Original Article

Factors Affecting Undergraduates' Participation in Medical Research in Lagos

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Abstract

Background: The current situation regarding the scope and contribution of undergraduate medical research to the health space in Nigeria is still largely unreported in formal literature. This study examined the knowledge, attitudes, and the perceived barriers faced by medical students in Lagos toward research. **Materials and Methods:** A cross-sectional study design was conducted among all medical students in 200–600 levels of study at the College of Medicine, University of Lagos. With the aid of Self-administered questionnaires, we examined their knowledge of research and the analytical tools used in research, their attitudes and the perceived barriers to their participation in research. **Results:** The data were obtained from 221 medical students, of whom 52.9% had prior involvement in research and 14.0% and 6.3% had presented or published their research, respectively. The overall knowledge of medical research was low (21.3%) and reported barriers included lack of funding for research' (79.6%), "lack of research and biostatistics curriculum" (76.0%), "inadequate training in research methodology" (74.7%), "insufficient time allocation to undergraduate research" (73.3%), "lack of professional supervisors and proper mentoring" (58.8%), and "lack of equipped laboratory facilities to conduct research" (77.8%). **Conclusion:** Our results highlight the need for more mentored supervision and training to improve their knowledge of the principles and techniques of clinical research to increase involvement.

Keywords: Barriers, medical students, research

Introduction

Physicians in the modern era require both the clinical skills to treat patients effectively and the mindset to keep abreast of rapidly emerging advances in medicine and the ability to critically appraise research evidence to determine the best treatments, management strategies and the outcomes, risks, and benefits of different options.[1,2] Initially, the concept of medical training was based on three premises – patient care, education, and research – often with research depicted as an "add-on" if resources were available. A recent narrative has more accurately placed research as an integral overarching mission of a system comprising patient care, education, community service, and global health.[3] Physicians are already in a good position to generate advances in knowledge through observations when carrying out their clinical duties, and literature has documented many significant advances that have been made that way.[4]

There has been an international documented decline in the number of "physician–scientists" in medical practice,[5-9] with research looking at the factors, barriers, and enablers influencing the career choices for young physicians in academic medicine. Several well-argued treatises have been written that sound a disturbing alarm on the decline of the "physician–scientist." Goldstein described the rise and fall of the "Shannon model," in which the physician–scientist was trained and equipped to apply scientific discoveries to bedside medicine. Through the immense contributions of Dr. James Shannon (1904–1994) who started and headed the National Institutes of Health (NIH), the areas of basic research, disease-oriented research, and patient-oriented research grew.[10] However, while basic and disease-oriented researches

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have developed significantly with many well-known ground-breaking discoveries, the area of patient-oriented research has lagged behind, populated by successful physicians colorfully described as sharing the characteristics 4 Ps: passion, patients, patience, and poverty.[10] It is in recognition of the peculiar plight of the patient-oriented researcher that the NIH has developed several strategies to reinvigorate the production of "physician–scientist."

The alarm bell sounded at the end of the 20th century about the rapidly declining number of first time medical doctors who were applying for NIH grants; this was noted to be due a decline of up to 10% of medical school graduates who indicated interest in research as a career in 1996.[9] It has been documented that trying to get young physicians interested in medical research during residency may be too late. [11] Involvement in research when in medical school has been documented as an underrecognized determinant of a future career in clinical research.[12-14]

In a country that is in such dire need of advancement in knowledge, this poses a frightening prospect. The development of low- and middle-income countries (LMIC) such as Nigeria is closely related to health research. There is a long-recognized lack of career paths to develop, recruit, and retain dedicated researchers, and it has been recommended that new career opportunities need to be opened for much younger researchers through improving access to and mentoring in academic medical research.[15]

