



Original paper

Participation of women medical Physicists in European scientific events: The European experience

Kalliopi Platoni^a, Sotiria Triantopoulou^{a,*}, Maria Dilvoi^a, Efi Koutsouveli^b, Agapi Ploussi^a, Virginia Tsapaki^c

^a National and Kapodistrian University of Athens, Medical School, 2nd Dpt. of Radiology, Medical Physics Unit, ATTIKON University Hospital, 1 Rimini St, 124 62 Haidari, Athens, Greece

^b Hygeia Hospital, 4 Erythrou Stavrou & Kifisias Av., Marousi 151 23, Athens, Greece

^c Konstantopoulou General Hospital–Agia Olga, 3 Agias Olgas St, Nea Ionia, 142 33, Athens, Greece

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ABSTRACT

Purpose: Though the number of women scientists is increasing over the years, studies show that they are still under-represented in leadership roles. The purpose of this work is to establish the percentage of women Medical Physicists (wMPs) that have participated in European scientific events and evaluate it as an indication of the current position of women in the field of Medical Physics in Europe and to propose possible ways to encourage their participation.

Materials and Methods: Data regarding the participants in European scientific events of Medical Physics were collected. The participants were divided into categories according to the program of the events and their gender was identified. The percentage of wMPs in each category was evaluated.

Results: The participation of wMPs attending courses is greater than 50%. The categories with the greatest participation are “Organizing Committees”, “Chairpersons-Moderators” and “Oral Presentations”. The categories with the lower participation of wMPs are “Scientific Committee”, “Symposiums” and “Invited Speakers”. None of wMPs were represented as “Course Directors”.

Conclusions: The attendance of wMPs in courses is slightly greater than average. However, wMPs do not have an equally important recognition in special invited roles in conferences. They are still under-represented in “Scientific Committees”, “Invited Speakers”, “Symposiums” and “Course directors”. wMPs should be encouraged to participate even more actively in European conferences and the organizing committees should invite more wMPs in special roles. More studies concerning the status of female MPs in each country separately should be encouraged as they will help in understanding the position of wMPS in Europe.

1. Introduction

Female scientists have played a major role in scientific achievements throughout history. A fine example is Marie Curie, one of the most well-known female scientists. She was not only the first woman scientist in Europe who obtained a degree of Doctor of Science, but in addition she was a winner of two Nobel prizes. Her research contribution in the fields of radiation and radioactivity was of paramount importance to the development of nuclear energy and consequently in cancer treatment [1,2]. Edith Stoney is the scientist considered to be the first woman Medical Physicist (wMP). She established stereoscopy for the localization of bullets and shrapnel in injured soldiers during the First World War. She also introduced the use of x-rays in the diagnosis of gas gangrene [3,4]. Other women scientists known for their

contribution to radiation science are Lise Meitner, Tikvah Alper, Ida Noddack, Katharine Way and Jane Hamilton Hall [5].

Though today the number of female scientists is continuously increasing, women are under-represented in many fields of science and engineering [6]. In 2012, women researchers constituted less than 40% in most countries of European Union [6]. The European Commission makes a great effort to identify and quantify the remaining inequalities between the two genders, as gender-equality is a fundamental value of the ethical code of the European Union. It is reported that women's career is often interrupted, or it is generally considered as inferior than the career of men. In addition, their salary is reported to be lower. Therefore, many policies are designed by the European Commission to promote gender balance. However, even though long-term gender equality trend is encouraging, there seems to be a long way ahead until

* Corresponding author.

E-mail address: iro.trnt@gmail.com (S. Triantopoulou).

true equality in all aspects [7].

