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Original Article

Studying the Relationship between the Teaching Status of Research Methods, Biostatistics Courses and, Academic Research Skills, from the Graduates Point of View

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ABSTRACT

Introduction: This study aimed to evaluate the relationship between passing biostatistics and research methods courses and academic research skills in graduates.
Methods: This cross-sectional study included 633 graduates during 2016-2022 from Iran University of Medical Sciences, Tehran, Iran. The explanatory factors were passing biostatistics and research methods courses and having statistical consultant. The outcomes were the duration of preparing proposal and thesis, and paper publication. Univariate and multiple logistic regression was used to estimate the odds ratio (OR) with %95CI. Significance level was set to 0.05.
Results: 433 (68.4%) were female, and 371 (58.6%) were married. The mean±SD age of the graduates was 34.5±7.06 years. 413 (65.2%) were graduates from MSc and MPH and 128 (20.2%) from PhD. For Masters and MPH, the odds of prolonging the duration of preparing the proposal for who had Biostatistical consultant in their research team was 40% lower than the graduates who had no Biostatistical consultant (OR=0.6[95%CI:(0.39,0.91], P=0.01). In PhD graduates, the odds of prolonging the duration of preparing the proposal for who passed research methods course was 2.94 (1.06, 8.2) times than that of did not pass (P=0.03). Passing Biostatistics course was associated with lower odds of prolonging the duration of preparing thesis (OR=0.3[95% CI: (0.1, 0.86)], P=0.04). The odds of paper publication was marginally associated with research methods workshop participation (OR=3.7[95%CI: (0.82, 16.74], P=0.09) in PhD graduates.
Conclusion: Passing Biostatistics and research methods courses and presence of a statistical consultant in the students' thesis team were associated with shortened proposal or thesis preparation duration, and having publications from thesis more likely.

Introduction

Since 1986, the teaching of Biostatistics has been approved in many bachelors, MSc, doctorate, and general medicine, dental, and pharmaceutical courses of the Ministry of

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Health and Medical Education (MHME).[1] During this time, thousands of students have graduated in the above fields, and many more are in the process of completing these courses. Recently, studies have been conducted on the situation of medical education in the medical sciences universities,[2-4] however, during this period, a comprehensive evaluation of presentation status of the Biostatistics course, lesson plan, content, and other educational aspects of the Biostatistics course, in medical sciences universities have received less attention. On the other hand, due to the existence of different and numerous grades and fields of study in the MHME, the inclusion or non-inclusion of this course in the syllabus of the different fields of study, the ability of teachers to teach this course, the extent of graduates' research needs according to the content of the Biostatistics course in research projects, theses, and dissertations, the possible presence of Research Methods topics and statistical software in this course, and checking the related expertise of the teachers of these topics, the possible relationship between the Biostatistics course and postgraduates' research skills, the relationship between passing the Biostatistics course and the duration of preparing the proposal, and the execution of theses and dissertations of the medical sciences graduates, the role of the Biostatistics course in publishing research papers from graduates' theses and dissertations, the role of Biostatistics consultant in graduates' theses and dissertations are among the issues that can be investigated more precisely, in order to lead to more preferable decisions by the educational authorities.

Among the areas that need further investigation, the following can be mentioned: the great difference in the syllabus of some Biostatistics courses in different fields of study, the impossibility of full supervision of Biostatistics departments on the content of this course in different fields of study and degrees, the needs and many references of postgraduate students to consult statisticians in their theses and dissertations.

According to the reports, undergraduate students are not interested in Biostatistics, but after graduation and employment, they will realize its value.[5] Balooch Hasankhani and Roudbari reported that 57.1% of doctoral and 43.5% of MSc students of Medical Sciences Universities in Tehran medical Universities were satisfied with the content of their courses.[4] In a study conducted on the perceptions of professional dentists about Biostatistics in India, two-thirds of the participants identified this course as difficult, and half of them identified it as very difficult. Moreover, in this research, it was proved that women use statistical skills significantly less than men.[6] Chen Li et al. showed that age, research experience, and mathematical and computer skills are effective factors in postgraduate students' abilities to learn Biostatistics in China.[7] Another study that investigated the attitude of clinical physicians regarding the Biostatistics course at the University of Rochester showed that 87.3% of the respondents believe that the Biostatistics course can support them in occupational success, while only 17.6% of them considered the content of this course sufficient for their occupational needs. Also, 23.3% of the respondents believed that they can correctly use statistical methods in their studies, and 28% of them believed that they can apply their necessary statistical analysis in the study with no help.[8]

The aim of the present study was to clarify the relationship between passing Biostatistics and Research Methods courses and academic research skills among Iran University of Medical Sciences (IUMS) graduate, to give an insight to educational managers of the MHME and universities of medical sciences across the country.

