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Original Research

Reperfusion Therapy for ST – Elevation Myocardial Infarction at Dr. Soetomo General Academic Hospital Surabaya

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ABSTRACT

Background: Cardiovascular disease is the number one cause of death in the world by killing 17,9 million people every year. The most frequent cardiovascular disease occurs as STEMI which related to the depiction of persistent depiction of EKG elevation with ST segment. This research is aiming for figure out the profile of reperfusion therapy at Dr. Soetomo General Academic Hospital, Surabaya. **Methods:** In this research, the data is collected using observation method, without any treatment applied with descriptive statistical analysis using table. The data collection techniques used is simple random sampling. **Results:** The STEMI patients at Dr. Soetomo General Academic Hospital Surabaya are dominated by referral patients (79,2%) from approximately 40 hospitals in East Java. Most of the patients were male, the ages between 51 – 60 years old with the most frequent risk factors was the combination of type 2 diabetes mellitus, hypertension, and smoking. The reperfusion therapy given was PCI with a door to balloon <120 minutes was 59.6%. Fibrinolytic that was done in <12 hours after onset was 82.9%. Patients with STEMI managed at Dr. Soetomo General Academic Hospital Surabaya, had mortality rates around 12.2%. **Conclusion:** Most of the STEMI patients in Dr. Sutomo General Academic Hospital Surabaya was a referral patient and had sufficiently good PCI and fibrinolytic reperfusion therapy, resulting in a low mortality rate.

Introduction

Cardiovascular disease is the number one cause of death in the world by killing 17,9 million people or about 31% caused of global death based on World Health Organization (WHO) in 2016 and became the number one dead cause in the last 15 years [1]. In Indonesia, as the highest prevalence rate of heart disease, East Java is in the second rank after Special Region of Yogyakarta in 2013. [2]

Acute Coronary Syndrome (ACS) is the manifestation of cardiovascular disease which usually caused by atherosclerosis. ACS can also be caused by vasospasm with or without atherosclerosis. This decreasing of blood flow in heart muscles can cause ischemia and then myocardial infarction. This ACS can be classified as, ST-segment Elevation Myocardial Infraction (STEMI), Non-ST-segment Elevation Myocardial

Infarction (NSTEMI), dan Unstable Angina Pectoris (UAP). [3]

With the high number of people with cardiovascular disease, especially ACS, of course the higher the referral rate for treating the disease. Therefore, management guidelines are needed so that ACS patient services in Indonesia can get better and standardized.

Indonesian Heart Association (IHA) forms an update management guideline for ACS patients that following the development, so does the SMF Cardiology and Vascular Medicine which customized with handling abilities of STEMI patients at Dr. Soetomo General Academic Hospital Surabaya. Based on the existing guideline, the reperfusion therapy that can be given to STEMI patients are fibrinolytic therapy, Percutaneous Coronary Intervention (PCI), dan Coronary Artery Bypass Graft (CABG). Besides that, concomitant therapy such as oxygenation, antiplatelet (aspirin, ticagrelor, clopidogrel, dual antiplatelet therapy), antiarrhythmics (Beta Blockers, Ca Channel Blockers, Digoxin), statins, ACE inhibitor, ARB, and MRA are also given. [4]

This study focuses on evaluation of reperfusion therapy for STEMI patient in Dr. Soetomo General Academic Hospital Surabaya. The target is determined based on the consideration that Dr. Soetomo General Academic Hospital Surabaya is a tertiary hospital as the main referral for eastern Indonesia with a high probability that the referred patient is a patient with STEMI. It is hoped that in the future the results of this study can be used as an evaluation for the management of STEMI at Dr. Soetomo General Academic Hospital Surabaya.

Material and Methods

In this research, the data was collected using observational method, with descriptive statistical analysis using table. The subject was STEMI patients at Dr. Soetomo General Academic Hospital Surabaya from January – July 2019. We were observing the subject using patients' medical record and descriptively elaborate the result of the research. The data collection techniques used is simple random sampling and gained 82 data.

Results

In this research, the big data that fulfilled the scoring criteria is 82 data. The existing data is grouped by sub-variable.

