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Characterization of a Population with Acute Coronary Syndrome in a Latin American Hospital between 2011 and 2016

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Abstract

Introduction: Cardiovascular disease is the first cause of death in developed countries, resulting in approximately 25 million deaths every year. This is no different in Colombia, where acute coronary syndromes (ACS) result in major morbi-mortality and health costs.

Methods: Here we present the results of our cross-sectional data from 2011 to 2016 at Fundacion Santa Fe de Bogota University Hospital, collected through the Colombian register of cardiovascular disease (RECODEC).

Results: 724 patients with myocardial infarction were included. All patients were classified according to ECG parameters based on the American heart association classes for ACS: 1.4% presented new left branch block (NLBB), 37.4% with ST elevation being diagnosed as ST elevation AMI (STEMI), and 61.2% had no ST elevation and were diagnosed as AMI without ST elevation (NSTEMI). Hypertension was the most prevalent risk factor in our cohort (57%). Most patients presented as Killip I and were classified as type I ACS. 40.2% of patients with STEMI received thrombolysis as their initial reperfusion strategy. Rescue angioplasty was needed in 29% of these patients. 42% of patients with STEMI received percutaneous coronary intervention (PCI). Successful reperfusion rates were 69% and 85% for thrombolysis and PCI respectively. All patients with NSTEMI were stratified and treated accordingly.

Conclusions: To our knowledge, this is the first study to describe risk profiles, reperfusion and pharmacological approaches and outcomes in Colombia, yet many more will be needed to accurately represent our population and impact our health policies.

Keywords: Myocardial infarction; Thrombolysis; Angioplasty; Mortality

Introduction

Cardiovascular disease is the leading cause of death in developed countries, resulting in up to 25 million deaths every year. Atherosclerosis and complications such as acute myocardial infarction (AMI) account for the majority of events [1]. According to the World Health Organization (WHO), ischemic cardiovascular disease had a mortality rate of 103.9 per 100000 in 2012 [2].

This is no different in Colombia, where acute coronary syndromes (ACS) result in major morbi-mortality and health care costs. In 2015 alone, 32976 deaths (16.3%) were reported to be due to AMI by the national statistic and administration department (DANE), making this the leading cause of death in the Colombian population [3,4]. According to our national register, the average age for ACS presentation is 68 years and the male: female ratio is approximately 3: 2 [5].

ACS account for 40% of the acute chest pain presentations to the Emergency Department. NSTEMI is diagnosed in 15-30% of cases and STEMI in 5-10% [6], in hospital mortality rates are 5% and 8% respectively, and 6-month follow up mortality varies only slightly from 12% for STEMI to 13% for NSTEMI [6].

ACS may present as unstable angina, NSTEMI (Acute Coronary Syndrome without ST-segment elevation), and STEMI (Acute Coronary Syndrome with ST segment elevation) [4,7]. Primary therapeutic strategies for patients with STEMI include thrombolysis with fibrin-specific agents and primary angioplasty, both of which have shown improvement of blood flow in the affected vessel, size of infarction, hospital stay and prognosis in terms of mortality [8]. In the case of NSTEMI patients, optimal medical therapy and invasive stratification and revascularization are the rule of thumb. Secondary prevention is mandatory for all patients presenting with ACS [9].

In spite of its frequent presentation, there is not enough data about ACS in the Colombian population and risk profiles, diagnostic distribution, treatment and prognosis have never been described before.

Methods

This is an observational cross-sectional study with a total sample of 724 patients. The data was gathered through the Colombian Registry of Cardiovascular Disease (RECODEC) that included all patients with AMI admitted to the emergency department of the Fundación Santa Fe de Bogota in the period between 2011 and 2016. Sampling was non-

probabilistic for convenience. This study is in full concordance with the ethical considerations on clinical research (Helsinki Declaration) and was approved by the Institutional Ethics Committee in la Fundacion Santa Fe de Bogota. Data analysis was done through SPSS 23 and Epidat 3.1, obtaining frequencies and percentages for the qualitative variables and measures of central tendency and dispersion for the quantitative ones. No further measurements were taken.

Results

A total sample of 724 patients diagnosed with AMI was analyzed. Out of all variables, only two had missing data: Killip class (6.4%) and patient education (35.5%). Univariate analysis showed a higher percentage of men (67.1%) and a median age of 66 years in our cohort. For quantitative variables, the average hospital stay in the intensive care unit (ICU) was 3 days with a minimum of 1 day and a maximum of 84 days. The total hospital stay in non-ICU units was 6 days with a minimum of 2 days and maximum of 145 days in patients who presented a complication.