Methods

This cross-sectional study conducted in 2022, including 633 graduates between 2016 and 2021 from different schools (Medicine, Allied Medical Sciences, Nursing & Midwifery, Pharmacy, Public Health, Advanced technologies in Medicine, Rehabilitation Sciences, Health management & information Sciences, Behavioral Sciences & Mental Health, Dentistry, and Persian Medicine), from IUMS, Tehran, Iran. Demographic characteristics were age, gender, marital status graduation year, degree. The explanatory factors were passing Biostatistics course in their program (Yes/No) and the related score (if any), thesis score; adequacy of the course credit and curriculum of Biostatistics course, the required course credit of Biostatistics course from the respondents' point of view, appropriateness of curriculum from respondents point of view for the Biostatistics course, the semester in which Biostatistics courses offered (1, 2, 3, ≥4), the presence of statistical software and Research Methods courses in the respondents' program, and the related credit course, the presence of Research Methods workshop, previous experience of research, the presence of a statistical consultant in thesis duration, necessity of Biostatistics course/statistical software course /Research Methods course, satisfaction from mentioned courses, the necessity of a statistical consultant in thesis.

The outcomes were the duration of preparing proposal (<6, ≥6 months), the duration of preparing thesis for master and MPH graduated (≤12, >12), the duration of preparing thesis for PHD and clinical graduated (≤24, >24), paper publication from thesis (Yes/No), and the score of theses (<18.5, ≥18.5). Potential sources of bias were recall bias and confounding bias in this research. All the demographic and educational data as well as outcomes were gathered via a web-based questionnaire including 45 questions.

Inclusion criteria were graduation from masters (MSc), Master of Public Health (MPH), Philosophy degree (PhD), and clinical fields (general Medicine, residency, fellowship, and subspecialty courses) between 2016 and 2021, having a valid mobile phone or e-mail in Education Management Information Systems (EMIS) of IUMS. Biostatistics graduates were excluded. The calculated sample size was 601 with an error of 0.05 with a minimum significant difference of 0.04.

Contact information (e-mail or mobile phone) of 9172 graduates was received from EMIS of the Postgraduate Education Department of the university, whom 2174 samples met the inclusion criteria. The web-based questionnaire was sent via a link to the mobile phone and email of the study participants. Finally, 633 questionnaires were received and analyzed. The reliability and validity of the questionnaire were examined by a focus group including nine members of faculty members of School of Public Health, IUMS. The minimum CVI and CVR of the questions were 0.79 and 0.78, respectively.

Qualitative data were described using the frequency (%) and quantitative data were described by mean ± standard deviation (SD). Univariate binary logistic regression was fitted, and the factors with P<20% included in the multiple analysis. Odds ratio (OR) along with a 95% confidence interval (CI) were presented. Hosmer-Lemshow goodness of fit was presented. The data were analyzed using SPSS considering a significance level of 0.05. This project was approved by ethics committee in IUMS with the code of IR.IUMS.REC.1401.079.

Results

From 633 graduates, 433 (68.4%) were female, and 371 (58.6%) were married. The mean± SD age of the graduates was 34.5±7.06 years. 413 (65.2%) were graduates of MSc and MPH, 128 (20.2%) were PhD, and 92 (14.5%) were graduates of clinical courses (general Medicine, residency, subspecialty, and fellowship). Table 1 shows the educational characteristics of the graduated. Statistical course was included in the approved curriculum of 473 (74.7%) graduates. 340 (53.6%) graduates stated that the course credits of Biostatistics course were not enough in their field of study, and 339 (53.5%) participants of them believed that 4 or more course credits are enough for optimal use of the Biostatistics course content, and 241 of them (38.1%) believed that the most applicable time to offer Biostatistics course is the first semester.

