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# Early introduction of African medical students into scientific research: a viewpoint and literature review of the importance, barriers, and proposed solutions

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**Abstract:** The involvement of medical students in scientific research has been advocated recently in medical education. With the voices calling for evidence-based practice, scientific research skills emerge as a critical factor in preparing future generations of physician-scientists. However, Africa is a developing continent with limited financial resources, economic problems, conflicts, and political instabilities that slow the developments in medical education. The involvement of medical students of Africa in scientific research has taken a new shape recently with the formulation of student interest groups, collaboration based on personal communications, and non-governmental research societies. The present review highlights the importance, challenges, and solutions to involve African medical students in scientific research.

**Keywords:** Africa; Communication; Evidence-Based Practice; Medical Education; Medical Students; Physicians

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## 1. Introduction

Scientific research has established itself as a strong predictor of optimal medical practice by medical graduates, most especially using evidence-based medicine (EBM) (1). An association of clinical experience and scientific evidence is used to better inform clinical practice decision-making. In 2008, Paul Glasziou advocated that a twenty-first-century physician who cannot search the literature or critically read a research paper is as unprepared as someone who cannot examine the cardiovascular system (2). Therefore, engaging medical students in research has been advocated as a necessity to prepare new generations of physician-scientists who can apply the EBM to improve patient care (3-5).

The need for the early introduction of scientific research skills into medical school curricula has been recognized (6-8). Scientific research enhances the ability of logical thinking and critical appraisal, better suited for understanding the disease process and consequent management (9-11). In the last decades, there has been an increasingly fast-growing trend towards scientific research. Reasons about the importance and compulsory early training of medical students (undergraduate level) in scientific research were highlighted by the Boyer commission. This commission emphasized the fact that research-based learning is the standard for any given undergraduate medical curricula. Many western countries have gotten the ball rolling.

In Africa, although research is taught in all medical schools, only a few African medical students are actively implicated in scientific research aside from the obligatory end-of-course thesis. This has been responsible for the low input into scientific research and literature. This article presents the authors' point of view supported by a literature review to answer the following questions: 1) Is scientific research important to African medical students? 2) Which barriers face African medical students when conducting research? and 3) How can the research productivity of African medical students be enhanced?

## 2. Why scientific research is important for African medical students?

For the past decades, evidence-based medicine has been advocated as the gold standard of modern medical practice. However, studies have shown that African medical students contribute very little to scientific research (12). African medical students should be engaged in scientific research for

**Table 1** The barriers that face African medical students to participate in research; data obtained from literature surveys and the barriers are classified based on the authors' point of view

| Type of barriers | Details | Reference No. |
|---|---|---|
| Educational | African medical students face educational barriers such as the lack of experience in research: Africa is not producing enough personnel for research; most of them are foreign countries products (21). Academic workload is overwhelming and research is not considered a part of the medical curriculum (13,21), especially at undergraduate levels in most African countries. Some medical schools consider engaging in scientific research and publications as a too advanced activity for undergraduate medical students. And medical students who are interested in research, lack mentorship by senior doctors or lecturers who are already in the research field. | (13,18-21) |
| Institutional | Institutional barriers include the lack of a clearly defined career pathway for students who are interested in research; little or no emphasis are laid on research activities and practices in most African medical schools; there is little or no medical faculty interactions, and acknowledgment of students who try to contribute into research. | (18-20) |
| Infrastructural | Some infrastructural barriers to medical students engaging in scientific research are: very few medical schools have research laboratories. In addition, the few laboratories present a lack of adequate equipment for research, and there is also a lack of necessary supplies needed to conduct research (22). Medical journals are mainly based in countries outside Africa. As a result, editors and publishers do not find local and regional studies in African countries as impactful in decision-making as studies done by locals of developed countries. This creates a sort of publication bias and decreases the opportunities for publishing for students from Africa. In addition, papers done by early-career researchers from developing settings face the problem of being perceived by the editors as "need a native English speaker," which creates a form of pre-existing judgment and bias towards authors from developing countries. | (18-20,22) |
| Financial | One of the barriers that African medical students face is lack of research funding. Research has shown that African countries collectively spend about 0.5% of their gross domestic products on research and development, significantly lower than the 2.2% global average (23). | (18-20,23) |
| Cultural | One of the riches of Africa is its culture, which in some cases is a barrier to medical students' involvement in research; one of these is the gender imbalance. In African societies, women have fewer career opportunities than men due to cultural beliefs. | (18-20) |

the following reasons; it helps develop judicious insight into their academic and clinical practice by promoting "bench-to-bedside" practice (13). It also facilitates critical thinking and appraisal and increases understanding of clinical medicine. It enables students to write what they think coherently and concisely. Research active healthcare providers appear to provide better care and achieve better patient outcomes, this makes the investment time in the training of medical students potentially essential to build a healthier society in the long term (14-16).

