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Careers and Research Performance of PhD Program Graduates of Health Sciences in Turkey

[Türkiye'de Sağlık Bilimleri Doktora Programlarından Mezun Olanların Kariyerleri ve Araştırma Performansları]

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ABSTRACT

In this review, we aimed to evaluate PhD graduates of the period between 1985-2010 and analyze the status, motivation and positive and negative factors influencing research motivation of graduates in eight disciplines from three graduate schools of Health Sciences in Turkey and to compare with the present status in the world. Some information obtained by web-based survey is the following: The most of graduates (83%) have academic positions in basic sciences departments in the faculty of medicine in universities. 94.2 % of graduates recognized the importance of personal motivation, while 54% of them thought that finding the appropriate research environment was important for research. For 52%, the biggest hindrance to medical research was lack of funding and for 39%, lack of technic personnel for research. The studies in the literature related to PhD graduates pointed out to the following facts: The number of PhD graduates is increasing gradually and the graduates' career choices have changed from academic to non-academic positions, especially in the industry. This is not parallel to our pilot study findings. About the teaching perspective treated in the relevant literature, the concept of "one should be a good researcher, as well as a good teacher" is dominant. PhD graduates in our pilot study mentioned that they had responsibilities in the education activities during their PhD education. We think that these responsibilities are useful for their future academic career. In conclusion, the majority (83%) of graduates from Graduate Schools of Health Sciences in Turkey are enrolled into academic researcher positions in universities**.** They keep producing funded research work as a first author and publish despite some problems.

Key words: PhD education, health sciences, PhD graduates' careers, research

Conflict of interest: The authors declared no conflict of interest.

ÖZET

Bu derlemenin amacı, Türkiye'de 1985 ve 2010 yılları arasında üç Sağlık Bilimleri Enstitütüsü'nün sekiz farklı doktora programında doktora eğitimlerini tamamlayan doktora mezunlarının statülerini, araştırma motivasyonlarını pozitif ve negatif yönde etkileyen faktörleri değerlendirmek ve dünyadaki mevcut durum ile karşılaştırmaktır. Web-temelli ankete dayalı pilot çalışmamızdan elde edilen bazı bilgiler şunlardır: PhD mezunlarının çoğu (%83) tıp fakültelerinin temel bilimler bölümünde akademik pozisyonda görev almaktadırlar. Mezunların %94.2'si araştırma için kişisel motivasyonun önemli olduğunu belirtirken, %54'ü de uygun araştırma ortamının önemli olduğunu ifade ettiler. Araştırma projeleri için en büyük kısıtlılık, mezunların %52'si tarafından parasal desteğin bulunamaması olarak, %21'i tarafından da teknisyen sayısının yeterli olmaması şeklinde belirtildi. Literatürde PhD mezunlarına yönelik çalışmalar aşağıdaki hususlara dikkat çekmektedir: PhD mezunlarının sayısı giderek artmaktadır ve buna bağlı olarak mezunların kariyer tercihleri akademik ortamdan endüstriye doğru değişmektedir. Bu durum, pilot çalışmamızdaki bulgularla paralellik göstermemektedir. Literatürde eğitim-öğretim ile ilgili olarak "iyi araştırıcı ve aynı zamanda iyi eğitici" görüşü baskındır. Pilot çalışmamızda yer alan mezunlar PhD eğitimleri sırasında eğitim aktivitelerinde sorumluluk aldıklarını ifade ettiler. Mezunların PhD eğitimleri sırasında eğitim aktivitelerinde aktif olarak rol almalarının, akademik gelişimlerine olumlu yönde katkı sağlayacağını düşünmekteyiz. Sonuç olarak Türkiye'de Sağlık Bilimleri doktora mezunlarının çoğunluğu (%83) üniversitelerde akademik pozisyonlarda yer almaktadır. Araştırma için parasal destekte ve personelde yetersizliğe rağmen araştırma projelerini gerçekleştirmekteler ve ilk isim olarak yayınlamaktadırlar.

