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RESEARCH ARTICLE

The need for redesigned pharmacy practice courses in Pakistan: the perspectives of senior pharmacy students

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Abstract

Purpose: In Pakistan, courses in pharmacy practice, which are an essential component of the PharmD curriculum, were launched with the aim of strengthening pharmacy practice overall and enabling pharmacy students to cope with the challenges involved in meeting real-world healthcare needs. Since very little research has assessed the efficacy of such courses, we aimed to evaluate students' perceptions of pharmacy practice courses and their opinions about whether their current knowledge of the topics covered in pharmacy practice courses is adequate for future practice. **Methods:** A cross-sectional study was conducted over two months among the senior pharmacy students of two pharmacy colleges. A content- and face-validated questionnaire was used to collect data, which were then analysed using SPSS version 20. Descriptive analysis and logistic regression were performed. **Results:** Research in pharmacy practice (30.2%), applied drug information (34.4%), health policy (38.1%), public health and epidemiology (39.5%), pharmacovigilance (45.6%), and pharmacoeconomics (47.9%) were the major courses that were covered to the least extent in the PharmD curriculum. However, hospital pharmacy practice (94.4%), pharmacotherapeutics (88.8%), and community pharmacy practice (82.8%) were covered well. Although 94% of students considered these courses important, only 37.2% considered themselves to be competent in the corresponding topics. Of the participants, 87.9% agreed that the pharmacy courses in the present curriculum should be redesigned. **Conclusion:** Our results showed that the pharmacy practice courses in the current PharmD curriculum do not encompass some important core subjects. A nationwide study is warranted to further establish the necessity for remodelling pharmacy practice courses in Pakistan.

Key Words: Curriculum; Pakistan; Pharmacy education; PharmD, Pharmacy practice

INTRODUCTION

The pharmacy curriculum in Pakistan is designed by the Pharmacy Council of Pakistan and the Higher Education Commission of Pakistan [1]. Pharmacy practice is an important element of the PharmD curriculum. Although the concept of the PharmD in Pakistan was adopted from the United States, dissimilarities between Pakistan and the United States exist in some of the basic principles of pharmacy practice courses. The concept of pharmacy practice experience is clearly lacking in the Pakistani curriculum, as the Pakistani curriculum does not require students to have community and hospital pharmacy experience. However, the completion of a clinical pharmacy clerkship is one of the requirements to obtain a PharmD degree in Pakistan, although no structured plan on how to execute this clerkship is mentioned in the curriculum [2]. In light of the poor healthcare infrastructure in Pakistan, concerns exist whether the learning outcomes of the clinical clerkship are frequently achieved. Some important objectives of the PharmD curriculum are to strengthen pharmacy practice in Pakistan and to enable students to cope with

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the challenges of meeting real-world healthcare needs. However, no studies have previously been carried out to evaluate what students think regarding pharmacy practice courses. To the best of our knowledge, this is the first study to evaluate students' perceptions of pharmacy practice courses and their opinions about whether their current knowledge of the corresponding topics is adequate for future practice.

METHODS

A cross-sectional study was conducted from July to August 2014 among senior (fifth-year) pharmacy students. The students of two pharmacy colleges were selected to participate in this study. The sampling frame included all the senior pharmacy students enrolled in these two colleges. The participants were in their last few weeks of the second semester of their final (fifth) year of the PharmD degree program, and had been exposed to all the courses of the PharmD curriculum. Both pharmacy colleges were recognized by the Pharmacy Council of Pakistan and the Higher Education Commission of Pakistan. Participants were contacted by two of the authors, who were responsible for data collection through in-person meetings. The data were collected through a self-administered pre-designed questionnaire; however, in cases of ambiguity or queries about any question, clarification was also provided by the same authors. A brief description of the study was also provided to the participants by the authors before asking them for their voluntary participation in this study.

