

Predictors of Time Delay in Commencing Primary Coronary Intervention in STEMI Kosova Case-Pilot Study

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Abstract

Kosovo is located in the Western Balkans in south-eastern Europe, has population of 1.78 million and only one center, at Prishtina University Hospital is covering STEMI with pPCI 24/7. The 24-hour operationalization of the Invasive Cardiology service seven days a week, in 2018 has increased the workload significantly. There is no fully operational health insurance in place and health information system.

The aim of the study was to evaluate the patient and system delay, since data are lacking. The hospitalization on Secondary Regional Hospital (non PCI Hospital) and primary health contact were seen as factors of time delay in commencing PCI in acute myocardial infarction patients.

A total 112 patients with AMI, who underwent pPCI were included in the study during period of five months, March 2019 September 2019 at Coronary Care Unit of Cardiology Clinic of University Clinical Center of Kosova in Prishtina. The main delay was first contact by Family Medical Center and with a cardiologist on Regional Hospital/non PCI center before arriving at the pPCI facility. The average distance from pPCI center was 41.11 km \pm 3-89.3 km, Q1-Q3 (20-89.5). The mean ischemic time was 894 min. Q1-Q3 (240-1040 min). Hospitalization in Regional Hospital/non PCI hospital mean distance was 50 km and this in time delay was 950 min. System delay was 348 min. Patient delay mean time was 173 min. Q1-Q3 (45-180). Door-to-balloon time, min 114 (0-65).

The hospitalization on Secondary Regional Hospital (non PCI Hospital) and primary health contact were seen as factors of time delay in commencing PCI in acute myocardial infarction patients. Strategies to optimize care for STEMI patients should be put in place. Patient delays in recognizing MI symptoms increasing awareness of MI symptoms. The National centers pPCI should increase from 1 to 3, enabling the program to expand to whole country by establishing Acute Coronary Syndromes and STEMI/PCI registries. Campaigns in reducing patient delay and it is important to identify factors related to prolonged patient delay and to focus media campaigns on these factors. Developing of transportation network.

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Introduction

Cardiovascular disease (CVD) is the leading cause of death and morbidity in Europe, and is estimated to be responsible for more than four million deaths every year, 49% of deaths among women and 40% among men. ¹

Cardiovascular disease is the major cause of death in adults aged 35–70 years in Middle Income Countries (MIC) and Low Income Countries, and strategies to prevent and treat cardiovascular disease, such as better availability of and access to hospitals and cardiovascular disease medications are likely to reduce the proportion of deaths associated with cardiovascular disease. ²

Treatment for patients with ST-segment elevation myocardial infarction (MI) (STEMI) consists of reperfusion therapy to restore blood flow into the ischemic myocardium.

The benefits of angioplasty are maximized if the procedure is performed within 2

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hours of symptom onset, including reduction in mortality, heart failures and hospitalizations. Between 3 and 6 hours after symptom onset patients still benefit, but with a decreasing rate.

Numerous longer observations confirmed this data by showing that every 30 min of delay in treatment resulted in an increase in the risk of death in MI patients by 7.5% annually.³

Total ischemic time i.e. time from symptom onset to the reperfusion therapy has prognostic implications.⁴⁻⁶

It is composed of two distinct periods: patient delay (time from symptom onset to first medical contact) and system delay (time from first medical contact to perfusion therapy).⁵

Kosovo University Clinical Center - Cardiac Surgery Service with Invasive Cardiology is the only public institution in the country that offers invasive cardiology services.

From February 2018 it was introduced primary PCI for STEMI in Kosovo⁷ and is assumed to have long delays in commencing PCI in patients with acute myocardial infarction (AMI).

Materials and methods

We examined 112 randomly hospitalized patients with STEMI in University Clinical Center of Kosova from March till September 2019, in Clinic for Cardiology, treated with primary PCI at University Clinical Center of Kosova.

82 patient were males and 28 females. 69 were anterior, while 44 inferior AMI. Mean age was 61 years ± 10.62.

Symptom onset to door to balloon time and door to balloon time were analyzed and compared with guideline recommendations.

