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Relationship between research self-efficacy and evidence-based practice in the medical students

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Abstract:

BACKGROUND: Due to the rapid advancement of medical knowledge, promotion in research is necessary to have the best clinical practice**.** Research Self-efficacy (RSE) is the researcher's confidence in their ability to conduct a specific study. The Evidence-Based Practice (EBP) represents how to improve the quality of care and treatment of patients. RSE and EBP are the cornerstones of successful research and then efficacious medical practice.This study aims to evaluate RSE and acceptance of EBP and their correlation among medical students.

MATERIALS AND MEHODS: This is a cross-sectional study designed on 600 clinical students at the medical school of Shiraz, using a census method in 2020. Students were invited to fill out the standardized *Phillips and Russell's* questionnaires about RSE (4 domains, 33 questions) and *Rubin and Parrish's questionnaire* of EBP (10 questions). The gathered data were analyzed through the SPSS at $\alpha = 0.05$ using descriptive statistics, t-test, Chi-square, and multiple linear regressions.

RESULTS: There was a positive correlation between EBP and RSE score ($P < 0.05$). The results of linear regression test showed that all variables had a significant effect on our response variables and their effect were significant ($P < 0.05$). The highest mean score in RSE was shown in the subscale of writing skills (52.54). The lowest score was observed in the subscale of quantitative (student's subjective assessment of their ability to work with statistically related data and formulas) as well as computer skills (35.61).

CONCLUSIONS: Students who participated in a research project, workshop, or Master of Public Health program got a higher RSE and EBP. Due to the positive correlation between RSE and EBP, we conclude that trained physicians who can research independently and use research evidence can find the best treatment approach for patients. These finding support the importance of integrating research education in medical curriculum to increase RSE and finally improvement of EBP among medical students.

Keywords:

Evidence-based medicine, evidence-based practice, medical students, research, self-efficacy

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Introduction

A successful academic system can train physicians with adequate clinical competencies and research ability to find valid and up-to-date evidence to deliver services to patients. Research plays a significant role in improving educational processes and the expansion of scientific services in society.[1] One of the critical topics in the research field is the researcher's beliefs and attitudes, especially about their self-efficacy.[2] For effective performance, acquiring skills and believing in performing those skills are required.[3,4] Research Self-efficacy (RSE) is the confidence of a researcher in their ability to conduct a specific study.[5] Individual researcher variables cause a substantial effect on

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research productivity.[6] There is an inverse relationship between RSE and researcher's anxiety; the lower the RSE in a researcher, the greater their anxiety in designing and conducting research.[1,2,7] Besides RSE, evidence-based practice (EBP) also represents an essential academic performance domain. On the other hand, for a better and evidence-based clinical practice, research-related abilities are crucial. Therefore, these two factors seem to be related.[8]

The EBP represents a way to increase the quality of care and treatment of patients. It is necessary for safe, high-quality, and ethical medicine.[9] More precisely, EBP integrates and efficiently utilizes the best present and up-to-date evidence, the physician's expertise, and patient preferences in clinical decision-making.[2]

With the rising demand in the healthcare industry, academic research and EBP are essential for the profession's future. EBP and the importance of RSE continues to influence education and medical practice. Medical educators should design curricular initiatives to facilitate critical thinking and improve the chances of adequately applying research skills in residency and beyond.[4] As *Getenet Dessie Ayalew* showed, most medical practice in low and middle-income countries is not evidence-based.[10] Therefore, understanding the extent and possible ways to improve research skills and EBP is essential for enhancing patient care quality. Several previous studies on EBP evaluated the barriers, awareness, and attitude. Lack of familiarity with effective research methods was one of the main obstacles to EBP.[6,8,10,11] Despite the importance of research and EBP in medicine, previous studies in medical students included a small sample size or directed in the medical-related field, including nursing.[11-14]

