

# Investigation of the relationship between hospitalization periods in patients with acute coronary syndrome

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## Abstract

**Aim:** The aim of this study was to investigate the relationship between high sensitivity C-reactive protein (HsCRP), cardiac markers, D-dimer and brain natriuretic peptide (BNP) measured at admission to the emergency department in patients with acute coronary syndrome (ACS).

**Material and Methods:** In our clinic, patient records were scanned backwards. The records of the patients who presented to the emergency department with chest pain were evaluated. Patients with acute coronary syndrome were included in the study. Laboratory values, echocardiogram and electrocardiograms of these patients were examined.

**Results:** 88 patients with acute coronary syndrome were included in our study. According to the complaints of the patients, 93.2% (n=82) had chest pain, 45.5% (n=40) sweating, and 42% (n=37) had left arm pain at their admission to the emergency unit. The mean stick blood glucose value of the patients who came to our emergency department was 157±75.38 mg / dl (37.00-524.00 mg / dl). Biochemical laboratory values measured from venous blood taken at the time of arrival of patients, mean HsCRP 11.67±15.4 mg / l, insulin 14.87±29.53 IU / ml, glucose level 139.11±74.3 mg / dl, CK 426.9±12x8.9 mg / dl and CK-MB were determined as 41.1±46.8 mg / dl.

**Conclusion:** We conclude that there is no correlation between cardiac parameters, DDIM, glucose, insulin and HsCRP levels in the in-hospital prognosis and there is a relationship between the measured BNP levels and the length of hospital stay.

**Keywords:** Emergency service; trauma; blood glucose; DDIM.

## INTRODUCTION

Cardiovascular diseases (CVD) are the leading causes of mortality in industrialized countries. Coronary artery disease (CAD) is the most common form of CVDs and considered as the leading cause of mortality and morbidity in the developed countries (1-3). Although new diagnosis and treatment methods have been developed every day in the medical world, patients with acute coronary syndrome (ACS) still need serious medical support (4,5). In the United States (USA), approximately 2 million people experience ACS every year (6). Coronary heart disease (CHD) is a common cause of death in our country. (7)

In general, when the causes of death in the world are examined, more than 50% of the causes related to the cardiovascular disease (7,8). According to the studies, it is seen that the mortality rate from CVDs in the world

will increase even more between 1990 and 2020. As malnutrition and infectious diseases are overwhelming problem in the developing countries and significant increase in smoking are among the primary causes of death (9).

Our aim in this study; The aim of this study was to evaluate the relationship between the blood glucose level, high sensitive C-reactive protein (HsCRP), and the length of hospital stay in patients who were admitted to our emergency department and diagnosed with ACS and were admitted to the cardiology service later on.

## MATERIAL and METHODS

After the approval of the ethics committee (28.02.2008 / 02-21) required for the study, 88 patients who were diagnosed with ACS in the emergency department of Firat University were retrospectively evaluated.

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Anamnesis of the patients who applied to the emergency department with complaints of chest pain, physical examination and laboratory examinations were performed. ECG was performed for the diagnosis of each patient due to chest pain. The diagnosis of acute coronary syndrome was based on patients who had positive history, ECG and 2 positive cardiac markers. Cardiology consultation was provided to the patients who were suitable for the diagnosis. For the biochemical and HsCRP examinations, 2 cc blood was collected and sent to the laboratory. HsCRP value was measured by nephelometric method using BN II machine (Dade Behring, Marburg GmbH, Germany). According to the diagnosis of hospitalization, the number of days in the clinic and the type of discharge (exitus, cured) were followed and recorded.

The data were processed by the physician who evaluated the patient with "the patient with chest pain questionnaire" form. The name, gender, age of the patients, the duration of admission to the hospital after the onset of pain, the patient's self (diseases, drugs, etc.) and family history, symptoms, vital signs, physical examination findings, ECG results, glucose, cardiac marker (Tnl, mass CK-MB, myoglobin), HsCRP, insulin level results, diagnosis, duration of hospitalization and outcome data were recorded. The information in the form was uploaded to SPSS 15.0 statistical package program and statistical analyzes were performed and demographic data of the patients were obtained. The measured biochemical values of the patients were divided into two groups as normal and high and these two groups were compared with the student-t test.