As for the population characteristics, 46% of the people who attended our hospital were professionals and 56.9% had access to prepaid medicine, which is in agreement with the Colombian population of medium-high socioeconomic class. Hypertension was the most frequent risk factor in our population (57%), followed by dyslipidemia (49.4%) and diabetes mellitus (20%), as shown in table 1 (Prior comorbidities and medications in patients with AMI). Regarding the time of evolution prior to seeking medical attention, 33.6% of the patients consulted for symptoms lasting more than 12 hours, and only 9.4% within the first 60 minutes.

As shown in table 2 and table 3 (Diagnosis and classification of patients with ACS and Stratification and in-hospital treatment of AMI patients), 37.4% of all patients presented ST elevation, 1.4% presented new left bundle branch block, and 62.6% were classified as NSTEMI. Of the 271 patients with STEMI, 109 (40.2%) received management with thrombolysis, most of them with Tenecteplase (82.6%). 51.37% of the patients who received thrombolysis did it within the first 30 minutes, as established by the international standards at the time (door-to-needle time or time from first medical contact -FMC) [11].

On the other hand 113 (41.7%) patients with STEMI received PCI, with only 38.1% being intervened within the first 90 minutes and 61.9% outside of the door-to-balloon time. After invasive stratification, 65 (9%) patients were taken to surgical myocardial revascularization. Successful reperfusion rates were 69% for thrombolysis and 85% for PCI, respectively. The most frequently compromised vessel was the ADA (anterior descending artery) in 38%, followed by the RCA (right coronary artery) in 30% of the cases. Within the group of patients with NSTEMI, approximately 9% required surgical management and 58% exclusive medical management.

The most frequent in-hospital complication was acute heart failure in 146 patients (20.2%), followed by renal failure in 48 patients (6.6%). 20% required mechanical ventilation (non-invasive 12.4%), 7% had cardiogenic shock, 6.4% had ventricular arrhythmias (sustained ventricular tachycardia and ventricular fibrillation) and 11% had bleeding. Cardiovascular in-patient mortality occurred in 3.2% (n=23) and non-cardiovascular mortality in 1.9% (n=14), table 3 (Events and in-hospital complications of patients with a diagnosis of AMI).

Finally, adherence to AMI management guidelines showed that the cardiac rehabilitation group evaluated 95% of the patients. After discharge, patients received pharmacological management based on beta-blockers (80%), statins (88%), aspirin (78%), ACEI or AIIRA (61%), and aldosterone receptor antagonists (11.6%) as shown in table 4-7.

Discussion

According to our data, 49.4% of the patients had a diagnosis of dyslipidemia, 56.6% were hypertensive, 46.3% were once smokers, and 20% had Diabetes Mellitus. The latter being the only risk factor with a lower prevalence when compared with previous studies in the Bogotonian population, which is closeto that reported by Jing Liu et al. [12]. In China (29%) and by Roe et al. [13] in the United states (35%). Dyslipidemia, arterial hypertension and cigarette smoking were 6.3, 2.6 and 2.7 times higher than the data reported for the general population of Bogota and its surroundings in the 2015 national healthcare report.

Similarly to other registries such as the National cardiovascular data registry (G-NCDR AR-G) in the United States [13], 20% of our patients had already presented at least one acute coronary event. At the time of

Table 1: Prior co-morbidities and medications in patients diagnosed with AMI (n = 724).

Variable		Frequency	Percentage (%)
Previous AMI	No	579	80
	Yes	145	20
Arterial hypertension	No	314	43,4
	Yes	410	56,6
Diabetes	No	579	80
	Yes	145	20
Smoking	No	384	53
	Yes	335	46,3
	No data	5	0,7
Dyslipidemia	No	366	50,6
	Yes	358	49,4
Aspirin	No	478	66
	Yes	246	34
Clopidogrel	No	658	90,9
	Yes	66	9,1
Plasugrel	No	723	99,9
	Yes	1	0,1
Ticagrelor	No	720	99,4
	Yes	4	0,6
Statin	No	490	67,7
	Rosuvastatin	28	3,9
	Atorvastatin	112	15,5
	Simvastatin	19	2,6
	Lovastatin	75	10,4
Beta blocker	No	514	71
	Metoprolol	143	19,8
	Bisoprolol	12	1,7
	Nebivolol	13	1,8
	Carvedilol	30	4,1
	Sotalol	1	0,1
	Propanolol	9	1,2
	Other	2	0,3
ACE inhibitors	No	610	84,3
	Enalapril	11	13,8
	Captopril	3	0,4
	Other	11	1,5
AIIRAs	No	491	67,8
	Candesartan	15	2,1
	Valsartan	33	4,6
	Losartan	161	22,2
	Irbesartan	11	1,5
	Telmisartan	13	1,8

AMI: Acutemyocardialinfarction
ACE inhibitors: Inhibitors of the angiotensin-converting enzyme.
AIIRAs: Angiotensin II receptor antagonist.