For a very long time, LMICs have relied heavily on research findings, interpretations, and applications by the developed countries. However, this has not been able to provide solutions to challenges that are unique to the developing world.[16] Slow advances, however, have been made in medical research in developing countries where more funding, material, and logistic support has been provided for conducting research.[17] Nevertheless, translation and incorporation by health policy makers has not been maximally utilized.[18] The medical undergraduate can play a very important role in any country looking to advance health research and, in turn, advance the health of the citizens. Studies have shown that training for research skills and experience of research early in career has been associated with continued professional academic work and helps inform residents' career decisions, thus encouraging them to devote more of their time to patient-oriented research.[19]

The current situation regarding the scope and contribution of undergraduate medical research to the health space in Nigeria is still largely unreported in formal literature; thus, no concrete statements about the above listed issues can be made. This study examined the perceptions, attitudes, and the perceived barriers faced by medical students in Nigeria toward research. The results will help in ensuring a more conducive and appropriate research environment at the undergraduate level in our medical schools in Nigeria.

Materials and Methods

This was an observational cross-sectional study aiming to identify factors that influence student willingness to undertake or participate in research in the undergraduate period carried out in the College of Medicine, University of Lagos, one of the foremost medical schools in Nigeria. It is in Idi-Araba Local Council Development Area under Surulere Local Government. The College of Medicine, University of Lagos, has three faculties: Basic Medical Sciences, Clinical Sciences, and Dental Sciences. There are 32 departments with a student population of almost 2000 students and staff strength of 1850. The College has to date produced over 6000 graduates in disciplines of Medicine, Dentistry, Microbiology, Physiotherapy, Physiology, Radiography, and Pharmacology.[20]

The study population consisted of all medical students both in the preclinical (200–300 levels) and clinical classes (400–600 levels) in the College of Medicine, University of Lagos, who are registered students in the College of Medicine, University of Lagos, paid up members of the Association of Medical Students, University of Lagos (AMSUL), and gave informed consent. Studentship was determined by ownership of a student identity card and an AMSUL receipt, and there were 989 students. Students on transfer from other medical institutions or who have already obtained bachelors' degrees in other subjects were excluded.

A structured self-administered questionnaire was designed from literature review which incorporated questions on attitudes and barriers that the researchers considered important to our local context. The medical school is currently undergoing a curriculum transition and therefore the lower levels of study also have some exposure to research. The validity of the questionnaire was further refined through pretesting in the main campus among science students (located approximately 7 km away) and suggested amendments made accordingly. The questionnaire was divided into four sections. Section one contained questions about sociodemographic characteristics: their age at last birthday, level of study of the respondents, and details of research experience if any. Section two collected information about knowledge of medical research using 15 close-ended questions about uses of medical research, knowledge of analytical tools, biomedical search engines, and basic research knowledge; the knowledge level of the students was computed and classified as "good," "fair," and "poor" based on scores 10 or greater as good, scores 8 and 9 as fair, and scores 7 and below as poor.

Section 3 addressed the respondents' attitudes and perceptions of research. Sixteen questions testing their opinions on the need and use of research, benefits, their roles, and responsibilities and its "fit" into the medical curriculum were assessed using a 3-point scale of "agree," "disagree," and "undecided." Section 4 identified the willingness of the students to participate in research and the perceived barriers to participate in medical research using 6 closed-ended questions with "yes"/"no" responses. Willingness was categorized as "good" if the participants gave

4 or more positive responses. The themes examined were perception of research as "stressful and complex," "lack of personal interest," unwillingness to understand what research entailed, not knowing how to get involved, preference for specialties that could better provide job opportunities in the future, and the perception that the medical curriculum is already too demanding. Participants were also asked if they were willing to participate in a research methodology workshop.

Barriers were categorized as personal or systemic. Personal barriers were "lack of reward or motivation," "unsure of what the opportunities are," and "difficulty in obtaining approval for study." Systemic barriers were "lack of funding for research," "lack of adequate and research and biostatistics curriculum," "inadequate training in research methodology," "insufficient time allocation to undergraduate research," "lack of professional supervisors and proper mentoring," and "lack of equipped laboratory facilities to conduct research."