Table 1. The characteristics of STEMI patients Dr. Soetomo General Academic Hospital Surabaya in January – July 2019

		n (%)	
Characteristics	**Male**	**Female**	**Total**
21 – 30 ages	1 (1,2)	1 (1,2)	**2 (2,4)**
31 – 40 ages	5 (6,0)	0	**5 (6,0)**
41 – 50 ages	14 (17,3)	2 (2,4)	**16 (19,7)**
51 – 60 ages	25 (30,5)	4 (4,8)	**29 (35,3)**
61 – 70 ages	21 (25,8)	4 (4,8)	**25 (30,6)**
71 – 80 ages	3 (3,6)	1 (1,2)	**4 (4,8)**
81 – 90 ages	0	0	**0**
91 – 100 ages	0	1 (1,2)	**1 (1,2)**
Total	69 (84,4)	13 (15,6)	**82 (100)**
Average Age			**56 ages**

Table 1 is shows that out of 82 data of patients with STEMI diagnosis examined, it was found that 69 patients (84,4%) was males and 13 patients (15,6%) females with a fairly varied age range, but were dominated by the 51 – 60 ages group (35,3%).

Table 2. STEMI patients' referral rates and mortality at Dr. Soetomo General Academic Hospital Surabaya in January – July 2019

STEMI Patients	**n (%)**	
	Amount	**Mortality**
Refer	65 (79,2)	10 (12,2)
Not Refer	17 (20,8)	0
Total	82 (100)	10 (12,2)

Table 2 is shows that out of 82 data of patients with STEMI diagnosis examined, it was found that 17 patients (20.8%) were not referred and 65 patients (79.2%) were referred from approximately 40 hospitals in East Java. Of the 65 referral patients, 10 of them (12.2%) died when receiving treatment at Dr. Soetomo General Academic Hospital Surabaya.

Table 3. Area in East Java that refer STEMI patients to Dr. Soetomo General Academic Hospital Surabaya in January – July 2019

Referrer Area	Amount (n)	Percentage (%)
Bangkalan	5	7,7
Gresik	4	6,2
Lamongan	1	1,5
Lumajang	1	1,5
Mojokerto	4	6,2
Nganjuk	2	3,1
Pamekasan	1	1,5
Pasuruan	3	4,7
Probolinggo	1	1,5
Sampang	1	1,5
Sidoarjo	6	9,2
Surabaya	36	55,4

Table 4. Risk Factors of STEMI patients at Dr. Soetomo General Academic Hospital Surabaya in January – July 2019

Risk Factors	Amount (n)	Percentage (%)
Type 2 Diabetes Mellitus	15	**18,3**
Hypertension	13	**15,9**
Smoking	10	**12,2**
Dyslipidemia	7	**8,5**
Combination	23	**28**
Without Risk Factors	14	**17,1**
Total	**82**	**100**

Table 4 shows that out of 82 data of patients with STEMI diagnosis examined, it was found that 14 patients (17.1%) had no risk factors and 68 patients (81.9%) had risk factors such as type 2 diabetes mellitus, hypertension, smoking, dyslipidemia, and combination (type 2 diabetes mellitus, hypertension, and smoking).

Table 5. The giving of medical therapy to the STEMI patients at Dr. Soetomo General Academic Hospital Surabaya in January – July 2019

Concomitant Therapy		n (%)
		Total
Oxygenation		26 (31,7)
Antiplatelet	Aspirin	80 (97,6)
	Ticagrelor	21 (25,6)
	Clopidogrel	51 (62,2)
	DAPT	78 (95,1)
Antiarrhythmics	Beta Blockers	73 (89)
	Ca Channel Blocker	1 (1,2)
	Digoxins	1 (1,2)
	Prophylaxis	1 (1,2)
Statin		82 (100)
	ACE inhibitor	62 (75,6)
	ARB	6 (7,3)
	MRA	14 (17,1)

Table 6. The giving of reperfusion therapy to the STEMI patients at Dr. Soetomo General Academic Hospital Surabaya in January – July 2019

Reperfusion Therapy	Timing of Therapy	n (%)
		Total
Percutaneous Coronary Intervention (PCI)	< 120 minutes	28 (59,6)
	> 120 minutes	19 (40,4)
Fibrinolytic	< 12 hours after onset	29 (82,9)
	> 12 hours after onset	6 (17,1)
CABG		0

Table 5 shows that out of 82 data of patients with STEMI diagnosis examined, it was found that form 47 patients who received PCI therapy, 28 patients (59.6%) were doing in less than 120 minutes from STEMI diagnosed at Dr. Soetomo General Academic Hospital Surabaya until the reperfusion with PCI, of the 35 patients who received fibrinolytic therapy 29 patients (82.9%) were being done for less than 12 hours from the onset until reperfusion therapy with fibrinolytic, and none of the patients received CABG reperfusion therapy.

