

Feminization of science: female pioneering in the healthcare area

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INTRODUCTION

The phenomenon of the feminization of science has been consolidated over the last few decades. The growth of female participation in science, specifically in medicine, is evident in the evolution of the number of women who graduated each year and the increase in their participation in the labor market, in Brazil and in most parts of the world¹.

Historically, the first women to remove barriers to accessing medical education deserve to be highlighted, not only because of the relevance of their contributions to society but also because they are examples of breaking paradigms. This phenomenon of greater job opportunities for women and access to social benefits, with consequent gains in productivity and competitiveness for the economies of the countries, is largely due to the legacy of the pioneering spirit of women who gave voice to their purposes, especially in the area of science and medicine^{1,2}.

However, society does not always witness the progressive decrease in gender differences in science. Several authors have shown that female physicians still differ from men in the choice of specializations, territorial fixation, working hours, remuneration, and the way of professional practice^{1,2}.

Given this scenario, the objective of this study was to collect, from a historical perspective, a brief biography and relevant data about the 10 main pioneer women in science and their contributions to society. As a secondary impact, the authors discuss the role of these women in breaking paradigms in the context of gender inequality in science, focusing on current medicine.

METHODS

For descriptive data, the Brazilian Medical Demography prepared by the Federal Council of Medicine and Regional Council

of Medicine of the State of São Paulo (2011, 2013, 2015, and 2018) was used. The evaluation of articles from PubMed, the Scientific Electronic Library Online, and the National Health Library databases was also included, using the descriptors “Medicine,” “Career progression,” “Leadership,” “Medical education,” “Women,” and “Gender Inequality.”

As this study is a qualitative descriptive research, focusing on the history of women in science, including the demographic context of medicine, there was no date, language, and/or nationality limit for the studied articles or area of science. Relevant articles from public domain sources have been included and properly referenced. As it was not a research involving human beings, there was no need for the approval of the research by the Ethics Committee or an informed consent form.

RESULTS

Next, it follows through a historical perspective, the collection of the 10 women who historically stood out in the areas of science, especially medicine, due to their relevance, pioneering spirit, and legacy to society.

Elizabeth Blackwell

Elizabeth Blackwell was born in 1821 in England. She challenged society at the end of the 19th century by being the first woman to enter a medical school²⁻⁶.

Gerty Cori

Gerty Cori was born in Prague, Czech Republic, in 1896. Based in the United States, Cori was the first woman to receive the Nobel Prize in Medicine in 1947 for her studies and discoveries that expanded the understanding of diabetes²⁻⁸.

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Rita Lobato Velho Lopes

Despite prejudice, Lobato became the first Brazilian doctor, trained in Brazil in 1887, and the second in Latin America, by defending the thesis “Parallel between the methods recommended in cesarean section”²⁻⁸. In her clinical practice in Rio Grande do Sul, she aimed to demystify the stigma that women’s modesty was more important than their health⁹.

Maria Augusta Generoso Estrela

Maria was the first Brazilian to receive a scholarship abroad. Even though she was only 16 years old – too younger than allowed – the young woman managed to get into the New York Medical College and Hospital for Women²⁻⁶.

Françoise Barré-Sinoussi

Françoise Barré-Sinoussi is a French virologist, born in 1947, who began her research at the Pasteur Institute in the early 1970s, where she devoted herself to the study of retroviruses. Her studies were instrumental in identifying HIV as the cause of AIDS. Recognition came in 2008, with the Nobel Prize in Physiology and Medicine²⁻⁶.

Ana Néri

Considering the pioneer of nursing in Brazil, Néri provided assistance in the Paraguayan War, in 1865, after becoming a widow. In 1923, the first nursing school in Brazil was named after Ana Néri²⁻⁶.

Florence Nightingale

Florence Nightingale settled in England and served in the Crimean War (Russia, 1953), where she treated soldiers wounded during the battle². The hygiene and sanitary aspects of the place were determining elements for the healthcare conditions of the people served, encouraged by her³.

Patricia Bath

Patricia always knew she wanted to be a doctor, but she faced a lot of racial discrimination to get into medical school. She created treatments for cataracts and co-founded the American Institute for the Prevention of Blindness⁴⁻⁶.

Mae Jemison

Being a astronaut, physician, entrepreneur, and Star Trek fan, Mae Jemison was the first African-American woman to reach space. “The first thing about empowerment is understanding that you have a right to be involved. The second is that you have important contributions to make, and the third is that you have to take risks to make those contributions” (Mae Jemison)⁴⁻⁶.

Zilda Arns

Zilda Arns (1934–2010) was a pediatrician and public health-care specialist, creator of the Pastoral da Criança, and mainly responsible for the historic reduction of infant mortality in Brazil and for the improvement of the living conditions of millions of children in several countries of the world¹⁰.

DISCUSSION

Vanguard of women in medicine

In the Middle Ages, women who were involved in medicine were considered representatives of Satan (healers) and condemned to death at the stake. Their only alternative was marriage or the convent; however, the work of midwives was allowed^{11,12}. In the Renaissance period, Italy was the exception. However, the woman is seen as a representation of beauty, procreation, and virtue, to the detriment of her intellect. Chronic diseases are considered “women’s diseases.”^{11,12}

During the French Revolution, based on the thesis of the “Incurable Inferiority of the Female Gender,” the philosophy of return to nature preached that the basic role of women was relegated to that of wife and mother. The greatest impact in this period was the outbreak of the Feminist Movement in Germany, where many medical faculties paved the way for 400 women to enroll in schools in 1899^{11,12}.