Consenting students were approached at the beginning of the lectures, by the research assistants who were also members of the classes they surveyed. This was done to minimize the possibility of perceived coercion of respondents. The questionnaires were distributed and retrieved at the end of the lecture. Only those that were properly filled were submitted for analysis.

Ethical approval for the study was obtained from the Human Research Ethics Committee of CMUL and respondents' privacy was ensured by not collecting any data that could identify the students other than their age, gender, and level of study. Informed verbal consent from each student was indicated by a check-box on the first page. Research assistants used were class members of each study level to reduce the risk of coercion.

Microsoft Excel and Epi Info were used in the analysis. The data collected were checked manually for correctness and completeness immediately after collection and thereafter coded for data entry. The data were entered and analyzed using Epi info version 7.1.2.0 by the Centre for Disease Control, US. The quantitative data generated from the study were analyzed and presented in Tables 1-3 as frequencies and percentages. Associations were examined between study outcomes, level of study, and prior involvement in research using Chi-square. Significance was determined at $P < 0.05$.

Results

Characteristics of respondents

A total of 835 questionnaires were distributed and retrieved over a 2-week period. Eventually 221 questionnaires were properly filled and submitted for analysis, yielding a response of 26.5%. The proportions of response rates for levels of study from 200 L to 600 L were 46.4%, 34.8%, 22.9%, 26.6%, and 15.4%, respectively. The age range was 17–34 years with a mean of 21.1 + 2.8 years. There was a slight preponderance of males (128, 57.9%) over females, and they were almost equally distributed in each level of the study [Table 1]. Almost two-thirds (133, 60.2%) went to private secondary schools. Prior involvement in voluntary or curriculum required research was reported by 117 (52.9%). There was a clear association with level of study, in that those in the higher levels – 400–600 L – were more likely to have had prior involvement in research ($\chi^2 = 17.07$, $P < 0.002$). There was no significant association with gender. Very few respondents had presented their research at a scientific conference (31, 14.0%) or published in a peer-reviewed journal (14, 6.3%). At the time of the study, 132 (59.7%) were undecided about their desired field of specialty in the future. Of those who indicated desired areas ($n = 89$), 32 (36.0%) and 17 (19.1%) indicated surgery and obstetrics and gynecology, respectively.

Knowledge and attitudes of medical research

Knowledge of research was examined using knowledge of what research entails, tools used for analysis research, and biomedical search engines. About two-thirds of the respondents (150, 67.9%) indicated that medical research is mostly about experiments to develop new drugs. Other responses were that medical research is best conducted in hospitals (164, 74.2%) and that research was one way that academic staff use medical students as "free labor" (119, 53.8%) [Table 2]. There was poor knowledge of pubmed.com as a biomedical search engine and 128 (57.9%) respondents

Table 1: Characteristics of respondents

Variable	Frequency ($n=221$), n (%)
Level of study	
Preclinicals 200 L and 300 L	98 (44.4)
Clinicals	123 (55.7)
Sex	
Male	128 (57.9)
Female	93 (42.1)
Secondary school	
Private	133 (60.2)
State	27 (12.2)
Federal	61 (27.6)
Prior exposure to research (yes)	
Prior involvement in research	117 (52.9)
Prior presentation of research at a scientific conference	31 (14.0)
Prior publication of research	14 (6.3)
Desired area of specialty	
Undecided	132 (59.7)
Lab medicine	3 (1.4)
Oncology	3 (1.4)
Psychiatry	3 (1.4)
Radiology	4 (1.8)
Internal medicine	9 (4.1)
Pediatrics	9 (4.1)
Public health	9 (4.1)
Obstetrics and gynecology	17 (7.7)
Surgery (including ophthalmology and anesthesia)	32 (14.5)

