

## STATUS OF MEDICAL PHYSICS EDUCATION, TRAINING, AND RESEARCH PROGRAMS IN MIDDLE EAST

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**Abstract— Middle East Federation of Organizations of Medical Physics (MEFOMP) was established in 2009 initially with 12 participating countries: Bahrain, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates and Yemen. Since then considerable efforts have been directed to establish medical physics society /association for Palestine. A Questionnaire was designed to compile the current status of medical physics in MEFOMP countries, focusing on the education, training, and research programs, as well as the year the society/association was established, approximate number of the members (male/female with PhD/MSc), graduate medical physics degrees granted (PhD/MSc), and equipment available for the programs. While there is a wide disparity among medical physics programs in Middle East, some programs have flourished since the inception whereas some programs have weakened due to the conditions beyond control of medical physicists and a few struggles to survive.**

**Keywords— Medical Physics, Education, Training, Research, Middle East, MEFOMP**

### V. INTRODUCTION

The idea of setting up an organization for medical physics societies and associations in the Middle East was first introduced after completion of the IOMP [1] (International Organization for Medical Physics) and AAPM [2] (American Association of Physicists in Medicine) International Scientific Exchange programs (ISEP) in Manama, Bahrain in 2007 under the leadership of Azam Niroomand-Rad, founder of the IOMP/AAPM ISEP programs. The establishment of the Middle East Federation of Organizations of Medical Physics [3] (MEFOMP) was part of the IOMP effort to organize regional medical physics societies under its umbrella to further enhance and improve the status of medical physics across the Globe. The formation of MEFOMP was endorsed by several medical societies in the Middle East as well as IOMP and AAPM. The MEFOMP

organization, which is a regional organization of IOMP, was officially formed in 2009 at the IUPESM [5] (International Union for Physical and Engineering Sciences in Medicine) XXII World Congress on Medical Physics and Biomedical Engineering in Munich, Germany under the leadership of Ibrahim Duhaini, who served as MEFOMP first President. The Organization consisted of 12 countries in Middle East: Bahrain, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates, and Yemen.

The main mission of MEFOMP [4] organization are to educate, train, and to promote research within local society members, to promote advancement in medical physics, and to encourage exchange of expertise and information among societies by organizing regional conferences and symposiums. The goals and objectives of MEFOMP are executed and moved forward by the Executive Officers (President, Vice-President, Past President, Secretary-General, and Treasurer) with input from Chairs of Committees (Education & Training, Science, Publications, Professional Relations, Awards & Honors, and Newsletter & Website).

#### VI. METHOD FOR UPDATING MEDICAL PHYSICS EDUCATION, TRAINING, AND RESEARCH PROGRAMS IN THE MIDDLE EAST

A Questionnaire was designed by Azam Niroomand-Rad with input from Slavik Tabakov and Ibrahim Duhaini to collect information on the current status of medical physics in MEFOMP countries, focusing on the education, training, and research programs, as well as the year the society/association was established, approximate number of the members (male/female) with (PhD/MSc), graduate medical physics degrees granted (PhD/MSc) institutions, and equipment available for treatment, diagnosis of patients for their programs. This project is part of a larger IOMP project "History of Medical Physics – A Brief Project Description" that was launched by Slavik Tabakov [6] during the past year. The 14 countries considered for this project are shown in **Appendix I**: Bahrain, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates and Yemen. However, we received very limited information from Bahrain at the time of preparation of this report.

The Questionnaire had several sections as shown in **Appendix II**: (A) Profile of association /society including number of medical physicists (male, female) with PhD, MSc and BSc degrees working in therapy, diagnostic / nuclear medicine, radiation safety / regulatory duties and other areas that could be specified by the respondents; (B) Summary of usual and customary meetings / conferences / seminars / workshops; (C) List of awards, honors, and special recognitions given to the medical physicists

(male, female); (D) List of the university / institution where graduate medical degrees (PhD / MSc) are offered including length of the program and number of students (male / female) admitted to the program; (E) List of the university / institution where *clinical training* are provided to the medical physicists (male, female) including length of training program; (F) List of the university / institution where *research* in medical physics and related topics are performed; (G) Number of equipment available in therapy (G.1) such as (Cobalt 60, Linear Accelerator, High Dose Rate (HDR) Remote After Loading, Low Dose Rate (LDR) Remote After Loading), in Radiology (G.2) such as (CT, MRI, Ultrasound, Fluoroscopy), and in nuclear medicine (G.3) such as (PET, SPECT, PET-CT, SPECT-CT, Gamma Camera). Some respondents specified other equipment such as Simulator, Orthovoltage, CybereKnife, GammaKnife, Tomotherapy and Proton.

#### VII. RESULTS OBTAINED FOR MEDICAL PHYSICS EDUCATION, TRAINING, AND RESEARCH PROGRAMS IN THE MIDDLE EAST

Responses to Sections (A – G) of the Questionnaire are compiled and discussed in Tables [A – G (G.1, G.2, G.3)] respectively.

**Table A** shows the profile of Medical Physics Societies and Associations in the Middle East Countries including Date Founded, Founding President, Website, Approximate Numbers of Medical Physicists (male and female) with PhD, MSc, and BSc degrees as outlined here:

The gender (Male, Female) of 1584 Medical Physicists who work in the Middle East region are as follows:

- 852 (~ 54%) are Male
- 705 (~ 44%) are Female
- 27 (~ 2%) genders are not specified

The college degrees (PhD, MSc., and BSc.) of 1511 (~ 95%) of 1584 Medical Physicists whose degrees were specified are as follows:

• 347 (~ 23%) of 1511 Medical Physicists have PhD degree. The gender of Medical Physicists with PhD degree are as follows:

- 187 (~ 54%) are Male
- 122 (~ 35%) are Female
- 38 (~ 11%) genders are not specified

• 912 (~ 60%) of 1511 Medical Physicists have MSc degree. The gender of Medical Physicists with MSc degree are as follows:

- 396 (~ 44%) are Male

- 403 (~ 44%) are Female
- 113 (~ 12%) genders are not specified

• 252 (~ 17%) of 1511 Medical Physicists have BSc degree. The gender of Medical Physicists with BSc degree are as follows:

- 104 (~ 41%) are Male
- 78 (~ 31%) are Female
- 70 (~ 28%) gender are not specified

As shown, the overall number of female Medical Physicists in the Middle East region is about 10% lower than male. Similarly the numbers of female Medical Physicists with PhD and BSc are about 10% lower than male. However, the numbers of female with MSc degree are comparable.

