

Efficiency Indicators of Mammography in the Detection of Breast Cancer Early Stages: Exploratory Study in Mexico

Enrique Gaona, Sofía Izel Osorio, Valeria Arenas, Miguel Salvador Bernal, Samara Tzitzitlini Labra, Nelly Molina-Frechero, Jesús Gabriel Franco

Universidad Autónoma Metropolitana
Xochimilco, México

Teodoro Rivera
CICATA, Instituto Politécnico Nacional, México

Beatriz Alvarez
Hospital Juarez de México

Abstract

The main purpose of this study was to analyze an indicator of the efficiency of screening mammography that is the proportion of women with breast cancer in advanced stage who had annual and biennial mammography screening before the diagnosis of breast cancer. Mammography screening aims to detect malignant breast cancer when there are no clinical signs or symptoms of breast disease, at a stage when an effective treatment can be provided and the risk of breast cancer death is reduced. A survey was conducted on 979 patients who had advanced breast cancer who received treatments at various cancer centers in Mexico City to determine personal and clinical characteristics. The survey results showed that patients age between 19 and 70 years old, it was found that 12.2% of the patients under 40 years old, and 87.8% of 40 years old and over. However, the findings show that 35% of patients had an annual and biennial screening examination; although 1% of patients had mammography screening every 3 years, 3% every four-years, and 61% of patients never attended any screening examination. In addition, results showed several personal and clinical characteristics of the patients. We can argue that the proportion of women with advanced breast cancer who had an annual and biennial mammography screening before diagnosis of breast cancer as an indicator of the efficiency of mammography facilities in countries where quality assurance programs have not been implemented, the absence of audits in mammography facilities and a small number of radiologists and medical physicist qualified in mammography. Controversial, but it is a warning of the efficiency of mammography facilities in countries that have a high rate of breast cancer mortality.

Keywords: screening mammography, efficiency indicators, breast cancer.

Introduction

The main purpose of this study was to analyze an indicator of the efficiency of screening mammography people who took part of the survey were women with breast cancer in advanced stage who had annual and biennial mammography screening before giving the diagnosis of breast cancer. Mammography screening aims to detect malignant breast cancer when there are no clinical signs or symptoms of breast disease, at a stage when an effective treatment can be provided and the risk cancer breast is reduced. Currently, there is a general agreement that mammography screening with program quality assurance reduces the rate of death from breast cancer. In Mexico, the Mexican Institute of Social Security (IMSS) with its campaigns that are focused on preventing from breast cancer with mammography has reduced the mortality from this disease by 20% (IMSS, 2016). The reduction in breast cancer mortality after implementing screening is strikingly similar in Denmark (25%) and Norway (28%) (Kalager et al., 2014). There is an additional benefit in reducing breast cancer mortality from the early detection of breast cancer through mammography screening over and above the benefits arising from improvements in treatment alone (Njor et al., 2015). The chance of saving a woman's life by a population-based mammography screening of appropriate quality is higher than that of over-diagnosis and false-positive screening results (Törnberg and Zorzi, 2012).

The chance of a woman's life being saved by population-based mammography screening of appropriate quality is more than that of over-diagnosis by screening (Paci et al., 2014). In 2014, of the total of cases of cancer diagnosed in the Mexican population of 20 years old and over this age, the breast is the one with the greatest presence by 19.4 percent and the country's death rate from breast cancer was 15 deaths per 100,000 women aged 20 and over (INEGI, 2016). Worldwide, breast cancer is the most common cancer among women, and it represents the 16% of all cancer cases in this population (OMS, 2016). Breast cancer has been a national public health problem in Mexico since 2006 and it has been the leading cause of death due to cancer in the female population of 25 years and over (CNEGSR- SSA, 2014). Only screening mammograms with audited quality assurance programs have the potential to reduce the mortality rate from breast cancer, and the rate of death from breast cancer in Mexico annually increases. In our country, we have a history of poor image quality of mammography facilities as it is shown in the following studies. In the evaluation of radiology facilities in five Latin American countries, experts found that 33.3% of mammograms in Mexico were clinical images of the worst quality (Fleitas et al., 2006). In a survey conducted in 65 mammography facilities, which use CRDM systems in Mexico City and surrounding States (either private clinics or public part of the health system). No distinctions were made regarding manufacture and model of the systems and only four CRDM mammography facilities meet the minimum image quality standards in the ACR (American College of Radiology) protocol and guidelines image quality (Gaona et al., 2014).

Material and Methods

According to the survey of personal and clinical characteristics of the female patients with advanced breast cancer, so in this sampling were included 979 patients who received medical treatment at several Cancer Centers in Mexico City by the National Health System. Analyzing the survey results, a database was created and processed using statistical software SPSS V22.

