Review Article

Academic medicine in Sudan: the challenges and solutions

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Abstract: Academic medicine is vital for Sudan as it reflects progress in diseases prevention and management, and it enhances both medical practice and academic environment. The academic medicine can be defined as interrelationships among teaching, research, and clinical service. For this reason, all the medical colleges in Sudan recommended that all staff should be involved in research practice, teaching beside clinical services. Importantly, many universities in Sudan are offering a master degree in medical education, which prove to be very popular among doctors. During the pandemic of COVID-19, the appreciation and enthusiasm for research and medical teaching increased not only in Sudan but worldwide. In addition, research output is of a significant value in increasing the chance of success in accreditation of medical schools and the ability to attract national and international funds. Importantly, several studies showed that more than 90% of doctors in Africa and Sudan are interested in participation in research. In this article, we will try to highlight the challenges and solutions that influence the chance for men and women to participate in academic medicine in Sudan. Some of these factors are also shared worldwide and represent common challenges for doctors in developing and developed countries. We have also tried to reflect on barriers that related to the culture and customs of Sudan, which can also decrease chance of participation in academic medicine. We have also presented an attempt for how to overcome all these problems and suggested possible solutions.

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Introduction

Scientific and clinical research in Sudan is needed in order to address the burden of different diseases like diabetes, hypertension, tropical diseases and the recent burden of COVID-19 (1,2). The definition of academic medicine was reviewed by different groups and authors. For instance, Ann Schwind defines academic medicine as part of her commentary to the Group on Institutional Planning of the Association of American Medical Colleges, "Academic medicine refers to the array of organizations which contribute to the education of physicians and biomedical

scientists, and which contribute new knowledge through their research programs. Patient care is a third element of mission for many of these organizations" (3). Other definition of academic medicine by the Milbank Memorial Fund's stated: "'Academic medicine' might be defined as the capacity of the system for health and health care to think, study, research, discover, evaluate, innovate, teach, learn, and improve" (4). The International Working Party to promote and Revitalise Academic Medicine endorsed the importance of the added value and integration of research, education and patient care and service (5). Taken all these definitions of academic medicine and their implication for Sudan, we believe academic medicine in Sudan should focus in the development of discovery that is linked with the health system in Sudan. It is hoped this will lead to the establishment of effective policies, and best practices that advance research and education with focus to improve the health and well-being of Sudanese individuals and the populations of Sudan in rural and urban areas. Therefore, health authorities in Sudan are needed to address the issues of planning, prioritizing, and supporting the implementation of clear policy for revitalisation of academic medicine. It worth mentioning, health authorities in Sudan are currently in support of academic medicine and implemented regulation of the ethical practice of conduction of research in humans according to the international standards (6). Importantly, the high burden of communicable and noncommunicable diseases is one of the reasons of weakening and slowing the economy and progress of Sudan. In Sudan there are many successful and shiny examples of success in academic medicine that led to improvement in health care and patient welfare, at levels of individuals and specialist centers (Mycetoma research center, Blue Nile Project in Gezira state and institute of endemic diseases in Khartoum University). However, there are many challenges for academic medicine in Sudan in the same scale as in other places in the world (7). These challenges over many decades have significantly decreased the research output of many brilliant Sudanese researchers and as a result the country have suffered brain drain to Europe, USA, and the Gulf countries. Furthermore, these challenges also negatively affected the opportunity for Sudanese researchers to attract international funding, attend international meetings and progress in academic ladder in similar scales as their counterparts in Africa, Middles East and Europe (8,9). In this critical review we have presented the challenges and solutions that decrease participation of Sudanese men and women in academic medicine. In the first section we have explained the challenges in academic medicine, followed by a section about the fact that having PhD is not a guarantee for excellent research output, a section about challenges for conduction of clinical trials in Sudan and a section about challenges for women in academic medicine in Sudan. There are essential factors that have significant impact on the progress of academic medicine in Sudan. In this manuscript we will discuss issues in relation to challenges in academic medicine like funding, work-related stress, lack of time dedicated for research and teaching and lack of financial incentives. All the above mentioned challenges were listed in *Table 1*, we have also added to this table a section about how to improve research culture and perception. 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 academic medicine in Sudan. We have included most articles that published about academic Medicine in Sudan. We have included large and major studies that published in other countries, but we excluded editorial and opinion papers. It worth mentioning the area of academic medicine is not well researched and more work is needed, and this may explain the scarcity of the literature.

Possible challenges for academic medicine in Sudan

The importance of conduction of research in Sudan can be seen and felt during the pandemic of COVID-19. In addition, the challenges of communicable and non-communicable diseases are clearly evident in Sudan and research may open the doors for understanding and implantation of solutions for these problems. It worth mentioning that different studies were published addressing the challenges in academic medicine in Africa and Middle East. For instance, the main focus of academic medicine in Africa is suggested to be towards improving primary care service, development in integration of the clinical service and achieving excellence in clinical research (10). The success in academic medicine depends largely in the presence of excellent leadership (11,12).