The major specialties of **1572** (~ 99%) of 1584 Medical Physicists in this region are reported; of which:

• 722 (~ 46 %) of 1572 Medical Physicists work in Radiation Therapy. The genders of the Medical Physicists who work in Radiation Therapy are as follows:

- 354 (~ 49%) are Male
- 332 (~ 46%) are Female
- 36 (~ 5%) gender are not specified

• 342 (~ 22%) of 1572 Medical Physicists work in Diagnostic and Nuclear Medicine. The gender of the Medical Physicists who work in Diagnostic and Nuclear Medicine are as follows:

- 172 (~ 50%) are Male
- 135 (~ 40%) are Female
- 35 (~ 10%) gender are not specified

• 182 (~ 12%) of 1572 Medical Physicists work in Radiation Safety and Regulatory positions. The gender of the Medical Physicists who work in Radiation Safety and Regulatory positions are as follows:

- 110 (~ 60%) are Male
- 72 (~ 40%) are Female

• 326 (~ 20%) of 1572 Medical Physicists work in Biophysics, Biomedical Engineering, Optics/Laser, and Academia. The gender of the Medical Physicists who work in these areas are as follows:

- 51 (~ 16%) are Male
- 54 (~ 16%) are Female
- 221 (~ 68%) gender are not specified

As shown, majority (~ 46%) of the Medical Physicists work in Radiation Therapy with number of male (~ 49%) almost comparable with female (46%). About (~ 22%) of Medical Physicists work in Diagnostic and Nuclear Medicine in which number of females are (~10%) lesser than males. About (~20%) of Medical Physicists work in academia and are mostly engaged in research in Medical

Physics related areas such as biology, biomedical engineering, optics and lasers and the number of males and females are almost the same (~ 16%). In addition, about (~ 12%) of the Medical Physicists work in Radiation Safety and Regulatory positions; in which number of females are (~20%) lesser than males.

**Table B** describes the frequencies and approximate number of the meetings, conferences, seminars and workshops organized within each country and/or in collaboration with other organizations and international agencies. In most countries there are some forms of routine meetings at least on annual basis. In some countries Medical Physicists often participate in training courses, conferences and workshops organized by (IAEA) [7] (International Atomic Energy Agency), AAPM, MEFOMP and Arab Health [8].

**Table C** shows awards, honors, and special recognitions established by the medical physics societies and associations in the Middle East region. Our intent for Section C of the Questionnaire was to learn how Medical Physicists, especially junior Medical Physicists and students studying Medical Physics, have been or are being recognized by their peers. However, only 3 countries have established such award and recognition for Medical Physicists: Iran (Parsai Award for Medical Physics Students on triennial basis), Qatar (Medical Physicist of the Year Award on annual basis) and Turkey (Best Paper Award on annual basis). Other countries stated awards that were mostly received by senior medical physicists in the region. Even then we believe this is a partial list of the awards received by Medical Physicists in the Middle East.

**Table D** is a list of the universities and institutions with graduate Medical Physics Programs; length and year (PhD / MSc) programs were established and annual (approximate) number of the students (male, female) admitted to the programs. Excluding the programs that are currently “on hold” in Iraq, the total number of graduate Medical Physics Programs in the Middle East that offer PhD and MSc degrees is 33, of these, 16 institutions offer PhD degrees. The length of the PhD programs in Iran are 4 years and in Saudi Arabia and Turkey are 3 years. The length of all MSc programs is 2 years in all institutions in the Middle East. Excluding the programs that did not specify gender of the students, approximate numbers of PhD students that are admitted on annual basis to the PhD programs are about 19 males and 14 females. Similarly, the approximate numbers of students admitted to MSc programs are about 94 males and 87 females. It should be noted that several countries do not offer graduate programs in Medical Physics and students often have to go abroad to study Medical Physics. Moreover, there is one institution in Yemen that offers an undergraduate BSc program in Medical Physics.

**Table E** is a list of the clinics, universities and institutions that offer *clinical trainings* to Medical Physicists (male, female) admitted to the graduate programs during PhD and MSc studies. The length of the program is also included. Except for Oman (2 years), Saudi Arabia (3 years) and Syria (4 years), most of the clinical training programs are few months in duration and are offered during MSc programs. The approximate number of students admitted to clinical training has not been specified by most of the respondents.

**Table F** is a list of the universities and institutions with medical physics *research* programs and description of research performed in collaboration with other centers and hospitals. It is shown that many different types of medical physics related research are performed in over 50 research centers in the Middle East; some of which are in collaborations with other centers and hospitals.

**Table G.1** shows the approximate numbers of therapy equipment used for treatment, diagnosis, teaching, training, and research in this region. Excluding the countries for which we did not receive estimate for teletherapy equipment, it is shown that linear accelerators ( $\sim > 382$ ) units are far more common than Cobalt 60 ( $\sim > 92$ ) units. For brachytherapy equipment, high dose rate remote loading ( $\sim > 67$ ) units are also more common than low dose rate remote loading ( $\sim 5$ ) units. Moreover, there are about 15 GammaKnife, 15 CyberKnife and 15 Tomotherapy, 2 High-Intensity Focused Ultrasound (HIFU), 2 Orthovoltage unit and 1 Proton unit (operational in 2018) for external irradiation.

