Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/18201
DOI URL: http://dx.doi.org/10.21474/IJAR01/18201

RESEARCH ARTICLE

DIFFICULTIES IN RESEARCH PROPOSAL WRITING

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Manuscript Info

Manuscript History
Received: 17 November 2023
Final Accepted: 23 December 2023
Published: January 2024

Key words:-
Difficulties, Research Proposal, Medical Students

Abstract

Background: Medical students face difficulties during research proposal development. This study aimed to identify proposal writing difficulties among medical students to provide better targeted research education.

Methods: A cross-sectional study conducted in King Saud Bin Abdulaziz University for Health Science using a self-administered questionnaire, which included 21 items assessing the difficulty of proposal segments. A content validity was done and piloted. Cronbach\'s alpha and exploratory factor analysis were used to assess the reliability and construct validity of the questionnaire.

Results: Two-hundred seventy-six participants responded with a response rate of 55%, 196 of which were males. The most common difficulty was in the statistical analysis section (70%) followed by finding full text articles (49%) then determining sample size (46%). The least common were writing ethical consideration (14%), objectives (17%) and describing study subjects (19%). Difficulty mean was significantly lower among students who have completed their research projects compared to those who have not (mean + SD) 2.91+0.45 vs 3.2 +0.43; with a p-value of < 0.001, respectively. GPA nor gender had an effect on the level of difficulty.

Conclusion: Students face difficulties in proposal writing particularly sections related to analysis plan and finding related articles. Further research is needed to support and improve studentsability to write good research proposals.

Introduction:-

Writing a research proposal is challenging for student researchers especially for those who have just joined medical school. Despite all the effort made by the faculty members to facilitate this process for students, there remain a significant number of students who find it very difficult to prepare a research proposal by themselves and that is evident by the repetitive demands by students to have side meetings and special sessions with the research unit faculty to help them with their proposal writing. As a part of understanding this issue it is useful to understand why conducting a research is important for students in order to help in solving this problem. Medical research has an integral role in health care development and in medical teaching curricula. It also helps medical students to get themselves familiar with the process of asking good scientific questions, learn the correct process of conducting a research early in their career and build good evidence-based knowledge.[1,2]

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Studies have emphasized on the importance of getting medical students involved in medical research courses whether these courses were mandatory or elective. A positive association has been found between conducting a research during undergraduate years of medical school and positive students' attitudes towards research later in their careers.[3,4] A good indicator of career development in future doctors was their involvement in research activities during their medical school.[5] A recent study conducted across 20 medical school in United Kingdom has shown a positive correlation between involvement in research activities and good academic performance.[6] It was seen in these studies that a relatively small number of students actually graduate from medical school with completed research projects and even a smaller number proceed to publication.

A study at King Abdulaziz University, Saudi Arabia was conducted to look into the publication practice among interns, in which, out of 249 interns, 78 had started a research project and 30 of those 78 interns stopped their projects, the most common reason for stopping the research was insufficient medical writing support.[7] In another study conducted across six medical science schools at two universities in Iran, 70% of the students were unwilling to participate in research activities.[8] At Isfahan University of Medical Science, Iran, the perception of students towards barriers to research activities was explored and the study results found that the mean score for barriers to research activities among students was 3.89 ± 0.48 (calculated using a Likert-scale ranging from one to five with five being strongly agree) and the highest mean was related to density of students' curriculum (4.22 ± 0.97), lack of familiarity with research methodology (4.22 ± 0.92), and lack of experience in research activities (4.21 ± 0.88).[9] In the same study, social, cultural, economic and organizational barriers had relatively smaller impact as barriers than individual ones.A study conducted in Iran that involved 608 students from two universities showed that only 36 (6%) students were labeled as researchers (any student who had at least one research project or academic paper).[10] The same study compared between barriers and challenges in research activities among “researcher” and “non-researcher” students and found that lack of time, scientific writing skills, and access to trained assistants were among the greatest barriers in non-researcher students.

Since research writing was a major concern from the students' perspective, and proposal writing for the most part serves as the foundation on which a good research can be established, this study will explore the process of research proposal writing from the aspect of difficultness. Knowing which steps of writing a research proposal pose significant difficulty will help to identify further exploration of solutions.