Research Methods course was included in the approved curriculum of 487 (76.9%) graduates, of which 275 (56.5%) graduates had taken it as a 2-credit course, and in 334 (68.7%) graduates Research Methods was taught by members of their department. 329 (49.1%) graduates stated that the faculty members from Biostatistics department is more suitable for teaching Research Methods compared to other departments (Table 1).

Duration of preparing proposal

Note that the proposal completion time≥6 months is called prolonged here. Table 2 shows that the odds of prolonging the duration of preparing the proposal for who had statistical consultant in their research team was 40% lower than the graduates who had no statistical consultant for Masters and MPH graduates (OR=0.6 [95%CI: 0.39, 0.91], P=0.01). In PhD graduates, by controlling the effect of other factors, the odds of prolonging the duration of preparing the proposal for who passed the Research Methods course was 2.94 (1.06, 8.2) times than that of did not pass (P= 0.03). Older age was significantly associated with the odds of prolonging the duration of preparing the proposal (OR=0.92 [95%CI: 0.86, 0.99], P=0.02). In clinical graduates, the odds of prolonging the duration of preparing the proposal was 63% lower among who took advantage of a methodologist compared with who had no methodologist (OR=0.37 [95%CI: 0.15- 0.87], P=0.02) (Table 2).

Duration of preparing thesis

In this section, the thesis completion time≥12 months for Master and MPH graduates and time≥24 months for PHD graduates is called prolonged. Table 3 demonstrates that passing Biostatistics course was associated with lower odds of prolonging the duration of preparing thesis (OR=0.3 [95% CI: (0.1- 0.86)], P=0.04).

Table 1. Educational characteristics of the graduated (Total=633)

	Variables	Number (%)
Biostatistics courses	Have passed statistical courses (Yes)	473 (74.7)
	Number of units Biostatistics courses (Unit)	
	1	63 (13.3)
	2	291 (61.5)
	3	79 (16.6)
	≥4	41 (8.6)
	Semester in which Biostatistics courses offered (Semester)	
	1	226 (47.8)
	2	151 (31.9)
	3	55 (11.6)
	≥4	41 (8.7)
	Number of units in Biostatistics courses (Suffice)	
	Enough	293 (46.4)
	Not enough	340 (53.6)
	Number of Biostatistics courses units	
	1 unit	63 (9.9)
	2 unit	139 (21.9)
	3 unit	93 (14.7)
	4 units or more	339 (53.5)
Software courses	Have passed statistical software courses	
	No	279 (44.1)
	Yes	354 (55.9)
	Number of units software courses (Unit)	
	1	121 (34.2)
	2	128 (36.2)
	3	53 (15.0)
	≥4	52 (14.7)
	Presentation of statistical software courses	
	Appropriate	165 (46.4)
	Inappropriate	189 (53.6)
Research Methods course	Have passed “Research Methods” course	
	No	146 (23.1)
	Yes	487 (76.9)
	Number of units in Research Methods (Unit)	
	1	76 (15.6)
	2	275 (56.5)
	3	87 (17.9)
	≥4	49 (10.1)

Continuation of Table 1

	Variables	Number (%)
Research Methods course	The group which presented Research Methods	
	Own group	334 (68.7)
	Biostatistics group	75 (15.5)
	Other groups	77 (15.9)
	Which group is the best to teach the Research Methods	
	Own group	227 (46.6)
	Biostatistics group	239 (49.1)
	Other groups	21 (4.3)
Research status	Duration of proposal preparation (Month)	
	1-5	328 (51.8)
	≥6	305 (48.2)
	Duration of thesis preparation (Month)	
	1-18	383 (60.5)
	≥19	250 (39.5)
	Published article	
	No	128 (20.2)
	Yes	505 (79.8)
	Number of Published papers	
	1	323 (64.0)
	2	118 (23.4)
	3	44 (8.7)
	≥4	20 (4.0)

Furthermore, the Odds of prolonging the thesis preparation was 10% higher in one-year older clinical graduates in comparison to youngers (OR=1.1 [95%CI: 0.97, 1.25], P=0.11). The odds of prolonging the thesis preparing in males was 2.28 times more than females, and nonsignificant in clinical graduates (OR=2.28 [95%CI: 0.61, 8.55], P=0.21) (Table 3).