Results and Discussion

Figure 1 illustrates the distribution of the States of the Mexican Republic, where patients come to Mexico City to receive treatment for breast cancer. Only 54.8% of the patients lived in the Greater Mexico City area. 33.1% of the patients come from neighboring states to Mexico City (Hidalgo, Tlaxcala, Querétaro, Morelos, Guerrero, Oaxaca, Puebla and Michoacán).

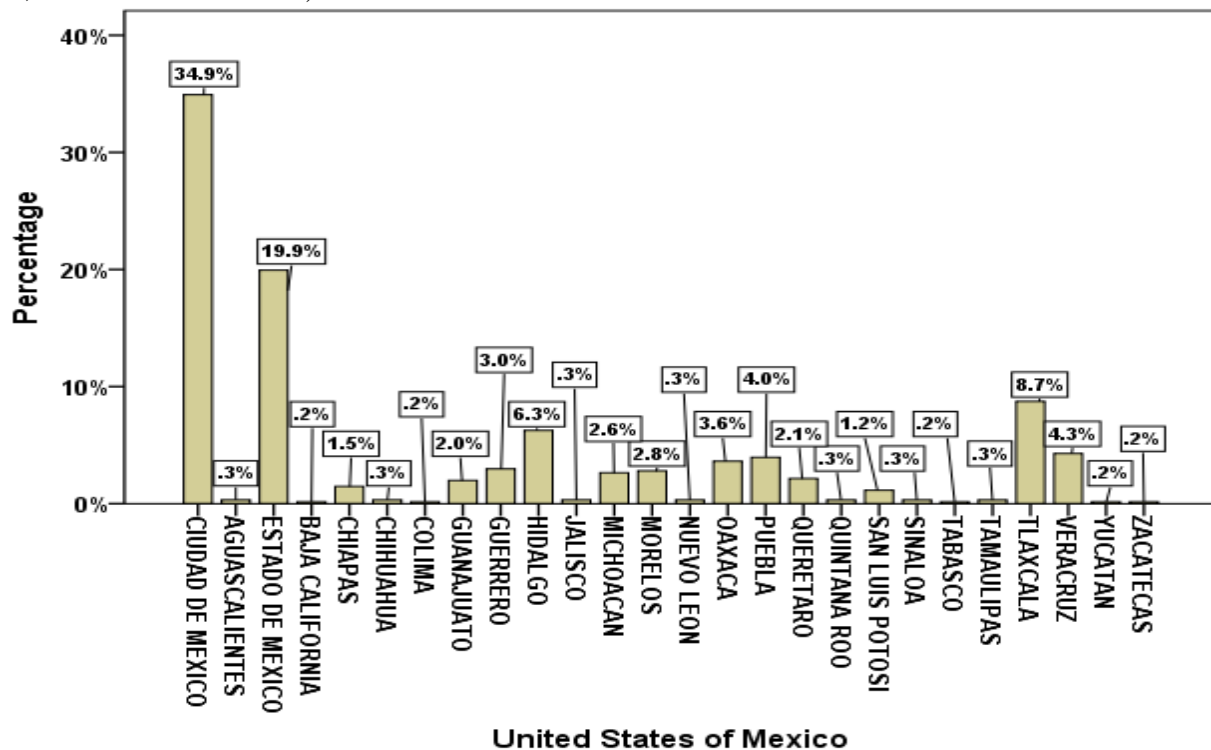


Figure 1. Distribution of patients who participated in the study, according to their State of origin in the Mexican Republic.

Patients participating in the sampling are between 19 and 70 years old (figure 2), it was found that 12.2% of the patients under 40 years old. It was unknown if these patients had previous diagnostic mammogram results. Given the high density of the breast cancer cases may reduce the specificity of screening mammography. Most patients were older than 40 years (87.8%) in comparison with the high frequency of the age range between 50 to 59 years old. As a result, we only know the rate of mammography screening from the time elapsed between the last mammogram taken and since breast cancer was diagnosed for the first time. Unfortunately, we see from these patients neither the density of the breast, nor the quality of the mammograms, or if they have complementary clinical studies to be able to realize an integral diagnosis.

