



Clinician-scientist (MD-PhD) postgraduate programs in Sudan: challenges, strategies, implementations and future directions?

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Contributions: (I) Conception and design: MH Ahmed; (II) Administrative support: All authors; (III) Provision of study materials or patients: All authors; (IV) Collection and assembly of data: All authors; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Abstract: The MD-PhD programme allows medical students to be trained in one programme and obtain two degrees, one in medicine and the other in research. In America, some countries in Europe and the far East, the MBBS is always referred to as MD. However, in UK, Australia, some countries in the Indian subcontinent and Africa, including Sudan, the MD is a postgraduate degree. The main goal is to produce physicians-scientist who can conduct clinical work with a researcher mindset. Other benefits are to provide research leaders, mentors and supervisors for the next generations of doctors. We searched Medline (PubMed) and Google Scholar for scientific publications published in English since 1950. We used the keywords MBBS-PhD OR MD-PhD programme AND academic medicine AND Sudan AND research OR barriers of research OR epidemiology. The Sudan Medical specialization board (SMSB) is the only postgraduate body in Sudan for training of medical doctors at postgraduate level and candidate will receive MDs in different clinical specialities after competing four years of training (research dissertation is expected to be completed in year four). In this review, we proposed that SMSB offer an MD-PhD programme at the postgraduate level with a duration of 6–7 years, with PhD in clinical epidemiology. Notably, the pandemic of COVID-19 brought immense recognition and light for the importance of epidemiology in managing the infectious disease and the management of the high prevalence of non-communicable diseases (diabetes and hypertension). In addition, clinical epidemiological research requires relatively less funding than molecular or cellular research. The databases for population studies will allow: how the illness develops, analysing data with understanding of the social and ethical conditions in Sudan, so researchers can produce solutions based on innovations with a practical ability to communicate these solutions to different teams. Therefore, a candidate like this needs to be trained in advanced understanding of statistics, logic, critical thinking, planning and strategizing skills and the ability to use broad clinical and research knowledge to understand the link between diseases and traditions and customs of different tribes in Sudan. Therefore, the MD-PhD programme in Sudan will lead to the establishment of new generations of clinical scientists who will be able to shed light on the behaviour of different diseases in Sudan including COVID-19 and how to apply appropriate strategies in management and prevention.

Keywords: Clinician-scientist; MD-PhD; postgraduate programs; Sudan

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Received: 10 June 2021; Accepted: 18 October 2021; Published: 25 March 2022.

doi: 10.21037/jphe-21-36

View this article at: <https://dx.doi.org/10.21037/jphe-21-36>

Introduction

The first MBBS (MD)-PhD programme was first offered in the USA in 1956. It was provided by different universities (1,2). Such programme was provided for undergraduate students as two years in basic sciences followed by four years as PhD and then followed by two years as clinical training. Then the candidate will be awarded MD degree (3,4). Cambridge university started MBBS/PhD programme in 1989, which last for nine years. Four years followed by three years research and then two years in specialist clinical practice (5). A Similar programme was established by other UK universities like university college London, Imperial College London, Manchester, Newcastle and Leicester (5,6).

The MD-PhD programme was also established in other countries like Singapore, Japan, Sweden, Switzerland and South Africa (7-11). Importantly, Abu-Zaid *et al.* [2016] suggested the need for the MD-PhD programme in Saudi Arabia. They based their argument on the benefits of the MD-PhD programme, such as scholarly activities for medical students are part of the progress of the country and the opportunity to produce doctors who can drive innovation in their country and around the world (12). Another reason is the fact that there is a severe shortage of physician-scientists around the world and such programme can help in filling the gaps in such important profession (12).

To our knowledge, this represents a first report to call for this innovative programme in Sudan at level of postgraduate. Furthermore, there is no programme for the award of MD-PhD in Sudan. The majority of the clinicians in Sudan are involved in clinical practice, with few clinicians are able to conduct clinical or basic research. Implementation of the MD-PhD programme will not be simple due to various reasons:

- (I) Funding constitutes one of the significant challenges against this program. Most MD candidates in SMSB are self-funded; extending the duration to seven or eight years will burden the candidate unless external fund resources are available through different sponsorship bodies.
- (II) Another challenge will be the long duration of the MD-PhD program; MD candidates are more likely

to have their subspecialty training immediately after completing the MD degree (4 years MD + 2 years). This per se may discourage some candidates from pursuing research career. This again emphasis the need to support candidates with research and academic interest.

- (III) The introduction of the MD-PhD program will need a considerable effort in term of coordination and collaboration between different stakeholder's and research leaders to adopt this program and to learn from the experience gained by different programs in different countries about the MBBS-PhD program. Ultimately this may allow for establishment and designing a community oriented curriculum model of MD-PhD in Sudan that will be aligned with the curriculums of medical schools in Sudan to serve the need of the community and address health challenges in Sudan (13-15).

