Review Article

Pharm D Program: Is it Necessary in BRICS?

Pei Yu[1,*], Beverley Joy Wilson[2], Amy Claire Bobbins[2], Sunitha Chandrasekhar Srinivas[2], Gang Yin[1]

[1]College of Pharmacy, Jinan University, Guangzhou, CHINA.
[2]Faculty of Pharmacy, Rhodes University, Grahamstown, SOUTH AFRICA.

ABSTRACT

The various trajectories of the development of the Doctor of Pharmacy (Pharm D) programs in BRICS countries were reviewed individually, showing the progress of Pharm D programs in each context. Evidence from developed countries indicates that Pharm D programs have contributed towards the positive development of public health and a country's local health requirements, with well-trained clinical pharmacists having a key role in the health and economic development of these emerging powers. The health systems of BRICS countries are heavily challenged with a dual burden of disease, weak health infrastructure and public health initiatives. Thus, not only will the development of Pharm D programs in BRICS countries strengthen pharmacy education contributing to a pharmacy workforce more readily able to target health-related problems, demographic and epidemiological shifts; but will also better equip public health systems with more patient-centered pharmaceutical care necessary for evidence-based, individualized and cost-effective healthcare.

Key words: Pharm D, Pharmacy education, Clinical pharmacy, BRICS, Pharmacist.

INTRODUCTION

The Doctor of Pharmacy (Pharm D) is a professional doctorate degree in pharmacy that was initially designed in the United States of America focused on delivering patient-centered pharmaceutical care to patients while improving the rational use of medicines. The Pharm D is not a Doctor of Philosophy (Ph.D) degree but involves the training of pharmacists to work in hospitals within the community. This program combines a rigorous basic science education with extensive and varied clinical and pharmacy practice experience.

In the 1960s, the Pharm D program started in some universities in the USA as pharmacy education began the shift from professional drug distribution to patient-orientated care. In 1989, the Accreditation Council for Pharmacy Education (ACPE) issued a notice of intent to develop new accreditation standards for programs that awarded the Pharm D degree.[1] A bachelor's degree was to be phased out, with all colleges of pharmacy commencing a 6-year Pharm D program in 2000, with the Pharm D being the sole degree required to practice pharmacy in the USA.[2] Currently, pharmacists are trained by Pharm D programs in more than 30 countries worldwide. Is it necessary for the developing countries?

Brazil, Russia, India, China and South Africa make up the BRICS countries, representing close to half the global population (over 43%) and 40% of the global burden of disease (of which 71% is accredited to non-communicable diseases (NCDs)).[3-5] The BRICS countries have the potential to initiate a 'paradigm shift in global health' if appropriate investments into their own public health systems are made aligned to commitments to achieve the World Health Report 2010 Universal Health Coverage (UHC) agenda.[6,7] The improvement of health systems in BRICS countries have the ability to greatly impact the global health of the world's population.[8] Furthermore, the investment in health systems of these nations is crucial to ensuring a healthy and productive

Submission Date: 30-09-2019;
Revision Date: 02-12-2019;
Accepted Date: 26-02-2020

DOI: 10.5530/ijper.54.3.100

Correspondence:
Prof. Pei Yu
College of Pharmacy, Jinan University, 601 Huangpu W Ave, Tianhe District, Guangzhou, Guangdong Province, CHINA.
Phone: +86 20 85224451
E-mail: pennypeiyu@163.com

www.ijper.org

workforce to power economic emergence and development of these nations. Currently, the large burden of disease and associated mortality rates result in catastrophic expenses to patients and governments, which require urgent health care system reform though patient-focused health care professionals providing efficient services. A worthy attempt to enhance healthcare provision and access to healthcare involves the development of healthcare professionals, including the pharmacist, to provide more sophisticated patient-oriented care.[2] Thus, the Pharm D program, focusing on the training of pharmacists in clinical pharmacy and related fields, would make a beneficial contribution to the access and rational use of medicines and the practice of appropriate and safe clinical pharmacy in BRICS nations.

Pharm D in South Africa

As the second largest economy after Nigeria, South Africa is leading many fields on the African continent. Despite this, the health burden is heavy with a quadruple burden of disease: including communicable diseases and NCDs, HIV/AIDs and the prevalence of injuries (due to road accidents and interpersonal violence).[9] Twenty-nine percent of disability-adjusted life years (DALYs) in South Africa are due to HIV/AIDS, in stark contrast to the rest of BRICS for which the figure is under 3%.[5] The high rate of HIV infection and related co-morbidities combined with TB and increasing NCDs (currently responsible for 45% mortality rate) makes prescribing and dispensing challenging. To ensure provision of high-quality pharmaceutical services in line with the South African National Drug Policy (1996), considerable planning for introducing a Pharm D program was facilitated from 1996.