**Table G.2** shows approximate numbers of diagnostic equipment used for diagnosis, teaching, training, and research in this region. As expected, there are more computed tomography (CT) units ( $\sim > 3296$ ) than magnetic resonance imaging (MRI) units ( $\sim > 2005$ ). The other commonly used equipment is Ultrasound ( $\sim > 8378$ ), Fluoroscopy ( $\sim > 2407$ ), Dental Units ( $\sim > 1044$ ), and Mammography Units ( $\sim > 60$ ).

**Table G.3** shows the approximate numbers of equipment used in the nuclear medicine procedures and imaging for diagnosis, training and research in this region. As shown, there are more Gamma Camera units ( $\sim > 6600$ ) than Positron Emission Tomography (PET) that are reported to be 5 units. The approximate numbers of Single Photon Emission Computed Tomography (SPECT) are about 221 units, Positron Emission Tomography–Computed Tomography (PET-CT) are about 151 units and Single Photon Emission Computed Tomography (SPECT) are about 164 units. There are also 11 Cyclotron units reported; of which 1 (one) unit is in Qatar and ten (10) units are in Saudi Arabia. However, we think that there are more Cyclotron units in the Middle East than reported here.

## VIII. CONCLUSION AND RECOMMENDATIONS

The formation of the Middle East Federation of Organizations of Medical Physics [4] (MEFOMP) as a regional organization of IOMP [1] in 2009, has been a major step in helping to establish Medical Physics Associations / Societies in the Middle East countries where there was none before. The process of establishing such organizations and recognition by the respective governments, varied greatly among the 14 countries that participated in this project. Overall, however, they have proven to be an effective channel to facilitate education, training, and research in all countries in this region. As per data of the IOMP that was reported by Slavik Tabakov [10], survey shows that the number of the Medical Physicists in the Middle East was almost doubled during the past 2 decades. This achievement requires special congratulations to all colleagues who supported and worked for the development of the Medical Physics Profession in the Middle East. However, it is very important to continue and accelerate the growth of Medical Physics profession in this region. In particular special attention needs to be paid by MEFOMP to the advancement and development of Medical Physics Profession in few countries, such as Bahrain, Palestine, and Yemen. The MEFOMP [4] as well as IOMP [1] and IAEA [7] need to actively work with medical physicists in these countries to teach, train, and advance Medical Physics Professionals in these countries. In addition to social / political challenges in these countries, lack of financial resources and equipment are serious problems especially in Palestine and Yemen.

Graduate Medical Physics educational and training programs offering PhD and/or MSc degrees are currently available in 7 (seven) countries: Iran, Iraq, Jordan, Lebanon, Saudi Arabia, Syria, and Turkey. One undergraduate medical physics program, offering BSc degree, is also available in the Ibb University in Yemen. To a large extent, of the 33 graduate Medical Physics Programs offering PhD and MSc degrees in the Middle East, most of them are in Iran (14) with (6) PhD programs and in Turkey (11) with (8) PhD programs. Noteworthy is that the approximate numbers of females admitted annually to PhD Medical Physics Programs ( $\sim 14$ ) are almost comparable to the numbers of males ( $\sim 19$ ). Similarly, the numbers of females admitted to the MSc programs ( $\sim 85$ ) are also comparable to male ( $\sim 92$ ). While the lengths of the PhD programs are 3 to 4 years, the length of all MSc programs are 2 years.

In addition to teaching and training, Medical Physicists are often involved in research and technical development in most academic settings. While the type of research conducted in most universities and institutions varies, research in radiation dosimetry is the most common one in the 3 (three) main subspecialties of the Medical

Physics: therapy, radiology, and nuclear medicine. In some institutions Medical Physicists are also engaged in radiation biology and biomedical research in collaborations with other hospitals and centers. Though research is required from all the PhD students, students in MSc programs are also encouraged to have optional research projects.

In most countries continuing education and training are offered in annual conferences, seminars, and workshops. In some countries Medical Physicists often participate in training courses and workshops organized by MEFOMP [4], IAEA [7], AAPM [2] and Arab Health [8] conferences in the region. Since 2013, a one-day symposium is organized in most countries on the occasion of the International Day of Medical Physics (IDMP) on November 7th of each year. Medical Physicists are sometimes recognized with honors and awards during national and international symposium and conferences.

The equipment used by medical physicists in this region differs greatly in various countries. Depending on financial resources available to the Medical Physicists, some advanced equipment has been acquired for treatment and diagnosis of diseases of cancer patients. However, from the data available at the World Health Organization [9] (WHO), we do not know with certainty if conventional equipment is adequate for cancer patients in this area. According to WHO, however, the number of lung cancer has increased in this region and will continue to increase in the next 10 years. Therefore the number of Qualified Medical Physicists, as defined by the IOMP [1], and number of educational and training programs must increase to meet the needs in this region. According to a report [11] by Nelly Enwerem-Bromson and May Abdel-Wahab, "Expanding global access to radiotherapy: the IAEA perspective" and a Task Group report by Rifat Atun et. Al [12] "Expanding global access to radiotherapy" it is projected that the number of Medical Physicists per million of the population will have to triple by 2035. Otherwise in future this may cause significant problems to healthcare providers in the Middle East - especially in the fields of Radiotherapy, Medical Imaging and Radiation Safety.

#### IX. AUTHORS CONTRIBUTIONS AND ACKNOWLEDGMENT

The first author carried out most of the data collection and writing. She reviewed the Questionnaire, resolved discrepancies, and performed the full analysis and reviewed main literature for this project. The second and third authors helped to edit the manuscript and check data consistency as related to the Tables. However, it was not

possible to ask all the authors to read and/or approve the final manuscript. This was done on one-on-one basis with contributors from each country.

