

# Challenges and Opportunities in Teaching and Research in Human Physiology in Ethiopia

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**Abstract.** The aim of this point of view paper is to discuss the challenges and opportunities in teaching and research in the field of human physiology in Ethiopia. The challenges are seen as low availability of physiology teachers, especially those that have PhDs, low research productivity, absence of grants for basic sciences and brain drain. Opportunity for improvement is seen in the emergency of more medical schools in the country. However, close attention to standards of quality, particularly the provision of the full range of inputs required to support teaching and research, is urged.

**Keywords:** Medical education; Quality assurance; Reform.

## 1 Introduction

In Ethiopia, education is given a central position in the country's efforts to eradicate illiteracy and poverty. Higher education institutions have expanded rapidly aiming to address the need of educated society. Currently there are forty-five government owned higher learning institutions and hundreds of private institutions. In its Education Sector Development Programme, the Ethiopian Ministry of Education defines the needs of the education sector and identifies a huge need for more teaching staff to keep pace with growing number of students through modernization of the learning process using modular and interactive approaches to improve the quality of education, and availability of teaching resources such as books, ICT and laboratory facilities (Federal Ministry of Education, 2015).



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Access to quality health service is also limited due to inadequate health facilities and health professionals. Figures from the Federal Ministry of Health of Ethiopia (FMOH) reveal that the physician to population ratio is 0.03 per 1, 000, which is significantly lower than the WHO recommended standard of 1:10,000 for developing countries (Abraham & Azaje, 2013).

The government is striving to improve health service delivery by increasing quality health care, access and the number of colleges and universities to train low, middle and high level health professionals.

One of the basic science courses which are given for every future health professional is human physiology. It is basically the study of life and functioning of internal body and its interaction with its surrounding for the very existence and survival. It is a branch of biology which studies the body functions under normal conditions. It is a foundation for clinical medicine and it is considered as an essential subject in any medical curriculum. The aim of this narrative review is to discuss the current challenges and opportunities in the teaching and research activities in the field of human physiology in Ethiopia.

In Ethiopia, there is a high need for graduates in physiology. Indeed, there are currently only three graduating schools in physiology, one teaching PhD and the other two MSc program but no undergraduate degree in physiology. This results in vacancies of physiology positions that are not filled, impacting possibly of quality education. Basic physiological courses are thought mainly by MSc holders in physiology whose undergraduate degree is either biology or health related programs.

## **2 Challenges in Teaching Physiology**

Physiology is one of the foundational courses for clinical preparation of students. It is taught in the pre-clinical years of medicine and health related programs as a basis for subsequent clinical courses. Physiology is applicable for future clinical practice. A study done in Iran revealed that pathology, physiology and anatomy were the basic sciences courses considered most helpful in preparing students for the clinical world (Jalili, Mirzazadeh, & Azarpira, 2008). Students understood that for inclusive medical aptitude and knowledge, basic sciences courses are significant. Hence quality physiology education for students is a cornerstone for a better understanding of pathological derangements. Teaching and learning physiological courses is challenging for both teachers and students especially in resources limited environments like medical schools in Ethiopia. The challenge is because of several scarcities as discussed below.

## **2.1 Limited number of staff**

The quality of education can be determined by the number and quality of educators. In Ethiopia the number of physiology educators are very few which is disproportionately low to number of medical schools and students. For example, in the author's institution, the department of physiology has five lecturers teaching more than 200 medical students and more than 600 allied health science students all in their first academic year.

Physiology educators have to teach lectures, facilitate laboratory sessions and participate in research and community services. Low lecturer to student ratio results in overloading of the lecturers and poor supervision for students. The number of graduates in physiology each year is quite low. Currently, only three universities are teaching physiology at the post graduate level. The graduate students enrolled in these universities are first degree holders in either biology or allied health professions like pharmacy and Nurses. There is no single higher education institution in the country that teaches physiology as under graduate program. This may be one of the causes for the shortage of physiology educators in the country.

