

# Pharmacy students' inter-professional perceptions towards the pharmacy profession in Bangladesh, Saudi Arabia and Malaysia

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## Abstract

**Objectives:** Inter-professional education that simulates real clinical practice serves as a catalyst that allows pharmacy students to learn both soft skills and new knowledge that could facilitate their transition into becoming a pharmacist. This study aimed to investigate the inter-professional perception of pharmacy students from Bangladesh, Saudi Arabia and Malaysia towards the pharmacy profession.

**Methods:** A 26-item questionnaire, adapted and modified from The Interdisciplinary Education Perception Scale (IEPS) was used in this multi-centre cross-sectional survey.

**Results:** There was a total of 909 respondents across the three countries. There were 494 students (54.3%) from Bangladesh, 275 students (30.3%) from Malaysia and 140 students (15.4%) from Saudi Arabia. Overall, male respondents were found to have higher scores than female students in all the factor-based classification of students' inter-professional skills. Third year students had better perceptions about Factor 1: professional competence and autonomy ( $29.52 \pm 3.06$ ), followed by first year, fourth year, second year and then fifth year students. In terms of perceived need for professional cooperation (Factor 2), significant differences were noted based on gender ( $p=0.008$ ) and academic level (year) of students ( $p \leq 0.001$ ). Similarly, in relation to the perception of actual cooperation/resource sharing within and across profession (Factor 3), significant differences were noted both in gender ( $p=0.019$ ) and academic year levels ( $p=0.003$ ). At the same time, training in hospital or community pharmacy within the last six months was found to significantly affect students' understanding of value and contributions of other professionals (Factor 4) ( $p=0.006$ ). However, no significant difference was noted in students that had attended pharmacy training sessions, seminars or conferences in the past six months.

**Conclusions:** Pharmacy students from Bangladesh, Malaysia and Saudi Arabia have almost similar inter-professional knowledge. The motivation for entering the pharmacy profession and practice exposure were found to significantly affect pharmacy students' inter-professional perceptions.

**Keywords:** *Inter-professional Perceptions, Collaboration, Inter-professional Relations, Interdisciplinary Communication, Cross-Disciplinary Communications*

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## Introduction

Pharmacy profession and education, though is a relative young discipline with its formal inception in early 1820s in England and United States, has undergone tremendous transformation in recent years due to the modernisation of the healthcare system and pharmaceutical industry (Ming & Khan, 2018; Stewart & Letendre, 2018). The radical changes in the pharmacist's role from compounding and dispensing to medication consultation and clinical role expansion has made it even more crucial for collaboration and integration with core healthcare and the medical profession (Mohamed Ibrahim & Fathelrahman, 2018; Wertheimer, 2018). The term 'inter-professional' with regards to the healthcare system refers to a group of people such as doctors, nurses and pharmacists that have different backgrounds in practical training, but work together in one organisation to achieve one ultimate goal, which is to effectively serve the community. These groups of professionals focus on the same objectives and have different but complementary roles (O'Connor *et al.*, 2018).

The increased complexity of health services has made the need for inter-professional skills imperative. Discrete but interconnected professional skills of healthcare professionals such as doctors, pharmacists and nurses need to be carried out simultaneously to deliver more effective, organised and supportive health and welfare services for patients, as well as to prevent the duplication of such services by professionals, thus saving time, effort and expense (Nasir *et al.*, 2017). In addition to that, the increase of knowledge and specialisation is another reason that requires the development of inter-professional skills (Leathard, 2002). Educational programmes need to be developed and implemented to ensure that future pharmacists are able to work collaboratively without any difficulties for better healthcare outcomes for patients (Bainbridge *et al.*, 2010). The prime focus of pharmacy colleges should be to adopt didactic and experiential strategies that inculcate inter-professionalism. For pharmacy students, the professional development process starts on day one and progresses slowly through interaction with faculty members, senior students and alumni students.