Table 2: Diagnosis and classification of patients with ACS (n = 724).

Variable		Frequency	Percentage (%)
Time from symptom onset to presentation	<60 minutes	68	9,4
	1-3 hours	170	23,5
	3-6 hours	81	11,2
	6-12 hours	91	12,6
	>12 hours	243	33,6
	No data	71	9,8
ECG	Normal	51	7
	New ST elevation	271	37,4
	ST segment depression or nonspecific changes	50	6,9
	NLBB	10	1,4
	Pathological Q wave	1	0,1
	Other	341	47,1
Electrocardiographic diagnosis	NSTEMI	453	62,6
	STEMI	271	37,4
Killip Class	1	567	78,3
	2	58	8
	3	34	4,7
	4	19	2,6
	No data	46	6,4
Type of myocardial infarction (Third universal definition of myocardial infarction) [10]	1	591	81.6
	2	101	14
	3	6	0,8
	4	5	0,7
	5	2	0,3
	No data	19	2,6

Table 3: Stratification and in-hospital treatment of AMI patients (n = 724).

Variable		Frequency	Percentage (%)
STEMI			
Thrombolysis	No	162	59,8
	Yes	109	40,2
Door to needle time	<30 minutes	56	51,37
	>30 minutes	18	34,86
	No data	15	13,76
Thrombolytic agent	Streptokinase	13	11,9
	Tenecteplase	87	79,8
	Alteplase	6	5,5
	No data	3	2,8
Complications (Thrombolysis group)	No	99	90,8
	Yes	10	9,2
Successful reperfusion (Thrombolysis group)	No	34	31,2
	Yes	75	68,8
Stratification (STEMI group)	Noninvasive	22	8,11
	Invasive	249	91,88
Rescue angioplasty (Thrombolysis group)	No	77	70,64
	Yes	32	29,36
Primary PCI	No	158	58,3
	Yes	113	41,7
Door to balloon time	<90 minutes	40	35,4
	>90 minutes	70	61,9
	No data	3	2,7
Successful revascularization	No	17	15
	Yes	96	85
NSTEMI			
Stratification	Noninvasive	349	77
	Invasive	104	23
Surgical revascularization	No	659	91
	Yes	65	9
Exclusive medical treatment	No	305	42,1
	Yes	419	57,9

NSTEMI: Non ST- segment elevation myocardial infarction
STEMI: ST- segment elevation myocardial infarction

Table 4: Medications prescribed for discharge (n = 724).

Variable		Frequency	Percentage (%)
Beta blocker	No	152	20,9
	Metoprolol	384	53
	Bisoprolol	17	2,3
	Nebivolol	39	5,4
	Carvedilol	131	18,1
	Other	1	0,1
Aspirin	No	159	22
	Yes	565	78
ACE inhibitors	No	469	64,8
	Enalapril	254	35,1
	Captopril	1	0,1
AIIRAs	No	538	74,3
	Candesartan	28	3,9
	Valsartan	23	3,2
	Losartan	120	16,6
	Irbesartan	6	0,8
	Telmisartan	7	1
	Others	2	0,3
Clopidogrel	No	285	39,4
	Yes	439	60,6
Prasugrel	No	722	99,7
	Yes	2	0,3
Ticagrelor	No	653	90,2
	Yes	71	9,8
Statins	No	88	12,2
	Rosuvastatin	17	2,3
	Atorvastatin	532	72,5
	Simvastatin	9	1,2
	Lovastatin	78	10,8
Spironolactone	No	678	93,6
	Yes	46	6,4
Eplerenone	No	686	94,8
	Yes	38	5,2

Table 5: Events and complications (n = 724).

