in age groups, while there was a significant difference between men and women, and its amount was higher in women than IN men ($P=0.017$), as indicated in Tables 3 and 4. Further, the mean of BUN in patients with cardiac arrest, cardiac arrhythmia, heart failure, and ischemic heart disease was above the normal range, and the highest value was observed in ischemic

Table 4. Mean and Standard Deviation of Factors Studied in Patients With Cardiovascular Diseases by Age Groups

Factors	Age (y)					*P* Value[a]
	≤45	46 - 60	61 - 75	≥75	Total	
FBS (mg/dL)	189.99±109.95	170.33±112.27	154.66±66.54	165.38±92.02	170.39±97.84	0.024*
BUN (mg/dL)	24.31±21.28	22.38±16.385	20.85±13.38	21.81±15.83	22.38±17.05	0.389
Cr (mg/dL)	1.61±1.79	1.50±1.47	1.37±0.69	1.42±1.01	1.48±1.32	0.473
Na (mmol/L)	142.28±4.93	141.47±4.05	140.68±4.45	141.76±4.71	141.56±4.57	0.037*
K (mmol/L)	4.29±0.59	4.25±0.65	4.19±0.53	4.26±0.59	4.25±0.59	0.543
CK-MB (IU/L)	49.36±65.37	39.57±33.86	35.55±21.89	38.33±27.81	40.79±41.38	0.073
Total bilirubin (mg/dL)	1.40±1.80	1.39±1.23	1.19±0.97	1.86±2.00	1.44±1.54	0.465
Direct bilirubin (mg/dL)	0.45±0.40	0.46±0.42	0.47±0.44	0.97±1.069	0.57±0.65	0.006*
SGOT (IU/L)	48.08±80.69	76.35±138.70	52.20±67.83	142.39±315.66	78.26±178.81	0.055
SGPT (IU/L)	33.36±51.06	48.10±91.13	50.65±99.67	123.63±324.05	62.35±174.72	0.075
PT (s)	14.16±7.55	13.16±3.85	13.50±5.46	13.75±5.88	13.66±5.89	0.635
PTT (s)	38.10±18.19	35.46±7.16	36.65±12.39	39.48±19.54	37.44±15.25	0.240
INR	1.29±0.90	1.15±0.53	1.17±0.53	1.20±0.71	1.21±0.69	0.410
ESR (mm/h)	35.50±33.12	49.35±37.43	37.69±38.62	37.84±37.55	39.43±36.35	0.591
WBC (/mm^3)	11.27±6.01	10.28±4.71	10.62±4.55	10.62±4.55	11.51±7.56	0.277
RBC (million/mm^3)	4.65±0.84	4.67±0.85	4.66±0.88	4.55±0.94	4.63±0.88	0.634
MCV (μm^3)	86.90±8.78	86.37±7.94	87.10±7.89	86.42±11.28	86.70±9.05	0.891
HCT %	38.94±6.91	39.44±7.13	40.13±8.02	38.45±6.80	39.23±7.23	0.273
MCH (pg/cell)	28.91±4.00	28.87±3.67	29.09±3.83	28.37±4.22	28.81±3.93	0.493
HB (g/dL)	12.65±2.35	12.64±2.59	12.59±2.41	12.00±2.61	12.48±2.50	0.095
MCHC (Hb/cell)	31.44±2.56	31.10±3.57	30.88±3.19	30.69±3.14	31.03±3.14	0.230
RDW-SD (fL)	46.83±5.85	47.13±8.20	47.58±6.34	46.34±6.92	46.97±6.88	0.523
PLT (mm^3)	239.67±85.63	249.88±99.93	224.44±80.09	252.98±88.93	241.84±89.46	0.041*
Neutrophil %	70.52±14.26	69.97±14.45	70.26±13.32	68.80±14.81	69.90±14.20	0.763
Lymphocyte %	29.48±14.26	30.19±14.44	29.82±13.32	31.20±14.81	30.16±14.20	0.773

Note. FBS: Fasting blood sugar; BUN: Blood urea nitrogen; Cr: Creatinine; Na: Sodium; K: Potassium; CK-MB: Creatine kinase-MB; SGOT: Serum Glutamate oxalate transaminase; SGPT: Serum glutamate pyruvate transaminase; PT: Prothrombin time; PTT: Partial thromboplastin time; INR: International normalized ratio; ESR: Erythrocyte sedimentation rate; WBC: White blood cell; RBC: Red blood cell; MCV: Mean corpuscular volume; HCT: Hematocrit; MCH: Mean corpuscular hemoglobin; HB: Hemoglobin; MCHC: Mean corpuscular hemoglobin concentration; RDW: Red cell distribution width; PLT: Platelet.
[a] *P* value conducted from one-way ANOVA test.

heart patients (Table 5).

