



Study on the sociocultural profile of women working in a Brazilian nuclear area institution

A. G. M. Santos,¹ K.F. Suzart², P.S. Rodrigues³, N.L. del Mastro⁴

¹*anagabryele@usp.br*, ²*karolinesuzart@usp.br*, ³*priihsr@usp.br*,
⁴*nelida@usp.br*

*Instituto de Pesquisas Energéticas e Nucleares, IPEN/CNEN,
Av Prof. Lineu Prestes, 2242, 05508-000, SP, Brazil*

1. Introduction

The discussion about gender relations and education is fundamental to the description of contemporary societies, as well as to the discussion of strategies in the educational field. Worldwide, gender inequalities are present in history, in which women are excluded or have their participation undervalued. Currently, after the implementation of universalist inclusion policies in Brazil, it is possible to observe a slow process of change in this scenario [1].

Marie Salomea Skłodowska Curie, a Polish physicist and chemist with French citizenship, who conducted pioneering research on radioactivity and was responsible for the discovery of the radium and polonium chemical elements, had to overcome numerous difficulties in her career because she was a woman, until she became a renowned researcher and scientist at the Sorbonne University in France.

As a result of Marie's performance, among other pioneers, two inherent aspects emerge when discussing the participation of women in science. The first would be to counter the false understanding that women would not have the capacity to do science, an understanding supported by biomedical theories about anatomical or physiological differences in relation to men, which limited their intellectual potential and conformed them, exclusively or primarily, to motherhood and home care. The second would be the desire to create models to encourage young women to enter science [2].

Instituto de Pesquisas Energéticas e Nucleares (IPEN) is an autarchy linked to the Secretariat of Economic Development (SDE) of the São Paulo State Government and technically and administratively managed by the National Nuclear Energy Commission (CNEN), an agency of the Ministry of Science, Technology and Innovation (MCTI) of the Federal Government. Located in the campus of the University of São Paulo - USP, occupying an area of 500,000 m², IPEN operates in several sectors of the nuclear area in Brazil.

The present work had the objective of identifying the sociocultural profile of women working at IPEN, one of the most renowned institutes in nuclear research in Brazil. The results found are discussed with the support of the literature that addresses women's fields of action, gender equity and ethno-racial aspects of the population.

2. Methodology

The research developed in this article was carried out using Google forms sent by email between 2019/2020 to survey the profile of women at the Institute for Energy and Nuclear Research, IPEN. The online questionnaire contained ten open questions described below:

1. What is your role at IPEN?
2. How do you identify yourself?

3. What is your age range?
4. Where do you come from (City, State, Country)?
5. In which IPEN center do you work?
6. What is your research line or assignment?
7. If you are a student/researcher, are you being oriented by a man or a woman?
8. If you are a female professor/researcher, have you been mentored by a man or a woman?
9. Do you know the pioneer women in the nuclear area in the center you are part of or in IPEN or in Brazil?
10. Do you know Women in Nuclear or WiN Brasil?

The answers received were spontaneous contributions from the women who make up IPEN's workforce, of which one hundred and five (105) women answered. According to data made available by the institute, there are around 600 federal civil servants currently working (men and women) and the estimate of women enrolled in graduate courses is around 223 women. The answers were analyzed and compared with data from the literature.

3. Results and Discussion

According to the answers obtained from the questionnaire sent out, 83.7% of the women identify themselves as white, 9.6% declared themselves as *black* (black and brown), 6.7% as yellow, and no *indigenous women* (Fig. 1).

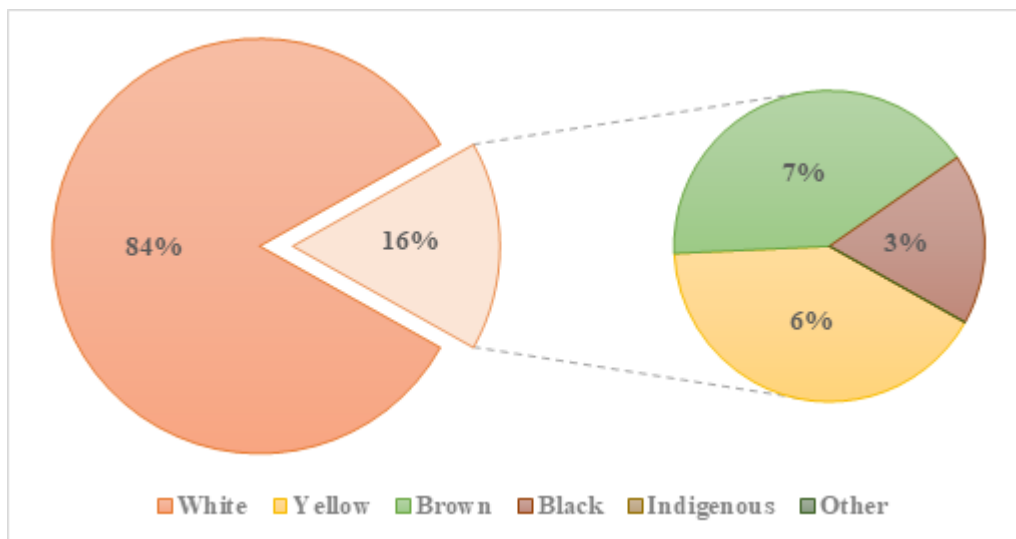


Figure 1: How women identified themselves at IPEN

The Brazilian Institute of Geography and Statistics (IBGE) changed the identification by color, until in 2000 the five categories currently used in the surveys were defined, in the order in which they appear in the questionnaire - white, black, yellow, brown, and indigenous - which also appear in the 2010 Demographic Census.