Thesis score

A high score (excellent score) in the thesis is considered ≥18.5. For MSc and MPH graduates who benefited from a methodological consult in their thesis, the odds for high score was 2.27 times that of who did not (Table 4, OR=2.27 [95% CI: 1.46, 3.55], P<0.001). Among PhD graduates, the odds of obtaining a high score in thesis for those participated in research methods workshop was 3.86 times that of those who did not participate (OR=3.86 [95%CI: 1.04, 14.34], P=0.04). Table 4 showed a direct relationship between passing Biostatistics and Research Methods courses and experience of a high score in the thesis, however, it was not statistically significant (P>0.05).

Paper publication

The odds of paper publication was marginally

Table 2. The crude and adjusted association between factors and the duration of proposal preparation using OR (%95CI)

Graduates	Masters and MPH graduated				PhD graduated				Clinical graduated			
Study Variables	Univariate		Multiple		Univariate		Multiple		Univariate		Multiple	
	OR (95%CI)	P	OR (95%CI)	P	OR (95%CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Passing Biostatistics courses												
No	Ref				Ref		Ref		Ref		Ref	
Yes	1.01 (0.56- 1.80)	0.98	-	-	2.98 (1.40- 6.37)	<0.001	2.29 (0.83- 6.34)	0.11	2.00 (0.84- 4.77)	0.11	1.88 (0.77- 4.60)	0.16
Passing Research Methods course												
No	Ref				Ref		Ref		Ref			
Yes	1.42 (0.75- 2.69)	0.28	-	-	3.9 (1.76- 8.61)	<0.001	2.94 (1.06- 8.2)	0.03	1.52 (0.62- 3.71)	0.36	-	-
Biostatistics consultant in the thesis												
No	Ref		Ref		Ref		Ref		Ref			
Yes	0.65 (0.43- 0.99)	0.04	0.6 (0.39- 0.91)	0.01	0.46 (0.21- 1.01)	0.05	0.46 (0.18- 1.18)	0.1	1.03 (0.41- 2.60)	0.95	-	-
Methodologist in the thesis												
No	Ref		Ref		Ref				Ref		Ref	
Yes	1.37 (0.90- 2.06)	0.13	1.53 (1.00- 2.35)	0.05	0.84 (0.40- 1.77)	0.65	-	-	0.35 (0.15- 0.83)	0.01	0.37 (0.15- 0.87)	0.02
Participate in research methods workshop												
No	Ref				Ref				Ref			
Yes	1.28 (0.82- 1.98)	0.27	-	-	0.50 (0.13- 1.91)	0.31	-	-	1.11 (0.42- 2.91)	0.8	-	-
Age	0.98 (0.96- 1.01)	0.2	-	-	0.93 (0.88- 0.98)	0.01	0.92 (0.86- 0.99)	0.02	1.01 (0.94- 1.08)	0.8	-	-
Gender												
Female	Ref				Ref		Ref		Ref			
Male	1.29 (0.83- 2)	0.25	-	-	0.44 (0.20- 0.96)	0.03	0.31 (0.12- 0.79)	0.01	0.86 (0.38- 1.98)	0.72	-	-
Marital status												
Single	Ref				Ref		Ref		Ref			
Married	0.81 (0.55- 1.2)	0.29	-	-	0.49 (0.22- 1.06)	0.07	1.16 (0.44- 3.06)	0.75	1.19 (0.49- 2.9)	0.7	-	-
Hosmer-Lemeshow Test			Chi-square= 2.27				Chi-square= 9	P= 0.34			Chi-square= 0.11	P= 0.94

Table 3. The crude and adjusted association between factors and the duration of thesis preparation using OR (%95CI)