All patients had clinical symptoms of chest pain, an electrocardiogram (ECG) with ST-segment elevation and elevated biochemical markers of acute myocardial injury. Patients with STEMI requiring primary angioplasty were preferably treated using the femoral technique, although a small number of cases were treated using the radial technique.

STEMI was defined as the presence of symptoms of myocardial ischemia for more than 30 min and persistent ST elevation (> 1 mm in two continuous leads) or new-onset or previously undocumented complete left bundle branch block. First Medical Contact was defined as the time of medical and/or paramedical staff to attend the patient for the time of arrival at a hospital for

pPCI. Patient delay was defined as the delay between symptom onset and FMC.

The study was approved by the Research Ethics Committee of our institution, informed consent was waived due to the retrospective nature of the data collection.

Different variables were analyzed in this study. For categorical data, associations between groups were assessed by the chi-square test or Fisher's exact test; for continuous data, differences were assessed by analysis of variance or by the Kruskal-Wallis test for non-normally distributed data. Patient delay was defined as the time from symptom onset to FMC. It was considered a continuous variable and expressed in min.

For analyses of patient delays, as these values were skewed, they were described using medians and interquartile ranges (IQR) and tested using Mann-Whitney U test or Kruskal-Wallis for two or more independent samples, respectively. Patient delays were log-transformed for subsequent analyses. The analysis was conducted at a 5% level of significance. All statistical analyses were performed using MedCalc Statistical Software version 19.0.3 (MedCalc Software bvba, Ostend, Belgium; <https://www.medcalc.org>; 2019).

Results

Patient's baseline characteristics of the study population are displayed in Table 1.

Parameters	
Age (year), mean (±SD)	61.52 ± 10.62
Gender	
Male n%	82 (73.31)
Female, n (%)	30 (26.39)
Medical history	
Hypertension, n (%)	58 (51.78)
Diabetes mellitus, n (%)	29 (25.89)
Dyslipidemia, n (%)	18 (16.07)
Smoking, n (%)	52 (47.32)
Family history of cardiovascular disease, n (%)	41 (36.6)

Table 1. Parameters.

The mean age was 60.52 ± 11.50 years old (60% male), hypertension as risk factor was in 58 (51.78%), diabetes 29 (25.89%), smoking in 41 (47.32%) dyslipidemia in 18 (16.07) and family history in 41 (36.60%).

In terms of coronary angiographic findings, the culprit artery was the left anterior descending

artery (LAD, 48%), right coronary artery (RCA, 40%) and circumflex (12%), whereas, in terms of vessel disease, 40% of patients had one-vessel disease, 31% had two-vessel disease and 29% had three-vessel disease as showed in Table 2.

Level of Education, n (%)	
High school	67 (58.29)
University degree	13 (10)
Primary school	18 (15.92)
Coronary angiographic findings	
Culprit lesion, n (%)	
LAD	40 (37.71)
LCx	20 (17.85)
RCA	44 (39.2)

Table 2. Level of education and coronary findings.

A total 112 patients with AMI, who underwent pPCI, were included in the study during period of five months, March 2019-September 2019 at Coronary Care Unit of Cardiology Clinic of University Clinical Center of Kosova in Prishtina. As showed in table 3 differences were observed over the time in the proportion and distribution of patients among different distance, the contact from Family Medical Center, with a cardiologist on Regional Hospital/non PCI center before arriving at the pPCI facility.

Time from onset of symptoms to diagnosis in min	60 (40-180)
Distance to PCI center, km	92.90 (67.21-124.34)
Total ischemic time, min	800 (240-1040)
Door to balloon time, min	348 (15-1080)
Distance from first medical contact, km	69.5 (20-89.2)
Hospitalization on non PCI hospital, km	12.43 ± 24.48

Table 3. Components of Time delay.

The average distance form pPCI center was 41.11 km ± 3-89.3 km, Q1-Q3 (20-89.5). The mean ischemic time was 800 min. Q1-Q3 (240-1040 min).

System delay was 348 min. Patient delay mean time was 173 min. Q1-Q3 (45-180).

