v1: 21 February 2024

Research Article

Attitudes and Knowledge of Pharmacy and Medical/Dental Students Towards and Barriers to Inter-Professional Education and Collaboration in the United Arab Emirates

Peer-approved: 21 February 2024

Qeios, Vol. 6 (2024)
ISSN: 2632-3834

Suleiman Sharif[1,2], Haya A. Al-Kaisi[3], Om Kalthoom M. Weisy[3], Obaida Hafez[3], Rubian S. Sharif[4]

1. Libyan International Medical University (LIMU), Libya; 2. Department of Pharmacy Practice, Faculty of Pharmacy, Libyan International Medical University, Benghazi, Libya; 3. Department of Pharmacy Practice & Pharmacotherapeutics, College of Pharmacy, University of Sharjah, United Arab Emirates; 4. Libyan International Medical University, Benghazi, Libya

Background: Inter-professional collaboration (IPC) is necessary for the provision of patient care. Poor IPC has a negative impact on the delivery of healthcare services and patient care.
Objective: The purpose of this study is to assess and evaluate the knowledge and attitude of final-year medical students toward IPC.
Methods: A cross-sectional study was designed, pre-piloted, and distributed to final-year pharmacy, medical, and dental students at the University of Sharjah and Ajman University of Science and Technology (UAE).
Results: A total of 212 (70.7%) surveys were received out of 250 targeted students; 3 of the surveys were excluded due to incomplete data. The response rate was 83.6%. The majority of the respondents were female (155; 75.2%), Arab (156; 75.7%), medical and dental students (129; 61.7%), senior students (104; 51.5%), and were living with their families (133; 63.6%). More than half of the participants were between 21-23 years old (158; 76%) and were self-sponsored (155; 74.9%). Among the 209 students, 80 (38.3%) were pharmacy students, and the rest were medical and dental students (129; 61.7%). In general, students' attitudes towards inter-professional collaboration seemed to be positive. The majority of students in both groups agreed that they share common goals and objectives when caring for the patient, that their roles are complementary to one another, and that an introductory IP experience would have a positive impact on their understanding of collaboration and teamwork. Again, there was general agreement among all students on the present barriers to effective inter-professional education and collaboration.
Conclusion: We conclude that some professional mandatory classes need to be common among the different health colleges. In addition, workshops should be implemented for pharmacy, medical, dental, and nursing students as a sort of practical regular extracurricular activity or can be projected as a theatrical play.

Corresponding author: Suleiman Sharif, suleiman_elsharif@limu.edu.ly

Introduction

A plethora of studies have clearly revealed the remarkable improvement in the delivery of healthcare services and consequently healthcare outcomes that can be achieved through interprofessional (IP) collaboration (Guraya & Barr, 2018, Carlisle & Taing, 2021). According to the World Health Organization, IPE "occurs when two or more professions learn from each other regarding the effective collaboration and improvement of health outcomes"(WHO, 2010). In light of the wise change in the role of the pharmacist from drug dispensing to patient care, the inclusion of the pharmacist as an essential member of the healthcare team becomes a

 doi.org/10.32388/EHN30G.2

necessity. The pharmacist can significantly contribute to the efforts of other healthcare professionals by counseling patients on their prescribed medications, the importance of drug adherence, and advising on lifestyle and proper drug storage conditions. The pharmacist can also advise the prescribing physician on the availability of equally effective generic drugs, drug interactions, and other aspects of the prescribed drug regimen. Management of chronic diseases while minimizing harm and improving therapeutic outcomes depends on the organized efforts of all professionals in the medical team. The pharmacist's contribution to the management of chronic diseases such as diabetes and hypertension has been the subject of several studies that showed a positive impact of pharmacist-led interventions (Hatah, Braund, Tordoff, Duffull, 2014; Cheema, Sutcliffe, Singer, 2014; Tan, Stewart, Elliott, George, 2014; Santschi et al., 2014).

Appropriate IP collaboration between healthcare team members requires a positive attitude, respect, and trust among members of various disciplines. This can be fostered through Interprofessional Education (IPE). The latter enhances interdisciplinary collaboration and teamwork and reduces barriers among health professionals (Guraya & Barr, 2018, Carlisle & Taing, 2021).

