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A bibliometric review of pharmacy education literature in the context of low- to middle-income countries

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Abstract

Objective: This review systematically identified published literature on pharmacy education in low- and middle-income countries. Specific aims were twofold: Firstly, to systematically identify and quantify published literature on pharmacy education in the context of low- and middle-income countries. Secondly, to explore and understand the major patterns of dialogue in this literature.

Methods: Through bibliometric review, a cohort of publications were quantitatively analyzed to determine paper types, country context, publication by year, and journal source. Through document analysis a narrative of major themes was identified.

Results: A small number of publications ($n = 36$) were sourced; the majority being letters to the editor, commentaries or viewpoints (80%). The Asian subcontinent (39%), the Middle East (25%) and low-income countries combined (17%) were the dominant geographic areas. There was a peak in publication during 2008 and 2009; a single journal dominated. From narrative synthesis, seven themes emerged and implications for the relevant literature, policy, practice and future research were considered.

Conclusions: Aside from rhetoric, this bibliometric review demonstrates that there are few empiric publications in the area of pharmacy education in low- and middle-income countries. There is a need for a robust research agenda in order to address both gaps in the research literature; alongside the implications of the findings for educational policy and practice in this context.

Keywords: Bibliometric review; Low- and middle-income countries; Pharmacy education; Pharmacy practice; Clinical pharmacy

Introduction

Pharmacy education in developed economies such as the United Kingdom (UK), the United States of America (USA), Australia, Canada and New Zealand (labeled "high-income countries") has evolved over time; in response to external forces and internal professional need. This has been the case within the field of the pharmaceutical sciences, largely due to the fast pace of change and pressure on pharmaceutical industry to deliver new products; alongside technological advancement.[1,2] Likewise, there have also been shifts within other fields of pharmacy; particularly clinical as well as social and administrative pharmacy.[3]

Historically, pharmacy held the domains of sourcing raw ingredients, formulation, supply and distribution of pharmaceuticals, as well as other remedies.[4] Industrialization involving large-scale manufacturing of medicinal products, resulted in pharmacy losing the source and compounding aspects of its role with the pharmaceutical industry making pharmacy's role in the production of medication largely redundant; particularly for the community pharmacy

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sector.[4–8] The simple act of dispensing medications on the order of a medical prescriber, and the associated financial transaction meant pharmacists found themselves over-trained for what they did and under-utilized for what they knew.[8] A loss of function, social power and status resulted in a loss of identity for pharmacy.[4,5] Part of the response to this (since the late 1960s) has been the drive for "reprofessionalization" where there has been a gradual shift in focus away from the technical roles of pure procurement, supply and distribution of medications, toward disease and patient-oriented approaches to pharmaceutical decision-making; alongside the adoption of more clinically oriented roles.[4,5,8]

Within the community pharmacy sector in high-income countries, it has been role extension through cognitive clinical services that has received the most attention with respect to education, policy, practice and research. The need to reposition the pharmacy profession as medicine management experts through delivering value-added clinical services has been one of the main drivers for reprofessionalization.[4] This has been supported by professional pharmacy bodies and health policy-makers; particularly in Commonwealth countries.

There has also been a professional movement within hospital pharmacy, with greater presence and clinical input at the ward level as a result of the professional movement in 1990s.[9] This came before the community pharmacy reprofessionalization movement that has been more recent; and driven more by health policy, than impetus from the pharmacy sector per se; as was the case for hospital pharmacy. This occurred in the USA, UK and a number of countries within greater Europe. Pharmacists have managed to subspecialize within the hospital sector and have been active in clinical service provision, alongside core hospital pharmacy services; the source and supply of medications. Hospital pharmacists have also taken on roles that require an outward-looking, collaborative approach including the provision of clinical advice and drug information, but also areas such as strategic planning and policy-making.[10]

In the broadest sense, the pharmacy reprofessionalization agenda is likely to have influenced the education system in high-income countries through the requirement to train clinically oriented pharmacists. Equally, it is expected that by providing this clinical training, the profession is also being assisted by pharmacy academia in "moving forward", and achieving the clinically based vision of the future. The focus of pharmacy education has shifted from the basic sciences, to include clinical and health sciences, along with social and administrative pharmacy. In some countries pharmacy faculty moved from science faculties to be part of medical faculties.

For some time the Doctor of Pharmacy degree program (PharmD) has been the mainstay of clinical pharmacy education in the USA. Clinical pharmacy is an important discipline within the practice of pharmacy in high-income countries. Having had much to offer the profession, population health and healthcare systems in the broadest sense, the clinical pharmacy movement has been a significant vehicle for the reprofessionalization of pharmacy in high-income countries.[11] The growth of clinical pharmacy and pharmacy practice in high-income countries has also affected pharmacy education and practice in low- and middle-income countries. However, it is not clear whether the concept of modern pharmacy practice has been properly understood in these countries.

There are many definitions of "clinical pharmacy", and the term has been understood differently across the globe. Some relate it to "patient care", while others associate it more with the "appropriate use of medicines".[12] However, amid these discussions in the developed world, the change has also greatly affected the pharmacy sector in developing countries. Under this influence, the term "pharmaceutical care" is used as popular jargon in developing countries. Pharmacy degrees have been changed from bachelor degrees to PharmD and the length of degree programs extended.[13] However, despite all of this rhetoric, there is enough anecdotal evidence that the philosophies underpinning clinical pharmacy are poorly understood. This is in-part due to most of the developing world not having stable pharmaceutical systems.[14] Pharmacy degrees have been switched to PharmD degrees based on models from high-income countries in the greater Asian region.

It is unknown to what extent formal evaluation of the adoption of these programs has taken place, within the context of low- and middle-income countries.[15] Understanding how clinical pharmacy is perceived in different countries would be useful. In this context it is also vital to explore the pharmacy education literature that is related to broader clinical, social, and health-system pharmacy in developing countries.