Progress in pharmacy education

The current undergraduate training of pharmacists in South Africa includes a 4-year BPharm degree, followed by one year of internship and one of community service.[10] To build onto the training of pharmacists in a postgraduate, practical setting, the Pharm D gained acceptance in 1997 by the Senate of Rhodes University (RU) and then in 2000 by an agreement between RU and the Eastern Cape Department of Health (ECDoH) in South Africa. In 2001, the program was given interim approval by the Department of Education, the Council of Higher Education and the South African Qualifications Authority. The first candidates were registered in 2004 at RU and it remains the only site for Pharm D education in South Africa. Although the Pharm D program was designed to meet international standards, its curriculum is unique in that the candidates spend all of their time in a tertiary level public training hospital providing pharmaceutical services, as agreed to in the Service Level Agreement between RU and the ECDoH, as well as meeting the requirements for the degree. The candidates are required to be registered pharmacists from the outset.[11]

The curriculum of Pharm D in South Africa was originally designed to be completed in three years, although candidates tend to take longer because of various factors. The course covers eleven rotations which give candidates a broad background in clinical experience in the wards. Assessment includes (1) on-site assessment by a preceptor according to a set of outcomes and activities required for each rotation and (2) of a portfolio which is sent to relevant experts in South Africa, Canada or USA. Satisfactory completion of both of these types of assessment leads to the granting of credit by the university. The first candidate for the degree was assigned to the East London Health Complex and awarding of the Pharm D degree took place in 2008 and provided the health service with its first 'home grown' pharmacist with advanced pharmaceutical care education and experience at this level. The program was extended to the Port Elizabeth Hospital Complex in 2009 on the same basis as that in East London, both centers in the Eastern Cape Province and later to other places in South Africa. Graduates of the program have been employed as pharmacists with clinical skills in public sector hospitals, in the national department of health, in the South African Health Products Regulatory Authority (SAHPRA) and in academia.

Obstacles in Pharm D development

From experiences of the program at RU, the following obstacles have been noted. Since its inception, the Pharm D program was funded through the Health Professions Training and Development (HPTD) Grant of the ECDoH; however, funding was stopped in 2012. Under the new system, candidates were hired by the government into positions for pharmacists; however, the retention of these candidates was a problem within the public sector due to delays in funding of the posts, resulting in the loss of Pharm D candidates. Additionally, the low level of posts created for Pharm D graduates has been a problem within the public sector hospitals, resulting in graduates not being included into the multidisciplinary healthcare teams (MDHT) involved in local hospitals. The South African Pharmacy Council (SAPC) has not yet created a specialist category, hindering the statutory guidance for creation

of these clinical pharmacist posts by the National Department of Health.

Feedback from those involved in the RU Pharm D program noted that due to the large number of patients serviced within the publics sector, the Pharm D candidates roles within hospitals were largely confined to dispensing medication prescribed with little opportunity given for ensuring adequate pharmacotherapy and collaborating with the MDHT. Furthermore, ensuring adequate preceptors for Pharm D candidates has been problematic, as it was planned that the availability of preceptors would be ensured by using graduates of the program. However, very few graduates have remained in hospital service in previous years. It was planned that senior medical practitioners at the various hospitals would assist with some aspects of the program, especially with disease state knowledge. Lastly, foreign pharmacy graduates from other African countries have been required to return to their country of origin according to an agreement among the Southern Africa Development Community (SADC) countries. Due to this, only South African nationals have been included in the Pharm D program to date.

Pharm D in India

As the 2nd largest population (1.3 billion) in the world, India has a heavy dual burden of diseases with 37% of deaths from communicable diseases (maternal, perinatal and nutrition related) and 53% deaths from NCDs, while the expenditure on health remains merely at 4.7% of the GDP.[12] However, due to the under-resourced and overstretched public sector health system, most of the population depends on the private health sector. The structure of the Indian health care system, with nearly two thirds of providers in private practice, has led to a high proportion of out-of-pocket expenditure for patients.[5] Private pharmacies remain a major source of information and medicines for a huge section of the population that can neither depend on the public sector, nor afford the expensive private sector.

In India, the growth of pharmacy education since 1937 has been industry-focused as the country was developing to become the 'pharmacy of the developing world'.[12,13] Hundreds of new pharmacy degree colleges were started in India during the period 2000-2008. The pharmacy education in India provides various levels of courses such as Diploma in Pharmacy (Dip Pharm), Bachelor of Pharmacy (B Pharm), Master of Pharmacy (M Pharm), Doctor of Philosophy (PhD) and the Doctor of Pharmacy (Pharm D).[13] The number of degree colleges increased to 900 by 2009 and by 2013 there are about 1500 pharmacy colleges providing programs after receiving approval by the Pharmacy Council of India (PCI) and All India Council of Technical Education (AICTE).