A way society classifies people in a perception through physical traits, it conditions the trajectory of each person's life, which may result in stigmas and disadvantages for some and social capital for others. The myth of "racial democracy", conceptualized in Brazilian society, was built and consolidated through discourses and practices throughout Brazilian history. Black women occupy the lowest positions on the scales of salaried, either when compared to white and black men, or when compared to white women [3].

According to the Census of Higher Education for the years 2018 and 2019, the white women are the highest graduates in undergraduate courses, both distance learning and face-to-face teaching. So, if white women graduate more, the probability of them entering a graduate degree or positions that require academic knowledge, will be greater, with consequent advance in the professional trajectory.

In research conducted by Cruz, the author identified the nuclear history of Brazil with a scenario of almost total absence or exclusion of women, including in publications. This author cites as an example the book, *O programa nuclear brasileiro*, by Carlo Patti, based on interviews with the main characters in the history of the Brazilian nuclear program, in which the author does not mention any woman as a main theme in his 16 (sixteen) chapters. However, from the time of Madame Curie to the present day there is in the nuclear sector a constant transformation in what involves women [4].

In Brazil, we have several names of great importance and representativeness. In the questionnaire answered by 105 women who are part of IPEN, all of them know women protagonists in Brazilian nuclear history who work or worked at IPEN, such as the researchers: Linda Caldas, Constância Pagano and Mitiko Saiki, the names most cited by women. Women perform several tasks in the institute, among them, post-graduation program students, professors and researchers, and technical-administrative employees. Among the 105 who answered, 60% are postgraduate students at IPEN-USP, 33.3% of whom are master's and 26.7% PhD students, and 5.7% are equivalent to post-doctoral students at the institute, i.e., one can conclude that most are postgraduate students. The remaining 40% correspond to female professors/researchers and other professionals essential to the research, administration, or radioprotection activities in the industry.

Regarding the age range, the results of this study show that the majority, corresponding to 38.1%, is up to 30 years old, followed by 29.5% between 31 and 45 years old, 22.9% between 46 and 60 years old, and 9.5% are over 60 years old. Considering the area of work, it is possible to verify that the smallest age group is of graduate students, which is equivalent to 53.3%. As the age range advances, we see an increase in the concentration of women working in higher positions; IPEN only has female professors/researchers from 31 years old (considering the options offered in the questionnaire) and 10.5% are between 46 and 60 years old. Considering the answers regarding age group and area of work, the women who are in the oldest age group are the ones who have the highest level of education, but the number of women in more advanced levels decreases. The results obtained were: the quantity of women who are up to 30 years old and are master's students (26), women between 31 and 45 years old who are doctoral candidates and post-doctoral candidates (18), and between 46 and 60 years old who are professors/researchers (11), that is, less than half of the master's students correspond to the number of professors/researchers, showing that they evade the trajectory also confirming the theory of leaky pipeline existing in the nuclear area.

In the present survey, when asked about the line of research or assignment, most work in the area of health or biotechnology, which is equivalent to 15.2%, but we can consider that some research such as in the areas of radiopharmacy, radioprotection or medical physics are also related to biotechnology, since they are fields that are applicable to health sciences; considering these areas, the amount becomes greater, equivalent to 40%.

The choice of areas more focused on the biomedical area suggests the feminization of health occupations and professions, that even though many of them work in the nuclear energy area, they apply their knowledge to the biotechnological field. This is caused due to the Brazilian historical factor that the female professionalization started in the nineteenth century was related to functions that women traditionally perform, activities such as caring, educating, serving, which were understood as a gift or vocation [5].

Regarding management and sector heads, 7.6% of the respondents also identified themselves with such attribution and relating it to the age bracket, they are women over 31 years old, but due to the large percentage of women over 31 years old, which amounts to 62%, it is considered a small number of women acting as managers, heads or leaders of the sector. However, if we restrict and relate the data of managers, chiefs or leaders of the sector who are teachers/researchers and are older than 46 years of age, this percentage becomes lower and is equivalent to approximately 4.8%.

Through the quantitative results obtained in the survey carried out at the Institute, it can be observed that the southeastern region had a higher record of female researchers when compared to other regions in Brazil. IPEN is located within the University of São Paulo (USP), in São Paulo/SP. Therefore, the number of women from other regions is smaller when compared to women from the southeast.

4. Conclusions

A summary and conclusions might go here. From this research, carried out through a questionnaire answered voluntarily, it is possible to conclude that more than 80% of the women declare to be white, 61% are between 18 and 45 years old, and that most of them come from the southeast of Brazil, where IPEN is located. The institute acts as a research center and has a graduate program linked to USP. 60% of the women who answered the questionnaire are graduate students and 54.7% are mentored by men. As for the women who are linked only to the institute as researchers/scientists, 57.1% answered that they were mentored by men during their academic career. In the nuclear area in Brazil, the construction for an egalitarian sector in terms of female representation still has a lot to be developed; research like these and dissemination of events about women is something that needs to be done more frequently. The insertion of women in this area is happening in a structural way and gradually, as you can see from the Agency's notices International Atomic Energy (IAEA) which in its selections has policies incentives for female participation in the nuclear sector. For future work, we seek to identify the sociocultural profile of women in other research institutions linked to CNEN.

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