Anahtar Kelimeler: Doktora eğitimi, sağlık bilimleri, doktora mezunlarının kariyerleri, araştırma

Çıkar çatışması: Yazarlar herhangi bir çıkar çatışması bildirmemişlerdir.

Introduction

The aims and the training programs of PhD (doctor of philosophy) education have been studied by many authors [1-3]. The doctorate has been defined having a research training element but is mostly comprised of independent research [2]. For Burton *et al.*[4], its most important feature is that the student makes an original contribution to scientific knowledge through an approved research project, supervised by experts in the discipline and in methodological approach [4]. A statement by the BRITISH research councils (UK GRAD) emphasized seven major skills that PhD students must acquire. These are: research skills and techniques, participation in the research environment, research management, personal effectiveness, communication, networking and team working and career management [5]. During the last decade, there has been ongoing interest in discussion of the scope, aims, outcomes, and standards for PhD education [6-8].

Graduate Schools of Health Sciences in Turkey were founded in 1982 to coordinate MSc and PhD education programs in various fields related to medical and health sciences, according to the regulations of Turkish Higher Council of Education. Acceptance of student candidates is strictly regulated by the Turkish Higher Council of Education in terms of the "minimum" prerequisites required. The program lasts four years, with formal courses being completed in the first two years. There are 47 active Graduate Schools of Health Sciences in Turkey [9].

In this review, we aimed to evaluate PhD graduates of the period between 1985 - 2010 and analyze the status, motivation and positive and negative factors influencing research motivation of graduates in eight disciplines from three graduate schools of Health Sciences in Turkey and to compare with the present status in the world.

Pilot Study for PhD Graduates Involving Three Graduate Schools

E-mail addresses of 104 graduates of PhD programs between 1985 and 2010 were collected from Graduate Schools of Health Sciences of Dokuz Eylül, Atatürk and Celal Bayar Universities in Turkey. These graduates were from the following disciplines: biochemistry, medical biology and genetics, microbiology, parasitology, histology & embryology, anatomy, physiology, basic oncology and pharmacology from Graduate Schools of Health Sciences, Dokuz Eylül, Celal Bayar and Atatürk University, in Turkey. Dokuz Eylül and Celal Bayar, are in the west of Turkey and to minimize bias from geographical localization, we also studied the graduates of Health Sciences from Atatürk University, in the east of Turkey. All of the graduates were accessible via e-mail and currently residents in Turkey, except one.

A web-based questionnaire with 45 multiple–choice questions was prepared, based on a study reported by Kuo *et al*. [10]. The questionnaire was sent to these addresses by e-mail. The questionnaire solicited information on: Background (sex, age, specialty, academic title), main research interest, number of PhD and M.Sc. students supervised, present research environment, factors influencing continuing research work, number of publications, as a first author, in the last five years and the number of publications, authorship 1-10, during the whole academic career (Table 1).

The first mailings were not successful with less than 35% responders. After three mailings we received 54 returns, a 52% response rate. The rest were non-responders. Since we could not reach them, we did not have any information about the characteristics of the non-responders. SPSS 11.0 and Stata 12.1 were used for descriptive statistics. The results were expressed as percent, median, interquartil range and frequency.

Graduates' background information

The responders were 54 (52%), of whom 19 (35.18%) were from biochemistry, 9 (16.6%), from medical biology and genetics, 5 (9.26%), each, from microbiology, parasitology and histology & embryology, and the rest 11 (20.44%), from other disciplines: anatomy, physiology, basic oncology, pharmacology. They were comprised of 27 (50%) males and 27 (50%) females, mostly 31 to 51 years old. The undergraduate education of these PhD graduates was as follows: 31 (57%) of was from medical schools, and 23 (43%) from other fields of science (e.g. Biology, Chemistry and Biochemistry). The average time to graduation varied from four to six years. Thirty two of them (60%) did not have any salary while 22 (40%) had a salary working as research assistant during their PhD training, according to information received by their institutes' registration offices. Fourty five (%83) had, presently, academic positions in basic sciences departments (biochemistry, medical biology and genetics, microbiology, parasitology, histology & embryology, anatomy, physiology, basic oncology and pharmacology), in the faculty of medicine in universities, 8 (15%) worked in government hospitals and 1 (2%) entered private practice as clinical researcher. Of those in academic positions, 13 were professors (29%), 21 associate professors (47%), 9 assistant professors (20%), 2 (4%) instructors. Twenty two (40.7%) had their wife or husband also in an academic position.