Progress in pharmacy education

In 2008, the Pharm D program was introduced by the PCI with two programs; a 6 year program after 10 plus 2 years of school and a 3 year program after Baccalaureate Pharm (3 years) with syllabus, norms and regulations for the Pharm D program also set via government gazette. The syllabus is uniform in every institution throughout the country with the Pharm D program requiring a total of 6 years, with 5 years (B Pharm plus 2 years) of campus study and 1 year of hospital internship. In the final year, students should independently provide the clinical pharmacy services to the allotted wards, including six months in general medicine department and two months in three other specialist departments.[14] This standardized approach resulted in more than 140 institutions receiving the PCI approval by 2013, including four government institutions.[15]

Obstacles in Pharm D development

Currently, Pharm D graduates are employed in pharmaceutical industries, research institutes, universities and other fields; however, their recruitment in Indian hospitals as clinical pharmacists has not been clearly stipulated.[16,17] Due to the high rate of unemployment of Pharm D graduates and, particularly, the underutilization of graduates by the public sector, the AICTE has been advised to not provide permits to new colleges providing Pharm D training until new employment conditions and opportunities arise to alleviate current Pharm D graduate unemployment.[18]

Currently, the program is in need of quality-enhancing inputs to complement the quantitative growth experienced. Well -reported evidence from several decades of positive impact of pharmaceutical care-focused interdisciplinary policies and practices are available to guide the present and future Pharm D program educators and students in India. The outcomes of the Pharm D program involve sufficient emphasis and exposure in patient-centred pharmaceutical care in an interdisciplinary manner. This is currently not being implemented in an adequately standardized way to students in all institutions. The system providing well-trained and experienced educators, clerkship (rotationship), internship, residency and related facilities are not uniformly adequate nationally.[17] Committed support and evaluation by the governing bodies such as PCI and AICTE, progressive developments in terms

of policies and practice, adequate funding, training of educators, consistent monitoring and evaluation indicators to provide evidence on developments and addressing identified gap areas are some of aspects that will require a goal-oriented and collaborative approach in promoting the Pharm D program in India.[17-19]

Pharm D in China

The Chinese economy is the 2nd largest globally with the largest population. Additionally, it has a fast-growing ageing population contributing to an accelerated demographic shift (0.23 billion people by 2030). China faces many challenges in reforming and developing its health care system to service the ageing population, together with other epidemiological shifts, such as the rise of NCDs.[20] The Chinese government began implementation of a health reform plan aimed at achieving UHC by 2020, coupled with improved access to essential medicines, expending PHC and increasing public sector health financing.[21] An Essential Medicines Program was developed together with a minimum defined package of health services to be provided to the population through public institutions.[22]

The role of pharmacists in the Chinese health system is in stocking, distributing and dispensing medications with posts generally in pharmacies within hospitals, community pharmacies, insurance companies, manufacturing of pharmaceuticals and research institutes.[23] The Chinese government promulgated a plan for drug safety in 2017 and specifically stipulated the need to increase licensed pharmacists at service level, advising the need for four licensed pharmacists per 10 thousand people by 2020.[24] This indicates that the required number of licensed pharmacists is over half million, considering the current Chinese population stands at 1.38 billion. The amount 0.245 million of licensed pharmacists will be newly increased by 80% on the basis of 0.307 million in 2017. There has been a noted need in China for the pharmacists' activities to transition from compounding and dispensing to rational medicine use and patient-orientated care.[25] The increasing demand of high-quality health care urgently needs increased numbers of well-trained pharmacists with appropriate clinical knowledge and skills. Currently there are not enough pharmacists with clinical background to meet this increased demand.[26]

Progress of pharmacy education

In China, the pharmacy program in higher education, particular for the traditional Chinese medicine, developed over one century with modern pharmacy programs being developed after 1949 with significant growth from 2000. Pharmacy schools or related courses were established in hundreds of universities, but most of them are focused on pharmaceutical science and technology, emphasizing training in skills needed for research in drug discovery, manufacturing and marketing for industry. Undergraduates receive a Bachelor of Science degree (BS) as a basic-level pharmacy degree, with graduates of the BS program earning a Master of Science (MS) degree or PhD degree in 3 or 5 years respectively.[25]

With the development of public health facilities, a quality, patient-centered system was prioritized in pharmacy education in China with the clinical pharmacy program being based on this principle. As for clinical pharmacy education, over 30 pharmacy colleges with undergraduate programs, over 40 colleges with master's degree programs and more than 5 universities with PhD programs were offering related courses at present.[22] Several 1 or 2-year continuing education programs were provided to train hospital pharmacists and clinical pharmacists in 93 hospitals.[23] By 2013, about 110 preceptors and 1200 clinical pharmacists were trained every year[22] in order to further improve their quality of professional service.

