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Research Article

Management of Acute Coronary Syndrome (ACS) in Clinica Girassol in Luanda (Angola)

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Abstract

Acute coronary disease has been in a steady lead as the number one cause of mortality worldwide, in the Angolan context, the rapid urbanization, development and epidemiological transition has led to the increase in incidence of noncommunicable cardiovascular disease. The rise in incidence and mortality requires improved management of ACS. This study uses data collected at Clínica Girassol, in Luanda, Angola, to analyse management and prevalence of ACS in a top institution in the setting of a country in Sub-Saharan Africa. 49.4% of the sampled patients that were diagnosed with STEMI received medical treatment after 12 or more hours of first medical contact, allowing for significant clinical development of the pathology and the predominant treatment therapy was PCI.

There are many improvements to be made in the context of Angola in relation to the management of ACS, not only in this hospital's setting, but also on a national level. The data from this study indicates that PCI is a treatment with much success in improving the patient's outcomes. It is recommended that the 2017 ESC Guidelines for management of acute myocardial infarction in patients presenting with ST-segment elevation be followed, that measures are taken to increase efficiency in management of ACS and also preventative awareness aimed at patients in regard to seeking out medical care at all costs upon onset of symptoms.

Keywords: *Acute Coronary Syndrome; ST Elevation Myocardial Infarction; Non-ST Elevation Myocardial Infarction; Interventional Cardiology; Angola; Clínica Girassol*

Abbreviations

ACS: Acute Coronary Syndrome; DALY: Disability Adjusted Life Years; LMIC: Low-and-Middle Income Country; NSTEMI: Non-ST Elevation Myocardial Infarction; STEMI: ST Elevation Myocardial Infarction; PCI: Percutaneous Coronary Intervention; WHO: World Health Organization

Introduction

Acute coronary syndrome is an encompassing term used when referring to the clinical signs and symptoms of coronary artery disease, covering any grouping of symptoms compatible with acute myocardial ischemia, that's clinical manifestations characterized by reduced blood supply to the heart. It is characterized by sudden and an acute coronary event in which occlusion of a coronary artery interferes with blood flow to the heart muscle. According to the WHO, for the past five years, acute coronary disease has been in a steady lead as the number one cause of mortality and is the greatest cause of loss of disability adjusted life years (DALYs) worldwide [1]. In 2016 it was

the third major cause of morbidity in low-income countries [1]. In the case of Angola, in 2017, communicable diseases and parasitic pathologies dominated the epidemiological context, with particular emphasis to the endemic diseases such as malaria, HIV/AIDS and tuberculosis, which were the dominating causes of mortality [2]. Due to the high burden of communicable diseases in Angola, the increase in the incidence of cardiovascular diseases such as arterial hypertension and coronary artery diseases is yet to be given the adequate prominence in relation to the epidemiological agenda of the country. Despite this, arterial hypertension is listed as one of the main causes of mortality in Angola. It is estimated that about seventy-five million people in Sub-Saharan Africa are hypertensive; this translates to high mortality and morbidity, as arterial hypertension is now the highest risk factor for mortality worldwide [1]. An epidemiological transition is being observed in Sub-Saharan Africa from the main communicable diseases as the main causes of mortality to noncommunicable diseases playing a bigger role in mortality rates. With the increase in incidence of arterial hypertension (240,155 new cases in 2017) [2], consequently the population is at higher risk for acute coronary syndrome; this makes for an even greater need for countries that do not have effective national disease surveillance programs to generate accurate data to document and guide the evolution of the prevalence of this disease to adapt existing intervention protocols or create new protocols to intervene in cases of myocardial infarction.

Angola is a country in Sub-Saharan Africa; it boasts one of the fastest growing economies in the continent and is one the worlds biggest oil exporters. Angola falls in the category of a low-and-middle-income country (LMIC); similar to many countries in this category the rapid economic growth has led to rapid urbanization and development. The transformational economic growth the country has, and is still, experiencing has brought on lifestyle changes, which has increased the prevalence and incidence of ischemic heart disease rates of mortality and risk factors. This is where hospitals such as Clínica Girassol (in Luanda, Angola) have a pivotal role to play. The hospital opened in 2002 and is one of the reference healthcare institutions in the capital, the hospital holds one of the best care facilities and is equipped with first generation medical equipment and healthcare specialists, including a capable cardiology department and emergency room to assist the population. The city of Luanda, where the hospital is located, has a total population of 6.945.386 inhabitants [3]. This article is setup as a quantitative observational study with descriptive content analysis, the data was all collected at Clínica Girassol with the aim to analyse the characteristics and variables that influence results within the country's context and to recommend actions that permit faster and more effective medical attention for the hospital patients (internal and external patients).