Methods:-

Study design and setting:

This cross-sectional study was conducted in the College of Medicine of King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia in the year 2016 in which medical students were surveyed using printed questionnaires. The university has a mandatory medical research program consisting of four years. During the first two years of the medical research program students learn how to write a research proposal and by the end of these two years they submit their completed proposal to a research center. In the next two years, the students conduct their research projects based on the plan provided in the submitted proposals and when they finish, they learn how to write a manuscript in order to publish their projects.

Participants and Data collection instruments:

Medical students who had completed writing their research proposal were included (2nd, 3rd, and 4th year medical students). Students in the first year were excluded due to their limited exposure. Students were surveyed using a questionnaire which was prepared according to the current research curriculum of the university.

The questionnaire consisted of two parts. The first part included five questions about gender, current year of medical school, whether the student is undergraduate (joined medical school after finishing high-school) or graduate (joined medical school after taking a bachelor degree), current research status and cumulative grade point average (CGPA). The second part included 21 items to assess the difficulty of the proposal's segments in a Likert-scale ranging from one to five with five being “very difficult”. The validity of the constructed questionnaire was confirmed by professionals from the research unit at the university and reliability based on Cronbach’s Alpha was 0.8. An exploratory factor analysis was done to assess the construct validity of the questionnaire. [Table 1].

Sample size and Sampling technique:
The sample size was calculated using Raosoft online software. With a 95% confidence level, 5% margin of error and 500 the population size the required sample size was 218 based on 50% outcome for the response variable. All students from 2nd to 4th year were invited to participate.

Data collection:
After validation, the questionnaire was distributed among the students by the researchers. A consent form was attached to the questionnaire to explain the purpose of the study and state the confidentiality of data. Distribution of questionnaires was done after the Problem-Based Learning (PBL) sessions, which are part of the university's curriculum, and all students are required to attend these sessions.

Data entry and analysis:
Data were entered in MS Excel using a coding sheet developed and agreed on by the authors prior to data entry. The Statistical Package for the Social Sciences (SPSS, version 20) was used for data analysis. Categorical data were presented as frequencies and percentages and the total score of difficulty of writing proposal was shown as the mean and standard deviation. The mean scores were compared between the sub-groups of the study's sample using two-independent sample t-test and ANOVA. Also, difficulty of each item was recoded as not difficult (by merging very easy, easy, and neutral) and difficult (by merging difficult and very difficult). Chi-square test was used to compare the level of difficulty of individual items between males and females based on difficult vs not difficult category. A test with a p-value of less than 0.05 was considered statistically significant.

Results:-

Demographics:
Two hundred seventy-six out of three hundred students responded to the survey with a response rate of 92%. Gender distribution of the participants was 196 (71%) males and 80 (29%) females. Of the respondents, 124 (45%) were in the second year of medical school, 56 (20%) in the third year and 96 students (35%) in the fourth year. Forty-four (16%) students out of the whole sample were post-graduate. Majority of the students were still conducting their research while 46 (17%) students had completed their project but only one had published a paper at the time of survey. Majority of the participants (81%) had a CGPA of 4 or above out of 5.

Difficulty rates of the proposal's segments:
When asked about difficulties in research proposal writing, students, in general, responded that the most common difficulty was in writing the statistical analysis section (70%) followed by finding full text articles (49%) then determining the required sample size (46%). The least common difficulties were in writing the ethical consideration (14%), writing the objectives (17%) and describing the study subjects (19%). [Figure 1].

Comparing the mean difficulty of the whole proposal between subgroups of the study's population, it was significantly lower in students who had completed their research projects (2.91 ± 0.45) compared to those who were still conducting their research (3.2 ± 0.43) with a p-value of < 0.001. The mean difficulty was significantly lower for fourth year students (3.04 ± 0.44) as compared to second year students (3.19 ± 0.42) with a p-value of 0.02. There was no significant difference in proposal writing difficulty regarding the academic performance measured by CGPA, between males and females or between undergraduate and postgraduate students. [Table 2].