The purpose of this article is to investigate if women scientists are under-represented in the field of Medical Physics in Europe. Today the number of women medical physicists (wMPs) is 4807, corresponding to a percentage of 28%. These data are derived from a survey carried out by the International Organization for Medical physics (IOMP) [8]. More specifically, according to the same survey, the percentages of wMPs in different regions correspond to 47% in Europe, 21% in USA, 33% in Africa, 35% in Asia and 50% in Middle East. Other demographic data from surveys have shown that concerning United States 23% of Medical Physicists (MPs) correspond to wMPs [9] and in Latin America, the greatest number of MPs are working in Brazil with 35% of them corresponding to wMPs [10]. Surveys in Australia and Canada showed that, though the number of wMPs is increasing over the years, they still are under-represented in leadership roles [11,12]. With the exception of these surveys, until now the available data about the role of wMPs in their field are scarce. For this reason, the main purpose of this study is to establish the percentages of wMPs that have participated in European Scientific events, and evaluate them compared to those of male MPs in order to understand their contribution to Medical Physics. The participation in scientific events is a strong indication of whether they are indeed under-represented in their field. Though this study provides only quantitative data of the wMPs' participation, data and results from other surveys will be discussed, in order to understand the reasons underlying the under-representation of female scientists in the field. Finally, possible ways and solutions are proposed in order to encourage the participation and representation of women scientists in Medical Physics in Europe.

2. Materials and methods

For the realization of this study, data concerning the participants of European Conferences – Meetings and Schools were collected. The conferences included are the 8th European Conference on Medical Physics 2014 (8th ECMP 2014), the 1st European Congress of Medical Physics 2016 (1st ECMP 2016) and the 3rd European Society of Radiation Oncology (ESTRO) FORUM Physics Biennial meeting 2015. The ESTRO FORUM is an event that provides meetings regarding different aspects of Radiation Oncology. The Schools included were the ESTRO School “Physics for Modern Radiotherapy” 2016, the ESTRO School “Imaging for Physicists” 2016, the ESTRO School “Comprehensive Quality Management in Radiotherapy-Risk Management and Patient Safety” 2016, the European Federation of Organisations for Medical Physics (EFOMP) Summer Schools from 2013 up to 2016 and the EFOMP Winter Schools from 2015 up to 2017. The data for participants in the ECMP conferences, ESTRO FORUM and ESTRO schools were derived from the program books that were distributed to participants, as the authors of this manuscript participated in those events. The data of EFOMP schools were kindly provided by EFOMP with the permission to publish.

All participants were divided into categories according to the program of each scientific event. The categories for conferences are shown in Table 1. It must be noted that some of these categories are not common for both conferences (ECMP 2014 and ECMP 2016). The categories for the ESTRO FORUM, ESTRO Schools and EFOMP Schools are shown analytically in Tables 2–4 respectively.

After the categorization, the gender of each participant was identified with the use of research engines such as Research gate and LinkedIn Accounts. With the use of those data the percentages of wMPs participants were calculated for each category of scientific event separately. In the end, the average values of female participants in the existing common categories of all scientific events was calculated in order to determine the overall participation of wMPs in the common categories of these scientific events.

Table 1
Categories of participants in conferences.

Categories of participants in conferences
President
Congress program committee
(Local) organizing committee
Awarded MPs
Scientific committee
Oral presentations
Invited speakers
Refresher courses
Joint sessions
Special sessions
Satellite lectures/Symposiums
Moderators/Chairpersons
Review courses
Symposiums
Workshops/Round tables
ECMP welcomes Italy
EFOMP working with EC
EFOMP meets MEFOMP

Table 2
Categories of the ESTRO FORUM.

Categories of participants in ESTRO FORUM
Scientific advisory group for the Physics Biennial meeting
<i>Teaching lectures</i>
Chair
Co-Chair
Invited speakers
<i>Symposiums</i>
Chair
Co-Chair
Invited speakers
<i>Proffered papers</i>
Chair
Presentations
<i>Poster discussion</i>
Chair
Presentations
<i>Debates</i>
Chair
Co-Chair
Invited speakers

Table 3
Categories of the ESTRO schools.

Categories of the ESTRO schools
Course directors
Local organizers – Local organizing committee
Teachers
Participants

Table 4
Categories of EFOMP schools.

Categories of EFOMP schools
Teachers
Participants

3. Results

The results of wMPs' participation in the 8th ECMP 2014 are shown in Table 5. In this conference the participation of wMPs ranges from 14.3% to 50%. The participation of wMPs was low – with percentages

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