Graduates' research work

In this section, participants were asked to answer the question: What was/is your priority with regards to routine laboratory responsibilities (i.e. studying and reporting patients' samples), teaching, and research in different stages of your career-during PhD education, after graduation and in present time? During their PhD education, 16 (29.6%) had priorities in the order: research, teaching and routine laboratory responsibilities while 15 (27.8%) had priorities in the order: research, routine laboratory

responsibilities and teaching. After PhD graduation 20 (37%) of participants had priorities in the order: teaching, research and clinical responsibilities, and 17 (31.5%) had priorities in the order: research, teaching and clinical work. For twenty one (38.9%), the current priorities were in the order: teaching, research and routine laboratory responsibilities, and 18 (33%) currently had priorities in the order: research, teaching and clinical responsibilities**.** As for time spent on weekly work distribution, 14 (26%) of respondents spent more than 75% of their working time in routine laboratory responsibilities, 16 (30%) spent more than 75% of working time in teaching, while only 11 (20%) spent more than 75% of working time in research (Table 2). On the question of financial support of research, thirty six (67.3%) had obtained national funding as the main researcher in at least one project. In relation to the types of research projects**,** eight (15.3%) did not participate in clinical research, while 6 (11.5%) did not participate in basic research. Some mechanism to reward research activities (including financial bursary) was present in 36.5% of the work environments. For twenty eight (52%), the biggest hindrance to medical research was lack of funding and for 21 (39%), lack of technical personnel for research. Eight (14.8%) supervised 1 student, 5 (9.3%) supervised 2 students, 3 (5.6%) supervised 3 students, 2 (3.7%) supervised 4 students, and 1 (1.9%) supervised 5 students, while the rest were not supervising any student. As to factors that negatively affect conduct of research, 28 (52%) listed insufficiency of funds for project support, 24 (44%) listed slowness in bureaucratic evaluation procedures. The importance of personal motivation was recognized by 51 (94.2%), while that of finding the appropriate research environment was recognized by 29 (54%) (Fig. 1).

Graduates' scientific output in the form of publication

When participants were asked to answer the question 'What is the number of your publications, as a first author, that have been issued in SCI and/or SCI expanded journals in the last five years?' 15 (27.8%) answered "one or less", 14 (25.9%) "two articles", 13 (24.1%) "three articles", 4 (7.4%) "four articles", 4 (7.4%) "six articles", 4 (7.4%) "more than ten articles". The results are presented in detail in Table 3. The total number of publications that have been issued, as a first author, in the last five years and the total number of publications, authorship 1-10, during whole academic career are also shown in Fig. 2 and 3, respectively.

Discussion and Conclusions

It is reported that Turkey is included in the group of countries that focuses on biomedical research [11]. Likewise, the results of research for Turkey in 2009 show that graduates who obtained PhD degrees are mostly (37.4%) from Health Sciences, according to the classification for field of science and technology [12].

In our study, the rates of male to female were very close to each other in the findings for graduates from 3 different Institutes of Health Sciences in Turkey. However, according to the statistics of Turkish Higher Council of Education, in the school year of 2009-2010, a total of 692 graduate students were enrolled in 47 active Graduate Schools of Health Sciences, of whom 411 were females and 281 were males [9].

