

Review

Development of Pharmacy Education in Kenya Universities to date

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The purpose of this paper was to examine the development of pharmacy education in Kenya since independence. Websites of the Pharmacy and Poison Board of Kenya and the Commission for University Education as well as those of the universities offering pharmacy education were used to obtain information such as the framework for establishment of programmes in higher institutions, curriculum, regulation of pharmacy practice among others. From a single institution in the 1970s, six universities that are evenly divided between government and private ownerships now offer Bachelor of Pharmacy programs in Kenya. Irrespective of the ownership the requirement for the establishment of programs in Kenya universities is centrally formulated and established. Pharmacy education is regulated by both the Commission for University Education and Pharmacy and Poisons Board. Adequate and well trained, motivated and productive workforce is required for effective teaching and learning and thus the key elements for local and international competence of the graduates. The proliferation of pharmacy education institutions requires a greater and continuous collaboration amongst the regulators and the stakeholders to ensure that pharmacy graduates from these newly established schools are adequately trained and equipped to meet the ever changing healthcare needs of the populace.

Key words: University, pharmacy education, healthcare, competence, human resource, Kenya.

INTRODUCTION

Pharmacy education leading to the award of Bachelor of Pharmacy degree in Kenya started in 1974 at University of Nairobi when the Department of Pharmacy was

created in the Faculty of Medicine. The societal need for indigenously trained pharmaceutical workforce prompted the establishment of the Department of Pharmacy in the

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university. The Department consisted of four sections: Pharmacognosy, Pharmacology, Chemistry, Pharmaceutics and Pharmacy practice, Pharmacology and Pharmacognosy; and it has remained so till date (www.uonbi.ac.ke). This pioneer university developed manpower for the government and private health institutions and it was the sole source of indigenously trained manpower until recently. The first set of the indigenously trained pharmacists graduated in 1978 with Bachelor of Pharmacy (BPharm) degree after a four year four year study. Since then, University of Nairobi remained the only institution for Pharmacy education leading to the award of Bachelor of Pharmacy in the country until recently. The unit of analysis of pharmacy education in the country then was the School of Pharmacy of the institution. Within the last decade, more institutions have established Departments and Schools for pharmacy education (www.cue.or.ke) and the unit of analysis of pharmacy education and pharmacy practice will have to change. The quality of pharmaceutical services that Kenyans and international community will get from holders of Bachelor of Pharmacy degree trained in Kenya depend on the quality of teaching and learning in these institutions that prepare the students for the drug related diverse needs of patients. Consequently, it is imperative to chronicle and have a perspective of the development of pharmacy education in the country.

The data for this study were obtained from the websites of universities offering pharmacy degree program in Kenya, the Pharmacy and Poison Board of Kenya, and The Commission for University Education in Kenya. The information searched for included the guidelines for establishment of programs in Kenya universities, accredited institutions for the training of pharmacists, the minimum benchmark for pharmacy education, quality control, curriculum, Academic staff requirements, qualification and rank. Other websites that were deemed relevant to this study were also visited.

FORMAL EDUCATION SYSTEMS IN KENYA

The gain of independence in 1963 was followed by changes in the formal educational system in Kenya. Between 1964 and 1985, the 7-4-2-3 education structure modelled after the British education system was adopted with the overall focus of building a national identity and unification of the different ethnicities through appropriate subjects (Gachathi, 1976; Buchmann, 1999; Amutabi, 2003). The system was designed to provide seven years of primary education, four years of lower secondary education, two years of upper secondary education, and three years of university (Buchmann, 1999). The university education was usually accessed in the United Kingdom and other countries before the independence (Buchmann, 1999).

The 8-4-4 education system replaced the 7-4-2-3 in January, 1985 in response to the changing needs of

individual Kenyans and those of the labor market (Gachathi, 1976; GOK, 1988; Muricho and Chang'ach, 2013). This is the current structure, and is similar to the U.S. education system (www.studyusa.com). It provides for eight years of primary education, four years of secondary, and four years of university education. University education in Kenya is, therefore, for a minimum period of four years leading to the award of a bachelor degree (Buchmann, 1999). The duration of study for some professional courses like Medicine and Pharmacy are usually longer, spanning five to six years.