In *Table 1*, we have provided a summary of the challenges of the academic medicine at the levels of the individuals, team, university and government. We have also attempted to provide suggestions and solutions for all these challenges.

Table 1 The major categories of challenges of academic medicine in Sudan at different levels: at level of individuals, level of research team, level of university, government and the issue of perception and promotion of research culture

Level	Individual	Research team	University/University and teaching Hospitals	Government	Research culture and perception and promotion of education and excellence in patient care (responsibility of individuals, research teams, university, and government)
Different examples of challenges	Lack of time dedicated for research, teaching and development of clinical services	Absence of research team	Provide free access to electronic journals/dedicate more time for teaching and patient care/promotion of innovations in health care	Clear strategies about promotion of all aspects of academic medicine (research, education and patient care)	Establish a culture of research that also promote excellence in teaching and medical education
	Increase in clinical or administration load	Skilled team	Provide accessibility for labs and statisticians	Adequate funding for all activities of academic medicine	Focus on both clinical care and research conduction and research in medical education
	Work related stress, lack of motivation and no financial gain	Lack of leadership	Provide incentives and celebrate the success of excellent researchers, policy makers and excellent medical educators	Provide infra-structure and state of the art technology and building that will lead to the flourish of academic medicine in Sudan	Encourage young generation of doctors to participate in research and medical education by providing mentors
	Working in private clinic	Lack of team harmony	Effective use of medical workforce and provide opportunities for those in retirement to contribute in teaching and research and service development	Promote conduction of clinical trials, encourage innovation through system of reward and recognition	Opportunities for research training and promotion of national and international collaboration (effective use of Sudanese medical diaspora around the world)
	Busy social and community commitments	Research meant to help people not only for academic promotion	Provide funding, capacity building, research and teaching strategies that relevant to development of the health system of Sudan	Protect individuals and clinicians by high level of safety in term of ethics in research conduction	Early career involvement in research and publication

Importantly, many universities in Sudan (Gezira, Khartoum and Al Neelain) are offering master degree in medical education, which prove to be very popular among doctors. Generally speaking, medical education/teaching and patient care is relatively performing well in comparison with performance of clinical research in Sudan. The following are some of examples of challenges in academic medicine in relation to *Table 1*, but with more detailed explanation:

The concept among clinicians that 'my focus is to provide clinical care, but not research'

This wrong belief among generations of Sudanese doctors were used to provide an excuse for not getting involve in research projects, but at the same time have sent signals for young and motivated doctors not to get involved in research. Furthermore, in COVID-19 pandemic we have seen the dire need for research and how important it is for the health and safety of Sudanese nation. Conduction of clinical research is an integral part of providing clinical care and only Sudanese researchers can understand and design clinical research based on the need of the community in Sudan (13,14). Importantly the concept of research, education and service and patient care should be part of the teaching in all medical schools in Sudan in order to promote the concept and core values of academic medicine.

The lack of funding and lack of financial incentives

Funding and lack of financial incentives were important barrier for academic medicine in Sudan and other developing countries (13-17). The conduction of successful and community research will definitely help to implement the correct preventive policies, monitor progress of disease and help health authorities to distribute budget and man powers according to facts and evidences rather than assumptions and prediction. Therefore, research is an integral part of the health system, not just as mean to get promotions in universities (15-17).

Unfortunately, due to economically sanctions imposed on Sudan for last three decades, the country lost major source of research funding from international companies or organizations. In addition, there is lack of clear policy about research funding through governmental channels or through non-governmental organizations (NGOs). The lack of funding have major in impact in providing the state of the art patient care facilities and expansion of the health system in Sudan.

The lack of time dedicated for academic medicine and impact of social life in Sudan for doctors

Ibn Auf showed that lack of dedicated time for research is one of the challenges for Sudanese doctors that decrease their participation in research (13,14). Several studies showed similar problems around the world and especially in Africa (7-9). It is crucial to ask whether this lack of time for research is an option by choice or by chance. For majority of Sudanese doctors to support their families and gain decent income, they have to work in private and governmental hospitals or private owned clinics in the evening. This significantly decreases the time dedicated for research and leads to more struggle to achieve a balance between working life, family life and social life (1,2). In addition, most doctors are also coming from extended families and well interconnected communities, so it's not surprising that its part of the usual daily practice of all Sudanese doctors he or she will be providing daily free medical consultations. Doctors in rural areas of Sudan and in communities around big cities may enjoy other roles as being point of contact for solving social and community problems. When these doctors settle in big cities with large universities to continue with their specialist clinical work, they will continue to enjoy that community role and this may represent an excellent legacy to leave behind. Hence small numbers of people will benefit, while conduction of research will have an impact on the entire nation. More detailed information about academic medicine can be seen in *Table 1*, which reflect challenges at levels of individuals, research teams, university, government, and promotion of research culture by research leaders in order to attract young students to enroll for higher research degrees.