Evaluating the graduates in our study according to their academic positions, we determined that most of the graduates (83%) have academic positions in universities, in accordance with the term of "linear pipeline" described by Fuhrmann *et al.* [13]. It is also reported that the number of PhD graduates is increasing gradually [14]. As a result, it is known that the graduates apply for non-academic positions. Fuhrmann *et al.* define this change regarding the career choices of graduates as 'branching career pipeline' [13]. Moreover, Rouch and Sauermann also surveyed over 400 PhD students at three major U.S. research universities in relation to taste for science (e.g., desire for independence, publishing, peer recognition and interest in basic research) and preferences for research careers in industry versus academia. They reported that PhD students preferring industry show a weaker 'taste for science', a greater concern for salary and access to resources, and a stronger interest in downstream work compared to PhD students preferring an academic career [15]. The higher percentage of PhD's working at university positions in our study could have been due to two reasons: it could be that our training is academic career or teaching based or, for finding a job in the field of industry in Turkey, a PhD is not enough regarding the inadequate funding for industrial research. We believe that our educational programs, in general, have not yet changed from the traditional tenure track to competitive individualism and much work and time is needed for the change.

On the question of the priority of routine laboratory responsibilities (i.e. studying and reporting patient' samples), teaching and research during PhD education and after graduation or in present time; teaching is the second order during PhD education while it becomes the first priority in the present time. In the study performed by Feldon and coworkers, it is reported that graduate students' teaching experiences improve their methodological research skills [16]. Currently, the concept of 'one should be a good researcher, as well as a good teacher' is dominant. Ciaccia have suggested that "graduate students and postdoctoral fellows should undergo training in teaching to strengthen their resumes, polish their oral presentation skills and improve teaching at the undergraduate level". She also indicated that "this ability allows busy scientists to fit pedagogical training into their research schedules in order to make a significant investment both in their academic career and in the continuing improvement of science education" [17]. In this context, we consider that our findings related to education-trai-

Table 1. Questionnaire

Background information
1. Sex
2. Age
3. Institute where you work
4. Academic title
5. Academic status now
6. Master's degree date
7. PhD degree date
8. Institute where you have a master degree
9. Institute where you have a PhD degree
10. Are the institutes that you had a PhD degree and you work now, the same?
11. University for your undergraduate education
12. The year finishing undergraduate
13. Anybody in your family, who works in academy as a permanent staff, except you?
Research work
1. Your main research interest
2. Average time spent in routine laboratory responsibilities in per week
3. Average time spent in teaching in per week
4. Average time spent in research in per week
5. What is the time between after graduation and having an academic position?
6. Priority during PhD education: clinical care, teaching, research
7. Priority after graduation: clinical care, teaching, research
8. Priority now: clinical care, teaching, research
9. The factors that negatively affect conducting research,
10. The factors that positively affect conducting research,
11. Do you have independent research area?
12. Number of research projects, as the principal investigator, now
13. Number of research projects, as the co-investigator, now
14. The percentage of your research projects in basic research
15. The percentage of your research projects in clinical research
16. The percentage of your research projects as retrospective
17. The percentage of your research projects as prospective
18. The percentage of your research projects as randomized controlled
19. Sufficiency of project fund
20. Satisfaction with technician/personnel
21. Satisfaction with research space and equipment
22. Is there a master program in your institution?
23. Is there a PhD program in your institution?
24. The number of master students for whom you are working as thesis advisor presently?
25. The number of PhD students for whom you are working as thesis advisor presently?
26. The number of speciality students for whom you are working as thesis advisor presently?
27. Is there a reward program for research in your university?
Scientific output
1. What is the number of your publications, as a first author, that has been issued in SCI and/or SCI expanded journals in the last five years?
2. What is the number of your publications, as a first author, that has been issued in SCI and/or SCI expanded journals during your whole academic career?
3. What is the total number of your publications that has been issued in SCI and/or SCI expanded journals during your whole academic career?
4. What is the total number of your publications, as a first author, that has been issued in other than SCI and/or SCI expanded journals during your whole academic career?'
5. What is the number of citation on whole publication during your whole academic career?'