Inter-professional collaboration in healthcare is crucial because it determines the safety and health of patients as the healthcare field involves the life of humans. Inter-professional collaboration interventions are strategies to improve work interaction and processes between healthcare professionals in a healthcare setting (Zwarenstein *et al.*, 2009). Therefore, inter-professional education is important as a preparation for pharmacy students before they enter the real work environment as practising pharmacists (Bainbridge *et al.*, 2010). World Health Organisation (WHO) stated that inter-professional education can increase the competency of professionals to share their knowledge and skills in the team, develop new skills and help with communication between professionals, create new roles, and promote inter-professional research (Barr, 2014). Similarly, The International Pharmaceutical Federation (FIP) Education

Initiative endeavours to provide a global vision in inter-professional learning and published the Inter-professional Education in a Pharmacy Context: Global Report in September 2015, which marked a milestone in the growing recognition of inter-professional learning in pharmacy globally (Arakawa, 2017).

Inter-professional learning, notwithstanding, also has its drawbacks. For example, unlike conventional didactic teaching using standardised curriculum, inter-professional learning varies between countries according to local and national health needs and systems. Furthermore, differences in practice, culture and attitudes between the healthcare professions, teacher-practitioner as well as students undergoing training, need to be streamlined and matched prior to learning sessions (Brandt *et al.*, 2018). It must be noted too often healthcare professional students have heavy lecture, laboratory, problem-based learning schedules, and continuous and structured inter-professional learning and time-table matching pose a challenge (O'Keefe & Ward, 2018). Also, nursing, pharmacy and medical students are taught with different subjects in order to deliver different patient care and achieve optimal health outcomes. Therefore, a shift to learning integration might dilute the intended education outcomes (Gallagher & Gallagher, 2012).

A good pharmacist is one who can give outstanding health and welfare services to patients by working together with other professionals. This aspect is very important to be incorporated so that students will become aware of what will happen in the future when they work as pharmacists, which will require them to deal with other health care providers.

The authors investigation into pharmacy students' inter-professional perceptions toward the pharmacy profession was carried out across three countries - Bangladesh, Saudi Arabia and Malaysia. The pharmacy practice settings for each of these countries were different, therefore the authors wanted to ascertain the students' views about the pharmacy profession. In addition, it was essential to assess how students perceived pharmacy practice in each country. To date, there is no study that has addressed this issue at a multinational level. Therefore the current study is perhaps one of the very few aiming to explore and compare students' opinions regarding their profession in their respective countries. Moreover, this effort will also assist in investigating the impact of differences in education systems and differences in the duration of study on their perceptions towards the pharmacy profession. The study also provided information about the factors and motivations influencing students' choice of pharmacy study.

## Method

A cross-sectional self-administered survey was conducted between July 2015 and December 2015. Printed survey forms were distributed among pharmacy students at the seven institutions across three countries:

(a) Faculty of Pharmacy, Universiti Teknologi MARA (UiTM), Malaysia; (b) College of Pharmacy, Umm Al-Qura University, Saudi Arabia; (c) School of Pharmacy, Noakhali Science and Technology University, Bangladesh; (d) Atish Dipankar University of Science and Technology, Bangladesh; (e) BGC Trust University Bangladesh, Bangladesh; (f) Rajshahi University, Bangladesh; and (g) Primeasia University Bangladesh, Bangladesh. The completed survey forms were collected back and data were tabulated. Approval to conduct this study was obtained from the UiTM Research Ethics Committee 600-FF(PT.9/19)-20141004, prior to implementation of the study.

**The study tool**

A 26-item questionnaire was used in the study. The contents of the questionnaire were adapted and modified from 'The Interdisciplinary Education Perception Scale (IEPS)' (Luecht *et al.*, 1990). Statements in the IEPS were modified in a way that the meaning of the original statement remained the same but reflected pharmacy practice in Saudi, Bangladesh and Malaysia. The modified questionnaire was given to one faculty member in each participating university to assess the content and interpretation of the tool. Based on their recommendations, some sentences were subsequently restructured to enhance the clarity and simplicity of the tool (Khan *et al.*, 2015). However, the analysis was based on the same scheme recommended by Luecht *et al.* (1990).

The validity and internal consistency of the questionnaire used had been tested and reported by Khan *et al.* (2015). The questionnaire was divided into two sections. The first section contained eight questions to elicit demographic information and the general view of students about the career of a pharmacist and factors that influenced the students to choose pharmacy as their course. The second section included the survey on the perception of pharmacy students regarding inter-professional collaboration in a healthcare team (Table I).