University education in Kenya

In 1970, the University College, Nairobi, was transformed into the first National university in Kenya and was renamed the University of Nairobi (Ominde, 1964; Amutabi, 2003). Universities in Kenya comprise public and private chartered as well as public and private constituent colleges. There are currently twenty two and seventeen, respectively public and private chartered universities (www.cue.or.ke). These chartered universities offer a wide range of courses that cut across several disciplines from science, medicine, and engineering to social sciences and liberal arts. Bachelor of Pharmacy degree course is one of such medical discipline that is offered within the chartered universities in Kenya. Generally, the design of an academic program in Kenya universities follows the Commission's standards (www.cue.or.ke) to ensure that it:

- 1) Is relevant and contextualized;
- 2) Contributes to the overall national human resource development and requirements and higher education reforms;
- 3) Is broad-based, diversified and integrated; and
- 4) Is as much as possible practical-orientation

PHILOSOPHY OF PHARMACY EDUCATION IN KENYA

Education for development is the core philosophy of education in Kenya (www.cue.or.ke). Formal education in Kenya is aimed at preparing individuals for the several changes and challenges in the job market in a rapidly changing socio-economic world. Society requires an educated populace to create the wealth, which can bring stability, progress and innovation. It also needs people who can provide the services that allow society to sustain its own growth, maintain its health and well-being and offer the range of cultural and leisure activities, which bring enrichment and satisfaction. The Kenya education system is, therefore, expected to promote the autonomy of individuals and at the same time to equip them, on the basis of interdependence, to fulfill the variety of roles which society demands in a global world. Pharmacy education in Kenya universities is based on the general philosophy of education for development and intended to

Table 1. Accredited schools of pharmacy in Kenya as at 2015.

S/N	Name	Year program established	Course duration	Degree
1	University of Nairobi	1974	4	BPharm
2	Kenyatta University	2004	5	BPharm
3	Jomo Kenyatta University of Agric and Tech	2010	5	BPharm
4.	Methodist University	2008	5	BPharm
5.	Mount Kenya University	2006	5	BPharm
6.	United States International University	2014	5	BPharm

be a platform to generate and disseminate knowledge through teaching and research on all areas of allopathic and alternative health care systems for a healthier and wealthier world. Pharmacy education in Kenya focuses on training a pharmacist who would fit into the various areas of specialization of pharmaceutical services but each university has her specific mission, vision and philosophy.

Pharmacy schools in Kenya

Six universities offer degree program in pharmacy as listed in Table 1. Although Thika and Meru are a few kilometers away from Nairobi, all the universities offering pharmacy education are within Nairobi and its vicinity. Nairobi had remained the center of government and commercial activities in Kenya until the devolution of government and this may be the reason for the concentration of the institutions in Nairobi and its environs. Both public and private institutions offer pharmacy education and these programs are accredited by the Commission for University Education and the Pharmacy and Poisons Board (PPB, 2014). The Commission for University Education approves programs, licenses, accredits, and monitors quality standards at the university level. Institutions that are chartered and those with letter of interim authority are accredited by the Pharmacy and Poisons Board if they meet the Board's requirements.

Admission requirements to study Bachelor of Pharmacy degree

There are two categories of students that gain admission to public universities in Kenya: Government sponsored students and the self-sponsored students. Entry to public universities is coordinated by the Kenya Universities and Colleges Placement Service, established in 2014 to replace the Joint Admissions Board (KUCCPS, 2015). The Kenya Universities and Colleges Central Placement Service (Placement Service) is established as a State Corporation under Section 55 of the Universities Act No. 42 of 2012 with its functions being to, among others, coordinate the placement of Government Sponsored Students to Universities and Colleges. University entry is

based on the Kenya Certificate of Secondary Education with a minimum average grade of C+ (the average of 8 subjects, including the compulsory English, Kiswahili and mathematics) traditionally set as the minimum threshold. Both the Government and self-sponsored students' admissions meet the minimum requirements for university admission in Kenya. Self-sponsored program is occasioned by the increased demand for higher education than the government can cope. Certain university departments sometimes require higher grades in certain subjects related to the field of study. In recent years, due to higher demand for university places, the minimum average threshold for guaranteed entry to a public university has been raised to a B, although the threshold is expressed as a combined 8-subject overall points score – where individual subject grades are converted to points – rather than an average grade. The admission requirements to the schools of pharmacy in Kenya are outlined in Table 2.