It is clear there is scarce empiric literature about the scope and status of pharmacy education within low- and middle-income nations and, a thorough bibliometric review of the literature had not been previously undertaken. Through a better understanding of current dialogue and of the gaps in the literature across low- and middle-income countries, rhetoric and gaps in the literature can be explored in a systematic manner.

Objectives

The aims of this bibliometric review were twofold:

1. To systematically identify and quantify published literature on pharmacy education in the context of low- and middle-income countries.
2. To explore and understand the major patterns of dialogue in this literature.

Methodology

The methodology comprised the following three steps: (a) identification and retrieval of publications, (b) categorization of publication by type, year, context and source, (c) document analysis to identify the major themes of dialogue and to consider the implications thereof.

Step 1: Identification and retrieval of literature

A comprehensive electronic search was undertaken to uncover all the pieces of work, empiric or otherwise, relating to this topic in peer-review journals. Databases, search engines and specific academic journals were systematically searched over a 2-month period up until the end of February 2011. No lower limit of the search date was set. The search terms included those outlined in Table 1.

Search results from MEDLINE and EMBASE were combined and screened for duplicate entries. Additional articles were also searched through citation snowballing by checking the reference sections of the sourced articles.

Step 2: Categorization of studies through quantitative analyses

Inclusion and exclusion of studies

Titles and abstracts of the retrieved articles were reviewed by two authors (ZB, MA) to determine exclusions. Papers were not excluded by type (i.e. viewpoints and commentaries, original research, letters to editor, editorials, and reviews) as long as they reported pharmacy education in the context of low- and middle-income countries; within peer-review journals. Exclusion criteria included papers that were not related to pharmacy education or those that reported educational theory or pedagogies as opposed to pharmacy educational concepts per se.

Quantitative analyses

In order to develop a selection algorithm and to undertake the bibliometric analysis, the retrieved papers were categorized according to the following schema: article type, country/context, year of publication and source journal. Microsoft Office Excel 2010 was utilized for the analysis and generation of the graphical outputs.

Step 3: Identifying patterns of dialogue

The research design was emergent; the uncovering of the major themes of dialogue was chosen for the qualitative phase based on the realization from the quantitative outputs that there was a high level of rhetoric in the papers, along with few empiric studies.[16] Documents are a frequent source of qualitative data.[16,17] The primary materials analyzed for this study were the original publications. In terms of preparation of documents and analytic template, the lead author developed a narrative summary of each paper in order to reduce the data set and condense the dialogue to a manageable level.[17] The language of the paper was maintained, to allow patterns in the text to manifest as a series of themes representing the dialogue. The document analysis identified patterns of dialogue through one of the co-authors (SS) selecting segments of text from the summaries and adding them to build the wider categories of dialogue outlined in Table 2. The full papers were read by SS in conjunction with the summaries to ensure that interpretation was optimized.[18]

Ensuring trustworthiness

There is an exploratory section of the inquiry; executed under an interpretative frame. As such, quality assurance around the narrative synthesis of the dialogue focused on ensuring trustworthiness. The aim of establishing trustworthiness is to support the argument that the inquiry's findings are "worth paying attention to".[19] This is quite different from the conventional experimental precedent of

Table 1
Source and search terms

Source	Search terms
Web-based search engines	Pharmacy education in developing countries, PharmD in developing countries,
• Google	Pharmacy education in India
• Google Scholar	Pharmacy education in Pakistan,
Electronic databases	Pharmacy education in the Middle East
• Science Direct	Clinical pharmacy education
• Springer Links	Pharmacy practice education
• Medline	
• PubMed	
• EMBASE	
Selected journals	
• Currents in Pharmacy Teaching and Learning	
• American Journal of Pharmaceutical Education	

Table 2
Narrative themes

Narrative themes	Content making up the theme
1. A lack of recognition and failure to contribute	Service levels low Lack of workforce Disparate between high- and low- to middle-income countries Lack of recognition for the need for clinically trained pharmacists Switch to PharmD degree without recognition
2. A shift in focus; reform and transformation	Health system puts undue stress on revision of educational programs Transformation from a product- to a patient-centered profession is required Degree programs are less relevant to pharmacy practice roles Practice lags education and there is a mismatch Changes in practice will influence the development of curricula Reform pharmacy education to cultivate talent Barriers to pharmaceutical care Evolutionary versus revolutionary curricular development The rise of social pharmacy as a discipline
3. The ascendency of pharmacy	A rise in the popularity of pharmacy as a profession and its courses Demand of talents in pharmaceutical care Face market demand and reform patterns of education Education has driven the demand Success of pharmacy education is context specific
4. Following the "West": go local or go global	Why switch to PharmD when BPharm is already inadequate? Educational sector sees itself as similar to the USA – desire to keep pace Identity of clinical drug expert The notion of PharmD degree as a "tag" or "label" Education at the crossroads – tension clinical versus technical PharmD will facilitate transition from industry-based pharmacy education to patient-based pharmacy education Education shifts promoting practice change versus the need to launch a degree largely because of the changing face of pharmacy A need versus following the trends within high-income countries Misalignment between low-income countries with what constitutes a PharmD Tailored degree programs as opposed to adoption of standardized degrees from high-income countries Is the PharmD degree needed and what are the critical indicators to determining whether it has worked Ways of transitioning to the PharmD degree in a needs-based fashion is called for Disparities in progress between low-income countries Benefits of North–South cooperation
5. The paradox of pharmacy "export"	Pharmacists are trained to be exported whilst there is a shortage in these countries The notion of "brain drain" versus "brain gain" Insufficient training available to be clinical consultants due to lack of academic capacity Job market centers on the pharmaceutical industry Rural shortage Differing levels of education between hospital and community pharmacy and activities undertaken
6. Regulator and policy-maker engagement is key	Lack of a role and/or engagement Engagement varies Failure of professional bodies to establish standards of practice Recognition of importance of government/regulators in change processes Responsibility of regulators needs to be made clear Educational inequality and the power struggles between medicine and pharmacy
7. Clinging to history	Dominant focus on history- or case-based rhetoric rather than looking forward Curriculum development needs to reflect new ways of learning Satisfy budding new pharmacists who have clinical interests