Discussion

Based on the result of the research, the data gained that 69 patients (84,4%) are males and 13 patients (15,6%) are females. The results of this study are in line with the study which showed by INTERHEART, that is males (74,9%) have myocardial infarction than women (25,1%) [5]. This finding is also supported by Suhayatra Putra et al's research data in 2017 where 62,3% of STEMI was experienced by males and 37,7% was with females [6], and Melissa Dharmawan et al's research data in 2018 where 87,0% was males and 13,0% females [7]. It is associated with hormone estrogen in reproductive age women which has protection and resistance to the process of atherosclerosis, so most of the women who have myocardial infarction are the one who is in the menopause. [8]

Based on age distribution, the highest age groups with STEMI diagnosed are between 51 – 60 ages. It was gained the highest incidence rate is in 56 years old from 29 patients (35,3%). This result is in line with Susilo's research in 2015, that the peak of infarction incident is happened on males between 50 – 60 ages [9]. The increasing ages is directly proportional with the progressivity of arteriosclerosis which lead to the relationship of increasing coronary heart disease patients' proportion and the possible increase of STEMI risk factors along with increasing ages. [10]

Patients with STEMI diagnosis and handled at Dr. Soetomo General Academic Hospital Surabaya, had mortality rates around 12,2% (10 patients) from the total of examined patients, this mortality rates is lower than Gayatri's research in 2014 in other hospital where the mortality rate is 20%. [11]

As the tertiary hospital (the main referral for Eastern region of Indonesia), Dr. Soetomo General Academic Hospital Surabaya is receiving referrals from various regions in East Java to handle patients with STEMI with continued reperfusion therapy. There are 65 patients (79,2%) from the total data of referral patients from about 40 hospitals in East Java there are: 36 patients (55,4%) from Surabaya, 6 patients (9,2%) from Sidoarjo, 5 patients (7,7%) from Bangkalan, 4 patients from Mojokerto (6,2%) and Gresik (6,2%), 3 patients (4,7%) from Pasuruan, 2 patients (3,1%) from Nganjuk, and 1 patient from Lamongan (1,5%), Lumajang (1,5%), Pamekasan (1,5%), Probolinggo (1,5%), and Sampang (1,5%) with varying length of patient stay based on from 1 day until 23 days. Referral patients are patients who come from various private hospitals and clinics in Surabaya and public hospitals in various regions in East Java. Generally, patients have been given initial therapy such as aspirin, oxygenation, and ACE inhibitors before and are referred for further therapy such as fibrinolytic and PCI.

23 of the STEMI patients (28%) had the risk factors which dominated by the combination of type 2 diabetes mellitus, hypertension, and smoking habit, while in another side, 15 patients (18,3%) had single risk factor of type 2 diabetes mellitus, 13 patients (15,9%) with hypertension, 10 patients (12,2%) with smoking habit, and 7 patients (8,5%) with dyslipidemia. This finding is quite similar with Surhayatra Putra's research in 2017, Sarumpaet's in 2009 and Ralapanawa et al's in 2019 that said the highest risk factor is hypertension. [6,12,13]

The increasing of blood flows can cause left ventricular hypertrophy (depends on the weight and length of hypertension) and lead to the shear stress on coronary arteries thus facilitating the occurrence of arterioscleriosis [14]. Type 2 Diabetes mellitus is one of many risk factors that effecting the number of STEMI case and tend to intensify the number of patients' mortality risk based on Unachukwu's research in 2012 [15]. Smoking history is a risk factor that effecting the rise of STEMI cases and also

another risk factors such as hypertension, type 2 Diabetes mellitus and dyslipidemia [16]. Meanwhile, there is no occurrence of dyslipidemia in this research, this might be caused by the fat level itself is not the only risk factor that effecting the intensity of STEMI.[6] But from this research, as the preventive action to decrease the Low Density Lipid (LDL) level, all patients got statin therapy in the early handling when they admitted to the hospital.