Inter-professional learning through undergraduate courses influences the knowledge of students and their appreciation of the roles and contributions of each other to the benefit of patients. The importance of IPE in health educational programs has been stressed by many national and international accreditation bodies, such as in pharmacy education by the Accreditation Council for Pharmacy Education (ACPE, 2016). IPE has also become the standard for entry-level pharmacy professionals (Olsen, Lupton-Smith, Rodgers, McLaughlin, 2021).

At the University of Sharjah, United Arab Emirates (UAE), the educational environment is ready to heavily embark on IP learning. Four colleges, namely the medical, dental, pharmacy, and health sciences, are situated in one complex, and the students share many elective courses, as well as scientific and extracurricular activities. The only courses shared by students of these colleges are a few elective courses. The same applies to Ajman University, which has only dentistry and pharmacy colleges. The pharmacy study plan is spread over 4 years as compared to 5 years in Sharjah. There is no official collaboration between the two universities. However, many researchers from both universities frequently collaborate on research projects. The objective of the present study was to evaluate the knowledge and attitude of pharmacy, medical, and dental students regarding various aspects of IP education and also to explore their views about IP collaboration and the barriers to IPE.

Methods

Study area

The University of Sharjah was established in 1997. However, the colleges of pharmacy (B. Pharm.), medicine (M.B.B.S.), and dentistry (B.D.S.) were established in the Medical and Health Sciences Complex in the year 2004 and were affiliated with the colleges of Pharmacy and Medicine-University of Monash and the college of Dentistry-University of Adelaide, Australia. The colleges adopt Problem-Based Learning and Team-Based Learning in addition to traditional lecturing and tutorials. In 2004, students of the three colleges had to enroll in a foundation year with common courses. However, later the system changed, and the pharmacy study plan was modified to include a separate first-year pharmacy instead of the foundation year. The common courses that are usually shared by students of the three colleges are principally elective courses. The three programs are accredited by the Commission for Academic Accreditation (CAA) of the Ministry of Higher Education of the United Arab Emirates (UAE).

The study plan of the colleges extends over 5 years (pharmacy) and 6 years (medicine and dentistry). The pharmacy curriculum includes basic and pharmaceutical sciences in addition to pharmacy practice and clinical pharmacy courses and experiential training. The college is, at present, applying for initial accreditation for a Pharm. D. program. Fourth-year students of the Faculty of Pharmacy and Health Sciences at Ajman University were included in the study. At Ajman University, the pharmacy program extends over 4 years, with pharmacy practice and clinical pharmacy taught in the advanced years. Basic and applied sciences are taught across the 4 years of the study plan. Ajman University was chosen because of its geographic location, accreditation, medium batch size, and the approval to conduct the survey that was granted by the university's administration and the dean of the faculty of pharmacy. The College of Sharjah-Medicine has adopted the module system where students are taught all the basic, applied, and clinical courses related to a specific system weekly as one block. In such a way, all courses are covered from the first to the fifth year, and then students have to do their hospital internship. In dentistry, basic and applied sciences are covered in the first two years in addition to some clinical subjects, the weight of which will increase as students advance to the third, fourth, and fifth years of the study plan, followed by an internship.

Study population

The study population consisted of two student cohorts: 1) fourth and fifth-year pharmacy students and 2) fifth-year medical and dental students. All students of these study years were targeted but not those of other study years, and as such, no sampling was made.

The present cross-sectional study was conducted during the period of January-April 2018 using a self-administered questionnaire that was developed by modification of a survey instrument designed and used in a previously published study (Hatah, Braund, Tordoff, Duffull, 2014). Prior to its administration, the questionnaire was pre-piloted for face validity by distributing it to 3 fifth-year dentistry students, 3 fifth-year pharmacy students, 2 fifth-year medical students, and 4 pharmacy professors at the University of Sharjah, and their comments and recommendations were considered in the final version of the questionnaire. The questionnaire consisted

of 4 sections; the first dealt with questions covering demographic characteristics of the participants, including age, gender, college, year of study, ethnicity, accommodation, and type of sponsorship. The second section covered questions on whether the students shared any common courses, collaborated in research projects or graduation projects, and their knowledge with regard to the prescription as a legal document and the meaning of the term polypharmacy. The third section covered questions that assessed students' views of each other as healthcare professionals and their attitudes towards future inter-professional collaboration. Separate questions were directed to and answered by each student cohort. Some of the questions examined the views of students on some ethical issues such as their willingness to associate themselves with the advertisement of pharmaceutical products and publicly criticizing other healthcare professionals. The last section questioned participants' views of the various barriers to their IP collaboration.

