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Production and Hosting by Knowledge E

Research Article

Medical Research Perspective of the Undergraduate Medical Students of University of Khartoum: A Cross–sectional Study

Abubaker Emadeldin Adlan Koko, Almegdad Sharafaldin Mohamed Ahmed, Almustafa Siddig Mohammed Mustafa, and Mohamed Nasr Mohamed Ahmed Elsheikh

Faculty of Medicine, University of Khartoum, Khartoum, Sudan

Abstract

Background: Research is one of the crucial factors in the advancement of health. Undergraduate medical research training is a cornerstone in medical students' education. This study aimed to evaluate the knowledge and attitude of medical students toward medical research.

Methods: This cross-sectional analytical study included 200 medical students in their fifth and sixth years at the Faculty of Medicine, University of Khartoum. Data was collected using a self-administered questionnaire, assessing students' knowledge and attitudes toward medical research, which were scored out of 100. Data were analyzed using the SPSS software.

Results: Of the 200 students, 69% were females and 31% males; 81% of them held a Sudanese secondary school diploma and reported future clinical career choice. Their mean academic score was 16 out of 32 ± 6.6 points. Students' mean knowledge score was 36 out of 100, which was considered low. Their mean attitude score toward medical research was 48.2 out of 100, which was considered moderate.

Conclusions: This study concluded that the knowledge of fifth- and sixth-year medical students about medical research was low. However, moderately positive attitude was reported among them. It is recommended that students' engagement in active research ought to be started early in their medical school. Additionally, more engaging and interactive methods of teaching research are endorsed to be implemented.

Keywords: attitude; knowledge; medical research; medical students; University of Khartoum

Corresponding Author:
Abubaker Emadeldin Adlan Koko;
ElQasr Avenue, 11111,
Khartoum, Sudan.
email:
bakri.imad.adlan@gmail.com

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1. Introduction

Research is one of the prominent cornerstones in the advancement of health [1]. It is believed that health research has immense economic value as it contributes to the economic gain from good health of workforce, financial savings originally expended on

healthcare, and its influence on commercial development [2]. Undergraduate medical research training is one of the important pillars of medical education [3]. Evidence suggests that medical students with research experience in medical school would have a positive postgraduate academic output and are more likely to pursue an academic career after graduation [4–7].

The undergraduate medical research education not only benefits those who pursue academic careers but also students' research experience can help in sharpening their skills of searching and critically appraising the literature [8, 9]. Besides, linking research and clinical practice is crucial for improving the knowledge base, generating evidence-based medicine, and enhancing patient care through making systematic scientifically based clinical decisions [10, 11].

Teaching research methodology as part of the medical school curriculum is very crucial and has been linked with better attitude toward research [12]. Furthermore, negative attitude toward research has been associated with poor performance in research among medical students [13]. Serving this purpose, several strategies have been developed and introduced into medical schools' curricula including lectures, tutorials, students' scientific conferences, and mandatory and elective research projects assignments [14].

Undergraduate medical research in developing countries is hindered due to several factors; a study reported that medical schools in many developing countries were not considering research as part of their curriculum [14]. Other barriers reported include lack of funding, time, and professional supervision [3]. In Sudan, medical research is included in the curriculum of many medical schools, including the Faculty of Medicine at the University of Khartoum [15]. However, the evidence about medical students' awareness concerning medical research is relatively scarce. The aim of this study was to assess the knowledge and attitude of the fifth- and sixth-year medical students toward medical research.

2. Methods

2.1. Study design and participants

This cross-sectional analytical study was conducted at the Faculty of Medicine, University of Khartoum. This faculty is the oldest and number one-ranked medical school in the country. The school admits a class of more than 300 students each year and offers the degree of bachelor of medicine and bachelor of surgery (MBBS) upon graduation. The school's curriculum was updated in the last five years. Community medicine became

a longitudinal course after this update which is now spread throughout different study years. This study included fifth- and sixth-year students, because a research methodology course is administered in the fourth year as part of the curriculum. A list of all students enrolled in the fifth- and sixth year was obtained from the faculty's register office; a systematic random sample of 200 students was selected from this list using students' identification numbers.