**Table I: Factor classification for the inter-professional domains**

Factor	Domains covered	Statements assigned for each domain
1	Professional competence and autonomy	1, 3, 4, 5, 7, 9, 10, and 13
2	Perceived need for professional cooperation	6 and 8
3	Perception of actual cooperation and resource sharing within and across professions	2, 14, 15, 16, and 17
4	Understanding the value and contribution of other professionals/professions	11, 12 and 18

**Data analysis**

Collected data were analysed using Statistical Package for Social Science (SPSS) version 18.0. Both descriptive and inferential methods were used in analysing the data. The demographic data was analysed by descriptive method and displayed in a form of a frequency distribution table. On the other hand, the second section of the questionnaire which included the perception of inter-professional collaboration among pharmacy students was measured using the Likert scale from 'strongly disagree' to 'strongly agree'. The results were also displayed in the form of a frequency distribution table. To test the reliability of the questionnaire, Cronbach's *alpha* was applied to determine the internal consistency. In addition, the normality of the data was determined by Kolmogorov-Smirnov and Shapiro-Wilks tests. One-way ANOVA was used to determine the differences in scores in view of the normal distribution of the data parametric statistics, *i.e.* one-way ANOVA, were applied to estimate the difference between the groups. A *p*-value of less than 0.05 was considered as statistically significant.

**Results**

Of the 1018 pharmacy students, 909 pharmacy students from three different countries participated in this study, giving a response rate of 89.3% (Table II). Most of the respondents were from Bangladesh (n=494, 54.3%), female (n=517, 56.9%), fourth year student (n=556, 61.2%) with an age range of 18-24 years old (n=853, 93.8%). The majority reported that personal motivation was their motivation to join the pharmacy profession (n=377, 41.4%), and viewed clinical pharmacy practice in their country in a development phase (n= 522, 57.3%). About the same proportion of the respondents would be willing to work as a pharmacist in a hospital (n=336, 36.9%) and pharmaceutical industry (n=295, 32.4%). Of note, most did not have any previous job experience or training in hospital or community pharmacy within the last six months (n=684, 75.2%). However, most had attended a pharmacy training session, seminar or conference in the last six months (n=566, 62.3%).

In general, pharmacy students from three different countries reported a positive perception of their professional practice (Table III). In view of the professional competence and autonomy aspect (Factor 1), the majority of the respondents agreed that pharmacists are well trained (n=565, 62.1%); pharmacists' work is acknowledged by other healthcare professionals with great respect (n=477, 52.5%); pharmacists are very positive about, and committed to their job responsibilities (n=638, 70.2%); pharmacists have positive attitudes toward their contributions and accomplishments to the healthcare system (n=648, 71.3%); and there is a high degree of trust among the pharmacist community about each other's professional judgement (n=487, 53.6%). Whilst the majority of the respondents agreed that pharmacists have good relations with other healthcare professionals (n=586, 64.5%), they also agreed that