Table 3
Components of "trustworthiness"
Source: Adapted from Lincoln and Guba[19]

Component	Definition	High-level strategy to ensure "trustworthiness"
Credibility	Evaluation of whether or not the research findings represent a "credible" conceptual interpretation of the data drawn from the papers sourced	The text is derived from the sourced publications and subjected to a rigorous analytic process which allows the seven themes of discourse to emerge in an interpretative manner
Transferability	The degree to which the findings of this inquiry can apply or transfer beyond the bounds of this project	The seven themes of discourse are transferable in terms of providing a high-level platform for researchers and educators across countries to consider the implications of the dialogue as well as gaps in current literature
Dependability	Assessment of the quality of the integrated processes of data collection, data analysis and synthesis of discourse	The overall study design is robust in terms of sourcing of papers, quantification and analysis processes for synthesis of discourse
Confirmability	Measure of how well the inquiry's findings are supported by the data collected	Several members of the research team were involved in the development and cross-checking of statements to be included in the discourse. There is an audit trail

attempting to demonstrate in a classical manner, validity and reliability.[16] Four issues of trustworthiness are drawn from Lincoln and Guba that demand attention: credibility, transferability, dependability, and confirmability (Table 3).[19] In this inquiry, trustworthiness was enhanced through the strategies outlined in Table 3.

The data set was relatively small and so was manageable for one researcher. However, in the interests of establishing trustworthiness, two researchers were involved in the qualitative analysis. The themes of dialogue were developed by (SS) as outlined in the previous section, and checked for meaning and interpretation by ZB.[20] A blinded process was not undertaken, the aim being to establish trustworthiness in terms of whether the findings are "worth paying attention to", not to try and determine any sense of "truth".[19] ZB read the original papers in full, re-read the summaries developed and then worked through the allocation of text into the themes of dialogue. Any perceived discrepancies or omissions were noted and discussed in a scheduled meeting between ZB and SS and incorporated or removed as deemed appropriate. This robust discussion ensured that findings and subsequent interpretation was consistent with the data set.

Under the interpretative frame, no attempt was made to undertake content analysis in order to differentiate the themes of dialogue frequency and/or importance. A sense of the more significant themes was gained and is stated in the findings section.

Findings

This section is divided into the quantitative findings of the bibliometric review and the narrative of themes uncovered through the textual analysis previously described.

Quantitative analysis

Publication selection

Figure 1 displays the selection tree resulting from the literature search process. Thirty-six ($n = 36$) papers were included in the final analysis.

Number of publications by type

For such an important topic, there was a scarce publication base of 36 articles at the time of the search. The majority of publications (80%) were letters,[13–15,21–29] commentaries,[3,30–42] or viewpoints,[43,44] suggesting a high level of rhetoric within the literature. There were relatively fewer editorials[45–47] (see Fig. 2) and a noticeable lack of empiric work.

There was a paper labeled a "special article" by a journal that was essentially an historical commentary.[48] A single review was based on publications sourced from a 5-year period,[49] but was predominantly used to portray the historical background of pharmacy within developing countries. The two other papers designated "reviews" were not based on systematic review of publications within the literature. They were reviews of the educational systems in low- and middle-income countries. As such, they are not systematic reviews in the traditional sense.[50,51] There was also a single publication labeled as a "Research Article" exploring pharmacy student views of curriculum in Egypt.[52]

Number of publications by journal source

The American Journal of Pharmacutical Education was the dominant journal with 53% of the published papers, followed by *Pharmacy Education* (14%) and the *Iranian Journal of Pharmaceutical Research* (8%). There were seven other journals with one or two publications each (see Fig. 3).

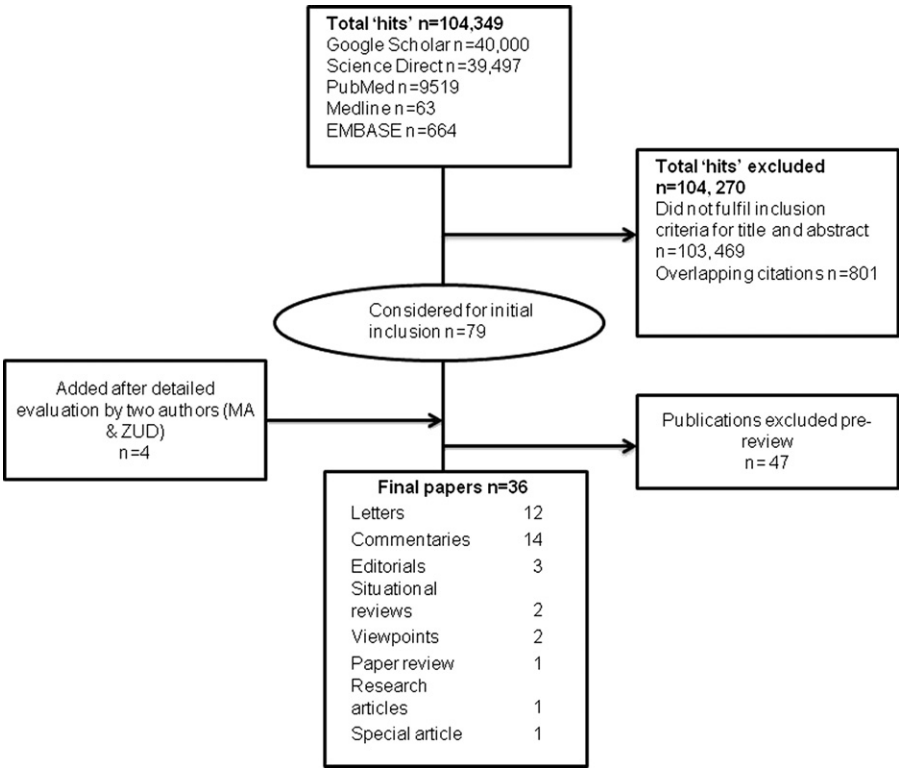

Fig. 1. Schema of selection tree for inclusion of papers.