Contextual teaching linking theory to real life situations is crucial to impress upon the students the usefulness of a basic science subject in clinical years. This would also motivate the student to adopt a deeper approach to learning, resulting in the student interacting vigorously and critically with the course and focusing on the overall meaning (Entwistle, Tait, & McCune, 2000). Accordingly, a sound knowledge and skills in the clinical practice help to integrate basic physiological courses. The number of medical doctors specialized in teaching physiology is almost null. To the author's knowledge currently there are only three physiologists whose undergraduate degree is doctor of medicine and active in teaching and advising students in the department of physiology.

A study done by Nebyou S. and his colleagues to assess the medical students' choice of specialty and factors determining their choice revealed that no one has any intention to join basic science disciplines (Seyoum, Biluts, Bekele & Seme, 2014). According to this study basic science courses were not their primary choice because of several reasons. One reason not to choose physiology or basic science courses is that there is no good income while teaching and involving in research in the areas of pre-clinical courses. Family expectations, prestige and power, interest in clinical services were among the factors which make them to prefer clinical fields as their career (Yamazaki et al., 2013).

Physiology teaching involves practical sessions ranging from minor vital sign monitoring practices like blood pressure measurement to organ bath preparation to evaluate the effects of ionic concentrations on the heart. These laboratory experiments need practical knowledge and skills. In this regard, another challenge in teaching physiology is limited number of laboratory technicians in the department of physiology. Majority of staff working in the laboratory are nurses, laboratory technicians or pharmacy technicians who are diploma holders. None of them got formal training to practice physiological experiments.

## **2.2 Poor and Ill-organized Teaching Infrastructure**

Effective teaching is delivered and knowledge transfer is achieved if the teaching and learning environment is favourable. The author had a chance to visit several medical schools over the past few years in the country. Most of the medical schools are struggling with shortage of class rooms, staff offices, laboratory rooms and up-to-date equipment and reagents. Students do not get enough references and even the text books are outdated due to unaffordable costs. In order to minimize the challenges in teaching –learning activities, the ministry of health distributed tablet computers for each student for self- learning. Author’s informal discussion with students about the significance of these educational devices revealed that students have benefited as they are able to access online books, videos lectures and animations simplifying complex concepts in physiology and anatomical organizations of the body.

## **2.3 Curricula Challenges**

Periodic revision of a given curriculum is mandatory to address the changes and expectations of the scientific world and society. Revision of medical curricula is recommended every 5 years as half of all medical knowledge becomes outdated within this period (Olopade, Adekunle, Raji, Fasola, & Oluwabunmi, 2016).

Since the launching of medical education in the country, the curriculum for medical education is designed in such a way that teaching basic science courses is teacher-centred and more theoretical and limited self- learning practice. There has been stagnation in teaching methods and learning of physiology.

In our set up we introduce the principles of physiology and proceed based on assumptions of pre-requisite and the proximity of functions and the complexity of the topic. For example, we give cardiovascular physiology followed by respiratory systems physiology. Instructors give their lectures printout to students and encouraged them to read available references in the library. Informal discussions with instructors and students claimed that students are heavily dependent on reading hand-outs and utilization of references is not well taken seriously. Physiology education is also devoted for theoretical aspects and there are limitations in hands of practical skills. It is now generally accepted that for the contemporary medical education competency-based medical education curriculum is the preferred instrument (Frank et al., 2010). In Ethiopia, majority of medical schools still use the traditional medical curriculum. Some educators have argued that the traditional curriculum has to be revised to tune the knowledge of graduates with the health needs of society and contemporary medical education. On the other hand others have reservations in the revision of the old curriculum citing depth of content as a reason for resistance.

Nevertheless, the Ethiopia Federal Ministry of Health (FMOH) along with ministry of higher education are working together to standardize the medical curriculum in all medical schools in order improve the quality of medical training.

In this new initiative the plan is to change and harmonize the traditional curriculum in to the “Competency-Based Integrated Modular Medical curriculum.

### **3 Challenges in Research in Physiology**

The policy of higher education institution of Ethiopia on teaching and research load article No. 5.5.1/2003:99 states that academic staff members are expected to devote 25% of their time to research, and staff members of research institutes are expected to have a home base in an academic faculty or department where they are expected to devote 75% of their time on research.