In giving the concomitant therapy, 26 of STEMI patients get oxygenation therapy in accordance with the indication. All patients got statin therapy, most of them got antiplatelet therapy (aspirin, clopidogrel/ticagrelor, dan DAPT), antiarrhythmic (beta blocker), ACE inhibitor, and some patients got the other concomitant therapy based on patients' indication (Ca channel blocker, Digoxin, MRA, dan ARB). The dual antiplatelet and beta blocker are the standard management of STEMI that should be given to 100% of STEMI patients. In this study, it was found that not all patients received the existing standard therapy, this could be due to the incomplete written therapeutic data on the medical record, or there were contraindications from the patient. Contraindications to beta blockers include asthma, uncontrolled heart failure, marked bradycardia, hypotension, sinus disease syndrome, second or third degree AV block, cardiogenic shock; phaeochromocytoma. [17]

Reperfusion therapy that has given to the patients can be given with PCI, fibrinolytic, and CABG method. In this research, no patients got CABG therapy, 47 patients got PCI therapy and 35 patients got fibrinolytic therapy.

On 47 patients that experienced PCI therapy, 28 (59,6%) patients were doing in less than 120 minutes from STEMI diagnosed at RSUD Dr. Soetomo Surabaya until the reperfusion with PCI was done. Moreover, on 19 (40,4%) other patients were not match because the time duration of the PCI therapy was more than 120 minutes. This finding is relatively the opposite of Ermiati's research in 2016 where the percentage of mistime treatment of STEMI patients with PCI in a hospital was 80,5% [18]. This indicates the performance in handling STEMI patients with PCI at RSUD Dr. Soetomo Surabaya is fairly well. Based on Pratiwi's, the mistime can be possibly caused by various factors such as, the great distance from patient's house to the health facility, the patient and family's lack of knowledge so the therapy cannot be done in time, uncertain diagnosis or the slow response from medical staffs that leads to the shorten of door to ballon and door to needle time when they arrived in the medical facility with PCI. Moreover, PCI which applied for more than 120 minutes can be caused by asymptomatic patients so PCI was not necessarily needed earlier. [19]

On 35 patients with fibrinolytic therapy that is streptokinase, 29 (82,9%) patients were being done for less than 12 hours from the onset until reperfusion therapy with fibrinolytic was commit. Meanwhile, on the 6 (17,1%) patients were not suitable because the timing of the onset until the reperfusion therapy with fibrinolytic was commit took more than 12 hours. This finding is relatively the opposite of Ermiati's research in 2016 where the percentage of STEMI patients handling mistime using fibrinolytic in a hospital was 75 % [18]. This indicates the performance in handling STEMI patients with fibrinolytic at RSUD Dr. Soetomo Surabaya is fairly well. The mistime of fibrinolytic admission can be possibly caused by various factors such as, the slow response in former handling by medical facility so when the patient has arrived in RSUD Dr. Soetomo Surabaya, was already 12 hours of patient's onset, administrative problems, the great

distance from patient's house to the referral health facility, and also the patient and family's lack of knowledge.

There are no specific parameters that can be used as a definite standard to say that the handling of STEMI patients is good enough in a health institution, but if we compare it with the data from several previous studies regarding the appropriateness of giving reperfusion therapy and the mortality rate of STEMI patients in other health institutions, the handling at Dr. Soetomo can be said to be quite good and needs to be improved in the future with collaboration and support from various related parties, including the government, referral hospitals, health workers, as well as patients and their families.

Conclusion

From the study results that have been discussed in the previous sections, it can be concluded that Dr. Soetomo General Academic Hospital Surabaya as the main referral hospital for STEMI patients in the area of East Java has handled PCI reperfusion therapy <120 minutes' door to balloon and fibrinolytics <12 hours since onset fairly well so it also affects the mortality rate of STEMI patients who are treated. Hopefully in the future the handling of STEMI patients can be better which of course needs support and cooperation from various parties, be it medical personnel on duty, referral hospital facilities and services, families and patients, and also the government.

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