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Impact of Post-Master PhD Degree on Publication Productivity in Neurosurgery

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ABSTRACT

AIM: This study aimed to evaluate the impact of the Post-Master PhD degree on publication productivity in neurosurgery.

MATERIAL and METHODS: An online national electronic survey was designed based on the recent literature and factors related to publication productivity. The survey was conducted to simply evaluate main bibliometrics of the participants consisting of neurosurgeons in different stages of their career. The survey was distributed via email to all Turkish Neurosurgical Society members.

RESULTS: A total of 220 neurosurgeons participated and answered all survey. Neurosurgeons that had published their Master's dissertation were found to have significantly higher number of published articles, citations and h index during their career ($p<0.001$). Neurosurgeons with a PhD degree who have been involved in such program were found to have significantly higher number of published articles and h index ($p<0.01$). A majority of neurosurgeons who were involved in a PhD program were found to work in university hospitals (41.5%) and research and training hospitals (26.8%). Clinical anatomy, neuroscience, and molecular/genetic biology were the most common PhD programs.

CONCLUSION: Standardization in measurability of scientific productivity is mandatory to maintain stability and move further in academic activity. PhD programs have a significant contribution to academic performance and scientific productivity. Surgical residents and young neurosurgeons should be encouraged to be involved in such PhD training programs to promote success in both neurosurgery and scientific arenas.

KEYWORDS: Doctor of Philosophy, PhD, Bibliometrics, Publication, Productivity

ABBREVIATIONS: MD–PhD: Doctor of Medicine-Doctor of Philosophy, **h-index:** Hirsch index

INTRODUCTION

Scholarly productivity is one of the main determinants of academic achievements (8,12). Publication productivity and factors that determine the involvement in such activity remain a major issue in academic research. Recently, many studies evaluated the association between any factors that may interfere with publication productivity of the individual (8,12). Among such factors, the Doctor of Medicine-Doctor of Philosophy (MD–PhD) integrated programs are well evaluated (1,2,3,6). However, the impact of the PhD degree in societies where such programs are isolated and not integrated with MD programs is not generally known.

This study aimed to evaluate the association between PhD degree and publication productivity in neurosurgery.

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MATERIAL and METHODS

An online national electronic survey was designed based on the recent literature and factors related to publication productivity. The survey was conducted to simply evaluate main bibliometrics of the participants consisting of neurosurgeons in different stages of their career. The survey was distributed via email to all Turkish Neurosurgical Society members.

The survey did not require any personal data. Questions were designed to collect information about the participant's age; career span; type of hospital he/she works; bibliometrics data such as number of articles, number of citations, Hirsch (h) index, and information regarding publication of both Master's and PhD (if applicable) dissertation and PhD programs. The survey was announced and published online between October 4 and 25, 2021. Records with missing data were totally excluded in the statistical evaluation.

Median, minimum, and maximum values were used in the descriptive statistics for continuous data, and percentage values were used for discrete data. Shapiro–Wilk test was used to examine the conformity of continuous data to normal distribution. The Mann–Whitney U test was used to compare the h index scores of the participants with the two independent variables, and the Kruskal–Wallis analysis of variance was used to compare more than two variables. Kruskal–Wallis multiple comparisons test was used to evaluate variables that were found to be different. IBM SPSS Statistics 20 software was used during the statistical evaluation, and a P-value < 0.05 was accepted as the statistical significance limit.

Table I: Main Characteristics of the Participants

	Mean ± SD Median (Min-Max)
Age (year)	46.2 ± 9.3 45 (30-73)
Career span (year)	14.4 ± 9. 8 12 (1-45)
	n (%)
Category of hospital	
State hospital	20 (9.1)
Training and research hospital	64 (29.1)
University hospital	88 (40)
Private practice	48 (21.8)
Higher academic title	
Professor	46 (20.9)
Associate Professor	57 (25.9)
Assistant Lecturer	37 (16.8)
Instructor	80 (36.4)

RESULTS

A total of 220 neurosurgeons participated and answered all survey. The institution that the participants work has been grouped into four: State, training & research, university hospitals, and private practice. Moreover, the higher title of the participant was determined to evaluate any relationship. The main characteristics of the participants are presented in Table I.