Table 2: Knowledge of the definition and scope of research

Knowledge item	Frequency (%)
Medical research is best conducted in hospital settings	164 (74.2)
Medical research is mostly about experiments to develop new drugs	150 (67.9)
Research is about distributing questionnaires in the community	122 (55.2)
Research is the way academic staff use medical students as "free labor"	119 (53.8)
"Google scholar" is more reliable than "Google" when seeking out journals	95 (43.0)
Research involves documentation of new discoveries in medicine	30 (13.6)
You need to seek ethical approval before commencement of a research	21 (9.5)

reported that MS Word is a research data analytical tool. Overall, there was poor knowledge among respondents about the definition of and tools used in research (174, 78.7%) [Figure 1]. Respondents also had very poor knowledge of credible biomedical search engines; only 63 (28.5%) respondents correctly identified PubMed as a biomedical search engine [Figure 2]. The overall knowledge scores were poor with only 47 (21.3%) of respondents giving 10 or more correct responses to the knowledge items [Figure 3].

Factors affecting knowledge

Knowledge was significantly positively correlated with the level of the study; the higher levels of study had higher knowledge scores ($\chi^2 = 74.4$, $P < 0.0001$). There was also a significant positive correlation with prior involvement in medical research; those who had been involved in previous research had higher knowledge scores ($\chi^2 = 6.29$, $P = 0.01$).

With regard to attitudes, more respondents agreed that research had to have monetary and financial benefits (130, 58.8%); however, in less than half of the respondents, there was general agreement that research experience should be a criterion for residency application, thereby ensuring its relevance (107, 48.4%), and that medical research should be included into the medical curriculum from 200 level (100, 45.2%). There were poor levels of agreement with the notions that undergraduate students should participate in research (17, 7.7%) or that the role of research in the medical field is important (7, 3.2%) [Table 3]. Overall, there was good attitude toward research with 175 (79.2%) giving 10 or more positive responses [Figure 4].

Willingness and barriers to research

Willingness was examined by the responses to 6 items. The most often reported item of willingness was "not knowing how to get involved," to which 195 (88.2%) of respondents indicated agreement. Other factors affecting willingness noted by the respondents include; The medical curriculum is too demanding" (184, 83.3%), "Unsure of opportunities available" (151, 68.3%), "Research is stressful and complex" (147, 66.5%), "Would rather

Table 3: Attitudes of respondents to research

Attitude	Frequency (yes) (%)
Research has monetary and financial benefits	130 (58.8)
Research experience should be an important criterion for residency application	107 (48.4)
Medical research should be included into the curriculum from 200L	100 (45.2)
I am only willing to conduct research if it facilitates a better chance of job security	89 (40.3)
Clinical research methodology should be mandatory for all undergraduates	78 (35.3)
Performing research will improve my skills and fulfill my interests	50 (22.6)
All medical advances are based on the proper application of scientific methodology	46 (20.8)
Research time should be allocated separately	43 (19.5)
Conducting a research will reinforce team spirit	35 (15.8)
Engaging in research will provide clarity on academic and career interest and goals	34 (15.4)
Medical student research may help instill a culture of evidence-based medicine	31 (14.0)
Conducting research during medical school will have positive impact	28 (12.7)
Research will help in synthetizing information rather than merely regurgitating it	26 (11.8)
Patient outcomes will improve with continued research	24 (10.9)
Undergraduate students should participate in research	17 (7.7)
Role of research in the medical field is important	7 (3.2)