Methodology and Results

The study took place at Clínica Girassol from 2011 to the year 2017; the sample universe was 483 patients; who were studied in the haemodynamic laboratory. The inclusion criteria for patients involved in the study was quite straightforward. Patients studied in the haemodynamic laboratory diagnosed with ACS were included, these patients were prevenient from various sources: either from the emergency room, or patients that were admitted at the hospital and redirected or transferred from other institutions with cardiovascular symptoms to the haemodynamic laboratory. The exclusion factor was the diagnosis; a patient diagnosed with pathologies other than STEMI and NSTEMI (including unstable angina) (ACS) was excluded. Therefore, from the universe of patients presented that met the criteria, 313 (all emergency) patients were diagnosed with ACS, corresponding to 65% of the universe. In this case 313 is the total sample size used. The table below shows the frequency of STEMI and NSTEMI within the sample of diagnosed patients (Table 1).

The remaining 35% of patients from the universe of 483 patients were diagnosed with other cardiac pathologies, thus excluded from the study. All patients presented at the emergency room and were observed in the haemodynamic laboratory. The remaining 35% were diagnosed with: stable angina, dilated cardiomyopathy and some were pre non-ischemic cardiac surgery patients above the age of 45.

When a patient presented with clinical signs of ACS other qualitative data was collected in relation to this patient, which were their risk factors (such as ethnicity, gender and age). This data was collected to assess any trend amongst these patients, to observe which risk factors are present and predominant within the context of the country and if any trends identified were in tune with what the literature

Clinical Presentation	Number of Patients	Percentage
Acute Coronary Syndrome (ACS) diagnosis	313	64.8%*
ST segment elevation myocardial infraction (STEMI)	143	45.6%**
Non-ST elevation myocardial infraction (NSTEMI) (includes unstable angina)	170	54.3%%**

Table 1: *Acute coronary syndrome cases (2011-2017).*

**: Percentage calculated taking sample universe of 483 patients as total (100%).*

***: Percentage calculated taking the value of 313 patients diagnosed with ACS as total (100%).*

posits. The literature posits that, patients with arterial hypertension, diabetes mellitus and dyslipidaemia have a higher risk of myocardial infarction; so do those who smoke, are obese and/or have black ethnicity and are male. From the universe of 483 patients suspected to have ACS 46% had two or more risk factors. Amongst the 313 patients diagnosed with ACS, 65% were between the ages of 50 - 69 (202 patients). The risk factors for the patients sampled are charted in figure 1.