The world wars ironically contributed to the female struggle to enter the healthcare area as protagonists. During the First World War, women were inserted due to the need to replace those who were drafted. They dedicated themselves to nursing (France/Germany), and when they were doctors, they were less accepted and received less honors. Social and political movements, industrial society, and intense cultural transformation (1960–1970) drove women to public universities in search of a life project beyond domestic^{11,12}.

Scenario of the current feminization of medicine

In recent years, the percentage of women in the total population of physicians in Brazil follows the global trend of feminization of medicine¹. Women are already the majority among recent graduates and among doctors under the age of 35 years. They represent about 57.4% in the group up to 29 years old and 53.7% in the group between 30 and 34 years old. Among the older ones, the participation of men continues to be higher; about 54.8% are between 40 and 44 years old and 62.5% are between 60 and 64 years old. Despite this, gender inequalities in remuneration and occupation by specialties remain¹³.

The female presence is greater in the specialties of Pediatrics, Family and Community Medicine, Gynecology and Obstetrics, and Internal Medicine, and men are the majority in surgical specialties of Urology, Orthopedics, and Traumatology, among others¹³. Women, ahead of their time, who choose surgical areas such as neurosurgery, breakthrough the paradigms of prejudice and inequality¹⁴.

Although the number of women practicing medicine is increasing, the salary is still lower than that of men who occupy the same positions. This was one of the conclusions of the fourth edition of the Medical Demography Survey in Brazil 2018¹⁵. When the variable length of practice was analyzed, the researchers observed salary differences in all categories, indicating that the disparity is not produced throughout the medical career.

Inequality between genders persists in terms of working hours, consultations, and shifts¹⁵, not only in Brazil but also in developed countries, even in specialties that are more prevalent among women such as pediatrics¹⁵. Studies carried out in countries such as Canada and the United Kingdom, evaluating specific subgroups of physicians, revealed salary discrepancies based on sex and gender between research, academic, and clinical groups^{16,17}.

Even in academic medicine, no difference is noted. Men are implicitly seen more as leaders than women¹⁸. In a study of internal medicine residents, most felt that gender was among the top three disadvantages in directing a healthcare team¹⁹. According to this study, female residents described feeling stressed when violating gender behavioral norms and conducting cardiac resuscitation¹⁹. Likewise, female residents reported that their decisions were challenged more often than men and also perceived negative feedback in residency assessments for showing assertive leadership behaviors^{18,19}.

On the contrary, in the challenge of overcoming all explicit and implicit prejudices, women physicians and researchers have consolidated their leadership and excellence in ethics and scientific quality in recent decades. The role of women is recognized and there are stories of determination and overcoming in the scientific area and throughout civil society through professionals such as the doctor Rossana Pulcineli Vieira Francisco, Ph.D., President of the Association of Gynecology and Obstetrics of the State of São Paulo (SOGESP), Brazil, biennium 2020–2021, the largest federation of FEBRASGO in the country²⁰. Next is the doctor Marair Gracio Ferreira Sartori, Ph.D., cited by the other authors without conflicts of interest in the result or ethical aspects, the first female head of the Department of Gynecology and Obstetrics at Paulista School of Medicine, Federal University of São Paulo²¹, among others who lead,

represent, and train other professionals in the field of science and healthcare in the country. Finally, Nísia Trindade Lima, Ph.D., president of the Oswaldo Cruz Foundation (Fiocruz, 2017), is the first woman to head the Ministry of Health in Brazil (2023).

In view of the above, the consolidation of women in science is aligned with ethical evolution, humanization, transparency, credibility, respect, representativeness, innovation, excellence, and commitment established in the midst of professional practice, whether in patient care or in the management of foundations, universities, medical societies, companies, and/or other entities.

CONCLUSION

Examples of intrepid women paved the way for generations of engineers, biologists, nurses, mathematicians, doctors, astronauts, physicists, and other professions that women decide to play in society. The legacy of the contributions of the female population in science goes beyond the area of healthcare and enhances the development of each woman's purposes, whether in female entrepreneurship, teaching, technology, agriculture, politics, among other diverse sectors. The dedication of women to domestic services, by free choice, and not by gender inequality, demonstrates the socioeconomic evolution of a nation.

Steps are being taken so that the representation of women in society is in accordance with personal and professional aptitudes, by free will, and never based exclusively on gender.

ETHICAL ASPECTS

The authors declare no conflict of ethical aspects in results of this article.

AUTHORS' CONTRIBUTIONS

GVM: Conceptualization, Data curation, Investigation, Validation, Writing – original draft, Writing – review & editing. **LMO:** Supervision, Validation, Visualization. **CCT:** Resources, Software, Supervision. **MMD:** Conceptualization, Data curation, Investigation. **EVS:** Conceptualization, Data curation, Investigation, Writing – original draft. **ABAN:** Conceptualization, Data curation, Investigation, Writing – original draft. **ZIKJDB:** Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **MGFS:** Conceptualization, Data curation, Validation, Visualization, Writing – original draft.

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