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EXPERT'S CORNER: A PERSONAL APPROACH

Observations in relation to myocardial infarction: Are there three different Mexicos?

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Cardiovascular diseases are the leading cause of death worldwide. The Global Burden of Disease (GBD) study proved that ischemic heart disease was the main cause of disability-adjusted life years, that is, the sum of the years of life lost and the years lived with a disability, having increased by 29% going from fourth place in 1990 to first place by the year 2010.[1] From 1990 to 2000, non-communicable diseases surpassed communicable diseases as the main cause of death worldwide, going from 43% to 54%.[1]

Mexico is not the exception; heart diseases are the leading cause of death in our country. When we include heart diseases, cerebrovascular diseases and diabetes in a single group, which we could name ''atherothrombosis'', mortality rate in Mexico was 36.8%, 37.5% and 38.1% in the years 2011, 2012 and 2013 respectively, according to the National Institute of Statistics and Geography (INEGI by its Spanish acronym).[2] In other words, 25 Mexicans died every hour as a result of atherothrombosis in 2011, 26 in 2012 and 27 in 2013 (Fig. 1).

One can argue that diabetes is not a cardiovascular disease but a risk factor; even so, current cardiovascular prevention guidelines support an aggressive management of diabetes to the same degree as a non-diabetic patient with a previous cardiovascular event, that is, with secondary prevention strategies.[3–6] The information sustaining this argument goes back to the end of the last century when it was shown that non-diabetic patients who had already suffered a heart attack had the same probability of dying due to cardiovascular disease, having a heart attack or stroke within the following 7 years as diabetic patients who had not suffered any cardiovascular event yet.[7] These findings have been replicated.[8] It may be necessary to rethink the INEGI's mortality codification and exclude diabetes as a direct cause of death in order to have more accurate information.

The situation in Mexico becomes more dramatic when we look at a recent report of the Organization for Economic Cooperation and Development (OECD).[9] They conducted a comparative 30 days mortality analysis of patients admitted to a hospital with diagnosis of acute myocardial infarction with 10-years between observations interval. Results are presented by country and compared with an average of the 32 countries from the OECD (Fig. 2). Average mortality for the OECD's 32 countries was close to 12% in 2003 and decreased to around 6.5% in 2013. In 2013, mortality rate in the US was 5.5% and 7.3% in Germany. The countries with the lowest mortality rate were Australia and Sweden with 4.5% and 4.7% respectively. In the 10-years of the study almost all countries had an approximate 20–30% decline in mortality. Mexico came last on the list, with a mortality rate of 27%, four times higher than the OECD average; moreover, Mexico and Latvia were the only two countries where mortality rates increased instead of decreased during the period of the study.

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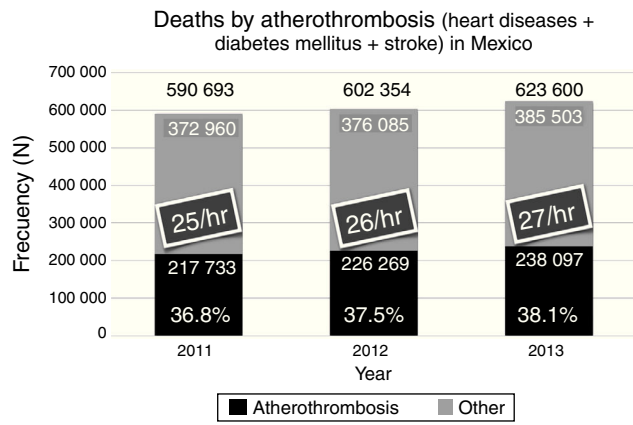*E-mail address:* drazpiri@yahoo.com

Figure 1 Mortality rate due to atherothrombosis in Mexico. INEGI, Instituto Nacional de Estadística y Geografía. CVE, cerebral vascular event.

I disagree with the data. In the year 2005, the Second National Registry of Acute Coronary Syndromes (RENASICA-II by its Spanish acronym) included 8098 patients, half of whom reported ST-segment elevation acute coronary syndromes with a global mortality rate of 7%; 10% for those with ST-segment elevation and 4% for those who did not have ST-elevation. Half of the patients recruited were from Mexico City. Two thirds of hospitals which included patients had hemodynamic rooms within their facilities. Renowned hospitals in the cardiovascular field in our country like the ''Centro Médico Nacional Siglo XXI'', the UMAE-34 of the IMSS, the National Institute of Cardiology and the ''Centro Médico La Raza'' treated 3968 patients.[10]

The sequel of this study is the RENASICA-III, which is similar to the previous, recruited nearly 8000 patients.[11] The results are in press; however, the author provided us the following information, which has been presented in different forums. Out of the total of patients, 37.6% of those with ST-segment elevation myocardial infarction received fibrinolysis and 15% primary angioplasty. Regarding patients with infarction without ST-segment elevation or those with unstable angina, 39.6%underwent invasive procedures. Mortality rate was 6.4% (8.7% for patients with ST-segment elevation and 3.9% for patients without ST-segment elevation, $P < 0.01$) [Personal communication from Dr. Carlos Jerjes Sánchez-Díaz].