The mean creatinine was higher than normal in both male and female groups, but this difference was not significant. Additionally, it was higher than normal in all age groups, but this difference was not significant (Tables 3 and 4). However, the mean of creatinine was higher than normal in patients with cardiac arrest, cardiac arrhythmia, heart failure, ischemic heart disease, and supraventricular tachycardia (Table 5).

According to Table 3, fasting blood sugar (FBS) was significantly different between male and female groups ($P=0.002$) and was higher in females than in males. As evident in Table 4, there was also a significant difference in age groups ($P=0.024$). The mean of FBS was also higher than normal in all subgroups of cardiac patients, and the highest value was observed in patients with cardiac arrhythmia (Table 5).

Discussion

In this study, 3162 patients with cardiovascular diseases were identified, of which 1627 (51%) were male and 1535 (49%) were female. The highest percentage of patients was related to patients with myocardial infarction with 1092 cases (35%). Laboratory information of 565 cardiac patients was studied, of which 262 (46.37%) were female and 303 (53.63%) were male. In the present study, mean creatinine was higher than normal in patients with cardiac arrest, cardiac arrhythmia, heart failure, supraventricular tachycardia, and ischemic heart disease. Further, the mean creatinine was higher than normal in both male and female groups. Subtle renal dysfunction is a factor in increasing the risk of stroke (17).

In this study, BUN was above the normal range in patients with cardiac arrest, cardiac arrhythmia, heart failure, and ischemic heart disease, and the highest value was observed in ischemic heart patients. There was no significant difference in BUN levels in age groups, while there was a significant difference between women and

Table 5. Mean and Standard Deviation of Factors Studied in Different Types of Patients With Cardiovascular Diseases

Factor	Unstable Angina	Supra Ventricular Tachycardia	Chronic IHD	Heart Failure	Cardiac Arrhythmias	Cardiac Arrest	Acute MI	Acute IHD
FBS (mg/dL)	159.46±83.95	178.29±110.49	148.77±46.81	176.91±92.20	188.53±121.09	171.47±90.97	185.93±120.47	146.02±67.65
BUN (mg/dL)	19.00±11.57	21.29±14.20	32.69±35.12	30.80±17.12	28.58±21.45	26.87±22.29	18.20±10.46	14.84±6.60
Cr (mg/dL)	1.23±0.686	1.33±0.801	1.37±0.671	1.78±0.94	1.89±1.92	1.79±1.97	1.25±0.44	1.25±1.43
Na (mm/dL)	140.98±3.99	142.32±4.37	140.33±2.49	141.07±4.71	141.53±4.82	142.71±6.47	140.93±3.68	141.78±3.15
K (mm/dL)	4.06±0.39	4.32±0.510	4.25±0.48	4.31±0.56	4.46±0.89	4.35±0.70	4.23±0.49	4.14±0.50
CK-MB (IU/L)	35.13±38.90	27.70±8.99	39.35±40.24	44.82±25.92	44.58±27.66	56.42±37.14	48.59±66.28	26.84±15.70
Total bilirubin (mg/dL)	1.02±0.56	1.20±1.23	0.63±0.66	1.24±1.18	2.28±2.95	1.47±1.27	1.63±0.74	0.77±0.50
Direct bilirubin (mg/dL)	0.44±0.32	0.35±0.23	0.30±0.34	0.52±0.40	0.88±1.20	0.57±0.60	0.71±0.41	0.24±0.26
SGOT (IU/L)	27.95±15.73	62.69±102.36	35.50±39.10	75.29±156.99	40.03±61.15	150.63±294.	66.00±84.4	25.30±17.8
SGPT (IU/L)	23.23±11.90	80.61±196.39	25.66±12.12	52.08±110.76	27.80±44.642	129.76±292.72	25.75±15.51	17.40±13.69
PT (s)	12.90±2.27	12.83±2.07	12.50±1.43	14.29±6.61	13.92±6.93	16.14±10.73	12.72±1.03	12.44±1.22
PTT (s)	33.96±6.23	38.48±17.40	35.40±7.74	37.14±16.58	39.40±18.01	43.37±21.66	33.16±10.97	38.16±10.68
INR	1.12±0.29	1.25±0.93	1.10±0.16	1.28±0.76	1.23±0.74	1.48±1.19	1.09±0.15	1.05±0.15
ESR (mm/hr)	71.00±38.19	47.83±43.18	31.00±SD	36.55±35.60	47.76±47.48	32.93±31.20	34.31±24.95	41.36±40.78
WBC (/mm3)	9.48±4.68	11.50±5.52	8.72±3.28	12.78±10.91	11.39±6.63	12.15±5.16	11.63±4.02	8.72±2.95
RBC (million/mm^3)	4.74±0.89	4.50±0.72	4.44±0.53	4.49±0.75	4.36±0.98	4.55±1.03	4.73±0.65	4.89±0.93
MCV (μm^3)	86.56±8.63	82.43±8.00	87.77±6.97	88.05±7.55	88.83±9.05	85.37±9.23	88.80±6.43	85.61±12.18
HCT %	40.03±6.42	40.06±10.03	38.46±5.65	38.50±6.10	37.55±7.10	37.08±7.89	41.53±6.22	39.62±6.89
MCH (pg/cell)	28.46±3.91	27.64±3.86	28.93±2.90	29.24±3.56	29.03±3.84	27.81±4.46	29.76±3.47	29.45±3.96
HB (g/dL)	12.81±2.32	12.26±2.66	12.21±1.82	12.22±2.23	11.91±2.52	11.75±2.65	13.19±2.51	12.86±2.39
MCHC (Hb/cell)	31.19±2.78	31.50±2.87	31.09±1.77	30.75±2.95	30.84±3.63	30.61±3.32	31.61±2.77	30.77±3.67
PLT (mm^3)	248.37±85.98	263.16±130.95	224.23±51.59	241.63±93.31	240.17±94.29	237.17±94.35	240.65±66.98	234.39±83.41
Neutrophil %	68.25±14.26	71.63±13.37	71.54±17.87	71.55±14.70	69.17±14.01	72.80±14.71	69.79±14.17	66.69±12.69
Lymphocyte %	31.85±14.25	28.37±13.37	28.46±17.87	28.45±14.70	30.83±14.01	27.32±14.72	30.21±14.17	33.43±12.66