Changing the pharmacy education system from medicine-centered to patient and population-centered has a long way to go. Compared with Pharm D programs in the United States, the curriculum structure of clinical pharmacy programs in China remain more traditional, where subjects are set separately for each academic year, rather than as integrated and incremental courses that run throughout academic years. The current focus of clinical pharmacy programs in China is to develop context-specific skill sets based on hands-on training geared for patient-centered pharmaceutical care concepts.[22,23] Although the exploration of patient-centered PhD program has been started in Peking University, the availability of clinical pharmacy high level patient-centered programs, such as the Pharm D, have not yet been established in China as yet.

Obstacles in Pharm D development

The clinical pharmacy program in China developed quickly after 2000, with a variety of programs and degrees offered. The standardization of training outcomes regarding the practice of a clinical pharmacist has proved difficult, resulting in variance in outcomes of pharmaceutical care.[25] In addition to this, it has been noted that higher education in pharmacy needs further modification and guidance to being consistent with the needs of Chinese society. This together with the large Chinese population could prove challenging in

higher education reform, as the MS and PhD in clinical pharmacy do not have the training capacities to produce large numbers of graduates annually. To help target these apparent obstacles, the Ministry of Education in China is assessing a plan of the Pharm D proposal by the Peking University as Master of Clinical Pharmacy (CPM) and the Doctor of Clinical Pharmacy (CPD) degrees.[26]

Pharm D program in Russia

The Russian Federation was the first globally to promote the assurance of the right to UHC despite income, employment or geographic location; however this 'guaranteed minimum' of healthcare service and coverage has become fragmented with health inequalities emerging between urban and rural areas and income disparities.[27] In recent years, the rise of NCDs (including cardiovascular disease, stroke and cancers) has been prominent, with the healthcare system aiming to develop programs for NCDs responsible for high mortality rates. Since 2000, improving healthcare for women and children has been a priority, with STDs (such as HIV/AIDs and hepatitis A and B) being targeted through appropriate programs.[9,28,29] Despite attempts by the administration to address population decline through healthcare initiatives, the public share of healthcare expenditures remains low compared to other countries in nearby Europe, with medicines prescribed to outpatients being one area considered to be chronically underfunded leading limiting access to healthcare.[8,30]

Pharmacies in Russia mainly operate as retailers of industrially manufactured medicines and a pharmacist can receive prescriptions and dispense medications as can a pharmaceutical technician.[31] As of 2012, there are over 60 000 'pharmacy type institutions in Russia', of which only half are classified as pharmacies. A survey showed female pharmacists are very common in Russian pharmacies and the majority of pharmacists have a baccalaureate degree offering care for minor injuries and infections, amidst noted medicine supply problems.[32,33] There are about 3,000 hospital pharmacies to service 140 million of the Russian population. The pharmacy profession has reportedly declined in social and financial status, with medicine supply (including provision of new medicines) remaining limited amid demographic and epidemiological changes in the country.[33]

Progress of pharmacy education

Undergraduate pharmacy education generally involves a 5-year degree, with postgraduate training (1-year internships) available in aspects such as pharmaceutical chemistry and pharmacoeconomics, with PhD fellowships of 3-4 years; however, the Pharm D program has not been introduced yet in Russia. Instead, a specialty 'doctor-clinical pharmacologist' was introduced into clinical practice (Russian Federation Ministry of Health Order no. 131, dated 5/05/1997).[34] The main task involves clinical pharmacology services and pharmaceutical care for patients. They also engage in relevant research such as pharmacoeconomic, pharmacoepidemiological, pharmacogenetic and pharmacokinetic studies. The training of clinical pharmacologists is carried out at the postgraduate level, after a degree in medicine or pediatrics is obtained through clinical residency or general improvements in clinical pharmacology. Clinical pharmacologists who have at least one year of professional experience may train in an attestation (certification) cycle. The practical and theoretical level of a doctor–clinical pharmacologist is confirmed every 5 years by related institutions.[34] The recommended number of positions is one clinical pharmacologist for every 250 beds or 500 ambulatory visits to hospitals.[35]