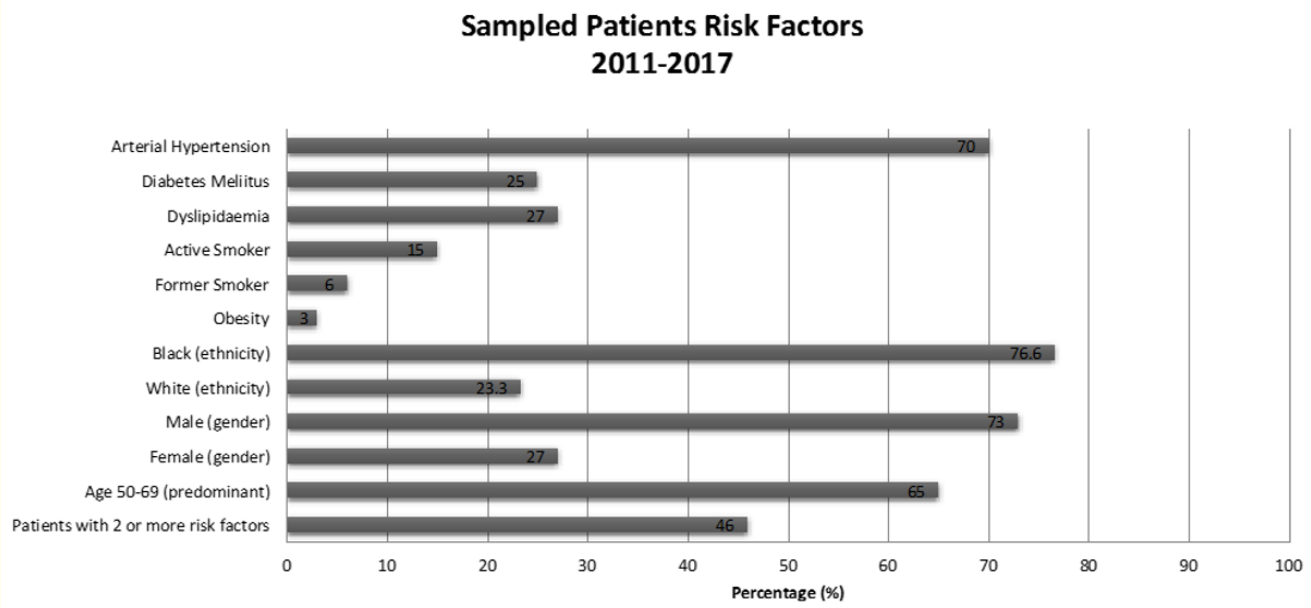

Figure 1: *Chart illustrating sampled patients' risk factors (gender, age and ethnicity included).*

Post diagnostic with ACS, three treatment options are available: medical, surgical or percutaneous coronary intervention (PCI, formerly known as angioplasty with stent). The following graphs illustrate the treatment distribution amongst the 313 diagnosed ACS patients (Figure 2).

Between 2011 and 2017, from the 313 ACS patients observed, 213 underwent PCI (138 STEMI, 75 NSTEMI), 55 received medical treatment (2 STEMI, 53 NSTEMI) and 45 received surgical interventions (3 STEMI, 42 NSTEMI). As demonstrated by figure 2 the most frequent treatment for ACS (in all variables) is the PCI. PCI is usually accompanied by the implant of a STENT. In total between 2011 and 2017 291 STENTS were implanted within the sample group; 7% of these were conventional STENTS and 93% were drug-eluting STENTS, with an overall PCI to STENT ratio of 1.36.

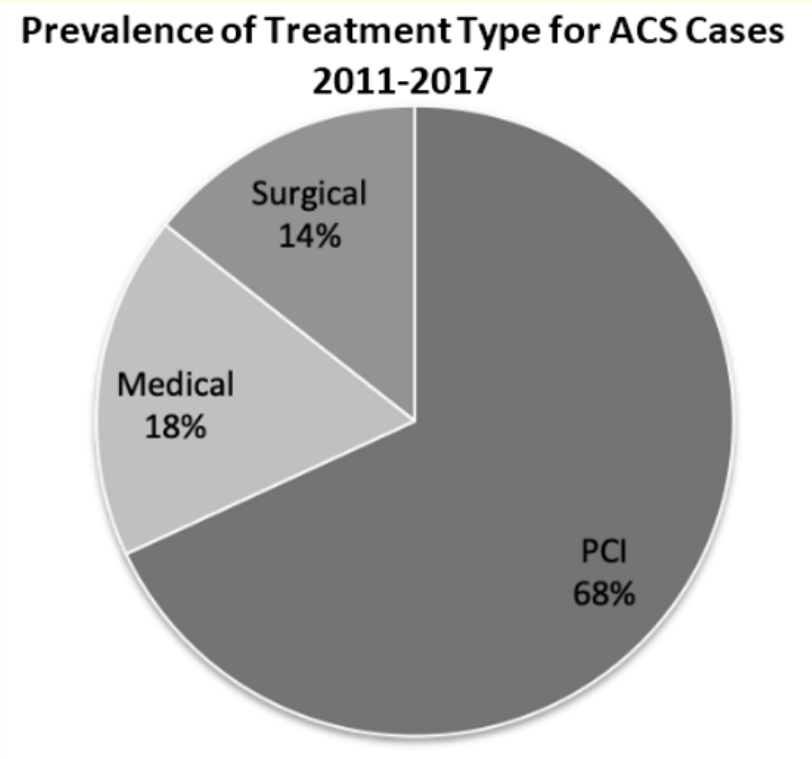

Figure 2: *Treatments undergone by patients from study sample diagnosed with ACS.*