The questionnaire was distributed after class times with the supervision of a faculty member after taking his/her permission. Two members of the research group, who conducted the study, were always present to distribute the questionnaire, clarify any misunderstood points as needed, ensure the confidentiality of the participants' information, and collect the returned filled-in surveys. The participants' consent was verbally obtained after a brief explanation of the nature of the survey. The average time required to fill out the questionnaire was estimated to be a maximum of 15 minutes.

Ethical approval

All participants were assured of confidentiality, and the survey was an anonymous one. Ethical approval was obtained from the Ethical Committee of the University of Sharjah (REC-18-02-12-02-S).

Statistical analysis

Responses of the participants were encoded, and the data were analyzed using the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, version 20.0, Armonk, NY, IBM Corp). Three categories of the relevant responses (agree, neutral, and disagree) were used. Descriptive analysis was used to calculate the proportion of each group of respondents who agreed, disagreed, and were neutral with each statement in the questionnaire. The chi-square test was used to identify any significant differences among the participants' demographics and responses regarding certain statements in the questionnaire with a significance level of $p\text{-value} < 0.05$.

Results

A total of 250 students were approached and invited to participate in the study, but only 209 students voluntarily participated and completed the questionnaire, producing a response rate of 83.6%. The questionnaire was filled out by 80 pharmacy (P) and 129 medical/dental (MD) students. Females (155, 74.2%) were more than male (51, 24.4%) participants, and 156 (74.6%) were Arabs living with their families (133, 63.6%) and were self-sponsored (155, 74.2%). The majority of students were in the age range of 20-24 years (Table 1).

Criteria	Frequency (%), N= 209
College	
• Pharmacy	80 (38.3%)
• Medicine/ Dentistry	129 (61.7%)
Year of Study	
• Fifth Year	104 (49.8%)
• Fourth Year	98 (46.9%)
• Missing Values	7 (3.4%)
Gender	
• Female	155 (74.2 %)
• Male	51 (24.4 %)
• Missing Values	3 (1.4%)
Ethnicity	
• Arab	156 (74.6%)
• Non- Arab	50 (23.9%)
• Missing Values	3 (1.4%)
Age	
• 20	27 (12.9%)
• 21	42 (20.1%)
• 22	69 (33%)
• 23	47 (22.5%)
• 24	16 (7.7%)
• ≥ 25	7 (3.4%)
• Missing Values	1 (0.5%)
Accommodation	
• Dorms	67 (32.1%)
• With Family	133 (63.6%)
• Other	9 (4.3%)
Tuition fees	
• Self-Sponsor	155 (74.2%)
• Grant	52 (24.9%)
• Missing Values	2 (1%)

Table 1. Demographic characteristics of participants

Similar percentages (50%) of both groups of students stated that they shared some elective courses, while the majority (P 88% and MD 70%) did not do any joint research with each other. The majority of both groups (92% of P and MD) knew that the prescription is a legal document; however, more P than MD knew what is meant by polypharmacy. Pharmacists (70%) believed that they have more drug expertise than MD practitioners, and are (72%) competent to provide unbiased, evidence-based information related to drugs and pharmaceutical products to other health care professionals, will not publicly criticize (74%) the ability or performance of other health care professionals, will consult the physician/dentist before making any change in a prescription (75%), and they trust the MD decisions (50%). On the other hand, MD (65%) participants have confidence in the