**Table II: Demographic information and motivation to choose pharmacy as a profession (N = 909)**

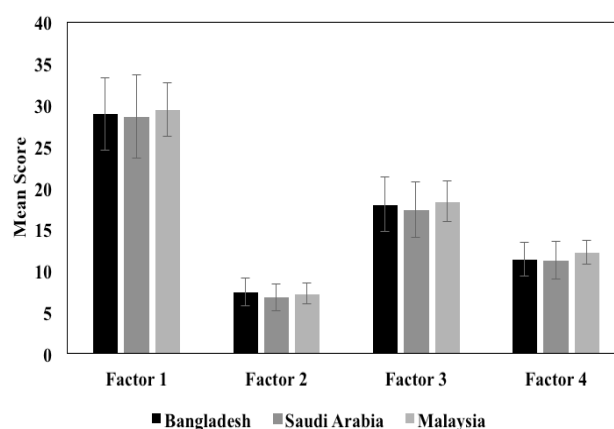
Demographic variables	N (%)
<b>Country</b>	
Bangladesh	494 (54.3)
Malaysia	275 (30.3)
Saudi Arabia	140 (15.4)
<b>Age</b>	
18-24 years	853 (93.8)
25-30 years	56 (6.2)
<b>Gender</b>	
Female	517 (56.9)
Male	392 (43.1)
<b>Academic year</b>	
First year	72 (7.9)
Second year	72 (7.9)
Third year	69 (7.6)
Fourth year	556 (61.2)
Fifth year	140 (15.4)
<b>What was your motivation to join pharmacy profession*</b>	
Personal motivation	377 (41.4)
Unable to get admission in medicine	191 (21.0)
Family member	147 (16.1)
Pharmacist highly paid	101 (11.1)
Others	40 (4.4)
<b>How do you see the clinical pharmacy practice in the country*</b>	
Development phase	522 (57.3)
Hospital pharmacy more established than clinical	300 (32.9)
International standard	48 (5.3)
Others	25 (2.7)
No answer / Missing data	5 (0.5)
<b>Upon graduation which sector you will be willing to join*</b>	
Hospital	336 (36.9)
Pharmaceutical industry	295 (32.4)
Academia / university	134 (14.7)
Community pharmacy	85 (9.3)
Others	17 (1.9)
No answer / Missing data	2 (0.2)
<b>Do you have any previous job experience</b>	
No	709 (78.0)
Yes	199 (21.9)
No answer / Missing data	1 (0.1)
<b>Training in hospital/community pharmacy within last six months</b>	
No	684 (75.2)
Yes	225 (24.8)
<b>Attended pharmacy training session, seminar, or conference in the last six months</b>	
Yes	566 (62.3)
No	341 (37.5)
No answer / Missing data	2 (0.2)

\*Responses are less than 100% because participants that provided more than one answers are not included

pharmacists need to improve cooperation with other healthcare professionals (n =726, 79.9%). Slightly more than half of the respondents agreed that pharmacists must depend upon the work of people in other professions (n=461, 50.7%). Whereas for domain "Perceived need for professional cooperation (Factor 2)", only slightly more than half of the pharmacy students (n=484, 53.3%) agreed that other healthcare professionals in their countries have a good perception about the pharmacy profession. On the other hand, most respondents (n=626, 68.9%) agreed that pharmacists practising in their countries are competent.

The majority of the respondents reported good perception of actual cooperation and resource sharing within and across the professions (Factor 3). They agreed that there is a great degree of team work among pharmacists with their colleagues (n=605, 66.5%) and pharmacists in healthcare system are making great efforts to understand the capabilities of other professionals (n=642, 70.7%). Of note, less than half of the pharmacy students (n=436, 48.0%) were aware of pharmacist dominance and independence in practice, or agreed that pharmacists in healthcare systems have higher status than other healthcare professionals (n=463, 41.0%). Most of the respondents understood the value and contribution of other professionals (Factor 4) with the majority of them agreed that pharmacists work well with each other (n=670, 73.7%), pharmacists are capable of working closely (n=681, 74.9%), and are willing to share information and resources (n=654, 72.0%) with other healthcare professionals.

Figure 1 compares the mean score of students from the three different countries with factor-based classification of students' inter-professional skills. Malaysian respondents in general had a higher score in all factors except Factor 2 when compared to respondents from Bangladesh and Saudi Arabia (Figure 1).