The questionnaire was designed after a rigorous literature review [3-5]. A draft of the questionnaire was then subjected to content validation, for which it was sent to a panel of three subject experts who screened the questionnaire for its relevancy and significance. All of the experts were academics with teaching and/or research experience in pharmacy practice, and at least one of the experts had experience in curriculum development. The revisions suggested by the panel were then incorporated into the questionnaire. The revised version was sent to a small group of ten students for face validation, who provided feedback about how the questionnaire could be made more simple and brief. After receiving this feedback, the necessary changes were made to the questionnaire, with reference to the previous literature. The data from these ten students were not included in the final analysis. The reliability coefficient of the questionnaire was determined in IBM SPSS ver. 20.0 (IBM Co., Armonk, NY, USA). The Cronbach's alpha value was 0.68. The final questionnaire that was utilized for data collection was divided into three sections. The first part asked the students for demographic information, including age, gender, academic year, university sector (public or private), cumulative grade point average (cGPA), and their prior

experience with pharmacy practice training. The second section elicited information about the courses that they had taken at their respective institutions. The third segment of the questionnaire contained questions regarding their perceptions of pharmacy practice courses.

The data were analysed using IBM SPSS ver. 20.0 (IBM Co.). Descriptive analysis was performed, and the responses were presented as frequencies and percentages. The chi-square test was used to assess the associations among dependent variables (perception questions) and independent variables (demographics). In cases where the conditions for the chi-square test were not applicable, Fisher's exact test was performed. Logistic regression was used to adjust for possible confounding factors. P-values < 0.05 were considered to indicate statistical significance.

Permission for data collection was obtained from all relevant preceptors of participants. Participants were also informed that completing and submitting the questionnaire would be considered to indicate consent for participation in the study. No personal details were obtained in order to ensure the anonymity of the participants. A high level of confidentiality was maintained throughout the study.

RESULTS

A total of 225 students responded to the questionnaire, with a response rate of 75%. However, 10 questionnaires were then discarded because they did not adhere to the guidelines for filling out the questionnaires, and 215 questionnaires were thus included in the final analysis. The majority of the participants were female (n = 139, 64.7%), at least 23 years of age (n = 148, 68.8%), attended public universities (n = 129, 60%), and had a cGPA of at least 2.8 (n = 165, 76.7%). The cGPAs of

Table 1. Demographic information of the participants

Variable	Number (%)
Gender	
Male	76 (35.3)
Female	139 (64.7)
Age (yr)	
< 23	67 (31.2)
≥ 23	148 (68.8)
University sector	
Private	86 (40)
Public	129 (60)
Cumulative grade point average	
< 2.8	50 (23.3)
≥ 2.8	165 (76.7)
Training/clerkship experience	
Yes	32 (14.9)
No	183 (85.1)

the participants had a normal distribution, and were divided into high and low groups based on the mean score (cGPA =

Table 2. Experience of participants with pharmacy practice courses

Courses	Responses of "yes" (%)
Healthcare delivery systems	150 (69.77)
Public health and epidemiology	85 (39.53)
Pharmacotherapeutics	191 (88.84)
Pharmacy management and administration	160 (74.42)
Hospital pharmacy practice	203 (94.42)
Community pharmacy practice	178 (82.79)
Applied drug information/pharmacy literature analysis	74 (34.42)
Pharmacoeconomics and outcome studies	103 (47.91)
Pharmacovigilance	98 (45.58)
Drug of abuse and society	155 (72.09)
Pharmacy Law and ethics	123 (57.21)
Geriatric pharmacy	65 (30.23)
Research in pharmacy practice	65 (30.23)
Self-care/non-prescription drugs	148 (68.84)
Health policy for pharmacists	82 (38.14)
Nutritional pharmacy	85 (35.93)

If fewer than 50% of responses were "yes," then the overall response was considered negative, meaning that the subject was not taught comprehensively.

2.8). Complete information about the demographic variables in presented in Table 1.

The results showed that the participants' experience was negative in eight of the 16 courses included in the study (50%). Research in pharmacy practice (30.23%), applied drug information (34.42%), health policy (38.14%), public health and epidemiology (39.53%), pharmacovigilance (45.58%), and pharmacoeconomics (47.91%) were some of the major courses that were represented most poorly in the PharmD curriculum. However, the students reported positive experiences with hospital pharmacy practice (94.42%), pharmacotherapeutics (88.84%), and community pharmacy practice (82.79), as shown in Table 2.