Obstacles in Pharm D development

Currently, the practice of pharmacy remains underdeveloped and largely misunderstood, particularly due to there being no pharmacy association to represent the profession nationally within sectors of government and within the medical field. Without this, progress toward development of a Pharm D program could be compromised. The concentration of pharmacists within the retail sector and void within hospital pharmacies, particularly within the public sector, could also prevent development of the clinical pharmacy profession, thus misjudging the need for Pharm D development.[34]

Pharm D in Brazil

Currently in Brazil, as in South Africa, a two-tier health care system exists with the underfinancing of a weak public healthcare system.[35] The healthcare system has a national health insurance framework with a private sector role providing a public-private mix of healthcare service provision, of which 47% and 53% of the healthcare financing services the public and private healthcare sectors respectively.[36] Brazil has a complex health burden, with the NCDs (including cardiovascular disease, stroke, diabetes mellitus and hypertensive heart disease) being common causes of mortality due to risk factors such as raised blood glucose, raised blood pressure, obesity and the use of tobacco. In addition

to this, communicable diseases (including lower respiratory infection) remain prominent together with interpersonal violence and road injuries.[36] Despite financial provision by the state into the largest public healthcare system in the world, Brazilian families spent 9-fold the public expenditure on acquiring medicines in 2013.[37]

The Brazilian Federal Council of Pharmacy (Counselho Federal de Famacia) (CFF) stipulates the standards of pharmaceutical practice in the country and ensures regulation thereof. Currently in the profession of pharmacy there are eight occupational classifications within the pharmaceutical sector, namely; the pharmacist, food industry pharmacist, complementary and integrative practice pharmacist, pharmaceutical industry pharmacist, toxicology pharmacist, clinical analyst pharmacist and hospital and clinical pharmacist; with the specialization of a clinical pharmacist occurring from Resolution 581/2013.[38] As of 2015, the Brazilian pharmaceutical sector employed 195 022 pharmacists (the third-largest health care workforce in the country) with 78.8% working in private pharmacies and a mere 6.4% working in hospital pharmacies.[39] The implementation of clinical pharmacy services is still new in Brazil and few studies have examined the perspectives of pharmacists on this practice. The Department of Pharmaceutical Assistance (DAF) and Strategic Inputs has made progress into developing guidelines of the National Drug Policy and National Pharmaceutical Assistance Policy to co-ordinate policies and to standardize inputs for health and pharmaceutical services offered in the healthcare system. A key aim of the DAF is the influence on the qualification of pharmacy professionals to better serve the current population and their health needs.[40]

Progress of pharmacy education

Each year 18,500 pharmacists graduate and enter the pharmacy workforce with four-year degrees in pharmacy (a B.Pharm degree) or interdisciplinary health degrees with 4000 hr training, including completion of an internship of at least 800 hr.[40] The National Curriculum Guidelines for Pharmacy guide curricula to ensure an strong understanding of clinical analysis, the food industry, the provision of healthcare, aspects of toxicology and the dispensing and manipulation of medicines to patients with three core pillars of healthcare provision, technology and innovation and management.[41,42] At present there is no Pharm D degree recognized in Brazil. Postgraduate programs include master- and doctoral-level programs subject to accreditation through the Ministry of Education and specialization courses offered by institutions of higher educations with a minimum of 360h duration with the fulfillment of a final assignment or monograph required. It is unknown how any of these courses currently exist, with only some being regulated by the CFF (Resolution 582/2013).[41,43]

Obstacles in Pharm D development

Within Brazil, despite the CFF having defined the role of clinical pharmacy within the practice of institutions, clinical practice of pharmacists remains 'fragmented' and 'insufficient'. There are a small number of qualified professionals compared to the large Brazilian population and institutions and the number of clinical services has developed slower than expected in public primary healthcare units and hospitals.[44] In addition to this, low professional remuneration and lack of investment in the infrastructure of pharmacies remains prevalent in Brazil.[45] Current multidisciplinary residency programs dedicated to theoretical-practical activities within the public healthcare sector, including the Multidisciplinary Residency in Health Program, are not well suited to retaining pharmacists, with only 428 vacancies open to pharmacy graduates. Although patient-centered pharmaceutical care is gaining more attention for its role in Brazil, the clinical training and creation of appropriate posts for pharmacists is still largely developing.[46]

The way forward for pharmacy education

Amongst BRICS countries, South Africa was the first to introduce a Pharm D program in 2004. It focuses largely on clinical practice,[11] but it has been suspended while a new curriculum with greater research emphasis is being developed. The program aims to bring about an increase in value to the public system with research focusing on practicality of clinical practice. India initiated its Pharm D program in 2008, supported by the Indian government and despite quality-focused barriers, it is developing further taking into consideration research in patient-centers care and pharmaceutical care practices.[13] China, Russia and Brazil have not yet introduced Pharm D programs in their countries, but clinical pharmaceutical practice is in demand and professional pharmaceutical care is hetergeneously advocated for within these hospital settings (Table 1).[25,34,41] The Chinese government recognizes the need to increase the level of licensed pharmaceutical care providers and is pushing for reform within the pharmaceutical sector and health care system.[24] Russia has established the Doctor of Clinical Pharmacology qualification for which personnel have been strictly recruited and trained with a focus on pharmaceutical care needs,

Table 1: Summary of Progress of the Pharm D program in BRICS Countries.