**Figure 1: Mean score for factors of the participating countries**

**Table III: Students' responses to the role of pharmacists**

No.	Statements	Cronbach's <i>alpha</i>	Strongly Not Agree N (%)	Not Agree N (%)	Do Not Know N (%)	Agree N (%)	Strongly Agree N (%)
1	Pharmacists working in health care system are well trained	0.835	45 (5.0)	119 (13.1)	180 (19.8)	492 (54.1)	73 (8.0)
2	Pharmacist demonstrate a great deal of dominance and independence in practice	0.824	31 (3.4)	170 (18.7)	272 (29.9)	338 (37.2)	98 (10.8)
3	Other health care professionals acknowledge the work of pharmacist with great respect	0.828	52 (5.7)	179 (19.7)	201 (22.1)	377 (41.5)	100 (11.0)
4	Pharmacists working in health care system are very positive and committed about their job responsibilities	0.824	20 (2.2)	74 (8.1)	176 (19.4)	455 (50.1)	183 (20.1)
5	Pharmacist have positive attitude toward their contributions and accomplishments to the health care system	0.829	14 (1.5)	50 (5.5)	197 (21.7)	449 (49.4)	199 (21.9)
6	Other health care professional in this country have positive perception about pharmacy profession	0.824	35 (3.9)	170 (18.7)	220 (24.2)	375 (41.3)	109 (12.0)
7	There is a high degree of trust among the pharmacist community over each other's professional judgment	0.823	16 (1.8)	112 (12.3)	294 (32.3)	397 (43.7)	90 (9.9)
8	Pharmacist practicing in this country's health care system are competent	0.830	13 (1.4)	88 (9.7)	181 (19.9)	417 (45.9)	209 (23.0)
9	Pharmacist need to improve cooperation with other health care professionals	0.833	10 (1.1)	57 (6.3)	115 (12.7)	455 (50.1)	271 (29.8)
10	Pharmacist individuals in my profession must depend upon the work of people in other professions	0.830	27 (3.0)	166 (18.3)	254 (27.9)	362 (39.8)	99 (10.9)
11	Pharmacist in hospitals of this country capable to work closely with other health professions	0.825	19 (2.1)	78 (8.6)	130 (14.3)	470 (51.7)	211 (23.2)
12	Pharmacists are willing to share information and resources with other professionals	0.827	15 (1.7)	78 (8.6)	160 (17.6)	437 (48.1)	217 (23.9)
13	Pharmacist in hospitals of this country have good relations with other health care professions	0.819	23 (2.5)	101 (11.1)	198 (21.8)	449 (49.4)	137 (15.1)
14	There is a great degree of team work among the pharmacists with their colleagues	0.825	19 (2.1)	81 (8.9)	203 (22.3)	433 (47.6)	172 (18.9)
15	Pharmacist has good relationship with people in other profession	0.819	23 (2.5)	101 (11.1)	198 (21.8)	449 (49.4)	137 (15.1)
16	Pharmacist in health care system have a higher status than other health care professionals	0.828	26 (2.9)	166 (18.3)	252 (27.7)	327 (36.0)	136 (15.0)
17	Pharmacists in health care system are making every effort to understand the capabilities and contributions of other professions	0.828	9 (1.0)	61 (6.7)	196 (21.6)	476 (52.4)	166 (18.3)
18	Pharmacist work well with each other	0.829	12 (1.3)	69 (7.6)	157 (17.3)	467 (51.4)	203 (22.3)

No significant difference was noted in the scores across all the factors among those respondents within different age categories regardless of their previous job experience, motivation of joining pharmacy profession, and if they have attended any training session, seminar or conference in the last six months (Table IV). It is interesting to note that those who had training in hospital or community pharmacy within the last six months had a significantly higher score in Factor 4, indicating that they understood the value and contribution of other

professionals better when compared to those who did not undergo training in a hospital or community pharmacy. Male pharmacy students reported significantly higher scores in Factor 2 and 3 while female pharmacy student had a significantly higher score in Factor 4. Surprisingly, fifth year pharmacy students had lowest scores in Factor 3 and 4 and had second lowest score in Factor 2 when compared to other academic year level of pharmacy students.