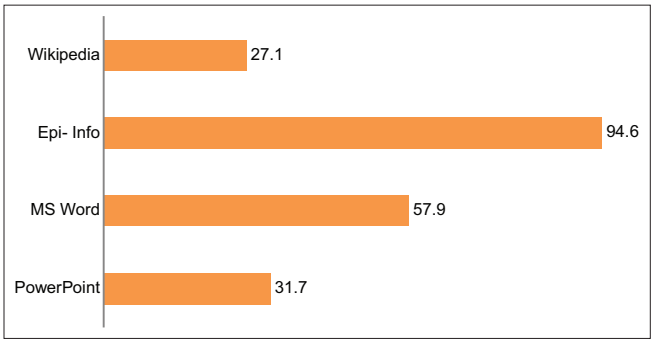

Figure 1: Knowledge of research analysis tools

focus on specialties that improve job opportunities" (120, 54.3%) and "I don't even know what research entails" (75, 33.9%) [Figure 5]. There was a significant negative association between the willingness to do research and prior involvement with voluntary or curriculum-required research ($\chi^2 = 19.3$, $P = 0.04$). Respondents that had prior involvement in research were less willing to do research. There was also a negative association between willingness and level of study; those in the lower levels were more willing to do research than those in the higher levels who had more likely been involved in research ($\chi^2 = 32.6$, $P = 0.04$). There was a statistically significant association between previous secondary education and willingness for research ($\chi^2 = 25.2$, $P = 0.03$).