Ninety-four percent of students agreed that these subjects were important. However, only 37.2% believed that their current knowledge of those subjects was adequate for future practice (Table 3). A remarkable number of students (94%) considered the given pharmacy practice courses to be important. However, private university students, students with a cGPA less than 2.8, and students with training/clerkship experience were more positive about pharmacy practice courses than their counterparts (Table 4). Training/clerkship experience and cGPA were found to significantly predict variation

Table 3. Students' opinions regarding the importance of pharmacy practice courses and their knowledge of the corresponding topics

Question	Responses	
	Yes (%)	No (%)
Do you think that the courses mentioned in Table 2 are important in enhancing knowledge and skills related to pharmacy practice?	94	6
Do you think your present knowledge of the topics covered in these pharmacy practice courses is adequate for future practice?	37.2	62.8

Table 4. Correlations between students' views of the importance of pharmacy practice courses and demographic variables

Variable	Participants' responses		Odds Ratio (95% confidence interval)	P-value
	Yes (%)	No (%)		
Gender				0.088
Male	71 (93.4)	5 (6.6)	0.27 (0.06-1.21)	
Female	131 (94.2)	8 (5.8)	Reference	
Age (yr)				0.858
< 23	63 (94)	4 (6)	0.89 (0.24-3.18)	
≥ 23	139 (93.9)	9 (6.1)	Reference	
University sector				0.067
Private	83 (96.5)	3 (3.5)	0.21 (0.04-1.11)	
Public	119 (92.2)	10 (7.8)	Reference	
Cumulative grade point average				0.997
< 2.8	50 (100.0)	0	0.1 (0.04-0.89)	
≥ 2.8	152 (92.1)	13 (7.9)	Reference	
Training/clerkship experience				0.237
Yes	171 (93.4)	12 (6.6)	0.26 (0.02-2.4)	
No	31 (96.9)	1 (3.1)	Reference	

The overall predictive accuracy was 94%. Omnibus tests of model coefficients: chi-square = 12.556, P < 0.05. -2 log likelihood = 85.59, Nagelkerke R-squared = 0.155. Hosmer and Lameshow test: chi-square value = 10.164, P > 0.05.

Table 5. Correlations between students' views of their current knowledge of pharmacy practice and demographic variables

Variable	Participants' responses		Odds ratio (95% confidence interval)	P-value
	Yes (%)	No (%)		
Gender				0.947
Male	33 (43.4)	43 (56.6)	1.02 (0.50-2.06)	
Female	47 (34.1)	91 (65.9)	Reference	
Age (yr)				0.843
< 23	26 (39.4)	40 (60.6)	0.93 (0.47-1.84)	
≥ 23	54 (36.5)	94 (63.5)	Reference	
University sector				0.744
Private	35 (40.7)	51 (59.3)	0.89 (0.45-1.75)	
Government	45 (35.2)	83 (64.8)	Reference	
Cumulative grade point average				0.001
< 2.8	50 (30.3)	115 (69.7)	0.20 (0.10-0.42)	
≥ 2.8	30 (61.2)	19 (38.8)	Reference	
Training/clerkship experience				0.001
Yes	21 (65.6)	11 (34.4)	0.18 (0.07-0.43)	
No	59 (32.4)	123 (67.6)	Reference	

The overall predictive accuracy was 71%. Omnibus tests of model coefficients: chi-square = 33.104, P < 0.05. -2 log likelihood = 249.789, Nagelkerke R-squared = 0.195. Hosmer and Lameshow test: chi-square value = 19.129, P > 0.05.