Graduates	Masters and MPH graduated				PhD graduated				Clinical Graduated			
Study Variables	Univariate		Multiple		Univariate		Multiple		Univariate		Multiple	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Passing Biostatistics courses												
No	Ref				Ref		Ref		Ref			
Yes	1.24 (0.66- 2.35)	0.5	-	-	0.39 (0.14- 1.06)	0.06	0.3 (0.1- 0.86)	0.04	0.60 (0.18- 2.03)	0.41	-	-
Passing Research Methods course												
No	Ref				Ref				Ref			
Yes	0.84 (0.44- 1.62)	0.6	-	-	1.04 (0.41- 2.67)	0.92	-	-	0.64 (0.18- 2.20)	0.47	-	-
Biostatistics consultant in the thesis												
No	Ref				Ref				Ref			
Yes	1.04 (0.67- 1.60)	0.86	-	-	0.72 (0.29- 1.79)	0.48	-	-	2.14 (0.61- 7.51)	0.23	-	-
Methodologist in the thesis												
No	Ref				Ref				Ref			
Yes	1.21 (0.78- 1.87)	0.38	-	-	0.81 (0.34- 1.94)	0.63	-	-	1.16 (0.34- 3.91)	0.8	-	-
Participate in research methods workshop												
No	Ref				Ref				Ref			
Yes	1.35 (0.84- 2.18)	0.21	-	-	0.66 (0.14- 3.15)	0.6	-	-	1.72 (0.46- 6.38)	0.41	-	-
Age	1.04 (1.00- 1.06)	0.01	1.03 (1.00- 1.06)	0.02	0.94 (0.89- 1.01)	0.11	0.9 (0.8- 1.07)	0.15	1.12 (0.99- 1.25)	0.06	1.1 (0.97- 1.25)	0.11
Gender												
Female	Ref				Ref				Ref			
Male	1.15 (0.72- 1.82)	0.56	-	-	0.80 (0.32- 2.00)	0.63	-	-	2.85 (0.79- 10.25)	0.1	2.28 (0.61- 8.55)	0.21
Marital status												
Single	Ref				Ref				Ref			
Married	1.41 (0.93- 2.14)	0.1	1.28 (0.83- 1.97)	0.26	1.40 (0.58- 3.36)	0.45	-	-	0.73 (0.18- 2.94)	0.66	-	-
Hosmer-Lemeshow Test			Chi-square= 18.34	P= 0.01			Chi-square= -	P= -			Chi-square= 5.82	P= 0.66

OR, Odds ratio from binary logistic regression; CI, Confidence interval

Table 4. The crude and adjusted association between factors and thesis score using OR (%95CI)

Graduates	Masters and MPH graduated				PhD graduated				Clinical graduated			
Study Variables	Univariate		Multiple		Univariate		Multiple		Univariate		Multiple	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Passing biostatistics courses												
No	Ref				Ref		Ref		Ref			
Yes	1.23 (0.69- 2.21)	0.48	-	-	5.04 (2.07- 12.27)	<0.001	2.80 (0.96- 8.15)	0.05	1.14 (0.48- 2.72)	0.76	-	-
Passing research methods course												
No	Ref				Ref		Ref		Ref			
Yes	1.07 (0.57- 2.02)	0.82	-	-	5.18 (2.17- 12.38)	<0.001	2.82 (0.97- 8.16)	0.05	0.72 (0.29- 1.75)	0.46	-	-
Bi												
Ostatistics consultant in the thesis												
No	Ref				Ref				Ref			
Yes	0.92 (0.61- 1.39)	0.69	-	-	0.74 (0.32- 1.72)	0.48	-	-	1.77 (0.69- 4.49)	0.23	-	-
Methodologist in the thesis												
No	Ref				Ref				Ref			
Yes	2.22 (1.43- 3.45)	<0.001	2.27 (1.46- 3.55)	<0.001	0.60 (0.26- 1.37)	0.22	-	-	0.94 (0.40- 2.18	0.88	-	-
Participate in research methods workshop												
No	Ref				Ref		Ref		Ref			
Yes	1.12 (0.72- 1.74)	0.62	-	-	3.96 (1.26- 12.41)	0.01	3.86 (1.04- 14.34)	0.04	1.92 (0.73- 5.06)	0.18	-	-
Age	0.96 (0.94- 0.99)	<0.001	0.96 (0.93- 0.99)	<0.001	0.96 (0.90- 1.02)	0.18	0.94 (0.87- 1.01)	0.08	0.99 (0.92- 1.06)	0.73	-	-
Gender												
Female	Ref				Ref				Ref			
Male	0.86 (0.55- 1.33)	0.49	-	-	1.40 (0.56- 3.47)	0.47	-	-	1.08 (0.46- 2.51)	0.86	-	-
Marital status												
Single	Ref				Ref				Ref			
Married	0.91 (0.61- 1.35)	0.63	-	-	0.64 (0.27- 1.51)	0.3	-	-	0.69 (0.27- 1.77)	0.44	-	-
Hosmer and Lemeshow Test			Chi-square= 3	P= 0.93			Chi-square= 7	P= 0.53				