We would like to thank the contributors from all countries for providing updated educational, training, and research opportunities for Medical Physicists in their countries. Attempts were made to acknowledge all authors in this report. However, we realize that more colleagues may have contributed to this project than we could possibly acknowledge them. We, therefore, hereby apologize to them

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**Appendix 1**

**14 Countries in Middle East Participated in this Project**



## Appendix II

### Questionnaire Designed for Educational, Training, and Research Programs in Middle East

#### Status of Medical Physics Education, Training, and Research Programs in Country of : -----

A. Official name of the medical physics **Society / Association** in English:

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Date (**Year**) it was established: -----

Name of the **Founding President**: -----

Official **Website** Address (if any): -----

Approximate number of members at establishment (if known): -----

Approximate number of members at present (Male / Female): M ----- F -----

Approximate number of the members (Male / Female) with **PhD** working in:

(a) Therapy: M ----- F -----

(b) Diagnostic / Nuclear Medicine: M ----- F -----

(c) Radiation Safety / Regulatory Officer: M ----- F -----

(d) Others (Specify): -----

Approximate number of the members (Male / Female) with **MSc.** working in:

(a) Therapy: M ----- F -----

(b) Diagnostic / Nuclear Medicine: M ----- F -----

(c) Radiation Safety / Regulatory Officer: M ----- F -----

(d) Others (Specify): -----

Approximate number of the members (Male / Female) with **BSc.** working in:

(a) Therapy: M ----- F -----

(b) Diagnostic / Nuclear Medicine: M ----- F -----

(c) Radiation Safety / Regulatory Officer: M ----- F -----

(d) Others (Specify): -----

B. Specify approximate number of the **meetings / conferences / seminars / workshops** organized in your country and/or combined with other countries: including their frequencies:

C. Specify the **Awards, Honors and Special Recognitions** Granted to the medical physicists (Male / Female); including their frequencies:

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D. Name and address of the university / institution where **graduate** medical physics **degrees** are granted; including annual number of the students (Male / Female) admitted to the program, length of the educational programs, and date they were established:

**(Note: Please revise and/or add row(s) to table below as needed)**

Name of University / Institution, City, Province	Length of Graduate Program (PhD / MSc.)	Date Graduate Program was Established (PhD / MSc)	Annual Number of PhD Students Admitted M / F	Annual Number of MSc. Students Admitted M / F
	/	/	/	/
	/	/	/	/
	/	/	/	/
	/	/	/	/
	/	/	/	/

E. Name and Address of clinic / university / institution where **clinical trainings** are provided to medical physicists with PhD and MSc degree (Male / Female); including length of the clinical training program:

**(Note: Please revise and/or add row(s) to table below as needed)**

Name of Clinic / University / Institution, City, Province	Length of Clinical Training Program	Annual Number of PhD Medical Physicists Admitted M / F	Annual Number of MSc Medical Physicists Admitted M / F



		/	/
		/	/
		/	/
		/	/
		/	/

**F. Name and address of university / institution / clinics where medical physics **researches** are performed; including type of research:**

**(Note: Please revise and/or add row(s) to table below as needed)**

Name of University / Institution City, Province	Briefly Specify Type of Research

141

**G. Equipment available to medical physicists for Teaching, Training, Research, and Cancer Diagnosis and Treatment:**

**(Note: Please revise and/or add row(s) to table below as needed)**

Equipment in <b>Therapy</b>	Approximate Number of Equipment
<b>Cobalt 60 Unit</b>	
<b>Linear Accelerator</b>	
<b>High Dose Rate Remote After Loading</b>	
<b>Low Dose Rate Remote After Loading</b>	
<b>Other Equipment (specify)</b>	

Equipment in <b>Radiology</b>	Approximate Number of Equipment

<b>CT</b>	
<b>MRI</b>	
<b>Ultrasound</b>	
<b>Fluoroscopy Units</b>	
<b>Other Equipment (specify)</b>	

<b>Equipment in Nuclear Medicine</b>	<b>Approximate Number of Equipment</b>
<b>PET</b>	
<b>SPECT</b>	
<b>PET-CT</b>	
<b>SPECT-CT</b>	
<b>Gamma Camera</b>	
<b>Other Equipment (Specify)</b>	

H. **Additional Comments** on any specific feature(s) of medical physics teaching, training and research programs in your country which were **not covered above** (Optional):

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I. **Name and e-mail** address of individual(s) filling out this Questionnaire including the **date** it was completed:

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Please **Return** this Questionnaire to:  
 Prof. Azam Niroomand-Rad, PhD, DSc., IOMP Past President  
[azam@georgetown.edu](mailto:azam@georgetown.edu)

**Thank you**

**Table A**

**Table A.** The Profile of Medical Physics Societies and Associations in Middle East Countries including Date Founded, Founding President, Website, Approximate Numbers of Medical Physicists (Male and Female) with PhD, MSc, and BSc Degrees

Country	Association / Society (Website / Twitter)	Founded Year	Founding President	Approximate Male / Female	PhD Degree Male / Female	MSc Degree Male / Female	BSc Degree Male / Female
Bahrain	Bahrain Society of Med Phys Bio-Eng. (BSMPBE)	2008		7 / 6 Not Specified 27	/	/	/
Iran	Iranian Asso. of Med Physicists - (iamp.ir)	1994	Azim Arbabi	233 / 172	100 / 50	120 / 110	13 / 12
Iraq	Iraqi Med Physics Society (IMPS)	2011	Nabaa Naji	14 / 30	0 / 3	2 / 7	5 / 6
Jordan	Jordanian Assoc of Physicists in Medicine - (japm-jo.org)	2006	Abdul Majeed Al-Yaseen	30 / 50	0 / 1 Not Specified 4	3 / 2 Not Specified 12	12 / 6 Not Specified 37
Kuwait	Kuwait Asso of Med Physics (@kuwaitmp)	2016	Meshari Alnuaimi	16 / 8	1 / 2	5 / 2	10 / 4
Lebanon	Lebanese Asso of Med Physics (LAMP)	2005	Ibrahim Duhaini	12 / 8	10 / 3	2 / 5	0 / 0
Oman	Oman Med Phys. Society (OMPS)	2011	Afkar AL-Farsi	24 / 27	2 / 1	2 / 9	1 / 17
Palestine	Palestine Med Physics Society (PMPS)	2006		2 / 2	0 / 0	1 / 1	1 / 1
Qatar	Qatar Med. Phys. Society (QaMPS)	2009	Huda AlNaomi	17 / 8	7 / 2	9 / 5	1 / 1
Saudi Arabia	Saudi Med Phys Society (SMPS): smps.org.sa	2006	Ahmed Outif	282 / 94	33 / 10 Not Specified 34	97 / 31 Not Specified 101	35 / 12 Not Specified 33
Syria	Syrian Med Physics Asso (SyMPA)	2009	Hassan Kharita	29 / 11	16 / 3	4 / 7	9 / 1
Turkey	Turkish Med Physics Asso (TMPA) – medikalfizik.org	1988	Seyfettin Kuter	172 / 237	16 / 10	140 / 215	16 / 12
UAE	Emirates Med Physics Society (EMPS)	2005	Jamila Salem Al-Suwaidi	7 / 51	2 / 37	5 / 9	0 / 5
Yemen	Yemen Med Physics Asso (YMPA)	2013	Mogib Al-Makdad	7 / 1	0 / 0	6 / 0	1 / 1