Variable		Frequency	Percentage (%)
Heart failure	No	305	42,1
	Yes	419	57,9
Renal failure	No	676	93,4
	Yes	48	6,6
Bleeding	No	646	89,2
	Yes	78	10,8
Cardiogenic shock	No	674	93,1
	Yes	50	6,9
Stroke	No	718	99,2
	Yes	6	0,8
SVT/VF	No	678	93,6
	Yes	46	6,4
Ischemic complications	No	695	96
	Angina	18	2,5
	Reinfarction	11	1,5
Mechanical complications	No	706	97,5
	Ventricular septal defect	3	0,4
	Mitral valve dysfunction	12	1,7
Arrhythmias	No	655	
	SVT	56	
	VT	13	
Other	No	690	
	Respiratory	6	0,8
	Hematological	4	0,6
	Other cardiovascular	2	0,3
	Infections	12	1,7
	Other	10	1,4
In patient mortality	No	687	94,9
	Other causes	14	1,9
	Cardiovascular	23	3,2

SVT/VT: Sustained ventricular tachycardia/Ventricular tachycardia.

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Table 6: Additional therapies (n = 724).

Variable		Frequency	Percentage (%)
Inodilators	No	676	93,4
	Yes	48	6,6
Vasopressor	No	612	84,5
	Yes	112	15,5
Ventricular assist devices	No	709	97,9
	IABP	12	1,7
	BYPASS	2	0,3
	ECMO	1	0,1
Mechanical ventilation	No	579	80
	NIMV	90	12,4
	IMV	55	7,6

IABP: Intra-aortic balloon pump
ECMO: Extracorporeal membrane oxygenation
MV: Mechanical ventilation, Invasive (IMV) and non-invasive

Table 7: Culprit vessel (n = 724).

Artery	Post-thrombolysis		PPCI	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Right coronary artery	28	25.6	40	35.4
Circumflex artery	7	6.4	13	11.5
Anterior descending artery	41	37.6	44	38.9
Posterior descending artery	1	0.9	1	0.9
Marginal artery	3	2.7	2	1.8
Main trunk	0	0	1	0.9
Left coronary artery	0	0	1	0.9
none	29	26.6	11	9.7

presentation, one third of the patients were being treated with Aspirine, and 9.8% were receiving an anti-P2Y12 as secondary prevention (93% Clopidogrel, 6% Ticagrelor and 1% Prasugrel), consistent with the current prescription distribution. Additionally, 29% of the patients were on beta-blockers (68% metoprolol and 14% carvedilol), 47.9% on antihypertensive treatment: 15.7% with angiotensin converting enzyme inhibitors (ACEI), and 32.2% with antagonists of the angiotensin II receptor (AIIRA), Losartan being the most frequently prescribed drug (46%), followed by Enalapril (29%), both of them covered by the basic national insurance. In spite of a high prevalence of dyslipidemia, only 32.2% of the patients were receiving Statins (80% of which had a moderate to high intensity statin prescription).

The time from symptom onset to medical attention seeking was particularly prolonged in our cohort when compared to European registries [14], with only 9.4% of the patients presenting within the first 60 minutes of symptom onset. Up to one third of the patients presented between the first and sixth hour, and another third after 12 hours. Such delays reveal the importance of educational intervention at the level of the general population, prompting early symptom recognition and attention seeking [15].

The emergency service network has not been yet coordinated to diagnose or treat AMI in the pre-hospital setting, transportation times and triage to appropriate institution still sum up for most delays in the attention of patients presenting with acute coronary syndromes. Thus pre-hospital fibrinolysis and direct catheterization laboratory transfer are still points of future improvement.

The frequency of patients with STEMI initially treated with thrombolysis was 40.2% (n=109). Optimal door-to-needle time (time from FMC) [11] was met for 51.4% (n=56) of patients. The percentage of patients that received thrombolysis was almost twice as many as that reported by other registries (except for the one of the UK, where it reaches up to 55%) [12-14] and compliance with the door-to-needle times was comparable to that commonly reported in American and European registries [11,13-16]. Tenecteplase was used in 85.7% (n=87), being the most frequently used thrombolytic agent, whilst Streptokinase was still used in 12.8% (n=13). After initial Thrombolysis, 68.9% (n=75) met successful reperfusion criteria, while 31.1% (n=34) did not and thus required rescue angioplasty. All patients who received Thrombolysis were subjected to invasive stratification within the next 24-72 hours, according to their individual risk following current recommendations in the prevention of post-thrombolysis thrombosis [17-20].

41.7% (n=113) of the patients with STEMI received PCI as their initial reperfusion strategy. Door-to-balloon time was kept under 90 minutes for 35.3% (n=40). 19.1% (n=49) did not receive any reperfusion treatment for multiple reasons, among which were: arrival at the hospital past treatment window time, death prior to reperfusion decision, medical decision and delay in diagnosis.

The catheterization laboratory in our hospital performed an average of 500 catheterisms every year for the accounted period, around 200 (40%) of them were emergent catheterisms in the context of acute coronary syndromes. The type of stent used was initially BMS (Bare Metal Stents) in 57% percent of the cases in 2011, 34% in 2012, 29% in 2013, 31% in 2014 and 17% in 2015.