It is generally required that an applicant for the program must have passed the relevant subjects at the Kenya Certificate of Education (KCSE) in the relevant subjects in either Alternative A or B in the KCSE. Although English language is used in teaching pharmacy in the universities, candidates may pass either English or Kiswahili Language to qualify for admission. Holders of certificates other than the KCSE in relevant subject areas can apply. Kenyatta University provides for acceptance of holders of diploma in Pharmaceutical Technology, Laboratory Technology, Clinical Medicine, Radiology, Basic and or Advanced Nursing and Public Health or Environmental Health. The university and Kenya Methodist University can accept holders of degree in biological sciences from recognized universities.

Although most programs in Kenya universities run double intake (admissions done in May and September), pharmacy programs have one intake in September, which is a good development. Double intake into Kenyan Universities, which started in the 1980s, results in large number of students and lectures held in huge halls to accommodate the class. This negatively impacts teaching and learning.

Regulation of pharmacy education

Regulation of pharmacy education is a shared

Table 2. Admission requirements for entry to pharmacy program in Kenyan universities.

S/N	Institution	Program entry requirements
1	University of Nairobi	KCSE with Alternative 1 or 2
2	Kenyatta University	KSCE with Alternative 1, 2 or 3
3	JKUAT	KSCE with Alternatives 1 or 2
4	KeMU	KCSE with Alternative 1 or 2
5	Mount Kenya University	KCSE with Alternative 1 or 2
6	USIU	KCSE with Alternative 1 or 2

Alternative 1. B in Biology and Chemistry, a C+ in Mathematics or Physics and a B in Kiswahili or English Language. **Alternative 2.** B + in Biology, Chemistry and Kiswahili or English Language, a C+ in Mathematics or Physics. **Alternative 3.** Holders of a Diploma in the following areas from a recognized Training Institution. The candidate must have attained the minimum University entry requirements of C+ at KCSE OR division II at O level: 1. Pharmaceutical Technology, 2. Laboratory Technology, 3. Clinical Medicine, 4. Radiology, 5. Basic and /or Advanced Nursing, 6. Public Health/Environmental Health, 7. Dental Sciences, 8. Diploma in Biological Sciences, 9. Holders of any degree in Biological Sciences or Chemistry from Kenyatta University or equivalent qualifications from a recognized University.

responsibility of the Commission for University Education and the Pharmacy and Poisons Board. The Commission for University Education is responsible for approval of university and programs to be run in such institutions based on certain criteria. The role of the Pharmacy and Poisons Board is to ensure that the educational institutions conduct the teaching and learning activities in such a manner that the graduate pharmacist renders appropriate and satisfactory professional services. The Pharmacy and Poison Board of Kenya is responsible for setting the criteria and prerequisite for registration as a Pharmacist in Kenya. Two examinations are administered to qualifying pharmacy graduates from recognized universities, the details of which have been captured in the 'Guidelines for Evaluation and Assessment for Registration of Pharmacists', published by the Pharmacy and Poisons Board (PPB, 2015). The document outlines a model course structure for the Bachelor of Pharmacy program, requiring a minimum of 5985 course hours (www.cue.or.ke). The professional examination for the assessment of a pharmacist in Kenya consists of Stages I and II. The Stage I examination is done on graduation from the university before embarking on the compulsory twelve calendar months internship (www.pharmacyboardkenya.org). The focus of this stage of examination was to test the candidates understanding of the basic medical and pharmaceutical sciences. On the other hand, stage II examination is administered after the successful completion of internship and examines the candidate's knowledge of applied clinical and pharmaceutical sciences as well as on Laws and Ethics of pharmacy practice in Kenya. Registration of an applicant as a pharmacist in Kenya is subject to successful passing of both stages of the examination.

