Turk J Phys Med Rehab 2024;70(2):233-240
DOI: 10.5606/tftrd.2024.12995
Available online at www.turkishjournalpmr.com

Original Article

Comprehensive analysis of publication of physical medicine and rehabilitation theses in Türkiye between years 2010 and 2020: Academic productivity and related factors

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ABSTRACT

Objectives: This study aimed to investigate the publication rates of physical medicine and rehabilitation specialty training theses, which are required to complete a residency in Türkiye, and determine the factors that affect publication.

Materials and methods: Residency theses involved in this descriptive study were detected from the database of Higher Education Council Thesis Center (tez.yok.gov.tr) between January 2010 and December 2020. Publication of theses and date of publication were investigated by the writer's and supervisor's names on PubMed and Google Scholar.

Results: Three hundred eighty-eight of 1,130 theses were turned into publications. Two hundred seventy-seven (24.5%) were published in SCI (Science Citation Index)/SCI Expanded indexed journals. The publication rates of residents were 47.1% in private universities, 34.2% in public universities, and 32.3% in training and research hospitals. The trainees who published their theses were more likely to become associate and assistant professors.

Conclusion: Although approximately one-third of the theses defended were published, this rate is insufficient for sharing the knowledge. Considering that publishing their theses affected the residents' current academic careers positively, supervisors should provide the residents supportive facilitation to give the knowledge in research and publish their theses.

Keywords: Graduate medical education, medical residency, medical theses, physical medicine and rehabilitation, specialty training.

Physical medicine and rehabilitation (PM&R) is the primary medical specialty that focuses on the comprehensive care of individuals with various disabling health conditions, with the main objective being prevention, medical diagnosis, and treatment and rehabilitation management. This specialty specifically addresses impairment and activity limitations of persons with disabilities to facilitate their physical and cognitive functioning and to increase their quality of life.[1]

Physical medicine and rehabilitation residency is a four-year postgraduate training program in Türkiye, with the main objective of teaching clinical and practical experience in this field. This four-year education program also guides residents toward academic experience in their future careers. To achieve this goal, trainees are guided to determine a supervisor and research subject within their first two years of education, and their process is carefully guided by their supervisor with regular assessments every three months. Before graduation, each resident has to complete their thesis, with the aim of having a scientific thesis successfully defended to a committee at the end of their residency.

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Received: April 28, 2023 **Accepted:** September 25, 2023 **Published online:** May 17, 2024

Cite this article as: Yılmaz B, Mutlu Arı P, Ayçiçek HB, Yardımcı G. Comprehensive analysis of publication of physical medicine and rehabilitation theses in Türkiye between years 2010 and 2020: Academic productivity and related factors. Turk J Phys Med Rehab 2024;70(2):233-240. doi: 10.5606/tftrd.2024.12995

The thesis provides residents the ability to prepare a scientific hypothesis, construct a study to prove the hypothesis, conduct the study, interpret its results, and write it as a scientific paper.[2] Writing scientific papers for publication in esteemed and peer-reviewed journals on their thesis contributes to both the academic progress of the authors and the science. Current information and substantial data are revealed with these intensive studies; however, if the theses are not published, this information cannot be utilized in evidence-based medicine.[3]

Many studies have been conducted in the world, as well as in our country to assess the academic productivity of these dissertations. In our country, studies have been conducted to investigate the publication rate of specialty theses from various medical specialties, such as neurosurgery, public health, psychiatry, otorhinolaryngology, urology, ophthalmology, emergency medicine, general surgery, microbiology, and infectious Diseases.[2-10] However, the data is scarce in the area of PM&R.

We believe that ascertaining the publication rates of PM&R theses created in our country and exploring the underlying reasons might contribute to the development of more productive theses in the future. Therefore, this study aimed to determine the academic productivity and publication rates of PM&R specialty dissertations and the factors affecting publication rates.

MATERIALS AND METHODS

In this descriptive study, PM&R residency theses conducted between January 2010 and December 2020 and uploaded to the database of the Higher Education Council Thesis Center (https://tez.yok.gov.tr) were investigated in detail between January 2022 and February 2022. Publications from this database were comprehensively retrieved by using the "fizik tedavi ve rehabilitasyon" (physical therapy and rehabilitation) and "fiziksel tıp ve rehabilitasyon" (physical medicine and rehabilitation) keywords. To discriminate PM&R specialty theses from master's degree and doctoral theses, the search category of "specialty thesis in medicine" were selected. Data recorded from the database included name and surname of the residents, the title and subject of the thesis, and the supervisors and the hospitals where they completed their PM&R specialty training.