Taking into considerations all these factors, implementation of the postgraduate MD-PhD may be an excellent option to fill the gaps of the physician-scientists in Sudan, especially PhD in epidemiology (16-20). We have recommended the PhD in clinical epidemiology as an option for various reasons: (I) to provide clinicians with the ability to conduct clinical and populations studies; (II) this will help to promote research culture and endorse the fact that research is an integral part of the health care system; (III) attraction of international funds and ability to conduct clinical trials in Sudan; (IV) the opportunities to establish research centres dedicated for communicable and non-communicable diseases; (V) epidemiology requires excellent written and verbal communication skills, which will increase the national and international profile of research conducted in Sudan. The main objective of this article is to discuss whether implementation of MD-PhD in clinical epidemiology can enhance the conduction of clinical research in Sudan. We present the following article in accordance with the *Journal of Public Health and Emergency* reporting checklist.

In this review article, we searched Medline (PubMed) and Google Scholar for scientific publications (original and review articles) published in English within the last four decades about MBBS (MD)-PhD programme in different countries and academic medicine. For the MBBS (MD)-

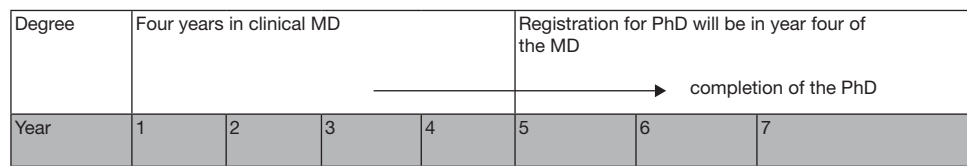


Figure 1 The postgraduate doctor will spend four years of clinical training as requirement for MD degree. In the fourth year, the graduate can register for the PhD and on successful completion of year four (clinical and research component) he or she will be awarded the MD and then will be allowed to complete the PhD research training. The MD-PhD programme can be completed in seven years and this better than the MBBS-PhD programme which usually takes nine years to be completed.

PhD programme we also searched for experience, obstacles, and outcomes. We used the keywords MBBS (MD)-PhD programme AND academic medicine AND Sudan AND research OR and barriers of research and OR epidemiology. We have included all major articles published in English since 1950 that we thought will be relevant to the readers to give comprehensive review about the MD-PhD programme in Sudan.

Suggested structure and benefits of the MD-PhD programme in Sudan

SMSB is the only organisation in Sudan that is responsible for the doctors training at postgraduate levels in different specialities (21) and after four years the candidate will receive MD in his clinical specialty. In the final year, the candidate is expected to conduct research and write a thesis and pass the oral examination. We propose that for candidates with research aspirations and careers in medical research, during this final year, they can have the option to register with a university for additional PhD degree and after one year they can qualify to receive their clinical MDs without delay in obtaining his/her degree. (*Figure 1*). The first year can be equivalent of MSc in epidemiology (this can be established by the SMSB or any of the leading universities in Sudan authorized by SMSB). This also may generate the flexibility that SMSB may consider the award of MSc in clinical epidemiology for candidate who don't want to pursue PhD, but with interest in conduction of clinical research. The option of PhD in epidemiology will benefit the country and the candidates. For instance, if a surgeon completed his Clinical MD, he or she can choose to look at risk factors associated with lower limb amputation with the opportunity to include thousands of patients and exploring the social, psychological and economic impact. Such a project can be extended to include all centres in Sudan and looking at different traditions and

customs that can be associated with or lead to amputation. Such a database can help understand how the health system can help handle risk factors for amputation using different surgical approach, medical treatment can also be investigated.

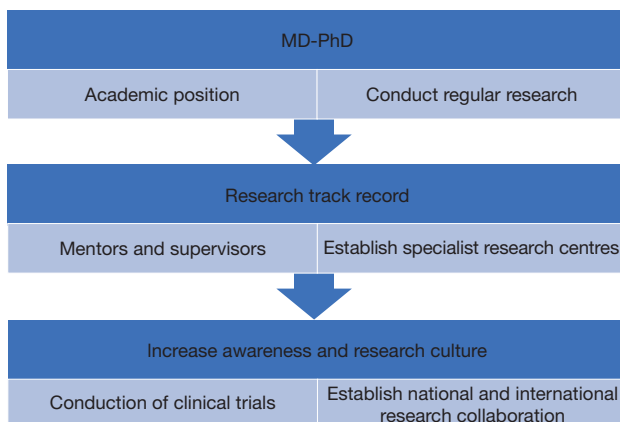
Such wealth of experience in research, will help the health care authorities in Sudan design policies and strategies to decrease the risk of lower limbs amputation. This example can be used in different specialities like diabetes, breast cancer, childhood illness, maternal mortality and morbidity, COVID-19 and other communicable and non-communicable diseases. Clinical epidemiologist is like pathologist in sense they try to understand the causes and association of illness from medical, social and environmental aspects, and this represent the main goals and approach of the community oriented and community-based teaching medical schools in Sudan like Faculty of Medicine, University of Gezira (FMUG) (22). Epidemiology is an office-based work and requires the skill of understanding statistics and the applications of different models to different population studies. It also involves providing an innovative approach, solving problem skills with high level of logical thinking, looking at diseases or illness from different perspective and ability to communicate all this ideas and result in effective written and verbal communication. Therefore, epidemiologists are expected to have the following skill and features listed in *Table 1*.