The Pharmacy and Poison Board of Kenya requires that a prospective candidate applying for full registration as a pharmacist in Kenya meets some minimum entry requirements in the 8-4-4 system of education (KSCE).

Specifically, applicants must have obtained a minimum of a mean grade of C+ and an average cluster weight of B- in the following subjects provided that no subject in this cluster shall have a grade below C+: Chemistry, Biology, Mathematics/Physics and English Language/Kiswahili as one alternative or Biological sciences, Physical sciences, Mathematics and English/Kiswahili Language as a second alternative. Applicants with GCE 'A' level, a minimum of two principal passes in Biology and Chemistry, a subsidiary pass in Mathematics/Physics and General Paper are required. While it is important that the regulatory body satisfies herself that the applicant for registration as a pharmacist has the requisite body of knowledge prior to registration, the terminal examinations can be replaced with structured routine in-process evaluation of pharmacy education institutions. In this way quality will be built into rather than being inspected into the final product. Of concern would be that a graduate of an approved institution for the training of pharmacists is not able to pass these examinations. This can result from either the individual or the institutional failure or a combination of these. Failures can also occur due to differences in the conditions under which such examinations are conducted when compared to the institution based examinations.

Studies show that environment affects performance of students in examinations. Institution based examinations are usually administered immediately when the learning has taken place and fresh in the learners mind. Continuous assessment tests have a way of improving the student's final scores because of the coverage areas in the semester based system. Moreover, as the number of pharmacy graduates increases as a result of the many institutions now, assessment in these final examinations may be compromised due to overload on the resource persons that have been involved in the conduct of the examinations, marking, and evaluations. Generally, early detection and correction of defective teaching and

Table 3. The Current academic staff profile of the pioneer school of pharmacy in Kenya

S/N	Rank	No.	publications	Average in year of the most recent publication from individuals in the group	Median in year of the most recent publication
1	Professors	9	415	2011	2012
2	PhD holders	13	121	2011	2011
3	MSc holders lecturers	14	78	2008	2013
4	BPharm/BSc	3	-	-	-

learning processes through rigorous inspections and enforcement of standards, particularly in the newly established institutions can assure quality of the graduates.

One other area that the regulatory body and indeed the government need to work on is to ensure that there are not only guidelines for places of internship but that such institutions have preceptors that have appropriate qualification, training, and experience that will impact on the interns knowledge, skills and attitude. Such places of internship should be assisted or provided with personnel and facilities or such other things as may be necessary for the smooth conduct of the training.

Pharmacy Education curricular

There is a general guideline for development of Bachelor of Pharmacy degree program. Each university is responsible for drawing up their curriculum based on the general guidelines for approval by the Commission for University Education. A minimum of 3960 instructional hours for medical and allied sciences by the Commission for University Education is prescribed by the Commission. As a bachelor's academic program is considered to be a foundational educational program the commission requires that the pharmacy program:

- i. Provides a broad knowledge base within the discipline involving critical and analytical understanding of the major theories, principles and concepts in the discipline;
- ii. Provides the learner with a comprehensive range of cognitive and analytical skills and their application to various situations;
- iii. Entails demonstration of adequate problem solving skills; and
- iv. Enhances society consciousness and contributions to the general development of the society.

Pharmacy education curricular in the institutions offering pharmacy education are similar to those offered elsewhere in the world covering basic and medical sciences at the lower level and the professional subjects at the higher levels. Calculus, trigonometry, advanced level physics and Biology, Physical Chemistry, Organic and Inorganic Chemistry are taught in the first year.

Biochemistry, Anatomy and Physiology taught and passed before the students are introduced to the core pharmacy courses of Pharmaceutics, Pharmaceutical Microbiology, Pharmaceutical Chemistry and Medicinal Chemistry, Pharmacognosy and Drug Development, Pharmacology and Therapeutics, Clinical Pharmacy and Pharmacy Management. Relevant Pharmacy Laws and Ethics are component parts of the curricular in the pharmacy education in Kenya.