2.2. Data collection tools

Data were collected using a self-administered questionnaire with a previously pretested and validated scale to assess knowledge and attitudes toward medical research [16]. While the first part of the questionnaire assessed demographic data of the students, their academic performance, and type of career choice whether academic or clinical, the second part assessed knowledge about medical research and comprised of 10 questions and the third part assessed attitudes toward medical research and comprised of six questions.

Each question on the knowledge and attitude scales was scored as 1 if the student answered correctly and as 0 if the answer was incorrect. Each scale was reported as a percentage to facilitate comparison with previous studies using the same scales. In addition, academic performance was assessed in the basic sciences (physiology, anatomy, biochemistry, microbiology, neuroscience, pharmacology, immunology, and behavioral sciences). For each subject, a score of 0, 1, 2, 3, and 4 were given for fail, pass, good, very good, and distinction degrees, respectively. Individual scores for each student were summed up to generate an academic performance scale with a total of 32. Data were collected between February and March 2018.

2.3. Statistical analysis

Data entry and analysis were done using the statistical package for social sciences (SPSS) version 21.0. While the continuous variables were analyzed and presented as medians and means ± standard deviations (SD), the categorical variables were reported as frequencies and percentages. Besides, Mann–Whitney U and Kruskal–Wallis tests were used to assess the differences in knowledge and attitude between groups since the data was not normally distributed. We used a multiple linear regression model to evaluate the association between continuous variables and knowledge and

attitude. Results were presented as means and medians ± SD; frequencies; regression coefficients; and *p*-values, considering values < 0.05 as significant for all tests.

2.4. Ethical considerations

Ethical approval was obtained from the institutional review board of the Community Medicine Department, Faculty of Medicine, University of Khartoum. Additionally, an informed consent was obtained for each student before collecting the data, and the methods were carried out in accordance with the relevant guidelines and regulations [17].

3. Results

3.1. Participants' information

The study included 200 students distributed evenly between the fifth- and sixth year, with a mean age of 21.8 years, ranging from 19 to 25 years. Females constituted the majority of the respondents (69%). Most of the students (81%) received Sudanese secondary school's diploma, while Arabic and international graduates constituted 12% and 7%, respectively. A large proportion of students (81%) reported a clinical career choice, while students favoring an academic career choice represented 14%. Also, 55.5% of students had at least one family member who studied medicine. The mean academic performance score was 16 out of 32 with an SD of 6.6.

3.2. Participants' knowledge

The mean knowledge score of students was 36 out of 100 (SD = 14.8). While multiple linear regression model showed a statistically significant influence of academic score on the knowledge scores of students (beta = 0.263, $p < 0.001$), the age of students did not have a statistically significant effect (beta = 0.007, $p = 0.916$). In addition, no significant difference was found in the knowledge scores of medical students across their academic levels ($p = 0.076$), types of high school certificate ($p = 0.69$), or their future career choices ($p = 0.12$).

Seventy-six (38%) participants differentiated the ordinal scale from other types of scale, 99 (49.5%), 88 (44.0%), and 13 (6.5%) students knew the definitions of scientific theory, scientific hypothesis, and scientific truth, respectively. Moreover, 69 (34.5%)

participants said that the best way to check the number of citations for a published paper is the citation index of the Science Citation Index database; 96 (48.0%) said that Medline is a medical database; 138 (69.0%) thought that representativeness is the key characteristic of a sample, and 54 (27.0%) said that the essential characteristic of science is that all conclusions are temporary. Table 1 shows the students' responses to knowledge questions .

Table 1: Responses of fifth- and sixth-year medical students to knowledge questions.