RSE and EBP are the cornerstones of successful research and then efficacious medical practice. They can be used to identify the disadvantages and weaknesses related to the research. The significance of research in clinical decision-making, especially for medical students, is often overlooked. This study aims to investigate RES and EBP in the large sample size of clinical students. By increasing RSE during the study period, future health professionals can improve their skills and motivation to use research evidence to expand clinical practice.[15] Since no similar study has been done in the Shiraz Medical School up to now, the results of the study can aid in educational planning to strengthen these factors in clinical medical students before their graduation. Furthermore, it may bridge the present gap between scientific research results and practice in future physicians.[8]

Materials and Methods

Study design and setting

This is a cross-sectional study conducted on the clinical students of Shiraz Medical School. Shiraz Medical School is the part of Shiraz University of Medical Sciences (SUMS), a public medical school located in Shiraz, Iran. About 1660 students in different educational stages are studying at this university. In the period from March to December 2020, approximately 600 students entered the hospital clinical environment and involved in the clinical decision-making in this medical school.

Study participants and sampling

All students who agreed to participate in the study, those who were in the clinical stage and those who entered the clinical stage during March to December 2020 enrolled in this study. No sampling was performed from the target population, and we used a census method. The exclusion criterion was medical students in their 4th year and below those who were not in the clinical stage because they had not entered the hospital or experienced a medical encounter. The total of 600 clinical students were invited to participate in the study. Five hundred and forty-eight students filled out the questionnaire with a response rate of 91.3%.

Data collection tool and technique

A total of 381 students have answered the self-declaration paper questionnaire, and for others, due to difficult access, the electronic questionnaire link was sent to each individual through email to complete.

Demographic characteristics of participants consisted of age, sex, university grade point average (GPA), and the clinical stages (Extern: represent students who enter this clinical stage at the 4th year of medicine. This period lasts 12 months, has four main sections, and covers common issues in general medicine, including internal medicine, surgery, gynecology, and pediatrics. Intern: In the internship, students are responsible for examining patients, diagnosing and treating patients in the hospital, and putting the skills they have been trained to practical use. this stage is the last stage of medical education and lasts 18 months).

Research-related data included participation in research training workshops or research projects (as a principal investigator or members of the research team) or voluntarily participating in the Master of Public Health (MPH) course.[2]

Research workshops in Shiraz Medical School are held separately in the various aspects related to research and EBP, such as academic writing, study design, method

of literature review, etc., in 1-day various workshops in the morning and evening all year round.The RSE questionnaire was used to measure RSE. Phillips and Russell designed the RSE questionnaire for the first time in 1994. Its validity and reliability have been checked in a previous study.[4] *Roshanian and Aqazadeh* translated it into Persian in 2012.[5] The validity of the questionnaire was 0.96. The overall Cronbach's alpha of different sub-domains was more than 0.80. The questionnaire consisted of 33 questions and four subscales, including practical research skills (eight questions), research design skills (eight questions), computer and quantitative skills (eight questions), and writing skills (nine questions). Each question is assigned a score of zero to nine. Zero indicates a lack of belief in the ability, and a score of nine shows sufficient confidence in the capacity to perform a specific research-related task. The range of possible scores varies from 0 to 297. Internal consistency and reliability are 0.96 and 0.94.[6] The subscales' reliability, including research design skills (0.776), practical research skills (0.688), computer and quantitative skills (0.813), and writing skills (0.891) confirmed, respectively, using Cronbach's alpha.[4,5] The EBP questionnaire was used to measure EBP.This questuinnare was first designed and used by Rubin and Parrish in 2010 to evaluate the level of EBP quantitatively. It assesses students' knowledge, attitude, and intention to implement EBP.[7] It was translated into Persian by Ashktorab *et al*. Experts confirmed the face validity of the EPB questionnaire, content validity, and the Scale-Content Validity Index in Persian was 0.98. The overall Cronbach's alpha was more significant than 0.80.[11] The questionnaire contains ten questions. It was measured using a 5-point Likert scale ranging from one (completely disagree) to five (completely agree). The scores range from10 from 50. The higher scores indicate higher EBP acceptance. Scores 10-16 mean low acceptance of the EBP, 17-33 signify intermediate acceptance, and scores above 33 reflect a high level of EBP acceptance.[7,11] The gathered data were analyzed through SPSS (PASW Statistics for Windows, Version 21.0, Chicago: SPSS Inc., USA) at $\alpha = 0.05$ using descriptive statistics, t-test, Chi-square, and multiple linear regressions. We used multiple linear regressions to estimate the relationship between the RSE, EBP scores, and the demographic and research variables.