OR, Odds ratio from binary logistic regression; CI, Confidence interval

Table 5. The crude and adjusted association between factors and paper publication using OR (%95CI)

Graduates	Masters and MPH graduated				PhD graduated				Clinical Graduates graduated			
Study Variables	Univariate		Multiple		Univariate		Multiple		Univariate		Multiple	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Passing Biostatistics courses												
No	Ref		Ref		Ref				Ref		Ref	
Yes	1.54 (0.81- 2.91)	0.18	1.58 (0.82- 3.02)	0.16	1.81 (0.57- 5.75)	0.31	-	-	0.32 (0.11- 0.94)	0.03	0.43 (0.13- 1.37)	0.15
Passing Research Methods course												
No	Ref				Ref				Ref		Ref	
Yes	1.42 (0.71- 2.84)	0.31	-	-	2.04 (0.64- 6.52)	0.22	-	-	0.40 (0.14- 1.14)	0.08	0.54 (0.17- 1.72)	0.29
Biostatistics consultant in the thesis												
No	Ref				Ref		Ref		Ref			
Yes	1.08 (0.67- 1.75)	0.74	-	-	0.38 (0.10- 1. 44)	0.15	0.39 (0.09- 1.64)	0.2	0.72 (0.21- 2.44)	0.6	-	-
Methodologist in the thesis												
No	Ref		Ref		Ref		Ref		Ref		Ref	
Yes	1.52 (0.91- 2.53)	0.11	1.52 (0.91- 2.56)	0.11	0.45 (0.14- 1.45)	0.18	0.53 (0.15- 1.83)	0.31	2.06 (0.72- 5.91)	0.178	1.98 (0.69- 5.89)	0.21
Participate in research methods workshop												
No	Ref				Ref		Ref		Ref			
Yes	1.24 (0.75- 2.05)	0.4	-	-	2.84 (0.68- 11.88)	0.15	3.7 (0.82- 16.74)	0.09	1.29(0.40- 4.13)	0.66	-	-
Age	0.96 (0.93- 0.99)	<0.01	0.96 (0.93- 0.99)	<0.001	0.96 (0.88- 1.05)	0.36	-	-	1.02 (0.94- 1.12)	0.59	-	-
Gender												
Female	Ref		Ref		Ref				Ref			
Male	1.49 (0.86- 2.57)	0.15	1.36 (0.78- 2.39)	0.27	0.73 (0.22- 2.38)	0.601	-	-	0.99 (0.35- 2.80)	0.99	-	-
Marital status												
Single	Ref				Ref				Ref			
Married	1.28 (0.81- 2.01)	0.29	-	-	0.60 (0.17- 2.06)	0.415	-	-	1.61 (0.55- 4.70)	0.38	-	-
Hosmer-Lemeshow Test			Chi-square= 5.08	P= 0.74			Chi-square= 0.41	P= 0.98			Chi-square= 1.81	P= 0.87

OR, Odds ratio from binary logistic regression; CI, Confidence interval

associated with research methods workshop participation (OR=3.7 [95%CI: 0.82- 16.74], P=0.09) controlling for other factors in PhD graduates. In other educational degrees, no significant factors were associated with paper publication (P>0.05). Hosmer-Lemeshow test for all models were satisfactory (Table 5).

Secondary outcomes

360 (64.6%) of the graduates who had statistical courses in their curriculum stated that the necessity of inclusion of this course is "Very much" and 176 (34.1%) of whom were "Moderately" satisfied with the presented content. 391 graduates stated that the necessity of a statistical consultant in the research team is "Very Much", and 161 (25.4%) of the graduates who benefited from a statistical consultant in their team claimed that the consultant made a substantial improvement in the quality of the thesis and article “Very Much”. 153 (27.1%) graduates believed that passing statistical courses affects the duration of preparing proposal; “Very Much”, and 141 (25.4%); “Moderately”. 161 (29.2%) graduates believed that statistical consultant affects the thesis or dissertation score; “Moderately”, and 181 (32.1%); “Very Much”. Finally, 191 (34.8%) graduates claimed that statistical consultant is necessary for increase chance of publishing paper; “Very Much”. 332 (67.7%) graduates who had statistical software in their program believed that its necessity is “Very Much”, and 134 (29.6%) of whom had “Very Little” satisfaction of the course content. 368 (67.2%) graduates who had research method at their program believed that it was “Very” necessary, and 173 (32.7%) graduates were satisfied from the content Moderately.