Staff strength, qualification and productivity

Being the pioneer university offering pharmacy education in the country, the staff strength of the School of Pharmacy, University of Nairobi is shown in Table 3. The qualification and the ranks, number of publications and the year last publication was made are also shown. Based on the 2015 updated curriculum vitae of the staff members on the University of Nairobi website there are currently nine faculty members in the rank of professor and they contributed 67.58% to the 614 publications of the academic staff in peer review journals. One of the professors had stopped publishing since 2006 and the most recent publication was in 2014. Of the thirty nine faculty members, PhD holders other than those in the rank of professor accounted for thirteen. Their publications accounted for 19.71% of the total publications from the school. One of the faculty members had stopped publishing since 1987. About four of the faculty members with Master's degree are currently pursuing their PhD programs. The School of Pharmacy has the best staff strength, qualification and productivity. It is generally required that the academic staff to student ratio be 1:7 for those in medicine and allied sciences but the actual ratio in the schools of pharmacy is currently at about 1:15, which is double the recommended ratio. Shortage of lecturers is a common trend in Kenya educational institutions (<http://wenr.wes.org/2015>).

Kenya is currently experiencing a general surge in enrollment in university education. More universities have also been established in underserved regions. Other studies showed that the lecturer shortages in Kenya continue to hinder growth in quality standards and lead to ever growing student to faculty ratios (<http://wenr.wes.org/2015>). For quality standards to be

maintained, the budgetary allocation to education need to be increased instead of the reduction by 6% as seen with the 2015 National budget. The class size in schools of pharmacy range from 55 to 80 students. This number may be manageable in some but not in all the schools when compared to the available facilities, especially for practical classes. One of the responsibilities of the pharmacy and poisons Board is to ensure that Schools and Departments of Pharmacy admits candidates based on their carrying capacities, putting the laboratories and class room facilities in perspective. An overcrowded class can negatively affect the teaching and learning process and hence the quality. Studies have shown that over crowdedness in classroom diminishes the quality and quantity of teaching and learning with serious implications for attainment of educational goals (Ijaiya, 1999).

Teaching and learning

The main teaching method in the universities offering pharmacy education remains the lecturing method with or without the information and communication technology. Physical attendance of classes is compulsory and students need to have at least 2/3rd attendance to qualify to sit for and write examinations. Each course is taught in unit system and a unit is equal to 36 lecture hours or equivalent, with 3 practical hours equivalent to 1 lecture hour. The use of power point presentation is common among many lecturers but some are immovable from the use of black or white board. At this point in the history of pharmacy education in Kenya, it is important, in addition to focus on research, to consider and develop discipline-specific pedagogical knowledge to foster learning within the pharmacy discipline (Lenze, 1995).

Course structure and duration

There is a general guideline on the course structure and duration in Kenya Universities. The course leading to the Degree of Bachelor of Pharmacy is full time for a minimum period of not less than five (5) years and maximum period of not more than ten (10) academic years. Each year is made up of 36 weeks and all candidates enrol for all the prescribed courses offered in each year of study. The degree program is by lectures, laboratory practical, clinical work, seminars, industrial attachment, tutorials, research papers and a research project.

Examinations

Candidates are required to attend all the prescribed courses and are allowed to sit for the examination on those courses. These examinations comprise written, practical and oral examinations. In most cases, the final

examination constitutes 70% and continuous assessment tests and practical constitute 30% in each course taken. In some schools the final examination constituting 40% and the continuous assessment tests and practical constituting 60%. The pass mark is generally 50% of the total mark. Bachelor of Pharmacy degree is not classified because of its professional nature.

External examiners

The requirement by the Commission for University Education that all university program should be assessed by an independent external examiner is one of the quality control measures to ensure standards, and it is practiced by the schools of pharmacy.