Publications by year

The earliest identified paper was published in 1996. There was a trickle of one to two papers per year published from 2000 through 2008. At this point there was a spike in publication, with eight papers published in each of 2008 and 2009 (see Fig. 4).

Publications by continent

Close to one-fifth (17%) of the publications address the issues associated with pharmacy education in low-income countries in a global sense, without addressing concerns within particular nations. It appears that the Asian continent is the highest generator of publications (39%) followed by the Middle East (25%) and low-income countries as a whole (17%) (see Fig. 5). Less than 10% of the papers were from the African (8%) and Central and South American (8%) continents. At the time of this review there was a single publication retrieved from Eastern Europe.

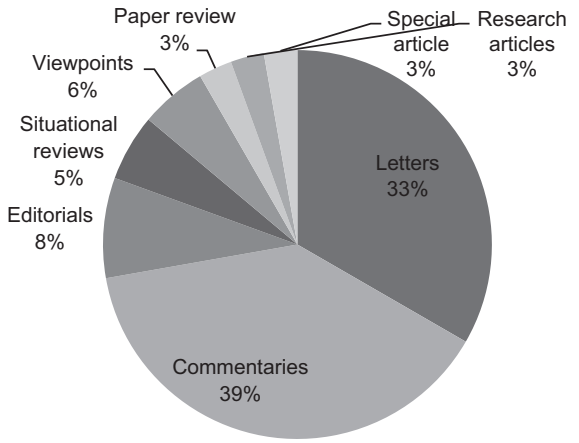

Fig. 2. Publication by type.

Narrative themes

This qualitative section draws together a divergent literature in order to: (a) understand the literature published to date, (b) identify the implications of this body of knowledge for the literature, policy and practice, and (c) determine the gaps in the literature and the implications of this for future research.

Theme 1: A lack of recognition and failure to contribute

Pharmacy service levels are sub-optimal in a number of low-income countries.[15,38,50] There is a strong possibility that pharmacy is failing to contribute to national healthcare in these countries. Not having enough qualified practicing pharmacists[13,15,25,26,32,48] is also likely to impact on health-service delivery. There are disparate levels of clinical service provision in pharmacy between high- and low- to

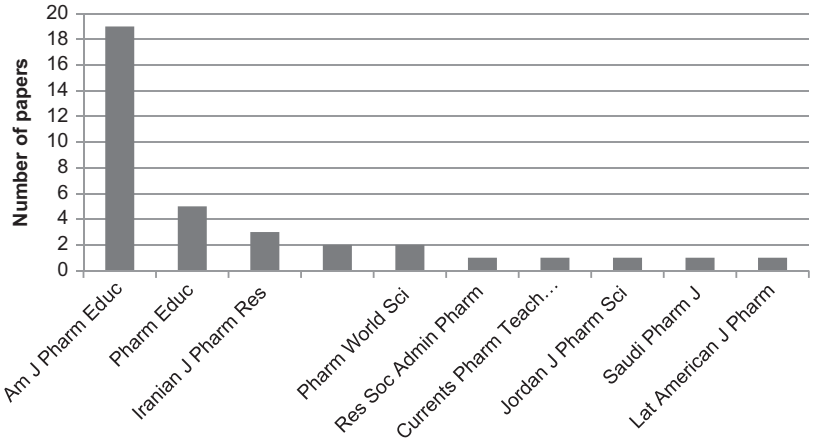

Fig. 3. Publication by source.

middle-income countries,[45] but this difference has not been investigated empirically in low-income countries.

Evidence suggests there is a lack of recognition for the need for clinically trained pharmacists in some low- to middle-income countries.[21,27,28,33] The assumption is made that switching from BPharm to PharmD degrees, even when pharmacists go unrecognized as health-care professionals, will increase acceptance and need.

Theme 2: A shift in focus; reform and transformation

Health systems in some countries may put undue stress on the revision of degree programs and uptake of curricular from high-income countries in order to remain contemporary.[48] Transformation from a product-centered to a patient-centered profession is required.[3,23,28] Despite this pharmaceutical science has dominated teaching and learning over clinically oriented learning and practice.[22,23,25,28,31,32] Pharmacy degree programs in these countries are less relevant to pharmacy practice and clinical pharmacy-based roles.

Two divergent viewpoints in terms of the influence of pharmacy education on practice and vice versa arose. First, practice lags education and there is a mismatch between change in education and practice.[23,44,50] Individuals need to be trained in order to deliver patient-centered care. Second, global and local changes in practice influence ongoing development of pharmacy education curricula.[36]

In some low-income nations greater pace of change[33,52] and reform of pharmacy education is called for in order to cultivate "talents" in pharmaceutical care.[42] The barriers to implementing pharmaceutical care and developing talent include[51]: (a) influence that comes from pharmacy professionals, (b) influence from other health professionals, (c) lack of a proper job description for pharmacists, and (d) the slow change in educational programs. In addition to

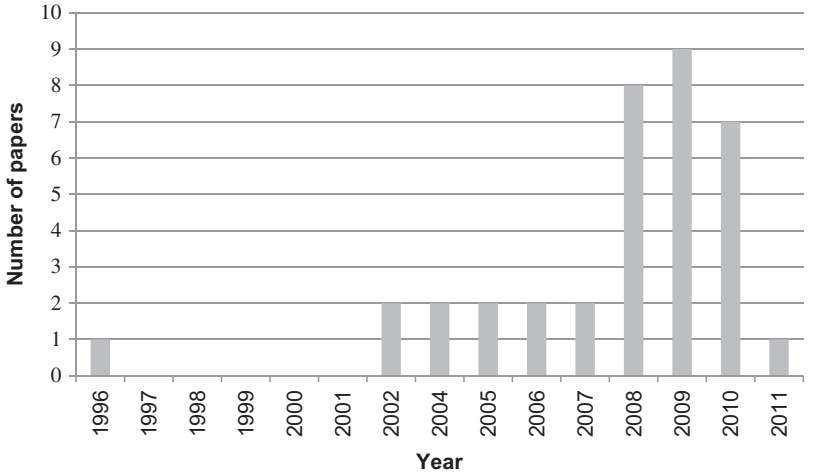

Fig. 4. Publication by year.