**Table B**

**Table B:** Approximate Number of the Meetings, Conferences, Seminars and Workshops Organized in the Country with Frequency of the Program and/or in Collaboration with Others (Specify)

Country	Meetings, Conferences, Seminars, Workshops	Frequency	Others (Specify)
Iran	IAMP Board of Directors Meeting	Monthly	
	IAMP Conference	Triennial	
	Workshops per Program at Various Sites, twice per month	Bimonthly	
	1 <sup>st</sup> Int'l Conference on Radiation and its Role in Diagnosis and Treatment, Tehran	2000	AAPM / IOMP
	1 <sup>st</sup> MEFOMP International Conference in Medical Physics, Shiraz	2011	MEFOMP
Iraq	8 Meetings: 2009, 2010, 2011, 2013, 2014, 2015, 2016, 2017	8	
	9 Seminars: 2013 - 2017	9	
	3 Workshops: 2015, 2016, 2017	3	
Jordan	JAPM Board of Directors Meeting (Administrative)	Monthly	
	JAPM Board of Directors Meeting (Public Board)	Annual	
	1 Conference, 1 Conference (in preparation)	1	
Kuwait	1 Medical Physics Conference in March	Annual	
	1 International Day of Medical Physics in November	Annual	
	1 Radiation Safety Refresher Course in May	Annual	
	Radiation Physics Seminars in Nuclear Medicine in September	Annual	
Lebanon	LAMP Meeting every 3 to 6 months	3 to 6 month	
	LAMP Workshops and Seminars once per year	Annual	
Oman	8 International Oncology Conference	8	
	1 Radiation Protection Workshop	Annual	
Palestine	Onsite Training Workshops with Varian when new machine is purchased	As needed	Vendors
Qatar	IAEA Training Course on Calibration of External Beam Radiotherapy Equipment	2012	IAEA
	IAEA Training Course on Brachytherapy	2013	IAEA
	1 Symposium, PET/CT, Doha	2015	MEFOMP
	1 Workshop, Radiation Safety in cardiology 2016, 2016, 2017, Doha	Annual	MEFOMP
	1 Workshop (Spect CT) 2015, (CT) 2016, 2017, Doha	Annual	MEFOMP

	1 Nuclear Medicine Conference, Doha	2015	MEFOMP
	2 Regional Meetings of MEFOMP (Spring and Fall), Doha	2015	MEFOMP
	1 International Day of Medical Physics (IDMP), Doha	Annual	
	1 Summit on Radiation in Life, Radiation Protection, Doha	2015	MEFOMP
	1 Workshop on Laser Safety Training Course	2017	MEFOMP
Saudi Arabia	2 SMPS Conference	Annual	
	20 Seminars and Workshops	Annual	
	1 International Conference on Radiation Medicine (ICRM)	Annual	
	6 Workshops at International Conference on Radiation Medicine	Annual	
	10 Radiation Safety Courses/Workshops (KFSH&RC, KFMC, SMPS, Others)	Annual	
Syria	Training on Radiation Protection	4	
	Training on Radiation Dosimetry		
Turkey	TMPA National Medical Physics Congress, every 2 years (16 <sup>th</sup> on Oct. 2017)	Biennial	
	Meetings /Workshops organized by various centers, 5 to 6 times per year	5 to 6 per year	
	Refresher Courses with International Organizations	1995	AAPM
	Refresher Courses with International Organizations	2011	AAPM
UAE	6 IAEA Meetings, workshops, training courses, every 2 months	Every 2 years	IAEA
	1 Conference in conjunction with Radiology, Arab Health Conference	Annual	Arab Health
	3 Radiation Protection Continuing Professional Development (CPD) Programs	Annual	
	3 Basics of Radiation Protection in Hospital – Radiology Practices (Dubai Health Authority)	Annual	
	2 Radiation Protection for Dental Radiology Practice (Dubai Health Authority)	Annual	
	3 Implementing Radiation Protection in Radiology Practice: What to do?, When? (Dubai Health Authority)	Annual	
	1 Workshop, Radiation Safety & Protection: Application of Ionizing Radiation and Detection Method, Univ. of Sharjah	2017	
	1 Workshop, Patient Radiology Services Referral Quidlines, Sheikh Khalifa General Hospital-Umm Al Quwain , Radiation Dose Monitoring	2017	IAEA
	1 Forum, 2 <sup>nd</sup> Sciences & Engineering Research Group, Univ. of Sharjah	2017	
	1 Symposium, International Day of Radiology, University Hospital Sharjah	2016	
	1 Symposium, International Education Exhibition, EXPO Sharjah	2016	
	1 Seminar, 7 <sup>th</sup> Medical Diagnostic Imaging, University of Sharjah	2015	

**Table C**

**Table C:** Awards, Honors and Special Recognitions Established by the Medical Physics Societies and Associations in Middle East including Frequency / Year Awarded