The most important factor/variable when providing interventions for STEMI is the time from first medical contact to treatment. Ideally PCI should be performed immediately within two hours of first medical contact [4]. For patients with STEMI primary PCI is recommended, for NSTEMI a course of aspirin is indicated after diagnosis, subsequently the patient should be assessed for risk of future adverse cardiovascular events and bleeding. Depending on risk level (low, moderate or high) a treatment plan is then made. PCI is also the most recommended treatment in these cases; very high-risk patients should receive PCI within 2 hours, whilst a conservative approach is suggested for those patients with low risk [5]. In the context of Angola and the setting of the hospital, in most cases, it is difficult for patients to receive medical care within 2 hours for various motives. Within this study, 49.4% of patients with STEMI received treatment 12 or more hours after first medical contact and only 8.4% received care less than 2 hours after medical contact. Table 2 Shows the times elapsed between first medical contact to treatment for sampled patients. Due to context and circumstances only 95 patients' first medical contact to treatment time was tracked. Patients whose first medical contact to treatment time was between 25-168 hours and were still indicated for reperfusion treatment presented with symptoms, no asymptomatic patients were included (nor presented); symptoms such as: persistent angina, acute heart failure, cardiogenic shock, acute cardiac arrhythmias, acute mitral regurgitation and the failure of thrombolytic treatment.

As figure 3 shows between 2011 and 2017, from a total of 143 diagnosed STEMI cases 96.5% (138 cases) of these were treated with PCI. Within the 138 cases treated with PCI there were variations in the nature of PCI employed, in 88% of cases the guideline of employing primary PCI was adhered too (Figure 4 and 5). In some exceptions thrombolytic therapy was used, but its use is low compared to the primary PCI, therefore there was a low incidence in the use of thrombolytics and fibrinolysis. This institution is amongst the few that offer interventionist treatments for ACS in Luanda, and the only one that offers assistance 24 hours a day 7 days a week. Other institutions that

offer it also reported prevalence in Primary PCI in favour of other approaches such as rescue PCI, the use of thrombolytics and fibrinolysis. From 170 NSTEMI cases diagnosed between 2011 and 2017, similar to STEMI cases, PCI was the predominant treatment (44.1%), however it should be noted that a high volume of these cases received surgical intervention (24.7%). Despite the service having low volume of patients, the incidence of complications and intra-hospital mortality (Table 3) is within acceptable range taking into account those established by the literature. The posited acceptable range for intra-hospital mortality for ACS is 4 - 12% [6]. In this case between 2011 and 2017, within the patient data collected, there was an intra-hospital mortality of 5.7% (Table 3).

First Medical Contact to Treatment Time (hours)	Number of Patients	Prevalence (%)
< 2	8	8.4%
2 - 6	15	15.7%
7 - 12	25	26.3%
13 - 24	35	36.8%
25 - 168	12	12.6%
Total	95	

Table 2: *Time elapsed from first medical contact to treatment for diagnosed STEMI patients sampled in this study between 2011-2017*