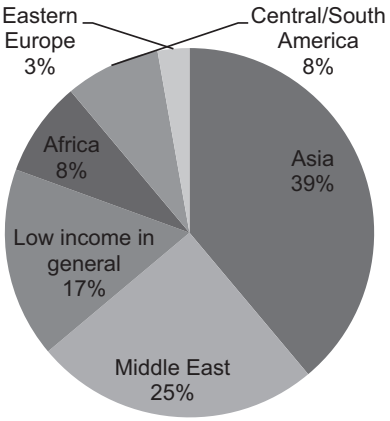

Fig. 5. Publication by continent.

adopting changes seen in high-income countries, local economic, political and social environments are driving re-evaluation of pharmaceutical education toward a more clinical focus.[3,36]

Some take the stance that curriculum development should be evolutionary not revolutionary and that new clinical teaching methods should sit alongside traditional training in the basic sciences[52] with more work in this area required before progressing to a clinical focus.[15] Others suggest a more revolutionary approach should be followed[23,25,30,31,35,36,46,48] and role change requires understanding patient behavior and psychology; the so-called socio-behavioral aspects of medicine use.[3] Social pharmacy is expected to be nurtured as a sub-discipline.[3] Being central to pharmacy education, some believe it should be taught too all future pharmacy practitioners.[3]

Theme 3: The ascendency of pharmacy

There has been a rise in popularity of pharmacy as a profession in some, but not all, low- and middle-income countries.[22,30,34,42,48] This trend is reflected by increasing demand for pharmacy degree programs. Demand for qualified pharmacists has increased due to population growth and the development and expansion of health-care sectors in low-income countries.[13,15,22,25,26,30,44,51] The implementation of new degree programs has been due to demand for "talents" in pharmaceutical care,[30,42,48,51] due to societal pressure, economic growth and improvement in living standards.[3,26,30,42,43,48,51]

Universities in low- and middle-income countries need to face market demands and reform patterns of current pharmacy education.[30,38,42,48,51,52] In some countries there are increased numbers of schools of pharmacy and graduates (i.e., Jordan, Saudi Arabia, Kuwait).[34] In some countries such as Lebanon, there is the belief that education has driven the demand; factors have initiated a surge of students towards pharmacy education.[43] Success of pharmacy education is reported to be context specific in low-income countries; the concepts being important: academic systems and curriculum, socio-cultural perceptions, organizational jurisprudence and licensure, and international recognition of pharmacy education.[43]

Theme 4: Following the "West"; go local or go global?

A dichotomy has emerged out of this synthesis between tailored degree programs and "off the shelf" adoption of degrees from high-income countries. One school of thought considers the local environment in developing tailored programs and highlights the misalignment of educational strategies with social need.[13,22,26,30,43,46] The design of comprehensive curricular is argued in order to meet the changing health-care environments of low- and middle-income countries.[44] Curricular development is expected to occur in accordance with social need, alignment with national and regional priorities and thereafter, global views.[26]

Multiple definitions are found and the term clinical pharmacy has been used interchangeably with terms like pharmacy practice and social pharmacy. This generates a confusing picture as internationally these terms are likely to have different meanings.[53] The philosophy underpinning clinical pharmacy is poorly understood in some low- and middle-income countries.[14] Assuming the PharmD "tag" is seen to be a "copy-cat" approach without a great deal of thought about the benefits or otherwise.[13,54] There has been considerable debate around the focus of clinical pharmacy in low- and middle-income countries, the need for PharmD programs and the focus or direction pharmacy practice should take.[13,22,27,55] Based on this commentary it is not clear to what extent these issues are "real".

Much of the rhetoric about pharmacy education in low- and middle-income countries centers on commentary about transition from the BPharm to PharmD degree programs. This is a significant theme within this literature, although very little empiric evaluation has been undertaken. Basic undergraduate pharmacy degrees have been changed to Doctor of Pharmacy degrees (PharmD), in some cases through an extension in duration of a year without content change.[13] There seems to be divergent viewpoints and commentary has centered on whether this is a rational approach. Whether the PharmD is needed by pharmacists serving all sectors in low- and middle-income countries has also been argued[44] along with the need to understand the critical success factors.[38,44] Hypothetically, success of transition to the PharmD program has been attributed to delivery and execution as well as the availability of clinical pharmacy staff to teach and practice.[27] Ways of transitioning the PharmD in a needs-based fashion that relate to curricular outcomes has been called for.[27,44]

Entry level is the BPharm/MPharm degree in many (non-USA) developed countries and arguably, these undergraduate programs are similar to the PharmD programs within the USA.[44] The BPharm degree is already inadequate with a maximum of 20% clinical content in some

programs.[27,33,44] The question has repeatedly been asked – "why switch to PharmD when there are still deficiencies in the current BPharm curriculum?".[26,27] To keep pace with education systems in the Western world is one common answer.[13,38,43,48]

The educational sector in many low- and middle-income countries is reported to be similar to the USA, where pharmacists need communication skills and the pharmacist has the identity of "clinical drug expert".[21,32,36] Equally, pharmacy education has been reported to be at the crossroads with the technical versus clinical tensions and the expectation of more practice-based PharmD degrees.[28] There is a perceived need to include more clinical and experiential placements within the PharmD curriculum than what is currently offered.[13,25,45] A solution that has been proposed for Pakistan is to split the PharmD into a Doctor of Pharmacy (Clinical) and a Doctor of Pharmaceutical Technology.[35]

Some authors suggest the PharmD degree will facilitate transition from industry-based pharmacy education to patient-based pharmacy education.[23,30,52] There is tension between education promoting practice change and the need to launch a degree due to the changing face of pharmacy. The question is being asked whether there is true interest and need for a PharmD level qualification or whether low- and middle-income countries need to address more basic issues[15,26,44] rather than simply follow international trends.[13,27]

There is significant variation in terms of what constitutes a PharmD degree. For example, Iran does not provide clinical insight through patient focused interdisciplinary training experiences, and the authors suggest that pharmacy may remain isolated from the wider team.[45] There is recurring dialogue around this in a number of low-income countries.[13,22,44]

There appears to be disparities in progress of pharmacy education amongst low-income countries, most commonly due to social issues such as war and so forth.[50] There is variation with respect to both educational and practice transformation.