Furthermore, contributing to scientific literature during student life gives the students the experience of academic publishing, stimulates more research interest, and develops scholarly research abilities (13). It also makes medical students familiar with the scientific literature. Therefore, they become able to identify which information is correct or not over the internet, journals, and newspapers. Further, it makes them more aware of the health problems of their communities (2,5). Finally, research experience during school days improves prospects of the successful application for post-graduate training, grants, and high-impact publications, increases exposure to the best clinical minds and stimulates more research interest in scholarly research (13).

## 3. What are the barriers faced by African medical students in conducting research?

Despite the continuously increasing need for scientific research in the world and especially in Africa, a variety of diseases require significant research to identify context-specific innovations and solutions. Unfortunately, studies show that Africa contributes very little (17). Africa is one of the world regions that have many limitations to clinical research; a recent survey in 27 African countries showed that the lack of formal research teams, lack of internet access, lack of research mentors, and lack of team commitment are the barriers to clinical research in Africa (18). In 2006, a survey of medical students

in Alexandria University in Egypt revealed that most medical students are interested in medical research, however, owing to the lack of funding, lack of mentorship, lack of time, and lack of proper research skills were the common barriers towards student research (19). Another survey of oncology trainees in Africa showed that the lack of research training and longitudinal mentorship are the barriers to their involvement in research (20).

African medical students face many barriers to participating in research. We classified these barriers into educational, institutional, infrastructural, financial, and cultural factors (Table 1).

## 4. Proposed solutions to enhance research capacity building and productivity of African medical students

The nature of the work of medical doctors makes it challenging to recruit qualified health personnel into research. Hence, it is better to equip the students at schools with research methodology so that they are conversant in various aspects of research methodology at the time of qualifying.

**4.1. Research methodology courses** should be introduced at the undergraduate level (13, 24). This will help in sensitizing and motivating them into further research. In addition, because of the overwhelming academic load, a research period should be included in educational programs as an internship. During this moment, the medical students will, with a mentor, carry out research and communicate their results in a write-up (21). By giving students the freedom to increase their duration in research experiences, students with above-average academic ambitions will be encouraged to participate in high-level medical research projects and voluntary courses to develop their skills.

**4.2. Creating medical student research networks** like our model in Egypt might be a solution. We developed a national medical student research model involving 300 medical students with exceptional success (19). The model starts by providing medical students with free online training in database and literature search, clinical study designs, basics of biostatistics, evidence synthesis, critical appraisal, and scientific writing and academic publishing. Additional training is provided through our regular interactive, hands-on workshops in different Egyptian universities. Then students who pass the educational courses are matched into student interest groups working on an evidence synthesis project or a review of the literature under the supervision of at least one senior student researcher with experience in research methodology and a clinician or faculty member to provide the clinical expertise for the research team. Throughout this model, we created a grassroots movement of medical student research in Egypt that is still alive to date. Many program graduates are currently working in top institutions in Egypt and outside Egypt and have had at least 20 international publications in Q1 and Q2 journals of their specialties.

**4.3. Another solution is arranging national and international research conferences** and symposiums for students to expose their skills in research work and consequently be motivated.

**4.4. Creating African medical journals** is essential to enhance student participation in research since their early years of medical school. Exposing students to the academic publishing process helps them identify the key steps and considerations that make the research work publishable.

## 5. Conclusion

Sub-Saharan Africa is one of the main parts of the world where there are not enough research studies to improve and adapt the medical practice to the local need. This is due to the late introduction of African medical students into scientific research and the educational, institutional, structural, financial, and cultural barriers these students face.

To improve African medical practice using research-based learning to attain the goal of evidence-based medicine, some solutions have been proposed, such as the development of a positive attitude towards scientific research and the implementation of research-oriented educational programs to involve African medical students earlier into scientific research.

## 6. Declarations

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None.

### *6.2. Authors' contribution*

Study concept and design: EB and IE; literature search and data acquisition: EB, FEN, LN, YOM, AD, ELM, MB, PR, SK, RN and LJ; manuscript writing: EB, FEN, LN, YOM, AD, ELM, MB, PR, SK, RN, LJ, AN and IE; manuscript revising and proofreading: AN and IE.

### *6.3. Conflict of interest*

There is no conflict of interest to declare.

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