**Table IV: Factors based classification of students inter-professional skills**

<b>Factor based classification</b>	<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>	<b>Factor 4</b>
Mean	28.92 ± 4.12	7.17 ± 1.47	17.91 ± 3.00	11.56 ± 1.89
<b>Country</b>				
Bangladesh	28.83 ± 4.34	7.33 ± 1.64	17.93 ± 3.24	11.34 ± 2.02
Saudi Arabia	28.48 ± 5.01	6.74 ± 1.58	17.25 ± 3.31	11.20 ± 2.26
Malaysia	29.33 ± 3.18	7.15 ± 1.22	18.27 ± 2.41	12.16 ± 1.41
<i>p</i> -Value	0.313	0.210	0.108	0.210
<b>Age</b>				
18-24 years	28.89 ± 4.16	7.16 ± 1.53	17.93 ± 3.04	11.55 ± 1.95
25-30 years	29.45 ± 3.85	7.63 ± 1.42	17.93 ± 3.00	11.79 ± 1.67
<i>p</i> -Value	0.338	0.625	0.908	0.216
<b>Gender</b>				
Male	28.99 ± 4.51	7.31 ± 1.62	18.11 ± 3.24	11.43 ± 2.05
Female	28.88 ± 3.85	7.09 ± 1.45	17.79 ± 2.87	11.67 ± 1.85
<i>p</i> -Value	0.057	0.008*	0.019*	0.015*
<b>Academic year</b>				
First year	29.03 ± 3.45	7.36 ± 1.17	18.54 ± 2.37	11.75 ± 1.28
Second year	28.49 ± 3.24	6.53 ± 1.35	17.42 ± 2.72	12.07 ± 1.74
Third year	29.52 ± 3.06	7.42 ± 1.03	18.62 ± 2.37	12.32 ± 1.31
Fourth year	29.01 ± 4.21	7.33 ± 1.58	18.00 ± 3.12	11.47 ± 1.98
Fifth year	28.48 ± 5.01	6.74 ± 1.58	17.25 ± 3.31	11.20 ± 2.26
<i>p</i> -Value	0.386	<0.001*	0.003*	<0.001*
<b>What was your motivation to join pharmacy profession</b>				
Family member	28.58 ± 4.31	7.15 ± 1.43	17.95 ± 3.03	11.64 ± 1.99
Personal motivation	28.86 ± 3.87	7.12 ± 1.53	17.75 ± 2.90	11.51 ± 1.87
Pharmacist highly paid	28.90 ± 4.70	7.29 ± 1.61	18.11 ± 3.27	11.59 ± 2.09
Unable to get admission in medicine	29.10 ± 4.56	7.30 ± 1.64	18.06 ± 3.38	11.40 ± 2.14
<i>p</i> -Value	0.474	0.939	0.430	0.650
<b>Do you have any previous job experience</b>				
Yes	28.75 ± 4.76	7.17 ± 1.46	17.70 ± 3.25	11.73 ± 2.12
No	28.99 ± 3.96	7.19 ± 1.55	18.00 ± 2.98	11.52 ± 1.88
<i>p</i> -Value	0.383	0.731	0.404	0.279
<b>Training in hospital/community pharmacy within last six months</b>				
Yes	29.28 ± 4.40	7.23 ± 1.50	18.20 ± 3.08	11.91 ± 1.96
No	28.81 ± 4.06	7.17 ± 1.54	17.84 ± 3.02	11.45 ± 1.92
<i>p</i> -Value	0.746	0.349	0.232	0.006*
<b>Attended pharmacy training session, seminar, or conference in the last six months</b>				
Yes	28.98 ± 4.35	7.20 ± 1.60	18.03 ± 3.14	11.52 ± 2.00
No	28.86 ± 3.79	7.17 ± 1.39	17.77 ± 2.87	11.64 ± 1.83
<i>p</i> -Value	0.649	0.522	0.304	0.619

\*statistically significant,  $p \leq 0.05$  was considered statistically significant.

\*\*for responses that has no answer or missing data, the value is not included in the table.

## Discussion

In recent years, multidisciplinary team-based approach concept has led to modifications in healthcare practices. Due to the continuous development of the healthcare system, this situation is predicted to become more challenging in the near future. In other words, pharmacists should always equip themselves to adapt to the ever changing environment in the healthcare setting to ensure quality care for patients (Khan & Bukhsh, 2018). Positive relationships between health professionals and a high degree of trust are important aspects in inter-professional collaboration (Makowsky *et al.*, 2009). Thus, inter-professional collaboration is one of the important aspects that need to be improved in order to deliver effective health outcomes. By assessing pharmacy students' inter-professional perceptions, it will be a great help for institutions across the countries in creating a conducive environment that promotes professionalism (Bridges *et al.*, 2011).

The findings of the current study revealed that 377 students (41.4%) joined the pharmacy profession based on their own personal interest. Pharmacy profession has gained public interest in Bangladesh, Saudi Arabia and Malaysia over the past years and students have a better understanding of the scope of the pharmacy profession. However, more than half of the respondents agreed that clinical pharmacy practice is still in the development phase. The complexity of the healthcare system has allowed pharmacists to deal with more challenging environments in serving the community effectively (Jatau *et al.*, 2018). More students prefer to work in the hospital sector upon graduation. This demonstrates a good understanding among pharmacy students of their future role in clinical practice. It could also be due to their institution's curriculum placing more emphasis on hospital pharmacy, which has developed pharmacy students' interest to work in the hospital sector (Khan *et al.*, 2011).