I. A scale from 1 to 5 (like grades on an examination) is called:	**Frequency**	**Percentage**
1. Interval	16	8%
2. It is not a scale	14	7%
3. Nominal	44	22%
4. Ordinal*	76	38%
5. Ratio scale	50	25%
II. All listed rules apply to the process of writing an Introduction		
1. Clearly define the question to which your research aims to provide an answer	18	9%
2. Clearly state why the research has been started	17	8.5%
3. Do not explain textbook facts	35	17.5%
4. Do not explain words from the title of the paper	43	21.5%
5. Make it longer rather than shorter*	87	43.50%
III. How would you define scientific theory?		
1. Scientific hypotheses that may be proven, but lacking evidence for verification	72	36%
2. Set of scientific knowledge on a given topic or area	18	9%
3. Speculation or assumption with no or insufficient evidence	11	5.5%
4. System of hypotheses logically connected to one another, with common background, some of which have been verified*	99	49.5%
IV. How would you define the scientific hypothesis?		
1. A proposed idea or thought	52	26%
2. An answer or solution to a question	9	4.5%
3. An answer or solution to a question which has a capacity of verification or empirical demonstration*	88	44%
4. logical deduction of the premises that may or may not be verified empirically	51	25.5%
V. How would you define the scientific truth?		
1. Absolute truth	11	5.5%
2. Consensus of competent experts*	13	6.5%
3. Fact that can be found in the textbooks	22	11%
4. Facts that your professors teach you	1	0.5%
5. The truth that will be reached through scientific research	153	76%

VI. In the previous year you have published a paper in a prestigious journal – Journal of Immunology. Now you want to check the number of citations your paper has received. The best way to do it would be to search the:		
1. Author index of the Current Contents database	27	13.5%
2. Author index of the MEDLINE database	44	22%
3. Author index of the Science Citation Index database	41	20.5%
4. Citation index of the Science Citation Index database*	69	34.5%
5. Corporate index of the Science Citation Index database	19	9.5%
VII. MEDLINE is		
1. Abbreviation (acronym) that lists the parts of the research article	26	13%
2. International association of medical informaticians	37	18.5
3. Medical database*	96	48%
4. Printed form of the Excerpta Medica	6	3%
5. The first and best known ”on-line” medical journal	35	17.5%
VIII. Representativeness is a key characteristic of a		
1. Population	6	3%
2. Professional paper	15	7.5%
3. Sample*	138	69%
4. Scientific paper	22	11%
5. Scientific research	19	9.5%
IX. The essential characteristic of science is		
1. All scientific conclusions are temporary*	54	27%
2. An experiment is not an objective model of the nature but serves as an introduction into real research of natural phenomena	80	40%
3. Rather obvious scientific conclusion does not have to be testable	11	5.5%
4. Scientific theory cannot merely explain natural phenomena, but must somehow also exert influence upon them	55	27.5%
X. The part of a scientific paper is		
1. Acknowledgment to persons who assisted you during the research*	91	45.5%
2. Author’s curriculum vitae	34	17%
3. Description of the timeline	45	22.5%
4. Letter to the editor enclosed with the paper	30	15%

*Mark the correct answer.

3.3. Participants’ attitude

The mean attitude score was 48.2% with an SD of 18.9. Although the age of the students was found to influence their attitude scores (beta = 0.144, p = 0.048), their academic score had no significant influence (beta = 0.013, p = 0.86), as indicated by multiple regression. In addition, the attitude scores differed significantly between students with

different career choices (academic: M (mean) = 55.95, Md (median) = 50; clinical: M = 47.4, Md = 50; others: M = 29.1, Md = 25), $p = 0.022$. Moreover, the attitude scores differed significantly between students' academic levels (fifth: M = 43, Md = 33.3; sixth: M = 53.5, Md = 50; $p < 0.001$) and types of high school certificate (Sudanese: M = 46.2, Md = 50; Arabic: M = 52.7, Md = 50; international: M = 63, Md = 58.3; $p = 0.004$). Table 2 shows the students' responses to attitude questions.

Table 2: Responses of the fifth- and sixth-year medical students to attitude questions.