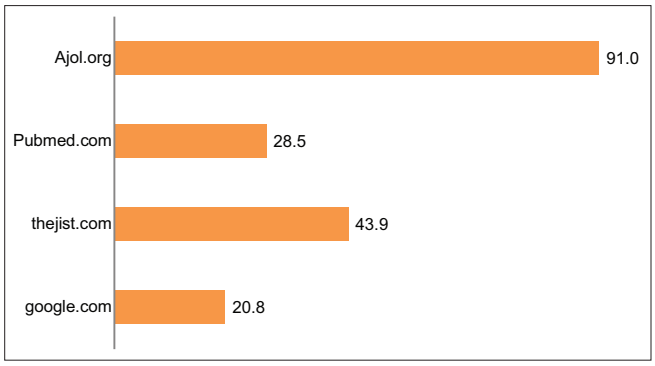

Figure 2: Knowledge of research biomedical search engines

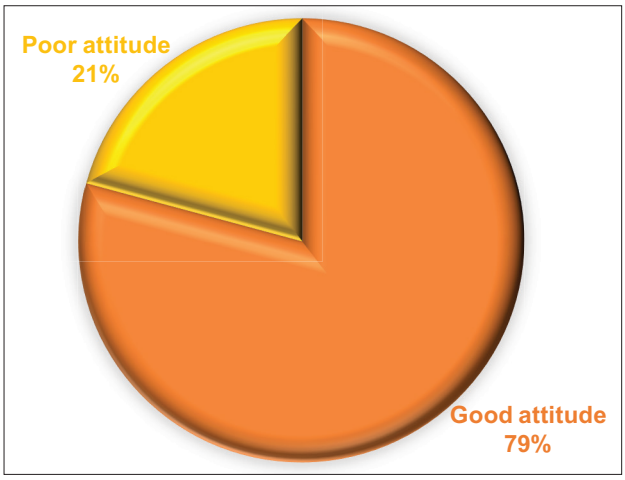

Figure 4: Overall attitude of respondents

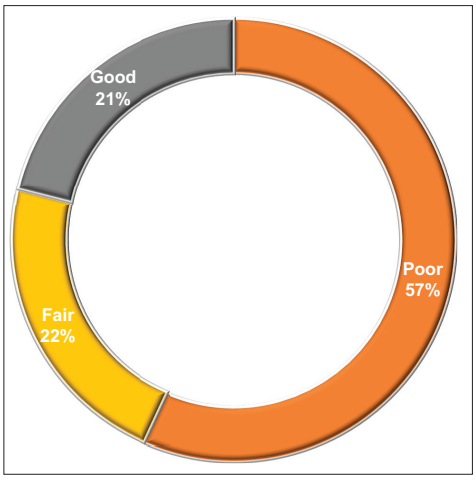

Figure 3: Overall knowledge of respondents about medical research

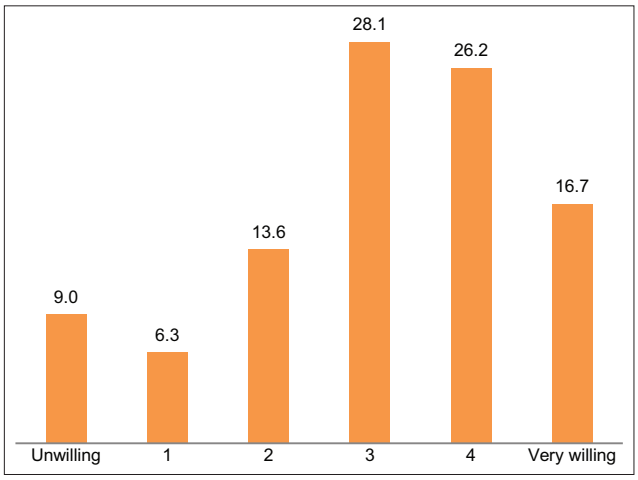

Figure 5: Willingness to do research

Barriers were thematically described as being either personal or systemic. Personal barriers reported were "lack of reward or motivation for research" (155, 70.1%), "difficulty in obtaining approval for study" (111, 50.2%), and "lack of personal interest in research" (81, 36.7%). Of these barriers, there was a significant positive association with personal interest. Those who indicated prior involvement with research also indicated that they had a personal interest ($\chi^2 = 7.3$, $P = 0.03$).

Systemic barriers reported were "lack of funding for research" (176, 79.6%), "lack of research and biostatistics curriculum" (168, 76.0%), "inadequate training in research methodology" (165, 74.7%), "insufficient time allocation to undergraduate research" (163, 73.3%), "lack of professional supervisors and proper mentoring" (130, 58.8%), and "lack of equipped laboratory facilities to conduct research" (172, 77.8%). A research methodology workshop had been planned to hold after the survey and 159 (71.9%) of respondents indicated their willingness to participate [Figure 6].

Discussion

To our knowledge, this is the first attempt to study the attitudes and perceived barriers to research among medical students carried out by medical students in Nigeria. The use of the students themselves as research assistants seems to have allowed the participants to express themselves without a fear of reprisal. The predominant proportion of private secondary school educational background is also indicative of the attitude to research. Private secondary school education has more exposure to the newer concepts of self-directed learning. The proportion of respondents that had been involved in prior research reflects the curriculum-required research that all undergraduates of the University of Lagos must undertake. The low proportions of presentations and publications confirms the challenges of research undertaken in LMICs with little or no sponsorships or funding and inadequate training of the researchers and research supervisors.[21-23] The contributions of medical student research to the body of knowledge have been documented to be a useful indicator of the prestige of a medical school.[24,25]

Knowledge about research, what it entails, analytical tools and biomedical search engines were generally poor among respondents. Knowledge scores were poorer at lower levels of study and in respondents who had no prior involvement in research. However, the lower levels of study are in a newer curriculum based on the student-centered, problem-based

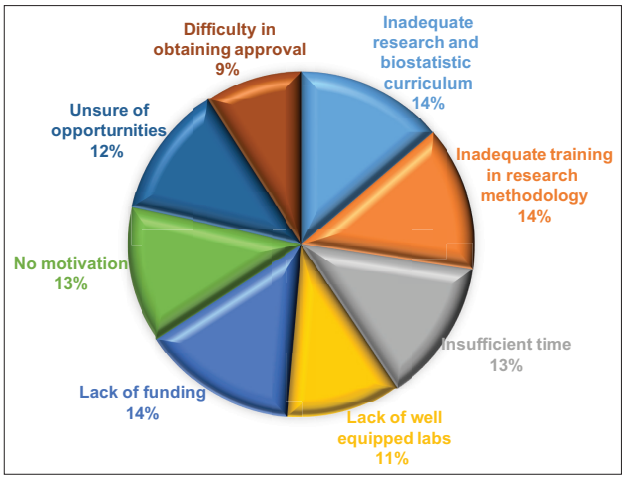

Figure 6: Barriers to participation in research

learning (PBL) model, which has been reported elsewhere to improve the skills and attitudes of medical students to health research.[26-28] Despite the poor knowledge, there was an overall good attitude to research; however, in this study, medical students in the clinical years were significantly less likely to have a positive attitude toward research than preclinical students. This is in contrast to the findings from other research in other similar contexts which report that higher levels of study correlate positively with better attitudes to research, the assumption being that an increased awareness and maturity among students in their clinical years leads to a better outlook. In this study, there was a steady decline first in the response rate to the survey and decidedly in the willingness to be involved in research[25,29,30] This was not examined thoroughly, but the finding that among the barriers to research, respondents had reported the lack of supervision and mentoring leads to the assumption that there are gaps in faculty capacity to instill a research-oriented mindset in the students.