Table 6. Perceptions of pharmacy students regarding pharmacy practice coursework

Perception	Participants' responses (%)			P-value				
	Agree	Neutral	Disagree	Gender	Age	Sector	Cumulative grade point average	Training/clerkship experience
The pharmacy practice courses in my present curriculum should be redesigned.	189 (87.9)	20 (9.3)	6 (2.8)	0.003	0.918	0.773	0.390	0.001
The knowledge gained from current pharmacy practice courses is sufficient to enable me to practice pharmacy effectively in the future.	80 (37.2)	64 (29.8)	71 (33)	0.302	0.124	0.002	0.387	0.018
Courses in pharmacy practice in Pakistan should be promoted.	202 (94)	3 (1.4)	10 (4.7)	0.038	0.409	0.102	0.798	0.589
Research in pharmacy practice is a way to promote the incorporation of more comprehensive courses in this discipline.	199 (92.6)	15 (7)	1 (0.5)	0.179	0.493	0.621	0.002	0.592
The incorporation of the above-mentioned courses would facilitate the development of additional skills in pharmacy students that would be important for tackling daily issues in practice.	180 (83.7)	13 (6)	22 (10.2)	0.963	0.390	0.001	0.025	0.001

in the responses to the questions regarding students' knowledge of pharmacy practice courses (P < 0.05). As shown in Table 5, students with a cGPA of at least 2.8 and those who had training/clerkship experience believed that they had an adequate knowledge of pharmacy practice courses.

It is noteworthy that 87.9% of the participants agreed that it is necessary to redesign the pharmacy practice courses in the present PharmD curriculum. Gender and training/clerkship experience were significantly associated with such responses (P < 0.05). Similarly, 94% of students agreed that courses in pharmacy practice should receive greater emphasis in Paki-

stan. Male students were significantly more likely to hold this opinion than female students (P < 0.05). A remarkable portion of the students (92.6%) agreed that research in pharmacy practice would provide an excellent opportunity to incorporate comprehensive courses on these topics. Students with a high cGPA (> 2.8) were more likely to agree with this point than those with a low cGPA (P < 0.05). Only 37.2% of students agreed that their current knowledge of pharmacy practice was sufficient for future practice. Private university students and those with clerkship experience were more likely to agree with this statement than their respective counterparts (P < 0.05).

The responses of the participants regarding their perception of pharmacy practice courses in presented in Table 6.

DISCUSSION

The response rate of pharmacy students in the present study was 75%. This response rate may be considered average in comparison to other studies that have reported response rates of 60%-99% [4,6]. Our results suggested that hospital pharmacy, pharmacotherapeutics, and community pharmacy courses were taught comprehensively, while research in pharmacy practice, geriatric pharmacy, and pharmacy literature analysis/applied drug information received the least attention in the PharmD curriculum. These results may have some negative implications from the Pakistani perspective. The practice of polypharmacy in elderly patients is common in Pakistan [7]. The use of psychoactive drugs is also common among elderly patients; a study has reported that 39% of patients at least 65 years of age use such drugs [8]. This highlights the need of introducing courses in geriatric pharmacy into the curriculum in Pakistan, as it is necessary to train pharmacists who can competently address the clinical issues associated with the geriatric population. Doing so would also help further establish the concept of medication therapy management services in Pakistan. This paradigm focuses on the reduction of polypharmacy and the optimization of complex medication regimens, which are both skills that are a part of geriatric pharmacy education [9]. Research in pharmacy practice is another area that is relatively ignored in the current PharmD curriculum in Pakistan. Although some universities consider a research project mandatory in order to graduate with a PharmD, to the best of our understanding, no corresponding coursework has been incorporated in the current curriculum. With the introduction of the PharmD program, the profession has recognized the necessity of providing cognitive services along with traditional services. However, in order to provide these services and to establish the relevance of these services to pharmacy practice, pharmacists must actively participate in research in order to obtain the requisite evidence base. Furthermore, exposure to courses such as research design, retrieval of scientific literature, and applied biostatistics would enhance the ability of pharmacy students to critically analyse and interpret the biomedical literature. We encourage the relevant authorities to consider implementing these courses in the pharmacy practice curricula of the PharmD program, as they would enable future pharmacists to apply those skills in clinical practice and, correspondingly, result in improved health outcomes [10].