Table 1:- Comparison of proposal difficulty mean between subgroups.

		n	Mean±	p-value
Gender	Male	196	3.14±0.44	0.21
	Female	80	3.07±0.44	
Academic year	Second year	124	3.19±0.42	0.02
	Third year	56	3.09±0.48	
	Fourth year	96	3.04±0.44	
Stream*	Undergraduates	232	3.11±0.44	0.20
	postgraduates	44	3.2±0.47	
Research status	Ongoing	229	3.16±0.43	< 0.001
	Completed	47	2.91±0.45	
Cumulative grade	4.5 - 5.0	127	3.09±0.47	0.10

point average	4.0 - 4.49	98	3.09±0.42	
	3.5 - 3.99	43	3.27±0.39	
	3.0 -3.49	8	3.12±0.41	

* There are two streams of students in KSAU-HS based on the academic degree acquired before joining medical school

Since King Saud Bin Abdulaziz University for Health Science have completely separate medical colleges with different medical writing support for male and female students, comparing both genders in matter of difficulty rates of each segment of the proposal might be useful. Female students reported significantly higher rates of difficulty in the segments of "Finding full text articles" and "Identifying the study design" and lower rates in "Funding". [Table 4].

Discussion:-

Students face difficulties in proposal writing particularly sections related to the statistical analysis, finding full-text articles and sampling. And as shown in this study, proposal writing becomes less difficult as students advance in the medical school. That might be attributed to the amount of knowledge and understanding of research importance and methodology students acquire from repetitive exposures to other researches or from lectures and courses conducted in the field of Evidence-Based Medicine.

Other difficult segments observed from this study were mainly related to methodology such as identifying the outcome variables, methods of data collection, preparing the data collection instruments and identifying the appropriate study design. Many students considered "doing literature review" difficult, that might be attributed to the lack of familiarity with the process of searching for articles especially that it requires a certain amount of skill which is developed mainly through practice. Another segment of difficulty was in selecting the title. As a medical student, selecting the title could be challenging particularly in the first years due to the lack of knowledge about areas of potential need for research, however, as the student learns more, the student starts to ask questions which eventually transform into hypotheses that can be tested.

A similar study, conducted in Cameroon on medical students and interns, showed higher rates of reported difficulties which included referencing of material (84%), writing a research proposal (79%), searching for literature (73%) and knowledge of applicable statistical tests (72%).[11] In the same study when participants were asked about their attitude toward research exercises conducted mandatorily in their university, about half of them did not think they are necessary and that might explain the high rates of difficulty observed from respondents.Good academic performance was not an indicator of less difficulties faced in research proposal writing in this study, even though involvement in research activities was a predictor of good academic performance in a study conducted across 20 medical schools in UK. [6]

This study compared between both genders regarding the difficulty of each segment due to the fact that they receive medical research support from totally separate and different research units. Even though they had different views regarding the order of segments in the difficulty scale, both agreed that writing the statistical analysis section is the most difficult and writing ethical consideration is the least difficult. The significant difference noticed in segments like finding full text articles and funding might be related to departmental matters.

Targeting the most difficult aspects of the proposal writing through different means such as conducting specific extra-curricular courses in the methodology, enhancing students' perception of the research importance to the development of the medical field in general and their future career in specific are important factors that might facilitate proposal writing and reduce the perception of proposal difficulty for medical students.

Researches like this one is very important at the basic level of learning how to conduct a research. It provides a valuable input in the knowledge about and preparation for research conduction for both beginners in the research field and professionals who help in teaching research basics. This research is the first to target such matter in the Middle East and internationally, as it focuses on the specific steps that should be gone through throughout research proposal development rather than exploring subjects that might affect involvement in research activities either directly or indirectly. However, it lacks exploring some variables that might have their impact on the different

segments of the proposal such as (whether students have taken extra-curricular courses in research methodology and the design of the study that they are conducting).