A systematic literature search of the PubMed and Google Scholar databases was performed with the names of the residents and supervisors, titles, and mesh words of all theses. They were accepted as published when the titles matched the content of the residents' thesis. Date of publication, journal name, and SCImago Journal Rank (SJR) were recorded. For the journals listed in the Source Citation Index (SCI), the journal impact factor (JIF) at the time of publication was obtained using the Web of Science.

The theses were divided into 10 subgroups according to the study subjects: Rheumatic diseases; neurological diseases; fibromyalgia-myofascial pain syndrome and regional musculoskeletal disorders; osteoarthritis; osteoporosis and vitamin D metabolism; carpal tunnel syndrome;

TABLE 1
Institution and supervisor characteristics of the PM&R theses between 2010 and 2020 in Türkiye

	Published theses (n=388)		Unpublished theses (n=742)		
	n	%	n	%	*p*
Institution					0.254
Public University	318	34.2	611	65.8	
Training and Research Hospital	54	32.3	113	67.7	
Private University	16	47.1	18	52.9	
Academic titles of supervisors					0.108
Professor	194	32.0	413	68.0	
Associate Professor	111	34.9	207	65.1	
Assistant Professor	65	42.2	89	57.8	
Consultant MD	10	45.5	12	54.5	
Two supervisors	8	27.6	21	72.4	

PM&R: Physical Medicine & Rehabilitation; MD: Medical doctor.

cardiopulmonary diseases; pediatric diseases; lymphedema and lipedema; others. Additionally, the theses were categorized into three topics on the basis of epidemiological study types: descriptive and analytical studies; methodological studies (e.g., validity and reliability); experimental studies. Finally, experimental studies were grouped into eight subheadings based on treatment types: physical therapy modalities, rehabilitation practices, exercise, kinesio taping, injection therapies, cardiopulmonary rehabilitation, drugs, and others. The current institution and academic title of the authors were scanned by using their names and verified by using hospital web pages.

Statistical analysis

Statistical data were analyzed using IBM SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). Descriptive analysis was presented using numbers and percentages for categorical variables. The chi-square test was used to compare published and nonpublished theses. While post hoc comparisons for significant

TABLE 2
Characteristics of the PM&R theses according to the study subjects, treatment modalities (for experimental studies), and epidemiological study types

	Published theses (n=388)		Unpublished theses (n=742)		
	n	%	n	%	*p*
Main subjects					**0.004**
Fibromyalgia, myofascial pain syndrome & Regional musculoskeletal disorders	108	32.0	230	68.0	
Rheumatic diseases	77	35.2	142	64.8	
Neurological diseases	56	32.6	116	67.4	
Osteoarthritis	39	33.1	79	66.9	
Osteoporosis & Vitamin D metabolism	32	59.3	22	40.7	
Carpal tunnel syndrome	25	43.1	33	56.9	
Cardiopulmonary diseases	10	41.7	14	58.3	
Pediatric diseases	13	36.1	23	63.9	
Lymphedema & lipedema	6	37.5	10	62.5	
Others	22	23.2	73	76.8	
	Published theses (n=388)		Unpublished theses (n=742)		
Epidemiological study types					0.278
Descriptive & Analytical study	190	32.4	397	67.6	
Methodological study (validity etc.)	7	29.2	17	70.8	
Experimental study	191	36.8	328	63.2	
	Published theses (n=203)		Unpublished theses (n=362)		
Treatment modalities used					0.163
Physical therapy modalities	52	28.9	128	71.1	
Rehabilitation practices	38	38.0	63	62.0	
Exercise	26	33.3	52	66.7	
Kinesiotaping	19	41.3	27	58.7	
Injection therapies	31	41.3	44	58.7	
Cardiopulmonary rehabilitation	14	41.2	20	58.8	
Drugs	13	56.5	10	43.5	
Others	10	34.5	19	65.5	

PM&R: Physical Medicine & Rehabilitation.

results in the chi-square test, Bonferroni correction was applied. A *p*-value <0.05 was considered statistically significant.

RESULTS

In the study period, the median number of PM&R theses defended was 111 (range, 63 to 144) each year. The total number of dissertations assessed in this study was 1,130, and 388 (34.3%) of these theses were published in international or national journals. The rate of publication in SCI/SCI Expanded (SCI-E) journals was 24.5%.