Similarly, our data suggest a few more areas that require further emphasis, such as public health, pharmacovigilance, and pharmacoeconomics. The Joint Commission of Pharmacy Practitioners has given two major recommendations for pharmacy practice in 2015: 'patient-focused and population-based pharmaceutical care' and 'improvement in health outcomes.' These concepts are directly related to public health and social pharmacy. Interestingly, the standard PharmD curriculum of Pakistan does include a social and administrative pharmacy course; however, the majority of the students believed that the subject has not been taught comprehensively. Further research is required to determine the factors associated with students' negative response towards this course.

The concept of pharmacovigilance is still in its infancy in Pakistan. This may also be the reason for the high prevalence of adverse drug reactions (ADRs) in Pakistan, as no diagnostic tool is available to identify ADRs in majority of hospitals. One study has reported that 41.5% of total medication errors involved ADRs [11]. Moreover, a study of senior pharmacy students found that only 44.7% of participants were knowledgeable about the Drug Regulatory Authority of Pakistan form for reporting ADRs [12]. In the current study, our results were discouraging, as the participants believed that the subject of pharmacovigilance was not taught in sufficient detail. At this point, it would be safe to say that there is a lack of basic understanding among pharmacy students regarding the concept of pharmacovigilance. It is imperative to include pharmacovigilance as a core subject in the pharmacy curriculum in Pakistan. This recommendation is also supported by the Uppsala Monitoring Centre, which is the primary international collaborative centre for ADR monitoring and has likewise emphasized that the subject of pharmacovigilance should be taught to undergraduate healthcare professional students in order to provide them with skills involving the optimization of medication usage [13]. The importance of pharmacoeconomics in the pharmacy curriculum has been well established worldwide. In the United States, the number of pharmacy schools teaching a pharmacoeconomics course has increased from 80% in 1997 to 92% in 2007 [14]. It is of utmost importance for a developing country such as Pakistan to expose future healthcare professionals to pharmacoeconomics and outcome assessment in order to ensure the financial sustainability of the healthcare system. We also recommend that stakeholders build an educational infrastructure that promotes education in pharmacoeconomics among students and other healthcare professionals, according their needs.

Our study also explored students' opinions regarding the importance of pharmacy practice courses and their knowledge thereof. Ninety-four percent of the students believed that the pharmacy practices courses presented in Table 2 are important in enhancing the knowledge and skills related to pharmacy practice. However, only 37.2% of students thought

that their knowledge in these areas was sufficient for future practice. In light of this, we can safely express our doubts regarding the comprehensiveness of pharmacy practice courses in the PharmD curriculum. It is also possible that these subjects are being taught as topics within other courses rather than as separate courses; nonetheless, these results were substandard. It was also noted that students with a high cGPA (>2.8) and students with training/clerkship experience were more positive about their current knowledge of pharmacy practice courses than their respective counterparts. These results may be compared to another study, in which 63.2% of participants responded that their current knowledge of pharmacy was insufficient for future practice [5]. A remarkable proportion of pharmacy students (87.0%) believed that it is necessary to redesign the pharmacy practice courses in the current curriculum. These results are similar to those of a study in which 82.7% of the participants agreed that it would be useful to teach social pharmacy courses to undergraduate students in Libya [5]. Another report from Malaysia indicated that 75% of students were satisfied with pharmacy practice courses [3]. Ninety-four percent of participants were also of the opinion that it is necessary to promote the discipline of pharmacy practice in Pakistan. We believe that hiring specialized pharmacy practice lecturers should be considered as a first step towards the achievement of this daunting task. A subsequent approach could be the use of the Partner for Promotion Program, as suggested by Rodis et al. [15]. This strategic method involves the training of pharmacy students and preceptors by pharmacists in academia in order to enhance their skills and confidence in promoting patient care services. Although this approach was initially examined in community pharmacies, it may be productive to implement this technique in other healthcare settings as well.

The results of this study, however, should be interpreted with caution due to its limitations. The approach of selecting two pharmacy colleges, while convenient, may have limited the generalizability of the results. As a general limitation of opinion and perception research, we cannot ignore the tendency of participants to provide more socially desirable responses.