## Results

A total of 88 patients who were evaluated with the diagnosis of ACS as a result of the evaluation in our emergency department were included in our study. Of the patients included, 29.5% (n=26) were female and 70.5% (n=62) were male. The mean age of the patients was  $60.6 \pm 12.9$  / year, and the mean age of female patients and

male patients were similar (Table 1).

**Table 1. Gender distribution of patients included in the study**

	Number of patients	Percent (%)
Female	26	29.5
Male	62	70.5
Total	88	100.0

According to the complaints of the patients, 93.2% (n = 82) had chest pain, 45.5% (n = 40) sweating, and 42% (n = 37) had left arm pain. 2).

**Table 2. Common symptoms in patients**

	Number of patients (n)	percent (%)
Chest pain	82	93.2
Sweating	40	45.5
Left arm pain	37	42
Shortness of breath	16	18.2
Dizziness	15	17
Epigastric pain	13	14.8
Fainting	4	4.5

The mean stick blood glucose value of the patients who came to our emergency department was  $157 \pm 75.38$  mg / dl (37.00-524.00 mg / dl).

The mean Tnl measured after admission in the emergency department was  $2.54 \pm 6.77$  ng / ml, Myoglobin:  $156.1 \pm 153.3$  ng / ml, CK-MB:  $13.4 \pm 23$  ng / ml, BNP:  $157 \pm 264$  , 77 ng / ml, DDIM:  $590.1 \pm 890.9$  ng / ml.

Biochemical laboratory values measured from venous blood taken from the time of arrival in the emergency room, mean HsCRP  $11.67 \pm 15.4$  mg / l, insulin  $14,87 \pm 29.53$  IU / ml, glucose level  $139.11 \pm 74.3$  mg / dl , CK  $426.9 \pm 12 \times 8.9$  mg / dl and CK-MB  $41.1 \pm 46.8$  mg / dl (Table 3).

**Table 3. General data of patients**

	N	Min.	Max.	Mean	Std. Deviation
Age	88	30,00	95.00	60.0565	12.87735
Stick Blood Sugar	88	37.00	524.00	156.9758	75.37564
Tnl	88	.05	30.00	2.5412	6.75795
BNP	88	5.00	112x0.00	156.9645	264.76544
panel CK MB	88	1.00	80.00	13.4137	22.98272
myoglobin	88	1.00	500.00	156.5968	153.27812x
D dimer	88	100.00	5000.00	590.0968	890.86996
Glucose	88	45.00	496.00	139.1129	74.29191
CK	88	25.00	3737.00	426.9113	12x8.93625
CK-MB	88	7.00	243.00	41.0887	46.84068
Insulin	88	2.00	300.00	14.8645	29.52754
hsCRP	88	.52	98.60	11.7645	15.39655
Length of stay	88	1.00	16.00	5.2903	2.12x428

The mean length of hospital stay was  $5.66 \pm 2.98$  / day in female patients and  $5.3 \pm 2.1$  / day in male patients. Overall, the mean length of hospital stay was  $5.29 \pm 2.6$  / day. There was no statistically significant difference in terms of length of hospital stay between two patient groups in terms of gender ( $P > 0.05$ ).

The mean hospitalization time for patients with normal brain natriuretic peptide values ( $n = 58$ ) was found to be  $4.97 \pm 2.15$  / day, while those with high brain natriuretic peptide values were  $6.27 \pm 2.57$  / day. There was a statistically significant difference between the patients with high BNP levels and the duration of hospitalization ( $P < 0.05$ ).

The mean length of hospitalization of the patients with normal myoglobin levels was  $4.11 \pm 1.97$  / day and the mean values of patients with high myoglobin ( $n=44$ ) were  $6.2 \pm 2.5$  / day. There was a statistically significant difference between these two groups ( $P < 0.05$ ).

Mean hospitalization values of patients with normal and high glucose values were found as  $5.43 \pm 2.58$  / day and  $5.39 \pm 2.18$  / day, respectively. There was no statistically significant difference between the patients with high glucose levels and the duration of hospitalization ( $P > 0.05$ ).