Ghana's cooperation with the Robert Gordon University in Scotland and uptake of degree programs is an example of remaining current with trends in pharmacy education from high-income countries; demonstrating North–South co-operation. The pharmacy sector in Ghana is benefiting through continuous staff development, recruitment and functional links with other schools of pharmacy.[38] Other countries appear to demonstrate far less development in this regard.

Theme 5: The paradox of pharmacy "export"

The notion of there being an international pharmacy education market[24–26,49] is fascinating and appears to be somewhat paradoxical. In India, for example, pharmacists are trained with a view to meet international standards and enabling them to sit for entrance examinations allowing them to work in the USA.[25] On the other hand, there is a perceived need for and shortage of suitably qualified and experienced pharmacists in low-income countries.[13,15,25,30,32,44] This drive for international transferability is likely to have substantial implications for both the "exporter" and the "importer" countries, particularly if there were policy changes in either country. The notion of the "brain drain" (talent export) – if losing talent versus the "brain gain" (talent import) – if talent is recognized, is likely to depend on whose view is taken.

One of the concerns of the export phenomena is insufficient levels of training available to become competent clinical pharmacy consultants.[45] There is a lack of clinically experienced pharmacy academics and trained preceptors (as per high-income countries),[13,26] as well as a lack of practice-based facilities.[13]

The pharmaceutical industry dominates recruitment and therefore a perceived lack of need for clinical qualifications.[15,28,44] There are also greater employment opportunities within the pharmaceutical industry which is a preferred career option. Pharmacists are trained to be product or formulation scientists and often have no pharmacy practice or clinical experience.[25,52] This exacerbates the shortage of clinical practitioners, particularly in countries such as India where there is a strong pharmaceutical industry sector.[25]

There is concern about the shortage of pharmacists in rural regions and a call for curriculum development in this area. Exposure of students from low- and middle-income countries to rural practice early in their pharmacy education is thought to be essential.[32] Another workforce related issue is the differing level of education between hospital and community pharmacy where employees with qualifications of 1-year duration can practice as per a PharmD graduate in the community setting.[50]

Theme 6: Regulatory and policy-maker engagement is key!

The notion that regulators, legislators and/or pharmacy professional bodies do not have a role or are not engaged in the development of pharmacy education and practice within low-income countries appears significant.[13,21,23,25,28,45,46] Engagement of regulators varies across low- and middle-income countries, dependent on the perceived need for better governance and engaged regulatory authorities. There has been a failure of pharmacy bodies to establish standards of practice and in some nations.[22,23,45] Government agency attitude must change to recognize the importance of regulatory reform for moving pharmacy education and practice forward.[13,21,23,25,28,45,46] Contrary to this there has been government commitment to support and fund successful pharmacy degree programs in several low- and middle-income countries (i.e., Jordan, Saudi Arabia, Kuwait).[34]

System change and the responsibilities of regulators need to be made clear with respect to health reforms and

pharmaceutical policy development and implementation.[45] Taking into account the link between policy-based systems and medication distribution systems is identified as important.[43] Wider stakeholder input into development and modification of curriculum is important, but is not common practice.[23] The potential for educational inequality and the notion of power struggles between the pharmacy and medical professions are two reasons for gaining wider stakeholder engagement.[13] In South Korea the pharmacy degree is a 6-year program (the same duration as the medical program) and this creates tension between professional subcultures,[13,56] which is different from some developed countries where pharmacists appear subservient.[57] There have also been reports of tension based on turf protection of roles in several countries.[6,57,58]

Theme 7: Clinging to history

There is a dominant focus on history and/or case-based dialogue about service development over time in the literature. This descriptive material is important from the perspective of global awareness and learning from history, however, it is anecdotal. Curriculum development will need to reflect different ways of learning including the embracing of technology in order to engage the new generation[52] with the need to satisfy budding new pharmacists who have clinical interests; potentially impacting pharmacy curriculum development.[48]

Discussion

This study set out to undertake a quantitative bibliometric review and a qualitative narrative analysis of the literature published in the field of pharmacy education in low- and middle-income countries.

Quantitative findings: comparison with literature

There is scarce literature and, to the best of our knowledge, this is the first systematic bibliometric review in this area. Suffice to say, the large majority of publications are based on opinion, anecdote and rhetoric. Evidence-based papers, empiric studies and a potential research agenda-based on literature gaps have not been previously outlined.

Publications peaked in 2008 and 2009 with eight publications in each of those two years. This is related to dialogue around introduction of the PharmD degree in Pakistan.[22,54]

One-fifth (17%) of the publications address issues associated with pharmacy education in low-income countries in a global sense, without addressing particular nations. The majority of country-specific publications are about Greater Asia and the Middle East and Africa, Eastern Europe and Central and South America being less represented. *The American Journal of Pharmaceutical Education* has been the dominant platform for publication with over half (53%) the publications. This may be a reflection of low- and middle-income countries attempting to align with the USA and higher impact than local journals.

Qualitative findings: comparison with literature

The quantitative arm of the study highlights the scarcity of pharmacy education research in low- and middle-income countries and the qualitative arm highlights themes based on commentary. The authors are not aware of studies like this that aim to systematically uncover the dialogue published in this field. Seven themes emerged from the narrative analysis including: (a) a lack of recognition and failure to contribute, (b) a shift in focus; reform and transformation, (c) the ascendency of pharmacy, (d) following the "West": go local or go global?, (e) the paradox of pharmacy "export", (f) regulator and policy-maker engagement is key, and (g) clinging to history.