The majority of the theses were produced by the residents working in public universities (82.2%). Training and research hospitals (TRHs) (14.8%) and private universities (3.0%) accounted for the remaining. Overall, there was no statistically significant difference between the type of centers in terms of publication rates of dissertations (Table 1). Another interesting finding was that there were 13 centers where no dissertations were published in this time period.

There were professors in 607 (53.7%), associate professors in 318 (28.1%), assistant professors in 154 (13.6%), and consultant physicians in 22 (1.9%) as supervisors in these theses. A total of 29 theses were guided by two supervisors. No significant difference was observed between supervisors' academic titles in terms of publication rate (Table 1).

The distribution of the main subjects, study types, and treatment modalities used in these theses are presented in Table 2. Findings revealed that the publication rate was significantly higher in theses about osteoporosis and vitamin D metabolism (p<0.001). There was no significant difference between study types and treatment modalities used.

Current academic titles and institutions were available in 1,066 of 1,130 residents (Table 3). It was found that the publication rate was significantly higher in those who were later academically promoted (p<0.001 for both associate professors and assistant professors). Almost half of thesis owners' current institutions were found to be state hospitals (n=512, 48.0%). Post hoc analysis of the data revealed that the publication rate of thesis conducted by physiatrists who are currently working at public universities was significantly higher than the ones currently working at TRHs, private institutions, and state hospitals (65.2% *vs.* 41.6%, 26.7%, and 25.0%, respectively; p<0.001). On the other hand, the publication rate of theses defended by physiatrists who are currently working at TRHs was significantly higher than the ones currently working at private institutions and state hospitals (41.6% *vs.* 26.7% and 25.0%, respectively; p<0.001).

The mean publication time of the theses was 3.3±2.1 years, ranging 0 to 11 years (Figure 1). Table 4 displays the frequency, JIF, and SJR distribution of published journal articles. The journals where the highest number of theses published were the Turkish Journal of Physical Medicine and Rehabilitation

TABLE 3
Current characteristics of the PM&R residents in relation their subsequent publication

	Published theses (n=388)*		Unpublished theses (n=742)*		
	n	%	n	%	*p*
Current academic titles of the authors					**<0.001**
Consultant (PM&R)	251	27.3	667	72.7	
Assistant Professor MD	43	74.1	15	25.9	
Associate Professor MD	43	86.0	7	14.0	
Fellowship/consultant (Rheumatology)	15	48.4	16	51.6	
Fellowship/consultant (Algology)	5	55.6	4	45.4	
Current institution of the author					**<0.001**
Public University	73	65.2	39	34.8	
Training and Research Hospital	106	41.6	149	58.4	
Private Institution	50	26.7	137	73.3	
State hospital	128	25.0	384	75.0	

PM&R: Physical Medicine & Rehabilitation; MD: Medical doctor; * Current academic titles and institutions of the authors were available in 1,066 PM&R residencies.

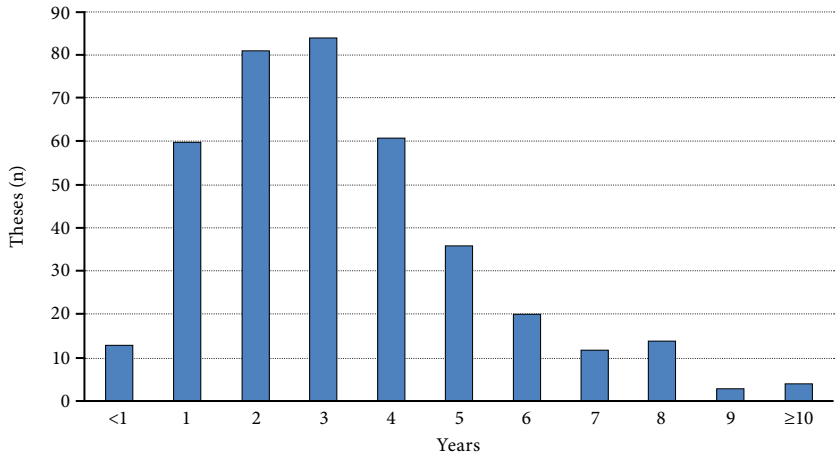

Figure 1. The time between the defense of the thesis and the publication of the thesis and related articles.

(n=53, 13.7%) and the Archives of Rheumatology (n=22, 5.7%). The mean JIF of journals published in SCI was 1.973±1.1 (range, 0.075 to 7.580). Among the journals, the ones with the highest impact factor were Rheumatology (one publication, JIF: 7.580), American Journal of Sports Medicine (one publication, JIF: 6.202), and Pain Physician (four publications, JIF: 4.965).