The preferred vascular approach in 2011 was the femoral. This changed progressively as new evidence came out. In 2014 the radial approach accounted for more than 60% of all catheterisms performed, this percentage ascended to 70% in 2016.

All the patients were targeted to have DAPT for at least 1 year after stent placement -after individualising for bleeding risk, co-morbidities, bleeding events and indication to anticoagulate [21].

With respect to coronary anatomy and culprit vessel identification in after thrombolysis stratification, most lesions were found in the ADA (37.7% n=41), followed by the RCA (25.8% n=28) and the circumflex artery (6.62% n=7). Only 1 (0.9%) patient was found to have lesions of the posterior descending artery, 3 (2.7%) patients had lesions of the marginal obtuse artery and 29 (26.6%) patients showed no culprit lesions.

In the PCI group culprit lesions were predominantly found in the ADA (38% n=44), followed by the RCA (35% n=40) and the circumflex (11% n=13). In 9% (n=11) of the patients who received PCI there was no angiographic evidence of culprit vessel *vs* 26.6% (n=29) in the thrombolysis group. This significant difference is explained by the antithrombotic effect of fibrinolytic therapy. After dealing with the culprit vessel, all patients found to have multi-vessel disease in the acute setting received differed PCI before discharge or at 1 month follow up for the treatment of non-culprit lesions.

In view of the availability of PCI in our institution (day time full availability and on call response during night time) and the adherence to reperfusion therapy initiation times [17,22,23] efforts have been made to improve opportune response and current guideline adherence through educational sessions on acute coronary syndromes. In response to this, we have seen progressive improvement in the adherence to early thrombolysis and door-to-needle time compliance. However, the present study does not show this trend on a year-to-year basis.

As for the evaluated points of adherence to current clinical guidelines, 95% were assessed by the cardiac rehabilitation group, initiating their first rehab phase while still at hospital this percentage is superior to that of other

registries such as the AR-G NCDR [13]. Discharge prescription included a beta-blocker for 79% of patients (67.1% metoprolol, 22.9% carvedilol, 6.8% nebivolol 3% bisoprolol), Aspirine for 78%, AIIRA or ACEI for 77.4% and statins (mainly Atorvastatin) for 87.8%. The low frequency of Aspirin prescription at discharge was due to clear contraindication, in-hospital death, type 2 infarction, concomitant anticoagulation and possibly some prescription errors.

71% of the patients were prescribed with anti-P2Y12 at discharge, Clopidogrel being the most frequently prescribed, probably because of the extensive experience with its use and recent approval of other anti-P2Y12. Only 6.4% were discharged with Spironolactone and 5.2% of with Eplerenone as part of their treatment for heart failure. We do not have information regarding dual therapy and triple therapy use, which would be worth evaluating in later registries.

During hospitalization, 18 of the patients (2.5%) had angina and 11 (1.5%) presented re-infarction. Only 3 patients (0.4%) had an interventricular communication and 12 patients (1.7%) had mitral valve dysfunction as a mechanical complication of ischemia. All-cause in-patient mortality was 5.1% (37 patients), similar to that reported in the literature [24]. In general, there was acceptable adherence to secondary prevention recommendations but this was somewhat lower than reported by other registries. Additionally, the use of mineralocorticoid receptor antagonists was low in relation to the percentage of patients who developed heart failure.

Limitations of the Study

No difference was established for risk factors, therapeutic management, complications or duration of hospitalization in patients with STEMI *vs* NSTEMI.

Additionally, we had losses in the education variable, which was available only for one third of our sample, in which 46% of the patients were professionals, less than 10% had elementary education or none, and 56% had access to pre-paid medicine. All results that may pose clear external validity limitations.

Lastly, during the follow-up years, there were changes in the recommendations on the type of drug eluting stents and in the drug of choice for antiplatelet therapy, these changes have been progressively accepted in our institution. We expect changes in our future statistics as a result.

Conclusions

This is the first descriptive study of acute coronary syndrome in Colombia. It is a unicentric register based in a local reference center, that shows management, risk profile, diagnostic distribution, reperfusion strategy and times, complications, and adherence to clinical practice guidelines for the management of ACS in the Bogotonian population.

Each item evaluated here was compared to international AMI records, obtaining a profile consistent with a developing western society with PCI limited availability. We hope that this effort will provide useful information that can be used to take action with regard to public health and enable the development of strategies focused on primary and secondary prevention, as well as optimal treatment of this disease in our population.

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