The influence of the PBL model of learning on engendering good attitudes to research has also been reported and this positive influence has implications for improving the research output of the university.[26] The very low number of respondents that had either presented at a local/international conference or had published compares to the experience reported in the UK where a survey of 515 students across 7 medical schools reported that 17.1% had published their research, and similarly, 17.6% of student research had been published from undergraduate research in Peruvian medical schools.[31,32]

The personal barriers reported in this study related to lack of funding and difficulty in obtaining approval for the research. Both of these are well-documented barriers to first-time researchers, but the advantage of faculty and older researchers is that they have the advantages of access to research funding and experience with the administrative framework required. This underscores the need for more active mentoring and supervision, active initiation of junior colleagues and medical students to the intricacies of quality clinical research. Griffin and Hindocha had reported that 91% of study participants wanted to take part in clinical research, 62% felt they had not been encouraged by their senior colleagues, and 57% would like to be involved in research publication to gain experience.[31] Even though this study did not examine these questions in this detail, the inference can still be made that this is an issue that can and should be leveraged on to improve quality and quantity of clinical research.

The other four main barriers to conducting research were inadequate time allocated to student research, inadequate training in methodology, inadequate research and biostatistics curriculum, and lack of well-equipped laboratory facilities. Similar barriers have been reported elsewhere in both developing and developed countries.[1,29,33,34] In the Canadian study,[33] as in this study, there was a comparable trend toward agreement that research experience should be a criterion for residency application. This is revealing of the opportunities that we have in encouraging better quality undergraduate research as a means to improving the residency experience and output.

The Japanese study reported the barriers faced by physicians getting involved in research and noted that "paperwork" was a problem, despite the fewer regulatory obstacles in the country to carry out clinical research. Sumi *et al*. suggested that there is benefit in setting up clinical research support in the form of an administrative center.[35] The importance of having a structure in place to assist with the administration of clinical research is an idea that has been documented previously as part of a strategy to improve the output of clinical research.[36] The study site, CMUL, has an established research administrative center, but perhaps the awareness of its roles and responsibilities needs to be communicated to the undergraduates as part of enhancing the mentored supervision. As was documented over 25 years ago, the factors that lead to improved interest in clinical and academic medical research have not changed much. It is important that an effective targeted leadership through mentored supervision is critical to creating a research-oriented mindset in medical students.[37]

This study has some limitations that need to be taken into cognizance in the interpretation and generalizability of the results. The results are derived from self-reporting on the knowledge, attitudes, and perceived barriers to conducting research as medical students and no independent verification of data was carried out. Students who chose not to fill the questionnaire were not examined to determine whether there was any fundamental difference between them and those who participated in the survey. There is a possibility of self-selection bias in that those who filled the questionnaires are friends of the research assistants utilized. Since a majority of student did not participate in the study, it is difficult to generalize the findings to the general population; therefore, there is a need for a more comprehensive study. The low response rate was unexpected and could be reflective of student attendance at lectures and seminars or general lack of interest in things pertaining to research.

Conclusion

Undergraduate medical students had overall poor knowledge of the definition of and tools needed to carry out clinical research. There was also poor research output in the form of conference presentations and publications. Our results highlight the need for more mentored supervision and training to improve their knowledge of the principles and techniques of clinical research and increase their involvement. The establishment's research administrative center can be used to assist in the production of study documents and guide the dissemination of results by presentation and publication.

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Conflicts of interest

There are no conflicts of interest.

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