As noticed, this is far from the numbers presented by the OECD and it is similar to the average myocardial infarction mortality in countries within the organization. Moreover, unlike OECD numbers, mortality rates by myocardial infarction with ST-segment elevation dropped from 10% to 8.7% in 2015, once again according to the average of the countries within the OECD.

On the other hand, upon reviewing the hemodynamic database of the Christus Muguerza Alta Especialidad de Monterrey Hospital, we are able to find that 13.4% of addmissions to the Cardiology Service were as a result of acute coronary syndromes, from which 85% were without ST-segment elevation. All patients with ST-segment elevation were taken to ''primary'' angioplasty or ''assisted'' by an antithrombotic medication previous to the procedure. Regarding the patients included in the sample, 84% were male, with a mean age of 59.5 ± 12 years. The time elapsed from the moment the patient arrived at the hospital to the time they arrived to the catheterization laboratory was 67 ± 38 min. Moreover; 66% of patients had less than 6 h of evolution with the symptoms; 35% were in Killip-Kimball (KK) classification 1, 49.2% in KK-2, 6.9% in KK-3 and 12.3% in KK-4. In patients with ST-segment elevation, 1.43 ± 0.8
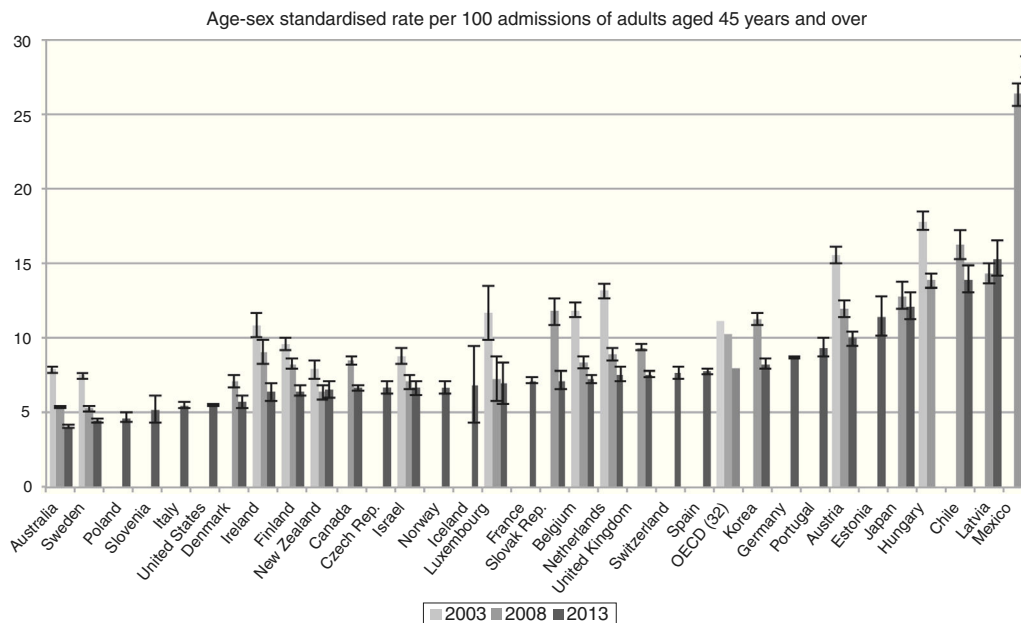

Figure 2 Mortality rate at 30 days of hospitalization due to acute myocardial infarction, according to the OECD. Adapted from Ref. [9].
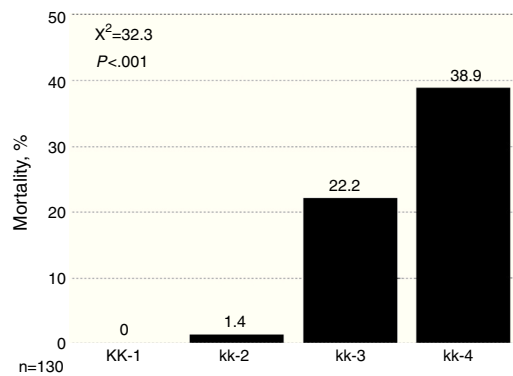
Figure 3 Mortality rate of patients with acute coronary syndromes with ST segment elevation at the Hospital Christus Muguerza Alta Especialidad de Monterrey, according to the Killip and Kimball functional classification (KK).