Country	Awards, Honors, Special Recognition	Frequency	Others (Specify)
Iran	1 Parsai Award to Medical Physics Students, every 3 years	Triennial	
	IOMP Young Investigator Award at World Congress-2006	2006	Dr. Ali A. Mowlavi
Lebanon	IDMP- IOMP Award 2015 For MEFOMP	2015	Mr. Ibrahim Duhaini
	IOMP Presidential Award	2016	Mr. Ibrahim Duhaini
	IOMP Fellowship (FIOMP) in 2017	2017	Mr. Ibrahim Duhaini
Oman	1 <sup>st</sup> Prize in Middle East Abstract (?) to Female (?)		
Qatar	1 Medical Physicist of the Year Award	Annual	
	IDMP- IOMP Award 2017 For MEFOMP	2017	Dr. Huda AL Naemi
Saudi Arabia	6 KA CARE Awards - Radiation Protection Experts, 2017	2017	
	1 Award by IDMP-IOMP For MEFOMP	2016	Dr. Abdallah AL Haj
	2 Canadian College of Physicists in Medicine (CCPM) Fellowship		
	2 Canadian College of Physicists in Medicine (CCPM) Membership		
	10 Diplomat of the American Board of Radiology (DABR)		
	8 Institute of Physics and Engineering in Medicine Membership (MIFEM)		
	5 Institute of Physics and Engineering in Medicine Fellowship (FIFEM)		
	5 International Atomic Energy Agency (IAEA) Experts		
Turkey	TMPA Best Paper Award at National Medical Physics Congress	Annual	
UAE	Presidential Award for Scientific Research in 2012	2012	Dr Jamila Salem AlSuwaidi
	Pioneers Award to the First Medical Physicist in 2015	2015	Dr Jamila Salem AlSuwaidi
	Sheikh Hamdan Award for Medical Sciences in 2014	2014	Dr Jamila Salem AlSuwaidi

**Table D**

**Table D:** Universities and Institutions with Graduate Medical Physics Programs, Length and Year (PhD / MSc) were Established and Annual Numbers of the Students (Male / Female) Admitted to the Programs

Country	University / Institution, City	Length of Program (PhD / MSc.)	Year Established (PhD / MSc.)	Annual No. PhD Admitted Male/Female	Annual No. MSc. Admitted Male / Female
Iran	Tehran Uni. of Med Sci., Tehran	4 / 2	1999/1995	2 / 2	4 / 4

	Iran Uni. of Med Sci., Tehran,	4 / 2	??	2 / 2	3 / 3
	Mashhad Uni of Med Sci., Mashad,	4 / 2	1997/1991	1 / 1	3 / 3
	Tarbiat Modares Uni of Med Sci., Tehran	4 / 2	1989/1985	1 / 1	3 / 3
	Ahwaz Uni of Med Sci., Ahwaz	4 / 2	2007/1976	4 / 4	2 / 2
	Tabriz Uni of Med Sci., Tabriz	2 years (MSc)	?	-	4 / 4
	Isfahan Uni of Med Sci., Ishahan	4 / 2	2007/1997	1 / 1	4 / 4
	Shahid Beheshti Uni of Med Sciences	2 years (MSc)	2012	-	2 / 2
	Shiraz Uni of Med Sci., Shiraz	2 years (MSc)	2012	-	3 / 3
	Yazd Uni of Med Sci., Yazd	2 years (MSc)	2013	-	3 / 3
	Kermanshah Uni of Med Sci., Kermanshah	2 years (MSc)	2009	-	3 / 3
	Urmia Uni of Med Sci., Urmia	2 years (MSc)	2012	-	3 / 3
	Semnan Uni of Med Sci., Semnan	2 years (MSc)	2011	-	3 / 3
	Kashan Uni of Med Sci., Kashan	2 years (MSc)	2013	-	2 / 2
Iraq	Univ. of Mustansirita Medical college, Baghdad	3 / 2	2000 /1989	On Hold	2 / 3
	Univ. of Baghdad Medical college, Baghdad	2 years (MSc)	2006-2014,	On Hold	
	Univ. of Nahrain Medical college, Baghdad	2 years (MSc)	2016		2 / 2
	Univ. of Sulaimania Med. College, Sulaimaniya	2 years Diploma	2015		2 / 0
Jordan	University of Jordan, Amman	2 years (MSc)	2007		
Lebanon	Lebanese University, Beirut	2 years (MSc)	2014		~ 6 / 6
	Beirut Arab University, Beirut	2 years (MSc)	2017		2 / 2
Saudi Arabia	King Faisal Specialist Hosp., Research Centre, Riyadh	3			2 / 1
	King Fahad Specialist Hosp., Dammam	3			1 / 0
Syria	Damascus Univ., Damascus	2 years (MSc)	2014-2015		5 / 8
Turkey	Istanbul Univ., Oncology Institute, Istanbul	3 / 2	1986/1986	~ 1 / 1	~ 3 / 3
	Hacettepe Univ., Univ. of Ankara, Ankara	3 / 2	2013/1993	~ 2 / 0	~ 1 / 1
	Ege Univ., Ismir	3 / 2	2015/2004	~ 2 / 0	~ 3 / 3
	Dokuz Eylul Univ., Ismir	3 / 2	2014/2006	~ 2 / 0	~ 5 / 5
	Trakya Univ., Edirne	3 / 2	2013/2008	~ 0 / 1	~ 1 / 1
	Uludag Univ., Bursa	3 / 2	2014/2008	~ 1 / 1	~ 2 / 1
	Erciyes Univ., Kayseri	2 years (MSc)	2007		~ 1 / 1
	Cukurova Univ., Adana	2 years (MSc)	2011		~ 5 / 5
	Akdeniz Univ., Antalya	2 years (MSc)	2013		~ 3 / 1
	Acibadem Univ., Istanbul	3 / 2	2010		~ 5 / 1
	Medipol Univ., Istanbul	3 / 2	2014		~ 1 / 1
Yemen	Ibb University, Ibb	BSc in Med Physic			2 Graduated