Door-to-balloon time, min 114 (0-65) Hospitalization in Regional Hospital/non PCI hospital mean distance was 50 km and this in time delay was 950 min. Door-to-balloon time, min 114 (0-65) <0.001.

As presented in table 4. There is still delay after arriving in the pPCI center due to emergency department delay.

	pPCI center time delay	Total Ischemic time
me (IQR)	65 (1-570) minutes	800 (240-1040) minutes
min	5 min	5 min
Max	60 min	1040 min

me (IQR) interquartile range median, min minimum, max maximum

Table 4. Components of System delay.

Discussion

Kosovo is located in the Western Balkans in south-eastern Europe. It has land area of 10 980 km and a population density of 177/km². It is administratively divided into 38 municipalities all with Main Family Medical Centers. According to Kosovo agency of Statistics estimations, the resident population is approximately 1.78 million 28% of the population in under 14 years old and 7% are over 65. Life expectancy at birth in 2011 was 74.1 years for males and 79.4 for females.⁸ There are 2.2 medical doctors per 1000 population, which is far below the EU27 average of 3.4 doctors per 1000 citizens, and Secondary care, with seven Regional Hospitals for in-patient care.⁹ There is no fully operational health insurance in place and health information system. The road network consists of 630 km of main roads. The country's road infrastructure is well developed,¹⁰ making possible transportation to pPCI center in time with guidelines.

In some studies low education levels were determinant of longer pre-hospital delay,¹¹⁻¹⁵ but because of the limited number of patients, not in our study.

Also some other data showed that inter-hospital transfer may have a negative influence on patient delay.^{1,4}

Bypassing the emergency department is associated with a 20 min saving in the time from FMC to wire crossing.¹⁶

For example, in Germany, the Czech Republic, Croatia, and Lithuania, the time from FMC to PCI was 120 min. The shortest times were reported in Belgium (60 min) and in Sweden (69 min). The longest times reported were in France (170 min) and Serbia (177 min).¹⁷

In order to reduce STEMI-related mortality, efforts should be made to improve the other times affecting treatment initiation, in

addition to door to balloon time. In line with this strategy, the American Heart Association introduced the 'Mission: Lifeline initiative in 2007, 10 and the European Association of Percutaneous Cardiovascular Interventions and the European Society of Cardiology established the 'Stent for Life' (SFL) initiative in 2010.^{18,19}

The SFL initiative established three main goals: (1) to treat 70% of STEMI patients by pPCI; (2) to perform 600 pPCI/year/million population; and (3) to ensure that centers with pPCI perform this procedure 24/7.^{20,21}

The success of a pPCI program is be assessed by the number of the patients treated (quantity) and by reductions in total ischemic time (quality). Patient delay is only one of the elements of total ischemic time; system delay is the other. The strategic approach of the program is to develop different programs for each of these variables, by increasing the public's awareness of patient delays and by promoting educational programs for health care professionals targeting system delay.

Conclusions

The hospitalization on Secondary Regional Hospital (non PCI Hospital) and primary health contact than transfer to Regional Hospital, were seen as factors of time delay in commencing PCI in acute myocardial infarction patients. Sometimes the Regional Hospitals issues the discharge letters increasing the system delay.

One of the aims of the program in Kosovo is to alert public to the symptoms of MI and to educate them for help by calling the national medical emergency number in order to reduce the patients and system delays.

Increase of National pPCI centers from 1 to 3. Expand program to whole country, establish regional pPCI network, introduce STEMI/PCI registry. Training of Emergency/Family doctors in proper diagnosis of AMI.

It is important to have more conventional public campaigns in reducing patient delay and increasing awareness of MI symptoms with focus media campaigns on these factors. Developing of transportation network.

Study limitations: data used in this study were only collected during a five months period of one year, and consequently the possible

effects of seasonal factors was not addressed. Future studies should be based on a continuous survey, in order to minimize these limitations.

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HÇ and RM was contributed in the preparation of manuscript and literature analysis. XK and FF had major contribution in preparation of the manuscript, the design of manuscript and literature analysis. Authors read and approved the final manuscript.

Declaration of Interest

The authors report no conflict of interest.

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