lesions per patient were treated with angioplasty and 1.59 ± 1.0 stents per patient were implanted. Glycoprotein inhibitors IIb/IIIa were used in 52% of cases, a manual aspiration thrombectomy was conducted in 14%, 6.9% entered hemodynamics with vasopressors, 10% were intubated and 3.8% received Cardiopulmonary Resuscitation (CPR). Angiographic success was accomplished (defined as a reduction of the obstruction to less than 20% residual, without local or systemic complications) in 93% of the patients. Global mortality was 4.6% (6.9% in patients with ST-segment elevation and 2.2% in patients without ST-segment elevation). Independent mortality predictors found by multiple regression analysis were the need for intubation, KK class, CPR and the need for vasopressors. Mortality of patients who entered catheterization receiving or having received CPR was 66%, using vasopressors 46% and intubated 40%. The simplest clinical predictor of mortality was the KK class at the time of hospital addmission, where patients who were class 1 at their arrival had no mortality, while patients who were class 4 had 38.9% mortality (Fig. 3). After excluding those who required CPR prior to or at their arrival at the cath lab (that is, those who arrived at the hospital or entered the procedure alive), global mortality rate was 3.1% (4.0% for those who presented ST-segment elevation and 2.3% for those who did not present ST-segment elevation). These results contrast favorably with those of RENASICA-III.

From this, we can distinguish three strata in the prognosis of patients admitted with an acute myocardial infarction. The first, is that of the people whose high-level medical attention is paid by their own resources or by the use of a private medical insurance policy. This group corresponds to about 10% of the population. In this group, the mortality rate is similar to that of the most advanced countries affiliated with the OECD, such as Australia and Switzerland. The second group is made of people who are affiliated to one of goverment-sponsored medical institutions such as the IMSS, ISSSTE, PEMEX, and the Institutes of Health and University Hospitals. In this group, the mortality rate is similar to that reported by the average countries in the OECD; close to 6.5%, but very distant from the alarming 27%. Close to 50% of the Mexican population has access to these healthcare systems.

Now, the serious problem is the remaining 40% of the population, who basically do not have any form of protection system. The Popular Insurance (Seguro Popular in Spanish, government sponsored) was created during the last administration, to, theoretically, meet these needs, but the reality is that only patients under 65 years of age are eligible, and only for their first heart attack, with ST segment elevation and during their first hospital addmission. This excludes more than 75% of the people with acute coronary syndromes. So what's the mortality rate of this group which includes 40% of the population, when the mortality rate for the whole country, according to official sources, is 27%? The answer to this simple mathematical problem is 58.7%. The ones with the least resources are the ones most affected and the most forgotten.

So there are ''3 Mexicos'' in the treatment of acute myocardial infarction. The minority that, due to their own economical resources or particular insurances, are attended with standards of excellence and have a mortality rate close to 3%. Those who have some form of social security, which makes up about 50% of the population, are closer to the average of OECD countries with a mortality rate of around 6.5%. And finally, the unprotected in Mexico, who have no resources or formal work, to whom basic resources such as healthcare should be provided, but are excluded in the majority of cases. The real mortality rate of this group is unknown, but if the official statistics are true, their mortality rate should be a horrifying 58.7%, much greater than the 30% that Gaziano suggested in his book ''Priorities of Disease Control in Developing Countries''.[12]

Deep reforms to our healthcare system are urgently required. The rules regarding access to medical attention for acute coronary syndromes by the Popular Insurance need to change. It is imperative to bring this to the public consciousness through health education campaigns, early prevention and detection as soon as the first symptoms appear.

We must educate the first contact physcians so they understand that ''time is life'' and that these patients should be treated as quickly as possible. We need to generate metrics for quality and evaluate them longitudinally to create trustworthy statistics. Healthcare centers should have the basic tools to make a diagnosis, such as an electrocardiograph and portable systems to measure cardiac enzymes. The first contact medical personnel should receive simple and economical systems for telemedicine, like the *whatsapp* platform, for the immediate transmission of the electrocardiogram to university centers for a rapid interpretation and initial management. It is imperative to develop well-equipped transport systems, both humanly and technologically, so that once treatment has begun, the patient can be moved to specialized centers to continue their management.

The problem is known. The solutions exist. What is required is a collective will and effort to reverse this serious health problem that is afflicting our country. Everyone, academics, physicians, civil society and the government, should pledge to this noble cause.

Funding

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