Ethical considerations

The goals of the investigation were explained to the students who participated in the study. Investigator assured the students that all their information would be maintained confidential, and all students signed the informed consent form. The Ethics Committee of SUMS approved the study under the code IR.sums.med.rec. 1400.169.

Results

Five hundred and forty-eight individuals participated in the study. The participants' age average (standard deviation [SD]) was 26.6 (1.77), with a range of 19-38 years. Other demographic data and research-related data are summarized in Table 1.

The mean score (SD) of RSE was 171.10 (55.71). The higher RSE scores were detected in individuals who took part in the research workshops or research projects. Moreover, these groups obtained higher scores in the RSE domains. In addition, individuals who took part in the MPH program received significantly higher scores regarding RSE and all its domains (all $P < 0.05$), as shown in Table 2.

The overall score of RSE and all its domains was greater in men (181.49 ± 55.98) than women (161.72 ± 54.27) ($P < 0.05$).

The mean score (SD) of EBP was 36.99 (4.33). Cross-tabulation analysis of intermediate and high acceptance of EBP score and demographic and research-related variables are summarized in Table 3. Group data of low acceptance of the EBP were statistically unavailable as no one scored ≤16.

The multiple linear regression tests were calculated to predict the RSE and EBP based on the participants' characteristics. There was a positive correlation between EBP and RSE score (0.343). The significance of all variables showed that the outcome of RSE is approximately eight times in women, 33 times in students who membership of a research project, 12 times in students who participated in the research training workshops, and 50 times in MD/MPH students. Moreover EBP is approximately two times in students who membership in a research project, 0.65 times in students who participated in the research

Table 1: Demographic and research-related characteristics

Variables	*n* (%)
Age (years), mean±SD	26.6±1.77
Overall GPA, mean±SD	16.81±1.11
Gender	
Male	260 (47.4)
Female	288 (52.6)
MD/MPH student	99 (18.1)
Clinical educational stage	
Extern	115 (21)
Intern	433 (79)
Membership of a research project	322 (58.8)
Participation in the research training workshop	302 (55.1)

Extern=5th year medical student, Intern=6th or last year medical students. SD=Standard deviation, GPA=Grade point average, MPH=Master of Public Health, MD=Medicine

Table 2: Comparison of research self-efficacy score by variables

Variable	Research self-efficacy score (mean±SD)	*P*	Research design skills (mean±SD)	*P*	Practical research skills (mean±SD)	*P*	Quantitative and computer skills (mean±SD)	*P*	Writing skills	*P*
Gender										
Male	181.49±55.98	<0.001	42.48±14.77	<0.001	45.43±13.41	0.004	38.73±15.15	<0.001	54.84±17.16	0.002
Female	161.72±54.27		36.89±14.54		42.09±13.32		32.50±15.11		50.24±16.54	
Clinical educational stage										
Extern	164.32±58.04	0.142	37.31±15.26	0.078	42.73±14.66	0.38	34.24±15.22	0.343	50.03±17.72	0.09
Intern	172.9±55		40.13±14.77		43.93±13.1		35.78±15.49		53.06±16.75	
Membership of a research project										
No	145.95±52.32	<0.001	33.55±13.76	<0.001	38.09±13.38	<0.001	29.35±14.36	<0.001	44.95±16.17	<0.001
Yes	188.75±51.11		43.91±14.63		47.59±12.07		39.74±14.72		57.66±15.54	
Participation in the research training workshops										
No	154.1±55.08	<0.001	35.54±14.53	<0.001	40.34±13.47	<0.001	31.43±15.45	<0.001	46.8±16.52	<0.001
Yes	184.95±52.36		42.8±14.42		46.4±12.83		38.74±14.64		57.0±15.97	
Participation in the research training workshops										
No	160.33±51.96	<0.001	36.80±13.84	<0.001	41.73±13.09	<0.001	32.0±13.99	<0.001	49.77±16.55	<0.001
Yes	219.96±45.15		51.98±13.15		52.5±11.44		51.05±11.59		64.42±13.45	