I. Do you feel confident in interpreting and writing a research paper?	**Frequency**	**Percentage**
1. No	69	34.50%
2. Undecided	60	30.00%
3. Yes	71	35.50%
II. Do you think undergraduate students can plan and conduct a research project and write a scientific paper?		
1. No	6	3.00%
2. Undecided	12	6.00%
3. Yes	182	91.00%
III. Do you think undergraduate students should participate in research?		
1. No	6	3.00%
2. Undecided	8	4.00%
3. Yes	186	93.00%
IV. Have you ever participated in a research project (apart from mandatory academic projects)?		
1. Yes	67	33.50%
2. No	133	66.50%
V. Have you ever written a scientific paper?		
1. Yes	29	14.50%
2. No	171	85.50%
VI. Medical students can plan and conduct research project without supervision		
1. No	128	64.00%
2. Undecided	28	14.00%
3. Yes	44	22.00%
TOTAL	**200**	**100.00%**

4. Discussion

This study assessed the knowledge and attitude of fifth- and sixth-year medical students in the University of Khartoum, Faculty of Medicine toward medical research. Usually, the formal research methodology course delivered by the Department of Community

Medicine starts in the fourth year; this course is preceded by small courses in epidemiology and biostatistics during the first two years in medical school, and the students are obligated to do a research project and submit their final report by the end of the fifth year.

Medical students' knowledge in this study was considered low, with a mean score of 36%; however, it is worth mentioning that their score was not associated with their gender nor with their type of high schooling and academic performance. A similar study was conducted among Pakistani medical students which revealed a moderate level of knowledge with a higher mean score of 49% [16]. Similarly, another Croatian study concluded that medical students' level of knowledge was moderate with a mean score of 44% [18]. This low level of knowledge might be attributed to many factors including limited research activities in the faculty that include journal clubs, evidence-based medicine sessions, and medical students research conferences. Furthermore, it might be due to the theoretical methods of teaching relying fundamentally on lectures and ignoring other types of engaging ways of teaching like workshops and seminars; however, new methods of teaching have been implied [19]. In addition, relative lack of research opportunities and mentorship might all be contributing factors. Regarding the mentorship and supervision, it's worth mentioning that 22% of study participants thought that medical students are capable of planning and conducting research on their own and without supervision, this might be a serious indicator about a huge gap between medical students and their supervisors in the faculty.

Conversely, the level of attitude of medical students toward medical research was considered moderate with a mean score of 48%, students from international high schools and those who had academic career choice had better attitude than their colleagues, and so did the sixth-year students over fifth-year ones, this might be due to the fact that sixth-year students engage more in research and have better experience [4]. In comparison to other studies, students in this study had a better attitude than contemporaries from Pakistan, however, a lower attitude than the Croatians [16, 18].

Although 93% of students in this study thought that medical students should participate in research, only 34% reported voluntary participation in research compared to 55% among Saudi medical students and 43% among the Canadians [3, 12]. This might be credited to the deficiency of initiatives that encourage medical students and facilitate their participation in active research. Furthermore, in this study, only 15% of the participants said that they had ever written a scientific paper, while in contrast, a study reported that German medical students had contributed with more than a quarter of publications in one institution [20]. The low level of knowledge might have

affected students' confidence on writing and interpreting scientific papers since only 36% claimed that they have the ability to do that, on the contrary, 90% of Pakistani medical students confidently claimed that they can do that [16].

This study deduced that the level of knowledge about medical research among fifth- and sixth-year medical students at the Faculty of Medicine, University of Khartoum was low. However, moderately positive attitude was reported among the students, which may open the door for positive improvements in the faculty research environment in the future. It is recommended that students' engagement in active research ought to be started early in their medical school. Additionally, more engaging and interactive methods of teaching research should be implemented in the curriculum. It is also recommended that extracurricular research activities in forms of seminars, workshops, research awards, and scientific conferences be encouraged.

Limitations

This study explored the medical students' perspective of research on a small subset of medical students population in a single institution, so studies on a much wider scale are recommended. In addition, the study did not delve into students' practices regarding medical research due to lack of a valid and reliable assessment tool.

Declarations

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Ethical considerations

Ethical approval was obtained from the institutional review board of the Community Medicine Department, Faculty of Medicine, University of Khartoum.

Competing interests

No potential conflict of interest relevant to this article was reported.

Availability of data and materials

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

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None.

Abbreviations

M: Mean; MBBS: Bachelor of medicine, bachelor of surgery; Md: Median; SD: Standard deviation; SPSS: Statistical package for social sciences.

Authors' contribution

Conceptualization: AK; study design: AK, AA, AM, ME; data acquisition: AK, AA, AM; data analysis: ME; writing initial draft: AK, AA, AM; and writing and revising final version: AK, AA, ME.

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