Bibliometrics, including the total number of published manuscripts, number of citations and h index, were evaluated in detail. The h index was questioned from three different databases (Scopus, Web of Science, and Google Scholar), and the higher value was adopted during the statistical analysis (Table II). The survey asked the participants for the number of their published original studies and total articles (including case reports, letter to the editor, and reviews). About half of the participants (53.2%) reported that they have published their Master's dissertation in a peer-reviewed international journal. This parameter was also evaluated regarding its relationship with total published studies and h index (Table III). Neurosurgeons that had published their Master's dissertation were found to have significantly higher number of published articles, citations and h index during their career ($p<0.001$). Data on the association between the total number of published manuscripts and other variables are presented in Table IV.

Neurosurgeons that work in university hospitals were found to have significantly higher number of published articles and h index compared to other groups ($p<0.001$). No significant difference was found between neurosurgeons with Professor or Associate Professor titles regarding both published article number and h index ($p>0.05$). Although 20.5% of neurosurgeons who had published their Master's dissertation have been involved in a PhD program, this association was found insignificant ($p>0.05$). Neurosurgeons with a PhD degree who have been involved in such program were found to have significantly higher number of published articles and h index ($p<0.01$) (Table V).

Table II: Bibliometrics of the Participants

	Median (Min-Max)
Total number of published international articles (including case reports, letter to the editor, reviews)	15 (0–149)
Published original studies	9 (0–120)
Total citations	172 (0-3002)
Higher Hirsh (h) index	4 (0–35)

Table III: Relationship Between Publishing the Master's Dissertation and Total Published Studies, Citations and H Index

	Total published articles	Total citations	h index	
	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	p
Publication status of the Master's dissertation				
Yes	24 (0–149)	1424 (0-3002)	6 (0–35)	<0.001*
No	4 (0–118)	33 (0-862)	0 (0–28)	

**Mann–Whitney U test.*

Table IV: Relationship Between Total Number of Published Articles and Other Variables

	Total published articles	Published original studies		
	Median (Min-Max)	Median (Min-Max)	p	
Category of hospital				
State hospital[a]	3 (0–26)	1 (0–1)	<0.001*	a–c p < 0.001
Training and research hospital[b]	11 (0–103)	7 (0–74)		b–c p < 0.001
University hospital[c]	26.5 (0–149)	16 (0–120)		d–c p < 0.001
Private practice[d]	4 (0–107)	2.5 (0–70)		
Higher academic title				
Professor[a]	49.5 (0–149)	24.5 (0.120)	<0.001*	a–c p < 0.001
Associate Professor[b]	35 (10–100)	20 (7–60)		a–d p < 0.001
Assistant Lecturer[c]	10 (0–35)	6 (0–23)		b–c p < 0.001
Instructor[d]	3 (0–33)	1 (0–25)		b–d p < 0.001
				c–d p < 0.05
Publishing status of the Master's dissertation				
Yes	24 (0–149)	15 (0–120)	<0.001**	
No	4 (0–118)	3 (0–110)		
Graduated from/involved in a PhD program				
Yes	30 (0–149)	17 (0–120)	0.002**	
No	14 (0–129)	8 (0–110)		

**Kruskal–Wallis analysis of variance; **Mann–Whitney U test.*

Regarding PhD programs, 9.5% of neurosurgeons declared their current participation in a PhD program, whereas 9% reported their graduation from such program (Table VI). A majority of neurosurgeons who were involved in a PhD program were found to work in university hospitals (41.5%) and research and training hospitals (26.8%). Clinical anatomy, neuroscience, and molecular/genetic biology were the most common PhD programs. The statistical evaluation achieved in the total participants who have been involved in PhD programs. Moreover, 2.3% of participants have been found to have a role as a lecturer in a PhD program.

DISCUSSION

Sustained research involvement and scientific productivity remain a major concern of the scholar public. The predictors

Table V: Relationship Between h Index and Other Variables

	Median (Min-Max)	p	
Category of hospital			
State hospital[a]	0 (0–7)	<0.001*	a–c p < 0.001
Training and research hospital[b]	2.5 (0–20)		b–c p < 0.001
University hospital[c]	7 (0–35)		d–c p < 0.01
Private practice[d]	0 (0–28)		
Higher academic title			
Professor[a]	14 (0–35)	<0.001*	a–c p < 0.001
Associate Professor[b]	7 (0–19)		a–d p < 0.001
Assistant Lecturer[c]	2 (0–10)		b–c p < 0.001
Instructor[d]	0 (0–7)		b–d p < 0.001
			c–d p < 0.05
Published status of the Master's dissertation			
Yes	6 (0–35)	<0.001**	
No	0 (0–28)		
Graduated from/involved in a PhD program			
Yes	7 (0–35)	0.003**	
No	3 (0–28)		