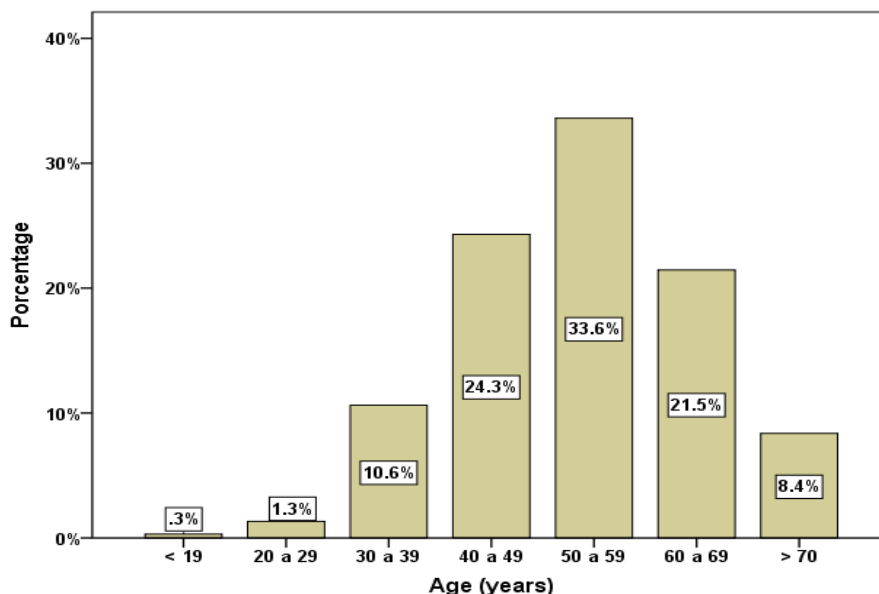


Figure 2. Age distribution of patients participating in the study.

Following characteristics have been noticed in patients with 85% history of pregnancies, 18% of abortions, 61% of hormone replacement therapy, 25.6% with a family history of breast cancer, 49.1% married, 23.9% single, 85.1% with children, and 38% of contraceptive use. However, we overlooked relevant information about the average age of first pregnancy, time contraceptive use, the number of abortions and time of hormone replacement therapy all this valuable data helps to understand the development of breast cancer. It is important to remark that 65% of the patients may not have access to a screening mammography prior a diagnosis of breast cancer, which it can be caused by lack of information and education level of the patients. Most of these patients, 5% have no education, 29% elementary, 25% High School, 20% College, 18% university and 2% postgraduate, Although there is not a significant relationship between the frequency of screening mammography examination and education level. NOM-041-SSA2-2011 standard related to breast cancer states that it must provide psychological support to the patients in their diagnosis and treatment, but only 23% received specific mental support.

A chi-square statistical test had been used to compare the clinical characteristics of the patients with a frequency of screening mammography examination (table 1).

Table 1. The frequency of screening mammography examination had or not a significant relationship with:	
Age (table 2)	p <0.000
Marital status	p <0.010
Family history of breast cancer	p > 0.183
Hormone replacement therapy	p > 0.333
Abortion practice	p > 0.115
Education level	p > 0.208
Contraceptive use	p > 0.115

Another finding found that may be non-significant in the incidence of breast cancer is that 10% of patients had been exposed to doses of radiation during at least three or more chests computed tomography, before the diagnosis of breast cancer (figure 3). In the particular case of female patients, chest tomography includes exposure to high radiation doses of intrathoracic tissues, the mammary glands, and thyroid gland. In comparison with a chest X-ray, radiation exposure to the mammary glands increases the risk of breast cancer. We do not know the doses received by the patients in CT because it is not mandatory to record the doses of patients in their medical records in Mexico. Also, it is not compulsory to verify the doses of radiation to patients in CT.

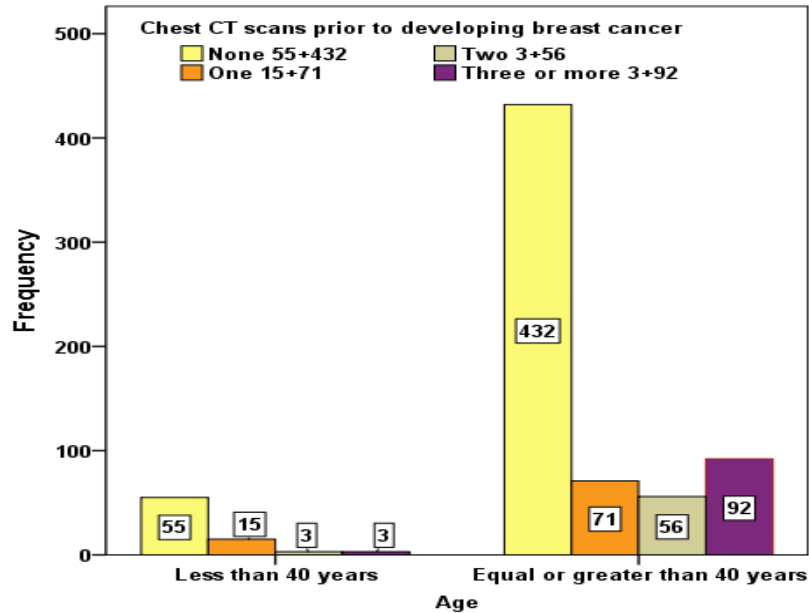


Figure 3. Distribution of frequency chest CT scans before developing breast cancer