Extern=5th year medical student, Intern=6th or last year medical students. SD=Standard deviation

Table 3: Cross-tabulation analysis of evidence based practice score and demographic and research related variables

Variable	EBP		*P*
	Intermediate acceptance of the EBP, *n* (%)	High acceptance of the EBP, *n* (%)	
Gender			
Male	51 (19.6)	209 (80.4)	0.21
Female	70 (24.3)	218 (75.7)	
Clinical educational stage			
Extern	28 (24.3)	87 (75.7)	0.5
Intern	93 (21.5)	340 (78.5)	
Membership of a research project			
No	64 (28.3)	162 (71.7)	0.003
Yes	57 (17.7)	265 (82.3)	
Participation in the training workshops			
No	60 (24.4)	186 (75.6)	0.2
Yes	61 (20.2)	241 (79.8)	
MD/MPH student			
No	109 (24.3)	340 (75.7)	0.008
Yes	12 (12.1)	87 (87.9)	

EBP=Evidence based practice, MPH=Master of Public Health, MD=Medicine

training workshops, and 1.8 times in MD/MPH students. No significant difference was detected in the RSE and EBP scores of the students in the different clinical stages. GPA showed a positive correlation with EBP in the bivariate analysis ($p < 0.05$), but not in the multiple linear regression [Table 4].

Discussion

In the present study, there is a direct correlation between RSE and EBP. It means that medical students who are more confident in their research-related abilities claim to use more EBP in the hospital environment. They find it easier to catch the up-to-date evidence. This correlation may bridge the present gap between scientific research results and practice in future physicians. As in previous studies, this positive relationship has been expressed to some extent.[8,16-18]

Students who participated in a research project, workshop, or MPH program obtained a higher score in EBP and RSE. EBP is a teachable and learnable skill, and holding training courses promotes its acceptance, similar to any other part of medicine that can be improved by teaching.[13,19-23] It has been observed that active learning approaches improve students' attitudes and communication abilities. All of these can be associated with self-efficacy.[24-26] It is essential for the physicians to have the ability to conducting their personal research or appraising others' researches. It can help them to properly introduce scientific advances into clinical use and practices that are more evidence-based.

The statistical analysis revealed that the mean score of RSE was 171.10 in students of Shiraz Medical School which was lower than that in the other studies.[5,14,27] It was less than the average score obtained from assessing RSE in students of *Phillips and Russell* in America, which

Table 4: Multiple linear regression. The predicting factors regarding research self-efficacy and evidence-based practice were assessed

Parameter	RSE				EBP			
	B	SE	95% CI (lower-upper)	*P*	B	SE	95% CI (lower-upper)	*P*
Gender[a]	8.21	4.2	0.28-16.7	0.043	-	-	-	-
Membership of a research project[b]	33.94	4.37	25.34-421.5	<0.001	1.4	0.38	0.64-2.15	<0.001
Participation in the research training workshops[c]	12.58	4.37	4-21.2	0.004	0.65	0.38	−0.098-1.4	0.08
MD/MPH student[d]	50.87	5.63	39.8-61.94	<0.001	1.8	0.47	0.87-2.72	<0.001
Overall GPA	4.83	1.94	1.02-8.64	0.01	-	-	-	-