Note. IHD: Ischemic heart disease; MI: Myocardial infarction; FBS: Fasting blood sugar; BUN: Blood urea nitrogen; Cr: Creatinine; Na: Sodium; K: Potassium; CK-MB: Creatine kinase-MB; SGOT: Serum Glutamate oxalate transaminase; SGPT: Serum glutamate pyruvate transaminase; PT: Prothrombin time; PTT: Partial thromboplastin time; INR: International normalized ratio; ESR: Erythrocyte sedimentation rate; WBC: White blood cell; RBC: Red blood cell; MCV: Mean corpuscular volume; HCT: Hematocrit; MCH: Mean corpuscular hemoglobin; HB: Hemoglobin; MCHC: Mean corpuscular hemoglobin concentration; PLT: Platelet.

men, and its amount was higher in women than in men

In a study, Sujino et al observed that the ratio of high urea to creatinine at discharge independently with higher mortality after discharge was related to any cause in patients with acute irreversible heart failure (18). The study by Keane Lan et al indicated an association between primary BUN and the incidence of cardiovascular disease in women. Higher BUN was observed to be related to an increased risk of atrial fibrillation in women and kidney disease in both groups, while no association was found between BUN and heart disease in men (19).

The current study found that mean PT was higher than normal in patients with cardiac arrest, heart failure, and cardiac arrhythmia. Moreover, the mean PT was higher in men than in women, but this difference was not significant. There was also no significant difference in age groups. Okada et al reported that prolongation of PT-INR in decompensated acute heart failure patients receiving anticoagulants does not confirm that coagulation was related to markers of liver congestion and increased right blood pressure (20).

In this study, it was observed that the mean SGPT in patients with cardiac arrest, heart failure, and ventricular tachycardia was higher than normal, so it was highest in patients with cardiac arrest symptoms. Additionally, the mean of SGOT was higher than normal in all subgroups of cardiac patients, and the highest value was observed in patients with cardiac arrest. The mean of total bilirubin was higher than normal in patients with myocardial infarction, cardiac arrhythmia, and cardiac arrest.

In their study, Alvarez and Mukherjee reported that perfusion impairment due to reduced cardiac output may be associated with acute hepatocyte necrosis with a significant increase in serum aminotransferase, and cardiogenic ischemic hepatitis may occur after a period of severe hypotension in patients with acute heart failure (21). Ndrepepa et al reported in their study that high and low aspartate aminotransferase (AST) values are

clinically important, so the increased AST activity may indicate increased tissue expression, apoptosis or plasma membrane disruption, plasma membrane vesicles, and AST complexes with plasma proteins. Further, the activity of serum AST in patients with myocardial infarction increased in proportion to the degree of myocardial necrosis, and low levels of AST may indicate increased cardiovascular risk associated with inflammatory disease, vitamin B6 deficiency, chronic kidney, or advanced liver disease sharp (22). Wang et al reported that an increase in the AST/alanine aminotransferase ratio is associated with an increased risk of cardiovascular diseases in men rather than in women (23).

Conclusion

Cardiovascular diseases are more common in men and people over 55 years old. FBS and renal, liver, and coagulation markers are abnormal in these patients. In some of these laboratory factors, a significant relationship can be found between two gender and different ages.

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Author Contributions

ER, ZBT: Draft preparation. NK, AZ: Data analysis. ER, ZBT, MB, AH, KHK: Data presentation. ER: Project administration. All authors reviewed and confirmed the final manuscript.

Conflict of Interests

There is no conflict of interests.

Ethical Approval

This study was approved by the Ethics Committee of Abadan University of Medical Sciences (Ethical approval ID: IR.ABADANUMS.REC.1399.026).

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