**Table E**

**Table E:** Clinics, Universities and Institutions with Length of Clinical Trainings and Approximate Numbers of Medical Physicists (Male / Female) Admitted to the Programs During (PhD / MSc) Studies

Country	Clinic, University, Institution, City	Length of Clinical Training Program	Annual No. PhD Admitted M / F	Annual No. MSc Admitted M / F
Iran	Imam Khomeini Hosp. Radiotherapy Physics Section, Tehran	3 months	/	/
Jordan	King Hussain Cancer Foundation, Amman	3-6 months	/	0 / 2
Lebanon	Rafik Hariri University Hospital	4- 6 months	/	1 / 1
	American University Hospital	4- 6 months	/	1 / 1
	Bsalim Hospital	4- 6 months	/	1
	Reyak Hospital	4- 6 months	/	1
Oman	Local Training for Junior Medical Physicists	2 years	/	/
Saudi Arabia	King Faisal Specialist Hospital & Research Centre, Riyadh.	3 years	/	2 / 1
Saudi Arabia	King Fahad Specialist Hospital, Dammam	3 years	/	1 /
Syria	AlBaironee Hospital, Damascus	4 years	/	2 / 3
Turkey	Istanbul Univ., Oncology Institute, Istanbul	During MSc	/	/
Turkey	Hacettepe Univ., Univ. of Ankara, Ankara	During MSc	/	/
Turkey	Ege Univ., Ismir	During MSc	/	/
Turkey	Dokuz Eylul Univ., Ismir	During MSc	/	/
Turkey	Trakya Univ., Edirne	During MSc	/	/
Turkey	Uludag Univ., Bursa	During MSc	/	/
Turkey	Erciyes Univ., Kayseri	During MSc	/	/
Turkey	Cukurova Univ., Adana	During MSc	/	/
Turkey	Akdeniz Univ., Antalya	During MSc	/	/
Turkey	Acibadem Univ., Istanbul	During MSc	/	/
Turkey	Medipol Univ., Istanbul	During MSc	/	/
UAE	On Job Training within Hospitals		/	/



**Table F**

**Table F:** Universities and Institutions with Medical Physics Research Programs and Description of Research Performed in Collaboration with other Centers and Hospitals.

Country	University, Institution, City	Description of Research and Collaboration with Other (Centers / Hospitals)
Iran	Tehran Univ. of Med Sci., Tehran	Radiotherapy, Diagnostic Radiology, Nuclear Medicine, Ultrasound, Bioelectricity, Radiobiology, Optical Imaging, Nanotechnology
	Iran Univ. of Med Sci., Tehran	Radiotherapy, Diagnostic Radiology, Nuclear Medicine, Ultrasound, Bioelectricity, Radiobiology, Optical Imaging, Nanotechnology
	Mashhad Univ. of Med Sci., Mashhad	Radiotherapy, Diagnostic Radiology, Nuclear Medicine, Ultrasound, Bioelectricity, Radiobiology, Optical Imaging, Nanotechnology
	Tarbiat Modares Univ. of Med Sci., Tehran	Radiotherapy, Diagnostic Radiology, Nuclear Medicine, Ultrasound, Bioelectricity
	Ahwaz Univ. of Med Sci., Ahwaz	Radiotherapy, Bioelectricity
	Tabriz Univ. of Med Sci., Tabriz	Radiotherapy, Diagnostic Radiology, Bioelectricity, Radiobiology, Nanotechnology
	Isfahan Univ. of Med Sci., Isfahan	Radiotherapy, Diagnostic Radiology, Nuclear Medicine, Bioelectricity, Radiobiology
	Shahid Beheshti Univ. of Med Sci., Tehran	Radiotherapy, Diagnostic Radiology, Nuclear Medicine, Radiobiology
	Shiraz Univ. of Med Sci., Shiraz	Radiotherapy, Ultrasound, Bioelectricity
	Yazd Univ. of Med Sci., Yazd	Radiotherapy, Diagnostic Radiology
	Kermanshah Univ. of Med Sci., Kermanshah	Radiotherapy, Radiobiology
	Urmia Univ. of Med Sci., Urmia	Radiotherapy, Diagnostic Radiology, Radiobiology
	Semnan Univ. of Med Sci., Semnan	Radiotherapy, Ultrasound, Bioelectricity
	Kashan Univ. of Med Sci., Kashan	Radiotherapy, Diagnostic Radiology, Ultrasound, Radiobiology
Iraq	Mustansiriya Med. College, Baghdad	MSc. Radiotherapy planning (A- Amel Radiotherapy Center)
	Mustansiriya Med. College, Baghdad	MSc. Radiotherapy Planning & Dosimetry (Baghdad Radiotherapy Hosp. & Med. City)
	Mustansiriya Med. College, Baghdad	MSc. Radiotherapy (Neurosurgery Sciences Hospital)