Discussion

According to the research results, the possibility of prolonging the duration of proposal preparation of master and MPH graduates who did not have a statistical consultant in their research team has increased. In the research of Sima et al. in 2020, it has been shown that the researchers were very satisfied with the provision of statistical consulting services by the statisticians.[9]

Furthermore, there is a direct relationship between prolonging the duration of proposal preparation of doctoral graduates and passing the Research Methods course. It could be concluded that this relationship was due to the accuracy of these graduates in paying attention to the rules of methodology in proposal writing. Moreover, the proposal of PHD male and older graduates took less time. Perhaps, the reason for prolonging the proposal completion period of female graduates can be referred to their higher obsession and probably their life events (marriage, pregnancy, taking care of children).[10] On the other hand, less experience in conducting research in younger graduates may lead to prolong the duration of proposal preparation.

Considering the research results, it seems that the presence of a methodologist in the research team can significantly reduce the duration of proposal preparation in clinical graduates.

The Master and MPH as well as clinical graduates whom are one year older than others, had longer thesis preparation period, which is significant in Master and MPH graduates. This result shows that younger graduates defended their thesis sooner, and older graduate cannot finish their thesis soon due to being employed or married. Also, in

male clinical graduates, the thesis preparation period is higher than the female, which is not significant, and this is probably due to males' employment. Furthermore, married Master and MPH graduates have longer thesis preparation period, which is due to their employment or other life event such as having kids.

The study of Wright et al. in 2020 on 3579 PhD students who graduated between 1984 and 1993, showed that there was an association between the duration of the PhD course and their field, and students of science, art, and literature have defended their thesis earlier than others.[11] Moreover, a study in New Zealand on 2770 PhD students, in 2000-2016, showed that the highest ratio of thesis completion belonged to Health sciences students. In addition, the gender and age of the students did not affect the duration of the thesis completion, which is against the result of current study.[12]

The results of the present research indicate that the presence of a methodologist in the Master and MPH thesis research team was significantly associated with the chance of a higher score in the thesis. Among Master and MPH graduates, the effect size of age is estimated to be very close to 1, while it was significant. The reason may be the lack of sample size in the analyzed contingency table cells, which has become significant despite the very small effect size. Therefore, this factor can only be considered as a potentially risk factor. It is expected that this relationship will be seen more precisely by conducting a study with a larger sample size and controlling more confounders. Based on our findings, PhD graduates, who had the opportunity to attend research methods workshop, had a higher grade in the thesis. Moreover, it was found that the older graduates, the lower chance of publishing paper during their study program, which may be attributed to getting employed or other life events at older ages. A Spanish study of 162 master's graduates found that female, subjects with a bachelor of science degree, people who completed their master's degree on time, subjects who entered a PhD program immediately after their master degree, and those who have obtained an excellent score in their master's thesis have succeeded in publishing a paper resulting from their thesis more than others.[13] In addition, another research including the graduates from Tehran University of Medical Sciences during the years 2001 to 2009, the field of the student, the score of the thesis, the scientific rank of the supervisor and adviser, and the number of supervisors and advisers were associated factors with paper publication from the thesis.[3] It is noteworthy to add that obtaining a score≥18 in graduates' thesis is equivalent to paper publication, but at the same time, there are graduates with the score<18 in their thesis with papers publishing after graduation. So, it is necessary to mention that we did not limit the time of paper publication and the time of thesis defense. Therefore, we have no certain point of view on paper publication of the graduates according to their thesis score.

Recall bias was a limitation of this cross-sectional study because the graduates may have lack of memory to remember score, number of units, the time of passing the Biostatistics course, passing the Research Methods course, appropriateness of the curriculum, passing the Research Methods workshop, passing the software course, or other similar cases. Then, the results should be interpreted cautiously.

This study was considered as an exploratory study by authors, and the authors intended to

design a confirmatory study throughout register and adjustment more relevant confounders.

Conclusion

Based on the findings, passing Biostatistics and research methods courses and presence of a statistical consultant or methodologist in the students' thesis team were associated with shortened proposal or thesis preparation duration, and having publications from thesis more likely.

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Conflict of interest

The authors declare no conflict of interest in the manuscript.

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