The survey results showed that 35% of patients had an annual and biennial screening examination (28.2% annual and 6.3% biennial), although 1% of patients had mammography screening every three years, 3% four-years, and 61% of patients never attended screening examination (table 2). We can argue that the proportion (35%) of women with advanced breast cancer that had an annual and biennial mammography screening before the diagnosis of breast cancer as an indicator of the efficiency of mammography facilities. This argument we consider valid in our country where we have the following characteristics: Mexico has less than 350 certified radiologists (CMRI, 2017) who are a specialist in mammography for a population of women in their 40s and over that were approximately 19 million in 2016. Most of the mammography facilities do not have a comprehensive quality assurance program in analog or digital mammography systems because The Ministry of Health does not have a national quality control audit program at mammography facilities equivalent to the FDA's auditing program in the United States to verify that mammography facilities comply with current national standards. In Mexico, there are less than 15 qualified medical physicists in radiology with training in mammography. Everything that was written in this paragraph is an indicator of the efficiency of mammography facilities and provides a direct assessment of the early detection capacity of breast cancer. Controversial, but it is a warning of the effectiveness of mammography facilities in countries that have a high rate of breast cancer mortality.

		Frequency of screening mammography examination					Total
		Annual	Biennial	Triennial	Four-year	Never	
Age	Less than 40 years old	14	2	0	0	99	115
	Equal or greater than 40 years old	262	60	12	30	500	864
Total		276	62	12	30	599	979

Conclusion

Sampling results show that 35% of the patients with breast cancer in an advanced stage had annual and biennial screening examinations before the diagnosis of breast cancer. We can argue that the proportion of women with advanced breast cancer who had an annual and biennial mammography screening before the diagnosis of breast cancer as an indicator of the efficiency of mammography facilities, controversial, but it is a warning of the efficacy of mammography facilities in countries that have a high rate of breast cancer mortality. The reality is that breast cancer is a national public health problem and mortality rate in Mexico annually increases.

Acknowledgements

Recognition for Maria Antonieta Crestani Torres and Olivia Rodriguez of Grupo de Recuperación Total Reto, A.C. For their support in the realization of this study. Thank you.

References

- CMRI, 2017. Base de datos de Radiólogos Certificados, (<http://www.cmri.org.mx/mostrarconsulta.php> /), accessed September 4, 2017.
- CNEGSR-SSA, 2014. Cáncer de mama, (http://cnegrs.salud.gob.mx/contenidos/Programas_de_Accion/cancermama/introduccion_CM.html), accessed September 20, 2017.
- Fleitas I, Caspani CC, Borrás C, Plazas MC, Miranda AA, Brandan ME, et al., 2006. La calidad de los servicios de radiología en cinco países latinoamericanos. *Rev Panam Salud Publica* 20, 113-24.
- Gaona E, Rivera T, Arreola M, Franco J, Molina N, Alvarez B, Azorín CG, Casian C, 2014. Exploratory survey of image quality on CR digital mammography imaging systems in Mexico. *Applied Radiation and Isotopes* 83, 245–248.
- INEGI, 2016. Estadísticas a propósito del día mundial de la lucha contra el cáncer de mama, (http://www.inegi.org.mx/saladeprensa/aproposito/2016/mama2016_0.pdf), accessed July 10, 2017.
- IMSS, 2016. Anuncia el IMSS inversión de 360 millones de pesos en mastógrafos para prevenir cáncer de mama, (<http://www.imss.gob.mx/prensa/archivo/201609/168>), accessed July 10, 2017.
- Kalager, M., Løberg, M., Bretthauer, M. & Adami, H-O., 2014. Comparative analysis of breast cancer mortality following mammography screening in Denmark and Norway, *Ann Oncol* 25 (6): 1137-1143.
- Njor SH, Schwartz W, Blichert-Toft M, Lyng E., 2015. Decline in breast cancer mortality: how much is attributable to screening?. *J Med Screen.* 22, 20-7.
- OMS, 2016. Cáncer de mama: prevención y control. Carga de cáncer de mama, (<http://www.who.int/topics/cancer/breastcancer/es/index1.html>), accessed October 16, 2017.
- Paci E, Broeders M, Hofvind S, Puliti D, Duffy SW, EUROSCREEN Working Group. European Breast Cancer Service Screening Outcomes: A First Balance Sheet of the Benefits and Harms, 2014. *Cancer Epidemiol Biomarkers Prev.* 23, 1159-63.
- SSA, 2011. Norma Oficial Mexicana NOM- 041-SSA2-2011, Para la prevención, diagnóstico, tratamiento, control y vigilancia epidemiológica del cáncer de mama. In: *Diario Oficial de la Federación de México* de 9 de junio de 2011.
- Törnberg S, Zorzi M., 2012. Summary of the evidence of breast cancer service screening outcomes in Europe and first estimate of the benefit and harm balance sheet. *J Med Screen.* 19 Suppl 1, 5-13.