	Mustansiriya Med. College, Baghdad	MSc. Radiation Protection (College of Science in Baghdad Univ.)
	Mustansiriya Med. College, Baghdad	MSc. Radiation Protection (Iraqi National Center for Radiation Protection)
	Mustansiriya Med. College, Baghdad	MSc. Radiotherapy (Iraqi National Center of Cancer Research)
	Mustansiriya Med. College, Baghdad	MSc. Radiotherapy & Dosimetry (Iraqi National Center of Hematology)
	Sulaimaniya Med. Univ., Sulaimaniya	Diploma: Radiotherapy Training (Zhianawa Cancer Center)
Jordan	Univ. of Jordan, Amman	Nuclear Medicine
	Yarmouk Univ., Irbid	Radiation Protection, Dosimetry, Medical Imaging
	Hashemite Univ., Alzarqa	Radiotherapy, Jell Dosimetry
	Univ. of Science and Technology, Irbid	Monte Carlo Simulation, Radiation Protection
	King Hussain Cancer Foundation, Amman	Support Different Types of Research
Kuwait	Cancer Control Center, Shuwaikh	Dosimetry, PET and Radionuclide Therapies
	Sheikh Jabir Molecular Imaging Center	PET
Oman	National Oncology Center, Royal Hospital, Muscat	Radiotherapy and Diagnostic (NM) Dosimetry, Radiation Protection
Qatar	Hamed Medical Corporation, Doha	Dosimetry, Quality Control, Radiation Protection
Saudi Arabia	King Faisal Specialist Hosp. & Research Centre, Riyadh	Radiation Dosimetry, Secondary Standards Dosimetry, Radiotherapy, Radiation Protection, Diagnostic and Nuclear Medicine, Electronics
	King Fahd Univ. of Petroleum, Minerals, Dhahran	Radiation Physics, Dosimetry, Radiotherapy,
	King Fahd Medical City, Riyadh	Dosimetry, Radiotherapy, Radiation Protection, Diagnostic, Nuclear Medicine
	Prince Salman Military Hosp., Medical City, Riyadh	Radation Dosimetry, Radiotherapy, Radiation protection, Diagnostic, Nuclear Medicine
	King Abdulaziz Medical City, Riyadh	Radation Dosimetry, Radiotherapy, Radiation Protection, Diagnostic Radiology, Nuclear Medicine
	King Saud Univ. Hosp., Riyadh	Radiotherapy, Dosimetry and Diagnostic Radiology
	King Faisal Specialist Hosp. & Research Centre, Jeddah	Radiotherapy, Dosimetry and Diagnostic Radiology
	King Abddulaziz Univ., Jeddah	Radiotherapy, Dosimetry and Diagnostic Radiology
Syria	AlBaironee Hospital / Damascus Univ., Damascus	Radiation Dosimetry and Radiation Protection
Turkey	Istanbul Univ., Oncology Institute, Istanbul	Dosimetry, Research & Technical Development (R&D)
	Hacettepe Univ., Univ. of Ankara, Ankara	Dosimetry, Research & Technical Development (R&D)
	Ege Univ., Ismir	Dosimetry, Research & Technical Development (R&D)
	Dokuz Eylul Univ., Ismir	Dosimetry, Research & Technical Development (R&D)
	Trakya Univ., Edirne	Dosimetry, Research & Technical Development (R&D)
	Uludag Univ., Bursa	Dosimetry, Research & Technical Development (R&D)
	Erciyes Univ., Kayseri	Dosimetry, Research & Technical Development (R&D)
	Cukurova Univ., Adana	Dosimetry, Research & Technical Development (R&D)
	Akdeniz Univ., Antalya	Dosimetry, Research & Technical Development (R&D)

	Acıbadem Univ., Istanbul	Dosimetry, Research & Technical Development (R&D)
	Medipol Univ., Istanbul	Dosimetry, Research & Technical Development (R&D)
UAE	Dubai Health Authority (DHA), Dubai	Patient Radiation Safety

**Table G.1**

**Table G.1:** Approximate Numbers of Therapy Equipment Used for Treatment, Diagnosis, Teaching, Training and Research in Middle East

Country	Cobalt 60 Unit	Linear Accelerator	High Dose Rate Remote Loading	Low Dose Rate Remote Loading	Others (Specify)
Iran	70	100	15		
Iraq	3	15	2		10 CT-Simulator
Jordan	1	10	2	1	1 Gamma Knife, 1 Treatment Planning System, 1 Brachytherapy (Seeds)
Kuwait	2	3	1	1	
Lebanon	2	17	3	1	
Oman		2	1		Simulator
Palestine		2	1		
Qatar		2	1		1 CyberKnife, 1 MRI Simulator, 1 CT Simulator, 1 High-Intensity Focused Ultrasound (HIFU)
Saudi Arabia	1	21	7	1	1 Co-60 GammaKnife, 6 Intraoperative, 2 Orthovoltage, 3 CyberKnife, 10 CT Simulator, 4 Conventional Simulator, 3 MRI Simulator, 1 PET/CT Simulator, 1 Proton, 1 HIFU
Syria	5	3	1	1	
Turkey	8	207	33		13 GammaKnife, 11 CyberKnife, 15 Tomotherapy,

**Table G.2**

**Table G.2:** Approximate Numbers of Diagnostic Equipment Used for Diagnosis, Teaching, Training and Research

Country	CT	MRI	Ultrasound	Fluoroscopy	Others (Specify)
Iran	1000	500	5000	1000	
Iraq	> 70	70	250 - 300	2	

Jordan	100	55	600	60	5 CT Simulator, >50 Mammography Units, 40 Cath Lab
Kuwait	36	14	23	26	
Lebanon	265	~ 100	> 1000	250	125 Cath Lab
Oman	3	2	2 - 3	3	
Palestine	1		1	1	
Qatar	13	9		54	9 Mammography, 80 X-Ray Units, 40 Dental Units
Saudi Arabia	150	50	> 500	> 500	Dental Units > 1000
Syria	150	50	> 1000	> 500	
Turkey	1500	1150	Unknown	Unknown	
UAE	7	5		11	4 Dental Units, 11 Intraoral Units
Yemen	1		2		Mammography, X-Ray Units

**Table G.3**

**Table G.3:** Approximate Numbers of Equipment Used in Nuclear Medicine Procedures and Imaging for Diagnosis, Teaching, Training and Research

Country	PET	SPECT	PET-CT	SPECT-CT	Gamma Camera	Others (Specify)
Iran	1	100				
Iraq		1			2	
Jordan	1	1 (Dual Head)	8		15	25 Bone Densitometer (DEXA)
Kuwait			8	12	6	4 Thyroid Uptake, 1 Urea Breath Test Device
Lebanon		20	15	1	5	
Oman		1	1		4	
Palestine						
Qatar	1			1		1 Cyclotron
Saudi Arabia	2	8	7	4	20	10 Cyclotron
Syria		8	2			
Turkey		80	110	145	600	3 PET-MR
UAE		2		1	4	
Yemen					2	