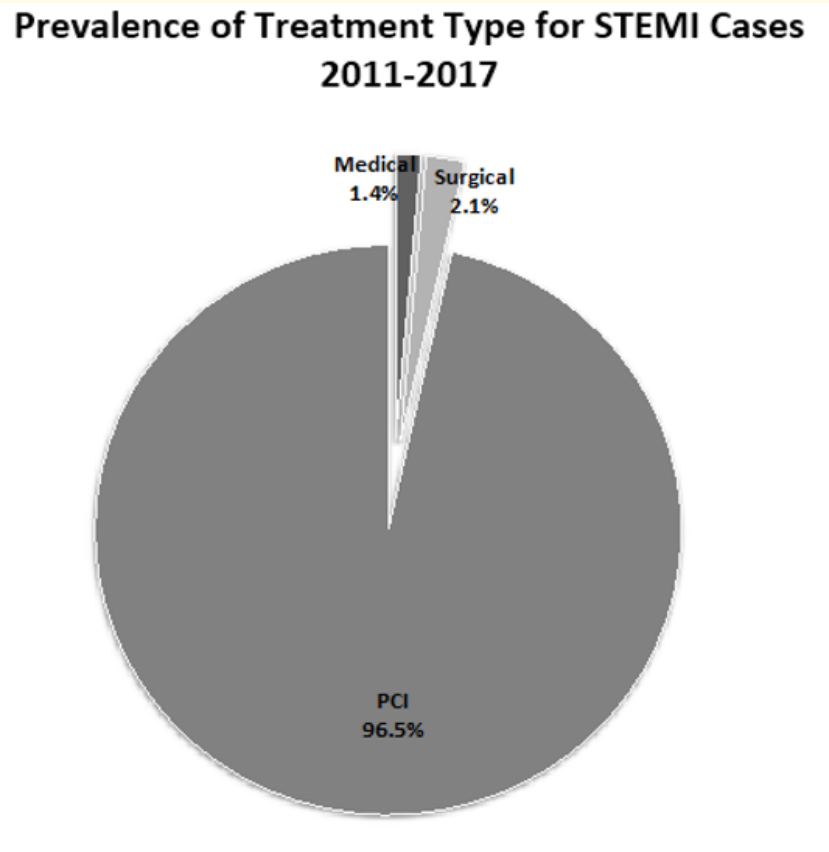

Figure 3: *Treatments undergone by patients from study sample diagnosed STEMI.*

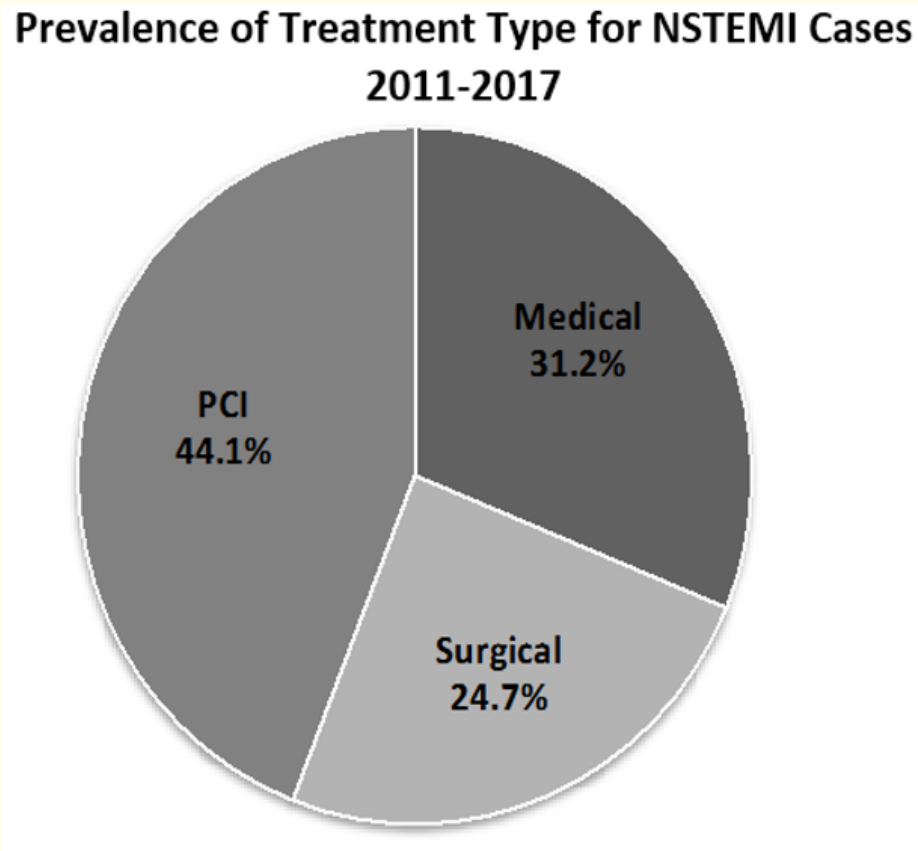

Figure 4: *Treatments undergone by patients from study sample diagnosed NSTEMI.*

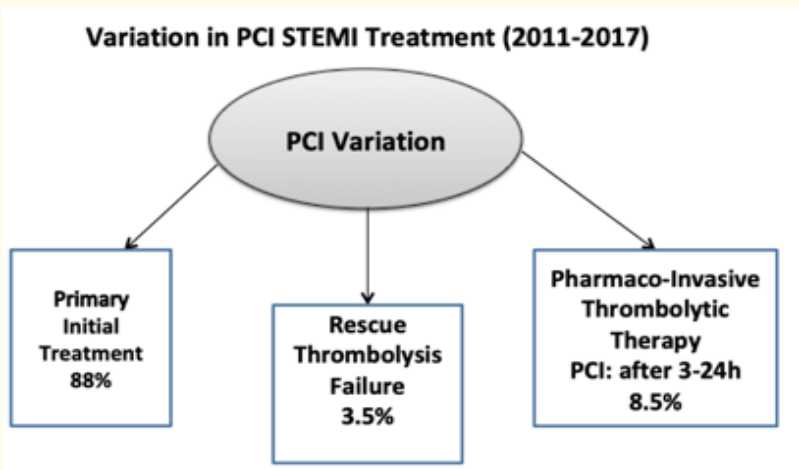

Figure 5: *Chart demonstrates variation in PCI treatment for samples STEMI cases between 2011 and 2017.*