There is a growing gap between pharmacy education activities and pharmacy practice in high- , low- and middle-income countries.[59] There is little to compare the qualitative arm of this study with, however there are striking similarities, as well as differences with high-income countries. This points to the likelihood that global pharmacy educational research is walking the same path in some areas and much can be learned from both contexts. Lack of recognition of pharmacists skills and knowledge, perceived failure to contribute to healthcare, the importance of policy-maker and regulatory relationships, clinging to the past; not taking the time to think about the future has been reported in the context of a high-income country.[60] The rural workforce shortage[61–64] is a theme that has appeared in literature regarding pharmacy practice in high-income countries alongside shortage of workforce.[65–67]

The reprofessionalization agenda in high-income countries has taken many years to embed and lack of recognition of pharmacy and the clinical role continue.[4,8,58] Unique to low- and middle-income countries is the literature surrounding the ascendency of pharmacy and adoption of the PharmD degree. The transition to different degree programs in low- and middle-income countries is likely to have a significant impact on the pharmacy practice sector. Establishing clinical pharmacy as a discipline is deemed to be "novel" and as such the concept of pharmaceutical care has been used as popular jargon in low-income countries.[13,22,27]

In high-income countries the discipline of clinical pharmacy has been established within stable drug management, distribution systems and regulatory mechanisms. As most low- and middle-income countries are still struggling with the issues of quality, safety, efficacy and distribution of medicines, the clinical pharmacy movement appears to be sitting in isolation of the wider health system. The philosophy of clinical pharmacy appears to be poorly understood in many low- and middle-income countries which is reflected by this and the lack of any systematic plan.[14]

Related to both high- and low- to middle-income countries is the international transferability of degree programs and the developing "import" and "export" markets. There is no empiric work in low-income countries to support high-income countries investigating competency of pharmacists immigrating there.[68]

Implications of findings for educational policy, regulation and practice

The findings have significant implications for pharmacy educational policy, practice and regulation. There is commentary and viewpoint with respect to pharmacy curricular development, at two levels. Firstly, within low- and middle-income countries, described by the outputs of this bibliometric review. Secondly, work focused on global standardization of pharmacy education and competency frameworks. [69,70] Collective global action acknowledges that health-care needs and systems vary across geographic and cultural settings and pharmacy education must be quality-driven, but directed towards societal health-care needs. The services required to meet those needs, competencies necessary to provide these services and the education needed to ensure this must be considered. There is a disconnect between the two literature streams. Those generating the commentary and rhetoric about low-income countries are not part of the development of the Pharmacy Education Action Plan (2008–2010).[69] This creates a potential disconnect between what is proposed at the governance level and those that need to be engaged at the strategic and functional levels within low- and middle-income countries.

Implications of findings for future research

This study is exploratory and has generated as many questions as it has answered. Gaps have also been identified in the literature that has implications for future research. The literature is immature and reflects the ongoing development of clinically oriented pharmacy activities in low- and middle-income countries. The quantitative analysis showed that commentary and viewpoint dominates and although important it is generally not based on evidence that has been derived from systematic empiric approaches. The time is right to consolidate the gaps in the literature into a systematic research agenda allowing academics from low- and high-income countries to work toward more North–South collaborations. Empiric research that moves the output from letters and commentary to studies underpinned by theory and empiric data will help build sound evidence for future decisions about policy- and practice.

Gaps in local research

There are a significant number of low-income countries that are not engaging in any form of pharmacy education research; commentary or otherwise. There is a dominance of dialogue from the greater Asian regions, less in Central and South America, Africa and Eastern European countries. There is a need to better understand what is happening in these countries so other countries in "like" situations can learn and be assisted. In addition to North–South collaborations that develop naturally through academics with common interests, more support from organizations such as the World Health Organization (WHO) and the International Pharmaceutical Federation (FIP) would be beneficial. Peer-review journals also play a critical role in this activity and *The American Journal of Pharmaceutical Education* (AJPE) has been publishing the majority of the dialogue to date. There is a need to widen readership through publishing this topic area in other journals such as *Currents in Pharmacy Teaching and Learning* and *Southern Med Review*.

Moving from commentary to empiric study

Much of the published dialogue is rhetoric, personal experience and opinion and as researchers interested in this topic and the context, it is important to question the value of continuing along this track. In order to progress the broader research agenda needs to transition from predominantly commentary and viewpoint to original research; answering well scoped questions.

Through this bibliometric review a series of themes have emerged from which research questions can be developed to address gaps in current knowledge. Building on anecdote and rhetoric through empiric studies is expected to inform future policy and practice. The findings of this review have the following implications for future streams of research.

Research stream 1 – The impact of transitioning to PharmD programs: tailored degrees or international standardization?

There has been much dialogue and opinion about the requirement to develop local needs-based pharmacy education programs that may be different in each low- and middle-income country. This is the framework adopted by members of the FIP Education Taskforce.[44,69] Equally, collaboration with Universities from high-income countries is occurring, with adoption of their programs and in some cases with reciprocal licensing of graduates to practice in those countries.[71]

For some time Ghana has had links with Robert Gordon University in Scotland[38] and more recently Qatar with a Canadian University.[71] A better understanding of the optimal approach to take is required and formal evaluation of implementation is warranted in order to determine the best way forward in the longer term. Within this research stream the notion of graduate competency from an international stance could also be explored in more countries, through systematic means.

This bibliometric review highlights two divergent viewpoints in terms of the influence of pharmacy education on

practice and vice versa. The influence of one on the other in the context of low-income countries warrants further investigation and will require a multi-stakeholder approach. Equally, the notion that the PharmD degree will facilitate transition from industry-based pharmacy education to patient-based pharmacy education requires longitudinal evaluation.