In conclusion, the results of our study indicate that some important pharmacy practice courses, such as pharmacovigilance, pharmacoeconomics, and research in pharmacy practice are not being taught comprehensively in the PharmD curriculum in Pakistan. More importantly, students do recognize the importance of pharmacy practice subjects; however, they believed that their competence in those subjects was inadequate. A large proportion of students felt the need to redesign their current pharmacy practice curriculum. We recommend that future studies be conducted, evaluating a range of pharmacy schools across the country, in order to address these issues in the current pharmacy practice curriculum.

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CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

SUPPLEMENTARY MATERIAL

Audio recording of abstract.

REFERENCES

1. Pharmacy Council of Pakistan. Revised PharmD curriculum final 2013 [Internet]. Islamabad: Pharmacy Council of Pakistan and Higher Education Commission, Government of Pakistan; 2013 [cited 2014 Nov 5]. Available from: http://www.pharmacy-council.org.pk/doc/Pharm%20D%20Curriculum%20Final%20 2013.pdf
2. Madiha M, Yang CQ. Curriculum and pharmacy practice experience offered for Pharm-D in Pakistan: needs and possibilities. Int Curr Pharm J. 2014;3:313-317. http://dx.doi.org/10.3329/icpj.v3i8.19406
3. Alefan Q, Mohammad MH, Awaisu A, Razak TA, Rahman JA. Students perspectives on pharmacy curriculum in a Malaysian University. Malay J Pharm Sci. 2009;7:125-136.
4. Abrika OS, Hassali MA, Abduelkarem AR. Perceptions towards the need of social pharmacy courses in Libya: findings from cross-sectional survey among senior pharmacy students. Prime Res Educ. 2012;2:237-238. http://dx.doi.org/10.1016/j.cptl.2013.02.001
5. Abrika OS, Hassali MA, Abduelkarem AR. Is there a need for social pharmacy courses in Libya?: findings from a cross-sectional survey among pharmacy practitioners. Curr Pharm Teach Learn. 2013;5:201-207. http://dx.doi.org/10.1016/j.cptl.2013.02.001
6. Igbeneghu OA. Knowledge and practices in the use of antibiotics among a group of Nigerian university students. Int J Infec Control. 2013;9:1-8. http://dx.doi.org/10.3396/ijic.v9i1.10539
7. Raza UA, Khursheed T, Irfan M, Abbas M, Irfan MU. Prescription patterns of general practitioners in Peshawar, Pakistan. Pak J Med Sci. 2014;30:462-465. http://dx.doi.org/10.12669/pjms.303.4931
8. Sabzwari S, Kumar D, Bhanji S, Sheerani M, Azhar G. Proportion, predictors and outcomes of delirium at a tertiary care hos-

pital in Karachi, Pakistan. Ageing Int. 2014;39:33-45. http://dx.doi.org/10.1007/s12126-012-9152-5

9. Odegard PS, Breslow RM, Koronkowski MJ, Williams BR, Hudgins GA. Geriatric pharmacy education: a strategic plan for the future. Am J Pharm Educ. 2007;71:47.

10. Kim SE, Whittington JI, Nguyen LM, Ambrose PJ, Corelli RL. Pharmacy students' perceptions of a required senior research project. Am J Pharm Educ. 2010;74:190.

11. Khan MU, Ahmad A. The impact of clinical pharmacists' interventions on drug related problems in a teaching based hospital. Int J Pharm Clin Res. 2014;63:276-280.

12. Shakeel S, Iffat W, Anjum F, Bushra R, Ibrahim S, Shafiq S. Emerging need of pharmacovigilance: perspectives of future pharmacist in Pakistan. Int J Pharm Teach Pract. 2014;5:966-969.

13. Mann RD, Andrews EB. Pharmacovigilance. 2nd ed. West Sussex: John Wiley and Sons Ltd.; 2007.

14. Catic T, Skrbo S. Pharmacoeconomic education for pharmacy students in Bosnia and Herzegovina. Mater Sociomed. 2013;25:282-285. http://dx.doi.org/10.5455/msm.2013.25.282-285

15. Rodis JL, Legg JE, Casper KA. Partner for promotion: an innovative advanced community pharmacy practice experience. Am J Pharm Educ. 2008;72:134.