Malaysian respondents in general had a higher score in all factors except Factor 2 when compared to respondents from Bangladesh and Saudi Arabia. This could be due to the difference in pharmacy education syllabus in Malaysia when compared to other countries. For instance, the pharmacy education syllabus in Malaysia and Saudi Arabia emphasises hospital pharmacy in which the students spend more time in clinical or ward attachments than the pharmaceutical industry attachment. As such, Malaysian pharmacy students may have a better perception towards the competence and autonomy of pharmacists, better perception of actual cooperation and resource sharing within and across the healthcare professions, and have a better understanding towards the value and contributions of other healthcare professionals. Inter-professional skills were further improved when pharmacy students attended introductory pharmacy practice experience (IPPE) and advanced pharmacy practice experience rotations (Khan *et al.*, 2015). IPPE is a major part of the curriculum with the goal of improving students' performance on subsequent practice experiences. It is an important first milestone in pharmacy students' journey to becoming capable

professionals that are ready to shoulder the responsibility to provide healthcare to patients (Mort *et al.*, 2010; Owle & Lawrence, 2011). Skills in knowledge sharing are also essential to ensure that all the knowledge and information are integrated effectively to be used by other healthcare professionals (Bose, 2003).

In the current study, a significantly higher score in Factor 4 was noted among those who had training in hospital or community pharmacy within the last six months, suggesting that they have better understanding in the value and contribution of other healthcare professionals. This can be due to the exposure gained during the hospital or community pharmacy training whereby pharmacy students had opportunities to engage with other healthcare professionals such as physicians, nurses and dieticians, leading to a better perception of pharmacists working in the hospitals, having good relationships and a great degree of team work with other health professions. Male pharmacy students reported significantly higher scores in Factor 2 and 3 while female pharmacy student had a significantly higher score in Factor 4.

The academic year level of the respondents also played an important role in the score differences across the factor-based classifications of pharmacy students' inter-professional skills. Findings from the current study suggested that third year students have higher scores than the rest of the students. This indicated that early exposure to practice and clinical activities could strengthen the professional skills of pharmacists and promote inter-professionalism among pharmacy students (Nimmo & Holland, 1999). Thus, it may be an effective approach to start pharmacy practice courses early for pharmacy students, which will then help to ensure that they have good skills that could be used to serve the needs of patients and the community after graduation. However, contrary to common belief, fifth year pharmacy students had lowest scores in Factor 3 and 4 and had the second lowest score in Factor 2 when compared to other academic year level of pharmacy students. The underlying reason for this observation should be further explored in future studies.

This study, though has projected some positive findings, has several limitations. The authors did not perform the full validation of the questionnaire tool that was adopted from literature, even though necessary steps had been taken to ensure the contents of the tool were relevant to the local participants. Furthermore, the authors did not analyse the results based on the responses of each country and compare those responses using statistical tests. Therefore, this study does not provide information to the discrepancy of inter-professional perception among pharmacy students in the participating countries.

## Conclusion

The findings of this research are useful in understanding the inter-professional perception of the institutions of pharmacy teaching in Bangladesh, Saudi Arabia and

Malaysia. Overall, pharmacy students from these countries exhibited similar pattern of inter-professional knowledge. The motivations to enter the pharmacy profession and practice exposure were found to significantly affect the inter-professional perceptions of students. Therefore, inter-professional education can be introduced to give students the opportunity to experience the concept of inter-professional collaboration. On the other hand, IPPE is also a platform for students to focus on learning as much as possible and to grow professionally. Thus, it would be useful if IPPE is introduced to students during their early years of pharmacy study.

## Declarations

### *Ethics approval and consent to participate*

Approval to conduct this study was obtained from the Medical Research and Ethics Committee in the Universiti Teknologi MARA (PT.9/19), prior to implementation of the study.

### *Availability of data and material*

Entire data are presented in the paper, no additional data are available.

### *Acknowledgements*

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