Research stream 2 – Identifying and addressing the barriers to "professionalization"; the uptake of pharmaceutical care

The authors are not aware of any systematic evaluation having been undertaken in low-income countries to determine what the barriers might be to the profession moving forward; adopting clinical roles and being accepted prior to, or as part of, a professionalization process. In this bibliometric review commentary has been identified that raises the question of whether clinically oriented pharmacists are required in low- and middle-income countries. This might be a potential barrier to implementing practice-based education in its own right. The answer to this question is dependent on "whom one asks" and so selection of key stakeholders will be a very important part of the needs assessment and evaluation process. Being told in a top-down fashion that there is a need for clinical pharmacists in low- and middle-income countries could be less than helpful if academics delivering pharmacy education, along with other health providers, policy-makers and regulators are not engaged either with the notion or the process.

This review highlights the lack of recognition of pharmacy externally alongside the rise of pharmacy, at least from the viewpoint of those who are, or would like to be within its ranks! There is a tension here yet that no formal evaluation or critique of the transition to the PharmD degree has been undertaken and to the best of the authors' knowledge, a needs-based analysis has not been undertaken.

The fact that pharmacists who attempt to undertake clinical roles may not have the recognition and therefore the status in some low-income countries, is compounded by the scenario where those working in pharmacy who have completed a 1-year qualification can undertake the same level of work as for a 5-year degree.[31] The implications of this are significant and a broad yet systematic evaluation of this issue has not been undertaken. Further, evaluation of the impact of any new clinical programs on pharmacy practice will be required.

With the above barriers in mind the diffusion of innovative pharmacy education and practices in low- and middle-income countries needs to be tracked, analyzed and compared to the pathway taken by high-income countries. Likewise, there appears to be scarce literature with respect to planning for change within the pharmacy education sector in low- and middle-income countries. Evaluation of this through robust research design and/or program evaluation will be essential.

Research stream 3 – Workforce movement: the potential for North–South collaboration

There is talk of the movement of pharmacy graduates and academics from low- and middle-income to high-income countries and the potential impact on health-service delivery. The notion of the pharmacist as an "export commodity" is an interesting proposition, although it is unknown to what extent this is occurring, and what the impact is on service delivery and health outcomes in both low- and high-income countries. It seems paradoxical that on the one hand pharmacy education is an export producer of graduates and academics to the Western world whilst there is a shortage of pharmacists to work in clinical roles within their homeland.

The shortage of hospital pharmacists in India is a good example of this. This paradox may induce considerable tension within health systems and this warrants exploration and lends itself nicely to North–South collaborative studies. Matching the entry-level PharmD curriculum in the USA allows graduates to take the USA license exams.[54] If educated pharmacists are an export commodity to the USA then what is the drive for the Pharmacy Council of India to advocate this if there is a continual shortage within Indian hospital pharmacy? Is the training for the USA employment market the underlying notion of a brain drain or mass exodus, or simply the result of a lack of local recognition or the quest for "a better life" through living in a high-income country? Some work has been undertaken looking at migration patterns and what drives this behavior,[72] however there is an absence of research that follows the integration of these graduates into high-income countries, investigating the barriers and facilitators that may attract them back to their countries of origin. Three questions are of interest with respect to this. Firstly, are these pharmacists contributing in any manner to the situation in their homeland whilst they are abroad? Second, are they "allowed" to contribute to their homeland whilst abroad and if not, what are the barriers to this? Thirdly, what are the barriers and facilitators or incentives that would help to bring these pharmacists home?

The suggestion is made that there are disparate levels of clinical service provision in pharmacy between high- and low- to middle-income countries.[45] The authors label this a "global gap" between low- and high-income nations and suspect that in addition to the practice arena this phenomenon may be present within pharmacy education as well, warranting further investigation. Some effort has been made to think about global competency frameworks.[70] It will be important (and interesting) to compare the competence of graduates from similar programs in a wider group of low-, middle- and high-income countries particularly those who migrate to high-income countries. It will be necessary and beneficial for researchers within high-income countries to develop relationships and forge ties with more countries within Central and South America, Africa and Eastern Europe in order to progress the research agenda outlined.

Other agencies such as FIP and the WHO could assist academics in schools of pharmacy to achieve this.

Integral to this research stream will be gaining an understanding of what current students in low- and middle-income countries foresee as the future and what they will need in order to achieve this. Some work has been undertaken in this area, but substantially more countries need to engage in answering this question. Other important topics include the outcomes and performance of clinical pharmacy programs especially where there is an absence of stable pharmaceutical systems.[13]

Limitations of this bibliometric review

Despite the significant contribution this study is not without its limitations. The findings need to be considered in light of these. Processes were put in place to ensure that the bibliometric review was as broad as possible. However, there is always the potential that papers were not captured or that other researchers who select related search terms that are not exactly the same may identify a different group of publications. This will influence the quantitative results including: types of papers, country of origin, context of the paper and publications over time. Until another group repeats this search with different terms, it remains unknown how the data may be affected.

This study reports quantitative data and a narrative of themes via document analysis. As with any qualitative oriented work it is not possible to remain "value-free" and the authors own biases are likely to affect the interpretation of the findings.[19] This is particularly the case when the lead author of this paper has been a significant contributor to dialogue in this field. It is possible that other groups of researchers will come up with different themes. It is generally accepted that this is the case with interpretative qualitative research and the findings are tempered by a lower level of generalizability than the quantitative data reported.[17] The document analysis is exploratory in nature and this analysis was expected to provide broad themes which inform implications for literature, policy, practice and future research so a level of exactness is not required.[20]

Conclusion

This paper set out to systematically review published literature within peer-review journals concerning pharmacy education in the context of low- and middle-income countries. This study is bibliometric and describes the type, source and context. There is a dominance of commentary and viewpoint largely published in several peer-reviewed journals. Empiric literature is scarce and there is a need to transition any future research agenda from anecdotal and rhetoric to full empiric studies using both quantitative and qualitative methodologies. Gaps in local commentary and research have been identified particularly in Central and South America, Africa and Eastern Europe. Key areas of study are outlined that will assist in moving from commentary to empiric research. The potential for North–South collaboration is argued to gain a better understanding of the status of pharmacy education in low- and middle-income countries from the viewpoint of education, policy and practice.

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