DISCUSSION

The results of this study revealed that one of three medical theses defended by PM&R residents were later published, and a quarter of all the theses were published in SCI/SCI-E journals. Comparable studies in different specialties were also done in Türkiye. In other studies conducted in Türkiye, publication rates were between 27.1 and 50.0%, and publication rates in SCI/SCI-E indexed journals changed between 14.9 and 32.7%.[2-8,10]

It is inspiring that the rate of publication of theses in our branch is comparable to many other branches, but it remains below expectations. The mean duration of publication was 3.3±2.1 years; therefore, some of the theses of the last years may be in evaluation or publication process, resulting in the underestimation of this publication rate.

Our study showed that the publication rate was not associated with the institution type of the residents. However, it was remarkable that there were some training centers with no published theses.

The results did not reveal any statistically significant difference in publication rates in terms of supervisors' academic titles. Nevertheless, when the results were examined in detail, we found that theses under the supervision of young mentors (consultant doctors and assistant professors) were more published than the ones supervised by experienced mentors (professors and associate professors). Moreover, the theses supervised by professors had the lowest publication rates in this study. This rate was clearly below the expectations. We thought that lack of motivation might be an important reason since they already had the highest academic title. Accordingly, it was reported in the same way in other specialty studies conducted in Türkiye.[7] Further studies are needed to determine the reasons for this low academic productivity to make use of qualified individuals in the right way.

Since PM&R has a wide range of scope, it was quite challenging to determine the subgroups of subjects of the theses included in this study. However, we believe that the subjects of the PM&R theses may have an impact on publication rates. Our findings revealed that the publication rate was significantly higher for theses about osteoporosis and vitamin D metabolism. It was also noteworthy that a few subjects were particularly prominent when the topics of theses were evaluated overall. Theses on fibromyalgia, myofascial pain syndrome, regional musculoskeletal disorders, and rheumatic diseases accounted for half of the theses. As it is well known, PM&R is a medical science devoted to the study of rehabilitation of neurologic disorders, trauma, rheumatologic disorders, deconditioning and general debility, orthopedic diseases, and almost all types of disabilities. It needs to be considered

TABLE 4
Distribution of the journals in which the PM&R theses were defended and published between 2010 and 2020

Journal	n	%	JIF	SJR
Turkish Journal of Physical Medicine and Rehabilitation	53	13.7	1.078	0.235
Archives of Rheumatology	22	5.7	1.472	0.397
Journal of Back and Musculoskeletal Rehabilitation	15	3.9	1.398	0.508
Rheumatology International	14	3.6	2.631	0.806
International Journal of Rheumatic Diseases	13	3.4	2.454	0.795
American Journal of Physical Medicine & Rehabilitation	11	2.8	2.159	0.701
Turkish journal of Physical Medicine & Rehabilitation Sciences	11	2.8	-	-
Turkish Journal of Osteoporosis	9	2.3	ESCI	0.108
Turkish Journal of Medical Sciences	8	2.1	0.973	0.277
Journal of Physical Therapy Science	7	1.8	0.391	0.340
Clinical and Experimental Rheumatology	5	1.3	4.473	1.184
Clinical Rehabilitation	5	1.3	3.477	1.150
Journal of Rehabilitation Medicine	5	1.3	2.912	0.893
Medicine Science	5	1.3	-	-
Pain Physician	4	1.0	4.965	1.310
European Journal of Physical and Rehabilitation Medicine	4	1.0	2.874	0.926
Journal of Stroke and Cerebrovascular Diseases	4	1.0	2.136	0.765
Journal of Hand Therapy	4	1.0	1.950	0.741
International Journal of Rehabilitation Research	4	1.0	1.479	0.690
Turkish Journal of Rheumatology	4	1.0	0.312*	-
Annals of Medical Research	4	1.0	-	-
Aging Clinical and Experimental Research	3	0.8	3.638	0.911
Clinical Rheumatology	3	0.8	2.980	0.755
Turkish Journal of Geriatrics	3	0.8	0.382	-
Eurasian Journal of Medicine	3	0.8	ESCI	0.337
Annals of Clinical and Analytical Medicine	3	0.8	ESCI	0.112
Northern Clinics of Istanbul	3	0.8	ESCI	-
Nobel Medicus	3	0.8	ESCI	0.101
Düzce Medical Journal	3	0.8	-	0.102
Aegean journal of Medical Sciences	3	0.8	-	-
Others (<3)	148	38.1		
Total	388			

PM&R: Physical Medicine & Rehabilitation; JIF: Journal Impact Factor; SJR: SCImago Journal Ranking; ESCI: Emerging Sources Citation Index; * Title has changed to Archives of Rheumatology since 2014.

that the scarcity of theses about rehabilitation may surely have a negative impact on the future of the branch.