Future directions and strategies for the MD-PhD graduates

The graduates of the Sudanese MD-PhD programme will be expected to take a leading position in academic medicine in universities and conduct regular clinical research. Within a few years, they can develop track record of publications presented in the national and international meetings. Hence, they can act as an excellent mentors and supervisors

Table 1 Essential skills and features that needed for successful epidemiologist who will graduate from the Sudanese postgraduate programme of MD-PhD

Features and skills needed	Explanation
1. High level of both emotional and academic intelligence	High emotional intelligence is must, and it is associated with high level of awareness in association with high level of general intelligence. These are essential features as conclusion of population studies may have an impact on the medical approach for the problems, social impact on the behaviour of people and economical future
2. Excellent managerial skills	Epidemiologists need to have that logic and problem-solving skills, ability to stay focus and calm under pressure, ability to work alone and with team, excellent listening skills and able to communicate effectively and lead if needed
3. Excellent and broad research skills	The most important part is being self-motivated to improve the health in Sudan (highly motivated by a desire to do good for society) and have an inquiring mind to link diseases with different medical, social and environmental factors; and ultimately this may allow the researcher to master the art of being able to juggle disparate pieces of information
4. Flexibility, adaptability and ability to cope with changes brought by new technology	Being able to use new technology and software is reflection of flexibility and adaptability. These skills are also needed in developing new approach for analysing data and approaching problems
5. Good understanding for Math and statistics	These skills will be gained during the practice and communication with statisticians especially during publication and in responding to reviewers' comments. These skills will also act as bonus when it comes to critical appraisal of new manuscripts and publications
6. Ability to enjoy working with different teams from different background	Successful epidemiologist always benefits from the collaboration with different peoples from different disciplines like biomedical scientists, medical technologists, statisticians, and doctors in different specialities
7. Able to attract funding at national and international level	Funding is crucial for medical research and it is necessity to learn how to write grant application
8. Conduction of clinical trials	It is expected that in the future, these Sudanese researchers will have track research record and allow them to have that influence to collaborate with international pharmaceutical companies in conduction of clinical trials

**Figure 2** Suggestions for the future direction of the graduates of the MD-PhD programmes and how they can bring significant benefit for conduction of research in Sudan.

for young generations of doctors. This will also allow them to contribute to establishing specialist centres (i.e., centre for non-communicable diseases or centre for social medicine, Ramadan Research centre). This will increase research awareness and research will be regarded as an integral part of the health care system. It is possible, some of the graduates will also be able in the future to conduct clinical trials in their centres with or without collaboration with pharmaceutical companies. In *Figure 2*, we provide a summary and suggestions for the future direction of the graduates of the MD-PhD programmes.

Conclusions

Sudanese doctors are well known for their enthusiasm

and keenness to conduct cutting edge research and to cure diseases with high prevalence in Sudan. With recent advances in the world, investment in young doctors and medical researchers of the future is an essential part for any healthy society. Sudan is a large country with different tribes and improvement in medical health through research is needed. We feel that the implementation of this proposal by the SMSB will bring new era to the conduction of research in Sudan. Importantly, new generations of young Sudanese clinical-scientist are needed to address and research new pandemics like COVID-19. The MD-PhD program will be long and difficult to achieve, but we believe the small number of doctors who will complete the journey of MD-PhD, they will be able to bring prosperity and life to the research culture in Sudan.

Acknowledgments

Dr Ahmed dedicates his contribution in this article for his parents (Hassan died 2003 and Fatima died 2020).

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Journal of Public Health and Emergency* for the series “What the Future Holds for Medical Education in Sudan”. The article has undergone external peer review.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://jphe.amegroups.com/article/view/10.21037/jphe-21-36/coif>). The series “What the Future Holds for Medical Education in Sudan” was commissioned by the editorial office without any funding or sponsorship. NEH served as the unpaid Guest Editor of the series. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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doi: 10.21037/jphe-21-36

Cite this article as: Ahmed MH, Husain NE, Ahmed M, Elshiekh M, Osman WN. Clinician-scientist (MD-PhD) postgraduate programs in Sudan: challenges, strategies, implementations and future directions? *J Public Health Emerg* 2022;6:6.