Researching is a path for new knowledge and a means for solving the societal problem. Research output in Ethiopia in particular and in sub-Saharan Africa to the global scientific world is very limited. This region contributes less than 0.9 % to global published work, with South Africa contributing over 50% of that amount (UNESCO, 2009).

The Ethiopian ministry of education together with ministry of science and technology clearly understood the significance of research and they are encouraging researchers and institutions to take time for research and community services for which universities are allocating budget.

Physiology is the basis of knowledge for health and medical professionals as it provides an understanding of the functioning of the various systems of the body under normal conditions, which is important for the diagnosis of diseased body organs and best possible management options((Sefton, 2019).

Researching in physiological field is challenging in Ethiopia. One can argue that the reason for the low output in research is poor funding and thus fewer resources for acquiring appropriate equipment for research. In addition to financial constraints to undertake research activities in physiology, several other challenges are visible in the Ethiopian context.

#### **3.1 Teaching Load**

Faculty members often loaded with teaching. The student–staff ratio is large enough impacting research work and therefore little research output to the scientific world. Most medical schools have laboratory rooms with outdated equipment and inconsistent availability of reagents and consumables for research projects due to inadequate budgets and lack of support from the institutions.

#### **3.2 Limited number of PhD holders**

There is only one university in the country accepting PhD candidates and give formal training. Because of this there is critical shortage in PhD and senior physiology educators and researchers. The problem is further complicated in that

medical schools do not support basic science staff to collaborate with developed nations for experience sharing, exposure and post graduate opportunities.

### **3.3 Limited Grants**

Internal and external funding to support projects in basic sciences is very scarce. The nature of the fields and direct application of the research output from these sciences is limited considering the status quo of the country.

### **3.4 Brain Drain**

Brain drain also known as a human capital flight is the movement of people especially the most skilled and competent individuals or manpower from the less developed countries to developed countries. It is the movement of a knowledgeable and skilled people such as medical doctors and scientists from one country to another, commonly for better quality standard of living. Bach speculated that brain drain from Africa to developed countries is due to several factors including conflicts and political instability, job opportunities, better standard of living, favourable environment and others (Bach, 2008).

Inter departmental transfer is also very common in the department of physiology. For example, Technical assistants often stay for about two years and then flee to other departments after upgrading their degree which renders quality laboratory works. Movements between institutions within the country are also common. Physiologists often leave their institutions for greener pastures resulting in unstable staff load within the physiology department which ultimately negatively affect the quality of service delivery at home institution.

## **4 Opportunities and Future Perspectives**

Physiology is a backbone of undergraduate medical curriculum. However, it has been recognized as a challenging discipline for students. Despite the presence of several constraints hindering the proper teaching and researching in the field, especially in the developing countries like Ethiopia, the author believes that there are windows to improve the status quo. The expansion of medical schools in the country is a good opportunity. It creates a platform for professional connections and transfer of knowledge and scientific contribution. The Ethiopian government is also developing a good attitude towards the significance of applied research in tackling the societal problems.

In addition to this, young and enthusiastic individuals are developing a positive attitude and perception towards teaching and research in physiology and this is a good opportunity for institutions to alleviate the problems of shortage of physiologists in the long run. Furthermore, institutions are striving to foster research

activities by building infrastructures and encouraging faculty to devote their time for research and community services.

Increasing the quality of higher education through teaching and research should remain the principal objective of every higher education institution. This objective would be achieved if the quality of educators and researchers is improved. The institutional leaders and the government at large should pay special attention and support basic science education and research including physiology for improvement in the quality of medical practices. The provision of funding for basic science fields like physiology should be improved. Creating the good teaching learning environment is also recommended to reduce staff brain drain. Opportunities have to be created for staff development through postgraduate training in masters and doctoral programs.

In addition to this, the curriculum over physiology education has to be harmonized in such a way that a course has to be vertically and horizontally integrated with clinical and basic sciences respectively. Hence the need for special training for physiology educators and sound collaboration with clinical disciplines is mandatory.

Finally, encouraging medical graduates to pursue their careers in basic sciences would also be of helpful for better integration of the courses with clinical concepts. Furthermore, purchasing laboratory equipment along with consumables and materials needed should be also given special attention.

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