Table 2. Time spent weekly on routine laboratory responsibilities (i.e. studying and reporting patients' samples), teaching and research by graduates

Time spent	Routine laboratory responsibilities	Teaching	Research
>75%	14 (26%)	16 (30%)	11 (20 %)
75%	4 (7%)	21 (39%)	16 (30%)
%50	6 (11%)	10 (19%)	18 (33%)
%25	7 (13%)	4 (7%)	8 (15%)
>25%	23 (43%)	3 (6%)	1 (2%)

*Data presented as n (%).

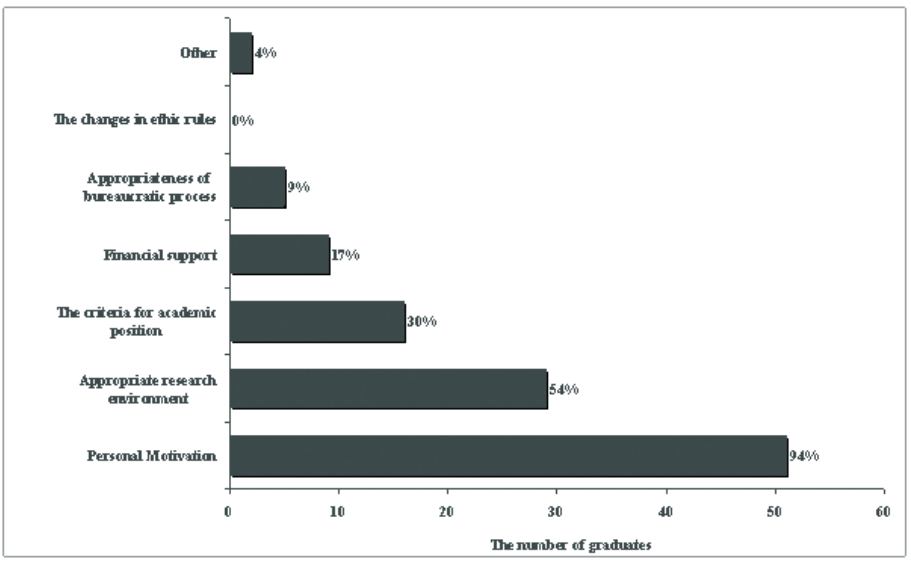

Figure 1: Factors that influence research performance of graduates (*): Respondents may select more than 1 item.

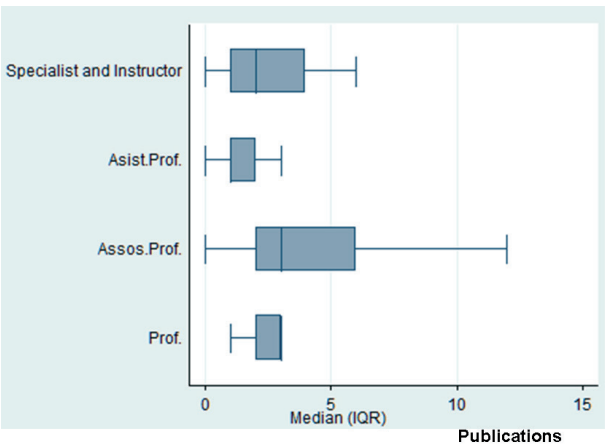

Figure 2: Box plots representing the number of SCI and /or SCI expanded articles as a first author published in the last five years by graduates

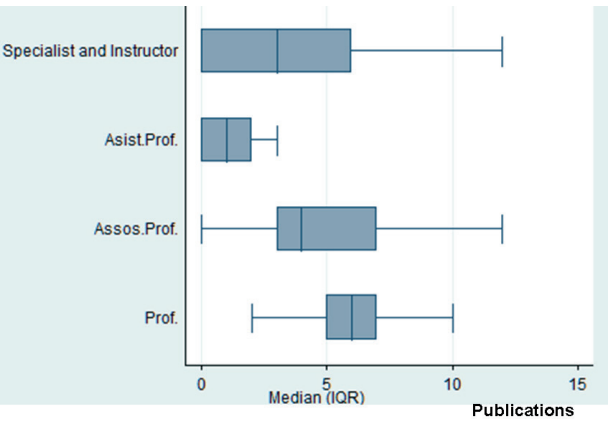

Figure 3: Box plots representing the number of SCI and/or SCI expanded articles as a first author during whole academic careers of graduates