	South Africa	India	China	Russia	Brazil
Year of initiation of national Pharm D program	2004	2008	-	-	-
Number of higher education institutions offering Pharm D	1 university.	Over 140 institutes.	-	-	-
Status of Pharm D program	Program suspended for modification.	Program is active, although not to be rolled-out at new institutions.	Pharm D program is in proposal stage.	-	-

but this is a medical specialty with no admission for pharmacy graduates.[34]

Noted challenges from the above experiences for development include Pharm D educator resources, including clinically experienced educators in colleges and adequate numbers of hospital-based preceptors, including graduates of the program. Secondly, in the close cooperation between pharmacy colleges and hospitals, the goal of consistent and functional specialization must be guaranteed with an efficient organization. It requires strong measures and co-operation among the government, professional associations and colleges to ensure that Pharm D graduates are retained within the public sector hospitals and that enough posts are made available. Particularly, collaborative efforts between these three stakeholders are necessary to set standards for clinical pharmacy programs, directions for implementation as well as the career development of the pharmacists would improve the efficiency of health care systems to cater toward a patient-centered focus.

To promote pharmacy education and professional affiliation together with government representation helps initiate and develop quality enhancement guidelines based on legislation. Multisectoral collaboration has the crucial role facilitating health care reform by improving the education systems, providing the facilities and developing career paths for the new category of clinical pharmacists. One of the options that could result in substantial improvement is by implementing the Pharm D program together with means of monitoring and evaluating the program and its benefits to the health system.

BRICS countries are not only influential in their own regions but represent a significant proportion of the world's population and trade.[5] Along with economic development, society has progressively realized their right to quality healthcare through local and regional commitments to UHC. For improved levels of pharmaceutical services in UHC, the training of clinical pharmacists should be a priority in colleges and hospitals.

Since its peak in 2013, the BRICS' collective GDP has fallen by almost a quarter, but at the individual country level, GDP per capita in China and India has continued to grow. Brazil and Russia recover from recession at present and South Africa improves slightly.[7] All of these economical transformations can have an impact on possible developments in pharmaceutical care and pharmacy education. While BRICS continued to contribute half of global economic growth last year, it is critical that a streamlined approach is adopted for focus on health care reforms that support preventative, curative and rehabilitative health for majority of the population.[47] When equitable and efficient health care systems are functional, a healthier and more productive population supports a more robust economic development in turn. The Pharm D program and well-trained clinical pharmacists in BRICS have a key role in contributing to the health and economy of these emerging powers.[3,4]

CONCLUSION

Pharm D programs have excellent potential to contribute to countries' local health requirements while enhancing the implementation of effective health care improvements. Despite this, the development of Pharm D programs have been staggered amongst BRICS countries due to obstacles noted through the above experiences. The further implementation of Pharm D programs in BRICS countries require evidence-based and incremental change that positively influences pharmacy education and practice in the developing countries. Thus, the pharmacy and healthcare workforce is better equipped to deal with demographic and epidemiological changes in patient-centered care.

ACKNOWLEDGEMENT

Nil.

Financial support and sponsorship

Pei Yu visiting Rhodes University in South Africa sponsored by Jinan University in China.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

ABBREVIATIONS

Pharm D: Doctor of Pharmacy; **BRICS:** Russia, China, Brazil, India, South Africa**; PhD:** Doctor of Philosophy; **ACPE:** Accreditation Council for Pharmacy Education; **NCDs: N**on-communicable diseases; **UHC: U**niversal health coverage; **RU:** Rhodes University; **ECDoH:** Eastern Cape Department of Health; **HPTD:** Health Professions Training and Development; **MDHT:** Multidisciplinary healthcare teams; **SADC:** Southern Africa Development Community; **Dip Pharm:** Diploma in Pharmacy; **B Pharm:** Bachelor of Pharmacy; **M Pharm:** Master of Pharmacy; **PCI:** Pharmacy Council of India; **AI-CTE:** All-India Council for Technical Education; **BS:** Bachelor of Science degree; **MS:** Master of Science; **CPM:** Master of Clinical Pharmacy; **CPD:** Doctor of Clinical Pharmacy; **CFF:** Counselho Federal de Famacia; **DIF:** Department of Pharmaceutical Assistance.