PCI Complications	Number of Patients	Percentage
Distal Embolization	3	2.2%
Non Reflow	3	2.2%
Coronary Dissection	2	1.4%
Pulmonary Oedema	3	2.2%
Stent Thrombosis (acute/sub-acute)	3	2.2%
Hospital Mortality	8	5.7%

Table 3: *PCI complications observed between 2011-2017 in sampled patients.*

Discussion and Recommendations

As observed in the data presented, 49.4% of the sampled patients with STEMI received medical treatment after 12 or more hours of first medical contact (not including time elapsed from onset of symptoms to medical contact), allowing for significant clinical development of the pathology. This is not the best scenario for patients with STEMI and many reasons both institutionally and contextually (pre-hospital) account for this. Life in Luanda is rushed and busy, healthcare is centralized and seeking out medical care is time consuming, due to this many patients ignore symptoms upon their onset, dismissing it as something passing or stress, until an acute critical state is reached a visit to a healthcare institution can no longer be avoided. At that point the clinical presentation is more often than not advanced. On the other hand when the patient is present at a healthcare institution to receive medical attention, often there is a delay or improper diagnostic, delays in undergoing the electrocardiogram test which all cause delays in diagnostic; in the case this STEMI is concerning as time is critical in these cases. There are also institutional delays while awaiting laboratorial results for markers of myocardial lesions; delays in transferring patients to available PCI centres and administrative/financial difficulties frequently influence treatment as well.

Three types of coronary artery disease are associated with the sudden rupture of accumulated plaque inside the coronary arteries which can cause partial or complete occlusion of an artery leading to myocardial ischemia; these are: unstable angina, ST segment elevation myocardial infraction (STEMI) or non-ST elevation myocardial infraction (NSTEMI). The clinical manifestations of acute coronary syndrome mentioned previously, share a common pathophysiology, involving coronary atheromatous plaque erosion or rupture, platelet activation, coronary thrombus formation and distal embolism of platelet rich material. Myocardial ischemia may (and often does) lead to myocardial infraction when heart muscle necrosis occurs due to ischemia. During a ST elevation myocardial infarction tissue death occurs within 15 to 30 minutes of vessel occlusion. Rapid diagnostic and treatment are essential in these cases in order to maximize survival chances, and reduce risk of mortality due to STEMI. This brings up the focus of this article, a reduction in mortality associated to ST elevation myocardial infraction through rapid interventions using: rapid utilisation of reperfusion treatment, antithrombotic therapeutics with higher efficacy and secondary prevention measures [4,15]. In the beginning of the 20th century, in 2008 cardiovascular diseases were estimated to account for 10% of all deaths in Angola. There are many obstacles causing the lack of comprehensive interventions for ischemic cardiopathy in Sub-Saharan Africa, namely: scarcity of appropriate diagnostic methods, deficit in the health workforce, absence of reliable statistical data and lack of knowledge regarding specific causes of death [7].

The current management of STEMI is guided by the use of reperfusion therapies, which aim to reduce the size of the infarct in timely manners to optimize the patients' outcome. The relationship between ischemia time (which is the time from the onset of symptoms to the time reperfusion therapy is received) and probability of cellular death is nonlinear; therefore a change in one does not correspond to continuous change in the other [15]. The data collected, reinforces this relationship, despite most patients with STEMI having received treatment more than 12 hours after first medical contact (some patients receiving treatment up to days after), patient rehabilitation and survival rates remained high. Despite this, the literature establishes that maximal benefit is delivered with treatment within 2 hours and clearing occluded arteries within that time [4], although about 30% of STEMI's arrive at healthcare facilities 12 hours or more after the onset of symptoms [9]. The survival benefit in early presentation of STEMI is crucially related with time; however, when patients present late this relationship meets an impasse, bringing back its nonlinear nature. Imaging studies are consistently showing that substantial