There was no statistically significant difference between the group of patients with pathological values and normal patient group ( $P > 0.05$ ). The mean duration of hospitalization of patients with normal insulin values ( $n=74$ ) was  $5.55 \pm 2.44$  / day, and those with high insulin values were  $4.64 \pm 1.87$  / day.

The mean hospitalization time of patients with normal HsCRP values ( $n=11$ ) was found to be  $4.64 \pm 2.54$  / day, while the mean hospitalization time of patients with high HsCRP values ( $n=77$ ) was  $5.52 \pm 2.34$  / day ( $P > 0.05$ ).

The mean duration of hospitalization of patients with normal troponin I ( $n=64$ ) was found to be  $5.21 \pm 2.44$  / day, while those with high levels were found to be  $5.91 \pm 2.12$  / day. There was no statistically significant difference between the patients with high and normal troponin I levels in terms of hospitalization time ( $P > 0.05$ ).

The mean hospitalization time was found to be  $5.1 \pm 2.60$  / day in patients with normal CK-MB values ( $n = 55$ ). Patients with high CK-MB values ( $n=33$ ) had a mean hospital stay of  $5.90 \pm 1.86$  / day. There was no statistically significant difference between the two groups with normal and high CK-MB values ( $P > 0.05$ ).

The mean duration of hospitalization of patients with normal DDIM values ( $n = 51$ ) was found to be  $5.25 \pm 2.19$  / day, while the mean duration of hospitalization of patients with high DDIM ( $n=37$ ) was  $5.71 \pm 2.69$  / day. There was no statistically significant difference in the duration of hospitalization between patients with high DDIM values and normal DDIM values ( $P > 0.05$ ).

**Table 4. The relationship of biochemical markers with the length of hospital stay**

	Average hospitalization value of patients with normal value	The average length of stay in patients with high value	P value
<b>DDIM</b>	$5.25 \pm 2.19$ /days	$5.71 \pm 2.69$ /days	$P > 0.05$
<b>BNP</b>	$4.97 \pm 2.15$ /days	$6.27 \pm 2.57$ /days	$P < 0.05$
<b>MYOGLOBIN</b>	$4.11 \pm 1.97$ /days	$6.2 \pm 2.5$ /days	$P < 0.05$
<b>GLUCOSE</b>	$5.43 \pm 2.58$ /days	$5.39 \pm 2.18$ /days	$P > 0.05$
<b>INSULIN</b>	$5.55 \pm 2.44$ /days	$4.64 \pm 1.87$ /days	$P > 0.05$
<b>HsCRP</b>	$4.64 \pm 2.54$ /days	$5.52 \pm 2.34$ /days	$P > 0.05$
<b>TROPONIN</b>	$5.21 \pm 2.44$ /days	$5.91 \pm 2.12$ /days	$P > 0.05$
<b>CK</b>	$5.1 \pm 2.60$ /days	$5.90 \pm 1.86$ /days	$P > 0.05$

When the patients who were admitted to the cardiology department were evaluated according to their hospitalization diagnoses, 45.5% ( $n=40$ ) had STEMI, 39.8% ( $n=35$ ) had USAP while 14.8% ( $n=13$ ) of them were diagnosed as NSTEMI.

**Table 5. Distribution according to clinical diagnoses of patients**

	Number of patients	Percent (%)
<b>NON ST MI</b>	13	14.8
<b>ST MI</b>	40	45.5
<b>USAP</b>	35	39.8
<b>Total</b>	88	100.0

The mean length of hospital stay in the cardiology department was calculated as  $5.3 \pm 2.6$  / day. All patients were discharged after treatment.

## DISCUSSION

Coronary artery disease is the leading cause of mortality and morbidity in the emergency department of developed countries (4,5,7). All the conditions formed as a result of myocardial ischemia are called ACS (10). Under the name of ACS; USAP, NSTEMI and STMI take place (11). Even though ACS is divided into two according to the clinical forms, they do not separate from each other in terms of symptoms, findings and initial evaluations (12).

The mean age of the patients we included in our study was  $60.6 \pm 12.9$  / year. Montoliu et al. found that the mean age of the patients was (13)  $67.4 \pm 12.4$  / year, Macdonald et al. (14)  $58 \pm 14.6$  / yr, and Bogaty et al. found it as (15)  $62 \pm 12$  / yr. Similar to the above, many studies have found similar results in terms of the average age. The average age obtained in our study is in parallel with the existing literature.