REFERENCES

1. Lin Y. Evolution of Pharm D Education and Patient Service in the USA. J Exp Clin Med. 2012;4(4):227-30.
2. Nunes-Da-Cunha I, Arguello B, Martinez FM. A Comparison of Patient-Centered Care in Pharmacy Curricula in the United States and Europe. American Journal of Pharmaceutical Education. 2016;80(5):83.
3. NCD Alliance. BRICS Health Ministers' Meeting Addresses NCDs in the Context of Emerging Economies 2014. Available from: https://ncdalliance.org/news- events/news/brics-health-ministers%E2%80%99-meeting-addresses-ncds-in-the-context-o-emerging-economies.
4. Acharya S, Barber SL, Lopez-Acuna D, Menabde N, Migliorini L, Molina L, *et al*. BRICS and global health. Bull World Health Organ. 2014;92:386-A.
5. World Health Organization (WHO). BRICS Health and WHO Country Presence Profile, Geneva: Switzerland. 2017;1-9.Available from: http://apps.who.int/iris/handle/10665/255800.
6. Harmer, A., Buse, K. The BRICS – a paradigm shift in global health? Contemporary Politics. 2014;20(2):127-45.
7. WHO. Health system financing: the path to universal coverage. Geneva: Switzerland, 2011.
8. Rodwin VG. Health and Health Care in BRIC Nations. NYU Wagner Research Paper. 2015;2598570. Available at SSRN: https://ssrn.com/abstract=2598570 orhttp://dx.doi.org/10.2139/ssrn.2598570
9. WHO: Geneva, Switzerland. South Africa: WHO Statistical Profile 2011.Available from: http://www.who.int/gho/countries/zaf.pdf?ua=1. [Last accessed 20 January 2018].
10. South African Pharmacy Council: Pretoria, South Africa. Good Pharmacy Education Standards, Board Notice 183 of 2017. Available from: https://www.greengazette.co.za/notices/pharmacy-act-53-1974-south-african-pharmacy-council-good-pharmacy-education-standards_20171117-GGN-41256-00183.pdf [Last accessed: 4 March 2020]
11. Rhodes University: Grahamstown, South Africa. Calendar, 2020. Available from: https://www.ru.ac.za/media/rhodesuniversity/content/registrar/documents/secretariat/governance/CALLENDAR_UPDATED_2020_03_03_WITH_LATIN_AND_GREEK.pdf [Last accessed: 4 March 2020]
12. Smith, F. The quality of private pharmacy services in low and middle-income countries: A systematic review. Pharmacy World and Science 2009;31(3):351-61.
13. WHO: Geneva, Switzerland. India WHO statistical profile 2015.Available from: http://www.who.int/countries/ind/en/. [Last accessed: 26 January 2018].
14. Ministry of Health and Family Welfare (Pharmacy Council of India). Pharm D regulations 2008. New Delhi, 10th. 2008.
15. Revikumar KG, Veena R. Doctor of Pharmacy Education in India - Its Genesis and Prospects: A Critical Study based on the Global vs. Indian Scenario. Int J Pharm Sci Rev Res. 2014;24(2):280-7.
16. Prasanna R, Deshpan D. Should the Pharm D Degree Be the Basic Educational Requirement in India for Pharmacists?. American Journal of Pharmaceutical Education. 2013;77(6):132.
17. Srikanth AB, Ahmad A, Reddy RK. Acceptance of Doctor of Pharmacy in India: A survey based study. Archives of Pharmacy Practice. 2013;4(3):93-7.
18. The Indian Express. Panel to look into Pharm D graduates unemployment. 2018. Available from: epaper.newindianexpress.com//c/25642535.
19. Jamshed S, Babar ZUD, Masood I. The Pharm D Degree in Developing Countries. American Journal of Pharmaceutical Education 2007;1(6):125.
20. The World Bank. Report Recommends Deeper Healthcare Reforms in China. 2016. Available from:http://www.worldbank.org/en/news/press-release/2016/07/22/report-recommends -deeper-healthcare-reforms-in-china.
21. Wang H, Gusmano MK, Cao Q. Review and evaluation of community health organization policy in China: Will the priority of new healthcare reform in China succeed?. Health Policy. 2011;99(1):37-43.
22. Yip W, Hsiao W. Harnessing the privatization of China's fragmented health-care delivery. The Lancet. 2014;384(9945):805-18.
23. Ye, H. Investigation on the employment of all previous years pharmacy undergraduate/graduate. J Pharm Educ. 2006;22:58-60.
24. State Administration of Food and Drug Administration: Beijing, China. 13.5 National drug safety planning. Available from: http://www.sda.gov.cn/WS01/CL0852/169745.html.
25. Jiang JH, Liu Y, Wang YJ, Liu X, Yang MS, Zeng Y, *et.al*. Clinical pharmacy education in China. American Journal of Pharmaceutical Education 2008;72(6):129.
26. Yu L, Tang R, Xu T. Primary analysis of the insufficient effective demand on clinical pharmacist education. Sichuan Med J 2008;129:471-2.
27. Cook L. Constraints on universal health care in the Russian Federation. UNRISD Working Paper 2015-5. 2015;1-31.
28. Russian Federation: WHO Fact Sheet. 2015. Available from: http://www.who.int/countries/rus/en/.
29. Adomanis M. Russian healthcare update. 2012. Available from: www.forbes.com/sites/markadomasnis/2012/02/28/488.
30. Cook L. 'Spontaneous privatization' and its political consequences in Russia's post-communist health sector. The politics of Non-State Welfare. Ithaca: Cornell U. Press. 2014.
31. Egorova SN, Akhmetova T. Pharmaceutical counseling: Between evidence-based medicine and profits. The International Journal of Risk and Safety In Medicine. 2015;27(1):S87-8.
32. Belkina T, Duvanova N, Karbovskaja J, Vlcek J, Tebbens JD. Antibiotic use practices of pharmacy staff: A cross-sectional study in Saint Petersburg, the Russian Federation. BMC Pharmacology and Toxicology. 2017;18:11.
33. International Pharmaceutical Federation. From Making Medicines to Optimizing Outcomes: the evolution of a profession 1912-2012. University College London: London, UK. 2020. Available from: https://www.fip.org/centennial/files/static/UCL_BOOKLET_Web.pdf.
34. Petrov VI, Kagramanyan IN, Khokhlov AL. Development of Clinical Pharmacology in the Russian Federation. Clinical Therapeutics. 216;38(5):1218-26.
35. Lindelow M, Araujo E. Universal health coverage for inclusive and sustainable development: Country summary report for Brazil. World Bank. Available from: https://openknowledge.worldbank.org/handle/10986/20732.
36. Cohn A. The Brazilian health reform: A victory over the neoliberal model. Social Medicine. 2008;3(2):71-81.