Transforming a thesis into a publication is an onerous and time-consuming process. The mean publication time was almost as long as a residency training duration in our study. In a study conducted by Hollman et al.,[11] heavy physician workload, family burden, insufficient personal interest, lack of motivation, and inadequate support of the supervisor were reported as barriers for theses not to be published. In another study, it was suggested that challenges of turning a thesis into publication are due to the fact that no articles were written during the residency training period, lack of encouragement to publish, and almost all SCI/SCI-E indexed journals accepting publications

in foreign languages, particularly in English.[12]

In Türkiye, after admission to a medical school, students are given core lessons in evidence-based medicine with the aim of training enlightened, research-minded students. Additionally, the approved curriculum for PM&R specialty training, like all the other specialties, includes core teaching sessions about research to provide residents with a suitable academic experience. Despite these efforts to train scientifically oriented individuals, a significant part of the specialization theses in medicine is still the first scientific research of the residents, which is, in our view, the greatest disadvantage and the biggest reason behind the failure of the publication of theses. In Germany, medical faculty students are required to do scientific research and write a graduation thesis to receive the title of "medical doctor." In this way, medical faculty students both gain an investigative approach to medical problems and have the opportunity to participate in scientific research activities before residency. Research conducted in a medical school in Germany reported that 66% of the medical students had a publication in the Medline index.[13] In a similar study from the USA, they found that 90% of medical faculty students worked voluntarily, 75% of the students published their research, and 52% of them gave a presentation at national congresses.[14]

According to a survey conducted in 2008 with 1,069 resident doctors from 11 provinces in Türkiye, 23% of the residents did not have information about Medline, and 82% did not have knowledge about the Science Citation Index Expanded. Sixty-five percent of the participants did not know how to prepare their thesis, and 58% had never written a scientific publication. Only 3% had 10 or more scientific publications. In the same survey, future plans of the residents were questioned. Thirty percent of the participants stated that they would like to work in a private clinic, 29% to have an academic career, 22% to work on their own, and 19% to work abroad.[15]

The quality of these articles is also another matter of issue. In the current system, it is a necessity to conduct scientific research and publish it for academic progress after completing specialty training. This requirement has led to a large increase in the number of scientific journals over the years. However, the rate of cited publications is also decreasing.[16] The fact that most of the publications are not cited reveals that these studies are only a step in the careers of researchers rather than seeking an answer to a scientific question that may be useful for physicians in improving patient care.

It is worth remembering that resident doctors are also research assistants in Türkiye. While developing clinical skills during their residency, they should also gain the skills to be able to do an independent research project in the future. We believe that teaching residents ways to conduct research is one of the primary responsibilities of their mentors. In this context, faculty members should guide and encourage their students to conduct research. The quality of PM&R theses was out of the scope of our research question; however, conducting more rigorous and well-executed research could potentially enhance their promotion and increase the likelihood of publishing articles.

This study has several limitations. One limitation is that all the theses might not have been registered with the Higher Education Council Thesis Center. Consequently, not all PM&R theses could be evaluated. In our study, it is possible that the inclusion of theses in recent years has affected the outcomes, such as rate of publication and current academic title. Another limitation is that the current institution and current academic title of 74 thesis authors could not be reached. Likewise, the data of some female authors could not be accessed due to a change in their surnames.

In conclusion, this study is the first to examine the specialization theses of PM&R residents and their publication rates. It is encouraging that the publication rate of theses in our branch is comparable with other branches, but it still falls short of expectations. Another concern is the scarcity of the theses on rehabilitation, which undoubtedly has a negative effect on the future of the field. Data sharing is one of the cornerstones of modern science that enables the transfer of knowledge to clinical practice and reproducibility. In our opinion, medical students should be provided with opportunities to develop their academic skills before residency, and supervisors should possess leadership qualities to help motivate residents to publish their theses.

Ethics Committee Approval: The study protocol was approved by the University of Health Sciences, Gulhane Training and Research Hospital Ethics Committee (date: 11.04.2023, no: 2023/145). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Concept: B.Y.; Supervision: B.Y., G.Y.; Design, data collection and/or processing, analysis and/or interpretation, literature search, writing manuscript, critical review: B.Y., P.M.A., H.B.A., G.Y.; Resources, materials: NA.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

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