Statement	Frequency (%)					
	Pharmacy N= 80			Medicine/ Dentistry N= 129		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
Research collaboration among Medical, Dental and Pharmacy students is beneficial	58 (72.5%)	17 (21.3%)	5 (6.3%)	98 (76%)	28 (21.7%)	3 (2.3%)
IP relationships between Medical, Dental and Pharmacy students should be included in their professional educational programs	59 (73.8%)	20 (25%)	1 (1.3%)	87 (67.4%)	36 (27.9%)	6 (4.7%)
Physicians/ Dentists are superior to Pharmacists	10 (12.5%)	18 (22.5%)	52 (65%)	31 (24%)	33 (25.6%)	65 (50.4%)
Pharmacists are more experienced in drugs than physicians/ Dentists	72 (90%)	6 (7.5%)	2 (2.5%)	81 (62.8%)	36 (27.9%)	12 (9.3%)
Pharmacists are qualified to assess and respond to patients' drug treatment needs	68 (85%)	9 (11.3%)	3 (3.8%)	55 (42.6%)	53 (41.1%)	21 (16.3%)
The Pharmacist is responsible for counseling patients on their drug treatment	72 (90%)	6 (7.5%)	2 (2.5%)	59 (45.7%)	42 (32.6%)	28 (21.7%)
The pharmacist should only dispense the drugs the doctor prescribes	18 (22.5%)	25 (31.3%)	37 (46.3%)	82 (63.6%)	30 (23.3%)	16 (12.4%)
The pharmacist can help in achieving the best therapeutic outcomes	64 (80%)	12 (15%)	2 (2.5%)	86 (66.7%)	31 (24%)	7 (5.4%)
A prescription by a Physician/Dentist should be filled as it is	23 (28.8%)	36 (45%)	21 (26.3%)	83 (64.3%)	36 (27.9%)	8 (6.2%)

Table 2. Attitudes and perception of pharmacy and medical and dental participants towards inter-professional collaboration.

Pharmacists and trust his/her opinion, while a majority (85%) believed that cooperation with the pharmacist is beneficial to the patient. More than half (55-75%) of the MDs stated that they accept the pharmacist's advice on dosage regimen, polypharmacy, drug interaction, two drugs of the same therapeutic class, and changing their prescribed brand to a generic drug. Table 2 shows that almost similar percentages of both P and MD groups agree that research collaboration, IP relationship between them as students, and an introductory IP experience are beneficial since they share common goals and objectives and their roles are complementary to each other. In addition, a large number of P (52, 65%) and MD (65, 50.4%) disagreed with the statement that physicians and dentists are superior to pharmacists but agreed to the latter being more experienced in drugs than physicians and dentists and can help in achieving the best therapeutic outcomes. Almost similar percentages (67-75%) of both groups believe that IP relationships between Medical, Dental, and Pharmacy students should be included in their professional educational programs. With regard to the statements that pharmacists are more experienced in drugs than physicians/dentists, pharmacists are qualified to assess and respond to patients' drug treatment needs, pharmacists are responsible for counseling patients on their drug treatment, and pharmacists can help in achieving the best therapeutic outcomes, positive responses from P were higher than those of MD students. As can be seen in Table 3, both groups agreed to all the barriers to IPC, but the responses of P were slightly higher than those of MD students. Table 4 shows regulatory barriers to efficient and effective participation of pharmacists in IPC. P's agree responses were significantly higher than those of MD students. Table 5 shows responses of participants to questions on knowledge and competencies of pharmacists, and some barriers to their full participation in IPC. The % responses of both groups were almost similar, with a tendency for those of P to be higher than those of MD students. The only variable that influenced IP collaboration was ethnicity, where significantly more Arab than non-Arab pharmacists believed that barriers to IP collaboration include lack of time, lack of trust in physicians/dentists, poor knowledge of IP collaboration, fear of inability to provide unbiased evidence-based information, and fear of being publicly criticized for poor ability and performance.