37. World Health Organization. Brazil: WHO Statistical Profile. 2015. Available from: http://www.who.int/gho/countries/bra.pdf?ua=1.
38. Brasília (Brazil): Brazilian Institute of Geography and Statistics (IBGE). Conta-satélite de Saúde Brasil 2010–2013. Contas nacionais no 48. 2015.
39. Brasília (Brazil): Ministério do Trabalhoe Emprego. Brazilian Classification of Occuptions. Available from: www.mtecbo.gov.br/cbosite/pages/pesquisas/BuscaPorTituloA-Z.jsf.
40. Brasília (Brazil): Conselho Federal de Farmácia, Comissão de Fiscalização. Regulation of Fiscal Activities. 2014.
41. Melo AC, Galato D, Maniero HK. Pharmacy in Brazil: Progress and Challenges on the Road to Expanding Clinical Practice. Can J Hosp Pharm. 2017;70(5):381-90.
42. Gramado (Brazil): Conselho Federal de Farmácia. National Control of Clinical Pharmacy Education. 2015.
43. Brasília (Brazil): Conselho Federal de Farmácia. The national forum discussion of curricula guidelines for courses to graduate in pharmacy. 2016.
44. Melo AC, Socolik I, Frade JCQP. Curso online: Prescrição farmacêutica no manejo de problemas de saúde autolimitados: CFF no 585/2013 no586/2013: linha do tempo e coletânea de documentos. Brasília (Brazil): Conselho Federal de Farmácia. 2016.
45. Dosea A, Brito G, Santos LMC, Marques T, Pimentel D, Bueno D. *et al*. Establishment, Implementation and Consolidation of Clinical Pharmacy Services in Community Pharmacies: Perceptions of a Group of Pharmacists. Qualitative Health Research. 2017;27(3):363-73.
46. Brasília (Brazil): Conselho Federal de Farmácia. Residência 2016. Available from: http://comunicacaocff.wixsite.com/residencia/ourtroop.
47. Suokas J. BRICS revival hangs on economic recovery 2017. Available from: https://gbtimes.com/brics-revival-hangs-economic-recovery.

Cite this article: Yu P, Wilson BJ, Bobbins AC, Srinivas SC, Yin G. Pharm D Program: Is it necessary in BRICS?. Indian J of Pharmaceutical Education and Research. 2020;54(3):517-25.