**Kruskal–Wallis analysis of variance, **Mann–Whitney U test.*

Table VI: Distribution of the Graduated/Involved PhD Programs of the Participants

	Already involved in the PhD program n (%)	PhD graduate n (%)
Clinical anatomy	8 (38)	6 (30)
Neuroscience	5 (23.8)	2 (10)
Molecular/genetic/stem cell biology	3 (14.3)	1 (5)
Neuro-endocrinology	-	3 (15)
Physiology	1 (4.8)	2 (10)
Pharmacology	-	2 (10)
Public Health	-	1 (5)
Immunology	-	1 (5)
Biochemistry	1 (4.8)	-
Morphology	-	1 (5)
Histology	1 (4.8)	-
Translational medicine	1 (4.8)	-
Unknown (missed data)	1 (4.8)	1 (5)
TOTAL	21 (100)	20 (100)

and quantifiers of such productivity gained much attention recently (8,14). However, identification of such factors that influence commitment to academics in neurosurgery is not sufficiently known (9,10). Related factors should be determined in detail to support and increase such activities.

In Turkey, integrated MD-PhD programs are not steadily established yet. However, individuals have the opportunity to be involved in PhD programs after graduation from Master's degree programs. This study was conducted to compare such individuals that have been involved in PhD programs regarding publication productivity.

Physicians with MD-PhD training constitute the majority of neurosurgeons since 1990 (3). Moreover, neurosurgeons are known to significantly undertake additional academic degrees besides the residency during their career (3,13). It was emphasized that individuals with MD–PhD degrees have an increased tendency toward research-oriented careers (1). Choi et al. reported MD–PhD trained neurosurgeons to have a greater proportion of academic positions compared with MD-only peers (73.7% versus 52.3%, respectively; $p < 0.001$) (3). Our results also reflect significantly more PhD involved neurosurgeons working in university hospitals and presenting in academic positions.

Bibliometrics have gained much popularity due to the need of establishing standardization in the measurability of scientific productivity. Keough et al. reported that neurosurgeons with MD–PhD degrees outperform the MD-only group in almost all bibliometrics (6). It may be expected for MD–PhD neurosurgeons to have higher academic productivity due to involvement in both clinic and scientific issues. However, 14–16% of integrated MD-PhD graduates have been reported not to pursue careers in research (2,11). Therefore, any factors that may interfere with such relationship should be evaluated in detail. Moreover, publication productivity is known to be positively affected by advanced academic rank (7). However, such relationship may be biased due to factors such as widened research network and gift authorship. Our findings support the data that a neurosurgeon with a PhD degree has higher scores regarding bibliometrics, such as published articles, citations and h index.

In Turkey, it is mandatory to present and write a dissertation to finish any residency program but publication of such a dissertation, which is not an obligation, in a peer-reviewed journal might be considered a criterion toward publication productivity and involvement in academic research. Any attempt to publish such studies usually achieved soon after completion of the study. Our results suggest no association between the publishing status of the dissertation and involvement in a PhD program. However, the population who had published their dissertation presents with significantly higher total published studies and h indexes. Thus, this supports the idea that such population may have a higher tendency toward publication productivity.

The positive relationship between PhD degree and publication productivity in neurosurgery seems to provide a clue regarding how to increase and support such activity. As previously reported, neurosurgery residents with an h index > 2 before graduation were independently associated with academic career placement (4,5). The same might be conducted to encourage residents to be involved in PhD programs. The findings of our study support the idea to establish integrated MD-PhD programs or enhance the funding for such programs in Turkish neurosurgical education.

As a limitation of our reported study, the self-report data could not be confirmed from bibliometric databases due to unknown personal information of the participant that was mandatory to provide totally blind survey.

CONCLUSION

Standardization in measurability of scientific productivity is mandatory to maintain stability and move further in academic activity. Interest in PhD programs continues to increase in neurosurgery as in other branches. PhD programs have a significant contribution to academic performance and scientific productivity. Surgical residents and young neurosurgeons should be encouraged to be involved in such PhD training programs to promote success in both neurosurgery and scientific arenas.

AUTHORSHIP CONTRIBUTION

Study conception and design: EB, GK, HCU

Data collection: EB, MZ, YEG

Analysis and interpretation of results: EB, GK

Draft manuscript preparation: EB, GK, MZ, YEG, HCU

Critical revision of the article: EB, GK, HCU

Other (study supervision, fundings, materials, etc...): EB, GK, MZ, YEG, HCU

All authors (EB, GK, MZ, YEG, HCU) reviewed the results and approved the final version of the manuscript.

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