salvaging of myocardium tissue can happen in some patients, even after more than 48 hours have passed since the onset of symptoms [10]. Many patients suffering from acute coronary syndrome experience sudden death before even reaching a healthcare institution in Angola, and as said before the degree of myocardial necrosis is related to ischemic episode length. Clinical studies have shown that early presentation to emergency departments is associated with decreased mortality and reinfarction rates [10]. Many patients first seek out treatment in local health centres in their neighbourhoods, these are not equipped with proper resources (both human and infrastructure wise) to treat ACS, and often do not diagnose patients correctly. When this happens patients are either sent home, where symptoms will usually progress or they are referred to other institutions until finally reaching an institution such as Clínica Girassol equipped to deal with such cases; not all patients are prevenient from urban settings, some come from rural areas. Therefore it is key for the efficacy and effectiveness of healthcare to improve, but its present capability of intervention in ACS cases must not be dismissed, as the data collected shows that despite late presentation effective intervention may still be conducted.

Due to the fast economic growth Angola is undergoing transformational developments, which has brought on lifestyle changes, increasing the prevalence and incidence of ischemic heart disease rates, mortality rates and risk factors. The transition the country is experiencing, from an epidemiological standpoint, speculates that the population initially had low life expectancies with mortality primarily being due to infections, malnutrition, and illness and injury during childbirth and early childhood [11]. As the living conditions and standards of the population increased, due to the country's development in sanitation, agriculture and infrastructure these causes of death tend to recede and noncommunicable diseases become more dominant, and the country graduates from receding pandemics to degenerative man-made diseases such as ACS and cancers. Rapid urbanization, sedentary jobs and mechanization of transport in many LMICs, such as Angola, has lead to an overlap and acceleration in the epidemiological transition stages. Malnutrition, infections and maternal and child mortality are still a heavy burden, but are being overlapped by the rise in dominance of diseases such as ACS and cancers, it could therefore be said that there is an overlap between the ages of receding pandemics and the age of degenerative man made diseases. This overlap has put many LMIC countries in a challenging position, and Angola is not an exception, with a double burden of communicable and noncommunicable diseases, due to the rise of the latter without a significant reduction of the other.

In the context of Angola and Sub-Saharan Africa, the available literature and data point to an increase in the predominance of cardiopathies as mortality causes and an increase in their incidence in the younger population [11-13]. Despite this, the call for reliable data in Angola remains; this data would greatly aid the decision-making process and creation of a plan of action and protocols to manage acute coronary syndromes, as this still remains a challenge. It is recommended that within the Angolan context, guidelines be adopted in relation to ACS management. Guidelines such as: the indication of reperfusion therapy for all patients with up to 12 hours of ischemia symptoms and persistent ST elevation, PCI preferable to fibrinolysis with the set time limits and if PCI is not applicable then fibrinolysis is recommended within 12 hours of the symptomatic onset, if no contraindications exist. These are 2017 ESC Guidelines that could be applied to this context, given the abundant pre-hospital delay of patients to present; these could similarly help decrease institutional delays. Further recommendations include, primary PCI indication in the absence of ST elevation when: the patient has current ischemia symptoms, cardiogenic shock, haemodynamic instability, recurring angina, acute arrhythmias, mechanical complications, heart failure and dynamic alterations in the ST segment. Lastly in asymptomatic patients routine PCI of occluded artery, later than 48 hours is not suggested.

Conclusion

In conclusion, there are many improvements to be made in the context of Angola in relation to the management of ACS, not only in this hospital's setting, but also on a national level. The data from this study indicates that PCI is a treatment with much success in improving the patient's outcomes. It is recommended that the 2017 ESC Guidelines [4] for management of acute myocardial infarction in patients presenting with ST-segment elevation be followed, that measures are taken to increase efficiency in management of ACS and also preventative awareness aimed at patients in relations to seeking out medical care at all costs upon onset of symptoms. An effort to increase networking within the healthcare force and its institutions is also recommended; the information in this study was presented and divulged amongst local medical and scientific forums (such as the Angolan Congress for Cardiology and Arterial Hypertension in September 2017)

in order to increase the awareness and emphasize the need for the creation of appropriate response protocols within the current context. It should be noted that despite the low flow of patients witnessed at Clínica Girassol during the study period (2011 - 2017) the institution and its cardiology team is capable and trained in managing large volumes of patients.

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