Tablo 3. Scientific output in the form of publication

Academic Status			The number of publications, as a first author, that has been issued in SCI and/or SCI-expanded journals in the last five years	The total number of publications that has been issued in SCI and/or SCI-expanded journals during whole academic career	The number of publications, as a first author, that has been issued in SCI and/or SCI-expanded journals during whole academic career	The number of citation on whole publication during whole academic career
Total (n=54)		Mean± SD	3.1±3.3	19.3±15	4.6±4.6	112.6±172.9
	IQR	25	1	9	1	10
		Median	2	15.5	4	40.5
		75	3	27	6	169.25
Specialist and Instructor (n=11)		Mean± SD	2.3±1.9	8.7±6.2	2.5±2.4	11.1±17.2
		25	0.75	4.75	0	0
		Median	2	7.5	2	4.5
		75	4	12.5	4.5	13.5
Assist Prof (n=9)		Mean± SD	1.4±1	10.3±10.2	2.2±3.6	41.7±91.6
	IQR	25	0.75	2.5	0	0
		Median	1.5	5.5	1	12.5
		75	2	17	2.25	29.5
Assoc. Prof (n=21)		Mean± SD	4.6±4.6	19±8.7	6±6	125.3±187.2
	IQR	25	1.5	11.5	2.5	28
		Median	3	17	4	56
		75	6	25	7	158.5
Prof. (n=13)		Mean± SD	2.7±1.2	34.8±18.5	5.8±2.2	224.7±201.2
	IQR	25	2	22	4.5	72.5
		Median	3	34	6	200
		75	3	40.5	7.5	300

ning are useful for our graduates during PhD education so that they can use these skills for education in their future career.

Questioning the time spent weekly on routine laboratory responsibilities (i.e. studying on and reporting patient' samples), teaching and research, we found that most of them spent more than 75% working time in routine laboratory responsibilities since the major part of our group has responsibilities in departments dealing with routine laboratory services in medical schools. However they stated that the priority of routine laboratory responsibilities is at the last order during their PhD education. On the other hand, we found that 20% of them spent more than 75% working time in research in their present position although they have more responsibilities related to routine laboratory reports.

As for the question about mentoring of students**,** we found that 65% of faculty members in our study did not supervise any student. In a study by Ozer, it is stressed that Turkish higher education has to invest in doctoral education and to come up with certain policies for the faculty development in order to sustain the growth in higher education [18]. Also Juliano and Oxford suggested supporting PhD students by competitive individual fellowships, training grants or institutional funds [1]. We think that the universities should make efforts to provide a salary or stipend to PhD students during their education.

Personal motivation and suitability of research environment were regarded to be important factors having effect on research, according to the results of our study. Likewise, Kua *et al.* have emphasized the importance of personal motivation [10].

When the scientific output in the form of publication was evaluated in this study, we showed that graduates publish despite some problems. According to Thomson's ISI web of science, Turkey has gained, in 2008, the18th position in the world in the total number of scientific articles published in indexed journals, the majority originating from health sciences [19]. Reviewing the distribution of publications from Turkey by their fields of professional interest, the publications related to health sciences were determined to constitute 53% of the total distribution [20].

Although the response rate was good for our study, we have some limitations in our study. We preferred the web-based survey since it speeds up the response times and reduces the cost. According to feed back some respondents, however, there were some problems encountered during the filling of this survey, like freezes and disconnections. Also some e-mail addresses may be out of use. Finally some graduates may have refused to respond. These points are the pitfalls of web surveys, resulting in the decreasing the number of respondents. Therefore, the whole universe of PhD graduates could not be reached in this study. Our findings may only be interpreted for this study group. The subgroup analyses could not be performed because of limitations in the number of samples obtained. Since we could not reach the non-responders, we cannot rule out non-responder-based bias.

In conclusion, we believe that this study may indicate a trend that can be verified by more extensive national investigation on this subject.

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