[a]Based=Female, [b]Based=Yes, [c]Based=Yes[3], [d]Based=Yes[4]. RSE=Research self-efficacy, EBP=Evidence-based practice, SE=Standard error, CI=Confidence interval, GPA=Grade point average, MPH=Master of Public Health, MD=Medicine

was reported as the RSE score in counseling psychology postgraduate students (190).[4] The differences observed in the RSE score can be due to differences in the students' field of study. Those studies were conducted on the postgraduate students of nursing school and the postgraduate students of psychology and Educational Sciences.[5,11] Through reviewing the medical school curriculum, we hypothesized that medical students may have limited free time due to several clinical tasks.[28] This may explain some of the differences, but comparative studies are needed to find the root cause.

Our analysis showed the student's highest mean RSE score in the subscales in writing skills. The lowest score was obtained in the quantitative and computer skills (based on the number of questions). These results are similar to other reports; the mean score in quantitative and computer skills was lower than other subscales.[4,5,14]When we review the questions of this subscale, contents such as selecting the appropriate statistical test and determining sample size, maintaining the research project documents, collecting data, defending the proposal, obtaining the necessary permissions, and attracting financial support had got lower scores. They require more attention for better training. Our study showed a statistically significant relationship between participation in research training workshops, being members of a research project, or participating in the MPH program and higher RSE subscales scores. These courses can improve the ability of the Trainees' self□efficacy in different domains of research. The results are in the same line with the prior study.[1] Short-term research training workshops helped increase the participants' self□efficacy for research, especially in methodology and communication skills.[12,29,30]

In this study, there was a high level of EBP acceptance among medical students. These results contrast the data obtained from previous studies that demonstrated a low level of awareness and use of EBP among physicians.[31,32] However, the studies on medical students showed increased EBP awareness and critical appraisal ability of articles after participating in the evidence-based training workshop.[8,13-15] The observed difference can be sufficient to hold various EBP training workshops and MPH courses for students. Having these multiple courses play a significant role in promoting EBP acceptance and awareness.[33-35]

There was a positive relationship between GPA and RSE. These findings are similar to those of previous studies.[14,36,37] One of the leading indicators of academic performance is GPA. Previous studies have shown that the higher the self-efficacy is positively associated with the higher the academic performance. Students who believe in their more remarkable ability have better academic performance.[38,39]

We showed that the male gender had higher RSE scores than the females despite the higher number of female participants. On the other hand, Bierer *et al*. revealed no sex difference in their study.[40] Other studies also did not show any significant difference in RSE scores according to gender.[4,14,41,42] This difference may be related to different university environments since men have more learning and support opportunities than women in some academic settings.[43] As with some previous researches, there was no gender difference in EBP.[44,45]

One of the strengths of this study is researching clinical medical students, especially final-year medical interns, in the large and significant sample size. The medical students' level of RSE and evidence-based performance abilities could play an important role, as they are a starting point for visiting and treating patients.

Limitation and recommendation

Among the primary limitations of this study, we can mention the lack of data to examine EBP and RSE barriers. Since the RSE and EBP are self-rated and subjective variables, they may be indented with other personality factors. It is recommended to designed longitudinal and cohort studies on medical graduates to find out the long-term effect of higher RSE and EBP at the time of graduation on clinical performance in the future. It is also suggested that research workshops be included as part of the medical training curriculum and their effects on the student's attitude and practice are evaluated from time to time.

Conclusion

Students who participated in a research project, workshop, or MPH program got a higher score in RSE and EBP. The overall score of RSE and all its domains was greater in men than women. Due to the positive correlation between RSE and EBP, we conclude that trained physicians who can research independently and use research evidence can find the best treatment approach for patients. These findings support the importance of integrating research education in the medical curriculum to increase RSE and improve EBP among medical students.

Acknowledgment and ethical moral code

This study was extracted from a MPH thesis written by Zahra Zia. The Ethics Committee of SUMS approved the study under the code IR.sums.med.rec. 1400.169. We would like to thank the students and professors who helped us in this research.

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Conflicts of interest

There are no conflicts of interest.

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