Figure 1:-Difficulty of proposal segments as students reported as difficult or very difficult.

	gender				
	Male		Female		
	N	%	N	%	P-value
Selecting the title	76	39%	23	29%	0.12
Doing the literature review	76	39%	34	43%	0.57
Finding full text articles	84	43%	52	65%	0.001*
Identifying the research question	57	29%	23	29%	0.96
Stating the rationale for the study	59	30%	22	28%	0.67
Paraphrasing the sentences	42	21%	18	23%	0.85
Writing the objectives	33	17%	14	18%	0.89
Describing the study settings	60	31%	20	25%	0.35
Describing the study subjects	39	20%	13	16%	0.48
Identifying the study design	59	30%	40	50%	0.002*
Determining the sample size	98	50%	30	38%	0.06
Describing the sampling technique	94	48%	32	40%	0.23
Writing the data collection method	89	45%	33	41%	0.53
Preparing the data collection instruments	80	41%	24	30%	0.09
Identifying the outcome variables	89	45%	34	43%	0.66
Writing the statistical analysis section	140	71%	52	65%	0.29
Bibliographic references	52	27%	22	28%	0.87
Ethical considerations	27	14%	11	14%	1.00
Funding	60	31%	15	19%	0.040*
Work plan	61	31%	21	26%	0.42
Quality of text and language	60	31%	16	20%	0.07

Conclusion:-

Further research is needed to identify other strategies which target the difficulties in proposal writing, especially methodology, to support and improve students' ability to write good research proposals. Strategies developed to enhance research conduction through targeting proposal writing can be followed through the application of the questionnaire used in this study to monitor the extent of their effectiveness.

Declaration:

Ethical consideration:

Approval of the Institutional Review Board (IRB) at King Abdullah International Medical Research Centre (KAIMRC) in order to conduct the research was granted prior to data collection. Confidentiality of data and anonymity of participants was insured. A consent form was used to explain the purpose of the study and gain consent from participants.

Consent for publication:

Not applicable.

Availability of data and material:
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests:
The authors declare that they have no competing interests.

Funding:
Not applicable.

Authors' contributions:
MM and FKA were involved in the design of the study and the development of the questionnaire. MFA and SIA were involved in collecting and tabulating the data. EM and AO were involved in the analysis of the data. All authors were involved in writing and reviewing the article. All authors read and approved the final manuscript.

Acknowledgment:-
Not applicable.

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Appendices:
Table 2:- Factors' loadings of the rotated matrix using vary-max rotation.

	Component			
	Introduction	**Aim and Subjects**	**Methodology**	**Uncategorized**
Selecting the title	0.69			
Finding full text articles	0.64			
Doing the literature review	0.55			
Identifying the research question	0.52			
Writing the objectives		0.70		
Describing the study settings		0.62		

Paraphrasing the sentences		0.54		
Describing the study subjects		0.53		
Stating the rationale for the study		0.50		
Describing the sampling technique			0.78	
Determining the sample size			0.73	
Writing the statistical analysis			0.63	
Identifying the study design			0.59	
Writing the data collection method			0.57	
Identifying the outcome variables			0.56	
Preparing data collection instrument			0.47	
Ethical considerations				0.67
Work plan				0.66
Funding				0.63
Bibliographic references				0.56
Quality of text and language				0.53

Table 3:- Difficulty of proposal segments as compared between male and female.

	Male (n = 196)		Female (n = 80)		
	n	(%)	n	(%)	p-value
Selecting the title	76	(39%)	23	(29%)	0.12
Doing the literature review	76	(39%)	34	(43%)	0.57
Finding full text articles	84	(43%)	52	(65%)	0.001*
Identifying the research question	57	(29%)	23	(29%)	0.96
Stating the rationale for the study	59	(30%)	22	(28%)	0.67
Paraphrasing the sentences	42	(21%)	18	(23%)	0.85
Writing the objectives	33	(17%)	14	(18%)	0.89
Describing the study settings	60	(31%)	20	(25%)	0.35
Describing the study subjects	39	(20%)	13	(16%)	0.48
Identifying the study design	59	(30%)	40	(50%)	0.002*
Determining the sample size	98	(50%)	30	(38%)	0.06
Describing the sampling technique	94	(48%)	32	(40%)	0.23
Writing the data collection method	89	(45%)	33	(41%)	0.53
Preparing the data collection instruments	80	(41%)	24	(30%)	0.09
Identifying the outcome variables	89	(45%)	34	(43%)	0.66
Writing the statistical analysis section	140	(71%)	52	(65%)	0.29
Bibliographic references	52	(27%)	22	(28%)	0.87
Ethical considerations	27	(14%)	11	(14%)	1.00
Funding	60	(31%)	15	(19%)	0.04
Work plan	61	(31%)	21	(26%)	0.42
Quality of text and language	60	(31%)	16	(20%)	0.07