PhD is not guarantee for successful career in academic medicine

There is misconception among many clinicians in Sudan is that research and teaching is only for those who are PhD holders. While its beneficial and advisable to have PhD in order to join research career, it is not necessary for conduction of research. The motivations of the clinicians and passion to understand and solve the community problems or understand the pathogenesis of the disease are the main drivers for research conduction. Passion is critical and essential and can provide momentum during the long hours/days/years of research. Several studies showed that majority of clinicians could not continue with research after obtaining PhD (18,19). For instance, Fosbøl *et al.* showed that scientific production of Danish medic PhD-

graduates decreased substantially after obtaining the PhD degree. They showed two third of graduate become inactive after one year and this predominately among female and median number of publications per year after PhD graduation was 1.12 papers. However, approximately 21% of the graduates remained active during the whole 18 years follow-up. While Andriole and Jeff showed over half of the PhD-MD graduates were able to have full time job in academic medicine (19). Therefore, not obtaining PhD is not barrier for being actively involved in academic medicine and a lot of stories in research success for clinicians for those without PhD. In addition, the clinical MD offered by Sudan Medical Specialization Board (SMSB) includes research dissertation at the end of the 4-year clinical training (1). Such research experience if utilized effectively may open doors for international collaboration that may lead for further joint research projects.

Challenges for conduction of clinical trials in Sudan

Even though clinical trials will come with benefit for Sudan in term of testing new medication especially against communicable disease, decrease disease burden, clinical trials were rarely conducted in Sudan (20,21). In addition, clinical trials will also enhance the research culture, exchange of information and allow for knowledge transfer and further strengthen the health system. Importantly, the same barriers for research can also be applied for clinical trials in term of understaff of research leaders, lack of financial resources and difficult and bureaucratic system of obtaining ethical approval (22,23).

It worth mentioning, clinical trials can be implemented in Africa and many lessons can be learned (22,23). For examples, there is more work need to be done in order to address regulation of clinical trials and safety of the population and decreasing harm to the minimum. Indeed, further studies and research are needed to overcome challenges with regard to conduction of clinical trials and being able to attract major pharmaceutical companies in order to build both research and health capacity system. It is also important that high measure of safety is needed in order not to allow for exploitation of Sudanese people and guard against implementation of trials that represent danger to human life.

Participation of women in academic medicine in teaching is more than research (despite the increase in the number females admitted to medical schools)

Less participation of Women in academic medicine is not exclusive to Middle East countries but also reported in Western countries (24). In addition, studies showed that women are less likely to be involved in research due to negative perception and they may prefer teaching (25,26). This can be attributed to family factors and looking after children, religious factors and gender climate and lack of mentoring in academic medicine especially research (27). Importantly, the number of females in Sudan admitted to medical schools exceed the number of males. This also applies to specialization in pediatrics and obstetrics and gynecology (28-31). In addition, the number of women joining academic medicine in Saudi Arabia increased and they are able to progress well in presence of adequate support (32). In Sudan, Ibn Auf *et al.* showed that the number of men in academic medicine is not only more than the numbers of women, but also men have published more papers than women and this was attributed to high perception of research among male (13,14). This can be attributed in part to the fact that women are also having their own challenges of looking after families and children (33). It worth mentioning, studies showed that women are generally interested in teaching more than research and they lose commitment to research as their academic education progress (34). Therefore, adequate support should be provided for those Sudanese women with interest in conduction of clinical and biomedical research and elected to engage in research career.

Conclusions

Sudan is large country with rich natural resources that provide an excellent opportunity to progress in economy, health, and research. Academic medicine should be treated as an integral part of the health care system in Sudan. The challenges that face academic medicine listed in *Table 1*, need concentrated effort from all health professionals, research centers, universities, and government. Promotion of research culture and awareness should be the initial step towards effective research implementation in Sudan. Obviously, conduction of research should aim to address the need of Sudanese communities and health related issues in integral manner to produce medical workforce that have sufficient medical educators and at same time able to provide excellent patients care. We are certain that the concept and components of academic medicine will continue to evolve in the coming future especially in large country like Sudan, with an increase in the numbers of medical schools and expansion in teaching hospitals. Therefore, one aim of

this is article is to steer discussion about the best ways to promote and develop academic medicine in Sudan. Another important aim is to utilize the time to plan and think about implementation of the required changes in the near future. Finally, its only with desire to succeed, determination to move forward and dedication of young medical Sudanese doctors, academic medicine will flourish in Sudan.

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