Clinical pharmacy

The paradigm shift in pharmacy world towards more patient-oriented training is gaining ground in Kenya. Students are exposed to settings that will inculcate in them the practical skills and attitude in pharmaceutical care. The participation of students in ward rounds and work experience attachment are encouraged as part of the training. The Indiana University School of Medicine (IUSM) has been involved in a unique collaboration with the Moi University School of Medicine (MUSM) in Eldoret, Kenya, since 1989 to provide clinical pharmacy services to the HIV/AIDS patients and at the same time facilitate the training of pharmacy students from the University of Nairobi on Clinical Pharmacy and Pharmacotherapeutics. This training is done under the United States Agency for International Development - Academic Model for Providing Access to Healthcare (USAID-AMPATH). Similarly, Purdue University School of Pharmacy and Pharmaceutical Sciences (PUSOPPS) collaborated and provided pharmacy services in Western Kenya. American and Kenyan pharmacy students were paired up in a unique partnership to facilitate the provision of these services. This collaborative model has given Kenyan pharmacy students a unique perspective into differences in the American practice of pharmacy, and vice versa, and has created lifelong friendships. In addition, the program encouraged the exchange of ideas, while promoting sustainability and independence at the same time. Moreover, the organized structure of the programs provided a platform for both training and research (Schellhase et al., 2013; <http://healthexchangenews.com>).

Postgraduate Pharmacy Education

The Commission for University Education approved the following master degree programs in the University of Nairobi:

1. Master of Pharmacy.
2. Master of Pharmacy (Pharmaceutical Analysis).
3. Master of Pharmacy (Industrial Pharmacy).
4. Master of Pharmacy (Pharmacovigilance and Pharmacoepidemiology).
5. Master of Science in Pharmacognosy and Complementary Medicine.
6. Master of Science in Molecular Pharmacology.
7. Master of Science in Pharmacology and Toxicology.

Similarly, the following PhD programs from the same university have been approved by the regulatory body:

1. PhD in Clinical Pharmacy.
2. PhD in Industrial Pharmacy.
3. PhD in Pharmaceutical Chemistry.
4. PhD in Pharmacognosy and Complementary Medicine

There is also some form of non-degree postgraduate clinical education provided by the Purdue Kenya Pharmacy program, since 2014, at the Moi Teaching Hospital where many Kenyan pharmacists benefit from international practice experiences of the US pharmacists as they interact together in an 8 week program.

International competencies

Workforce mobility makes it imperative for international competencies in any profession and one of the ways to have an understanding of the quality of pharmacy education in a country is a demonstration of international competency. The number of overseas pharmacists registering in recipient countries can be used to estimate the extent of competence of the applicants, which is also a reflection of the level of pharmacy education. There is currently no adequate data on the number of Kenya trained pharmacists practicing in the Diasporas. It has been estimated by the Kenyan Pharmacy and Poisons Board that over 190 pharmacists have migrated abroad in the last ten years. Pharmacy educational institutions in the country need to focus on the training of pharmacists that can provide patient-centered care work in inter-professional teams and employ evidence based practice as well as employ quality improvement techniques.

FUTURE PROSPECTS AND CHALLENGES

Kenya is one of the largest economies in the East African sub-region. It is also a highly visited country by foreigners, and this has the potential to shape the pharmaceutical care in the country, and thus pharmacy education. The international exposure of some pharmacists in Kenya through various collaborations, especially with North America, has the potential to lead to a revolution in pharmacy education in the near future (Gruppen et al., 2012). The University of Nairobi remains the region's

leading training institution for pharmacists but the training capacity remains low to sustain the growth and aspirations of East and Central Africa and help the countries achieve their health and access to safe medicines objectives.

One of the main challenges that pharmacy education in the country would need to address is the issue of infrastructure and highly competent manpower requirements for the emerging schools of pharmacy to assure quality of the products. The pharmacy workforce would need to acquire additional training and skills and sensitivity to be able to deal with the evolving challenges from the practice.

CONCLUSION

Since the establishment of the pioneer pharmacy school in the 1970s many more universities are currently providing pharmacy education for the development of Kenya health systems. Both private and public stakeholders are involved in rendering this service to the nation. The increasing number of institutions offering Pharmacy education comes with it additional responsibility on the part of the regulators to ensure that the standard of education is high and maintained by ensuring that adequate human and material resources are provided for effecting learning and teaching. The trained pharmacists must have competencies that can offer them international opportunities. Patient centered care, working with other health professionals as team players, and ensuring that there is evidence based practice with consistent and continuous quality improvement will make the graduates from these institutions relevant to local and international markets.

Conflict of Interests

The authors have not declared any conflict of interests.

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