In many studies conducted with NT-proBNP, a cardiac marker, it is supported that plasma NT-proBNP level elevation is associated with increased mortality (13,16-18). Brain natriuretic peptide and NT-pro BNP are an increasing and important prognostic factor in ACS patients, and in recent years, studies have shown that the levels of these markers are related to mortality and

morbidity (19,20). Jernberg et al. (20), in their study, measured the plasma NT-proBNP level of patients who had no ST-segment elevation and hospitalized in the coronary care unit due to chest pain and followed them for an average of 40 months. Lemos et al. (21) studied plasma BNP levels measured at approximately 40 hours after the onset of ischemic symptoms in studies involving 2525 hospitalized patients with ACS. They found that increased plasma BNP levels correlated with mortality in the 10-month period. In our study, those with high BNP values were hospitalized with an average of  $6.27 \pm 2.57$  / day and the mean duration of hospitalization was  $4.97 \pm 2.15$  / day in those with normal BNP values. The results of our study were that patients with high BNP values had longer hospitalization time than the normal group. This is in parallel with the literature.

Macdonald et al. (14) have shown that serial myoglobin measurements are very useful markers in the early discharge from hospital and follow-up of out-patients after discharge in ACS patients. Jaffery et al. (22), in their study on 955 patients with chest pain, showed that the high values of myoglobin were associated with mortality in the following 5 years. In a 6-month retrospective study of 355 patients with ACS who came to hospital with chest pain, Rathore et al. (23) analyzed patients' hospital admissions and cardiac-induced death and found that CK MB could be safely used in following up patients with ACS after discharge from hospital. In our study, the mean duration of hospitalization of patients with normal myoglobin values was  $4.11 \pm 1.97$  / day and the mean duration of hospitalization of patients with high myoglobin values was  $6.2 \pm 2.5$  / day. This shows that there is a statistically significant difference between the patients with high myoglobin levels and the duration of hospitalization. This result is in parallel with the literature.

CRP, which can be detected by immunological methods, is an agent that can be used in the diagnosis of ACS and starts to release in 6 hours after AMI and reaches peak level in 50 hours (24,25). In the studies performed in patients with USAP (26), the CRP levels of these patients was examined during hospital admission, and was found that hospitalization time (mean,  $9.8 \pm 7$  / day) in patients with HsCRP level  $< 3$  mg / l was much higher than those patients whom HsCRP level  $\geq 3$  mg / l (mean,  $5.4 \pm 3$  / day).

Ridker et al. (27) in their study on healthy 122 female volunteers reported that baseline CRP values predicted future MI and stroke risk at the 3-year follow-up (28). In our study, the mean hospitalization time of patients with normal HsCRP values was found to be  $4.64 \pm 2.54$  days, while the mean duration of hospitalization of patients with high HsCRP values was found to be  $5.52 \pm 2.34$  days. No statistically significant difference was found between the two groups with normal and high HsCRP ( $p > 0.05$ ). In conclusion, HsCRP level did not correlate with the duration of hospital stay. We think that this difference with the literature may be due to initial measurement of the patients at the time of our arrival.

Creatinine kinase is indispensable in the diagnosis of ACS. In addition, this marker is associated with short and long-term prognosis (31). Studies have shown that there is a significant correlation between CK-MB levels and mortality risk in patients with CAD and causes the highest risk in patients with a  $\geq 5$  fold increase than normal levels (31,32). In our study, mean duration of hospitalization of patients with normal and high CK-MB values was  $5.1 \pm 2.60$  and  $5.90 \pm 1.86$  / day, respectively ( $p > 0.05$ ).

Troponins are indispensable cardiac markers in the diagnosis of ACS. It has been shown to be associated with short and long-term prognosis (30). Cardiac Tins are highly sensitive and specific indicators of myocardial injury.

## CONCLUSION

In conclusion, we conclude that there is no correlation between cardiac parameters, DDIM, glucose, insulin and HsCRP levels in the in-hospital prognosis, and there is a relationship between measured BNP levels and length of hospital stay. We believe that new studies are needed on this subject.

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