doi.org/10.32388/EHN30G.2

Barrier	Frequency (%)					
	Pharmacy N= 80			Medicine/ Dentistry N= 129		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
The inability of pharmacists to document patient care recommendations in the medical record due to laws prohibiting this practice	51 (64.6%)	22 (27.8%)	6 (7.6%)	64 (49.6%)	46 (35.7%)	19 (14.7%)
Physicians/ Dentists are concerned that pharmacist-patient care recommendations will conflict with their care plan for patients, causing patient harm or poor patient outcomes	47 (58.8%)	27 (33.8%)	6 (7.5%)	58 (45.3%)	47 (36.7%)	23 (18%)
Organizational obstacles such as lack of support from the administration or absence of healthcare policy defining the pharmacist's direct patient care role	55 (68.8%)	20 (25%)	5 (6.3%)	63 (49.6%)	50 (39.4%)	14 (11%)
Inadequate education and clinical training about direct patient care in the pharmacy curriculum	53 (66.3%)	18 (22.5%)	9 (11.3%)	73 (56.6%)	36 (27.9%)	20 (15.5%)
Physicians'/ Dentists' fear of being criticized by other members of the healthcare team during collaborative practice	45 (56.3%)	27 (33.8%)	8 (10%)	59 (46.1%)	47 (36.7%)	22 (17.2%)
Lack of incentives for pharmacists to change their practice, such as increased salaries or more professional prestige	39 (48.8%)	33 (41.3%)	8 (10%)	51 (39.8%)	60 (46.9%)	17 (13.3%)
Lack of pharmacists' desire or willingness to change from medication dispensing to direct patient care practice	36 (45%)	36 (45%)	8 (10%)	44 (34.4%)	61 (47.6%)	23 (18%)

Table 3. Responses of participants to questions on pharmacist-related barriers to inter-professional collaboration

doi.org/10.32388/EHN30G.2

Barrier	Frequency (%)					
	Pharmacy, N= 80			Medicine/ Dentistry, N= 129		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
The inability of pharmacists to document patient care recommendations in the medical record due to laws prohibiting this practice	51 (64.6%)	22 (27.8%)	6 (7.6%)	64 (49.6%)	46 (35.7%)	19 (14.7%)
Physicians/ Dentists are concerned that pharmacist-patient care recommendations will conflict with their care plan for patients, causing patient harm or poor patient outcomes	47 (58.8%)	27 (33.8%)	6 (7.5%)	58 (45.3%)	47 (36.7%)	23 (18%)
Organizational obstacles such as lack of support from the administration or absence of healthcare policy defining the pharmacist's direct patient care role	55 (68.8%)	20 (25%)	5 (6.3%)	63 (49.6%)	50 (39.4%)	14 (11%)
Inadequate education and clinical training about direct patient care in the pharmacy curriculum	53 (66.3%)	18 (22.5%)	9 (11.3%)	73 (56.6%)	36 (27.9%)	20 (15.5%)
Physicians'/ Dentists' fear of being criticized by other members of the healthcare team during collaborative practice	45 (56.3%)	27 (33.8%)	8 (10%)	59 (46.1%)	47 (36.7%)	22 (17.2%)
Lack of incentives for pharmacists to change their practice, such as increased salaries or more professional prestige	39 (48.8%)	33 (41.3%)	8 (10%)	51 (39.8%)	60 (46.9%)	17 (13.3%)
Lack of pharmacists' desire or willingness to change from medication dispensing to direct patient care practice	36 (45%)	36 (45%)	8 (10%)	44 (34.4%)	61 (47.6%)	23 (18%)

Table 4. Regulatory barriers that hinder the effective inter-professional collaboration of

doi.org/10.32388/EHN30G.2

Statement	Frequency (%)						Chi-square test P value
	Pharmacy N= 80			Medicine/ Dentistry N= 129			
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	
Pharmacists are more experienced in drugs than physicians/ Dentists	72 (90%)	6 (7.5%)	2 (2.5%)	81 (62.8%)	36 (27.9%)	12 (9.3%)	0.001
Pharmacists are qualified to assess and respond to patient's drug treatment needs	68 (85%)	9 (11.3%)	3 (3.8%)	55 (42.6%)	53 (41.1%)	21 (16.3%)	> 0.001
The Pharmacist is responsible for counseling patients on their drug treatment.	72 (90%)	6 (7.5%)	2 (2.5%)	59 (45.7%)	42 (32.6%)	28 (21.7%)	> 0.001
The pharmacist should only dispense the drugs the doctor prescribes.	18 (22.5%)	25 (31.3%)	37 (46.3%)	82 (63.6%)	30 (23.3%)	16 (12.4%)	> 0.001
The pharmacist can help in achieving the best therapeutic outcomes.	64 (80%)	12 (15%)	2 (2.5%)	86 (66.7%)	31 (24%)	7 (5.4%)	0.03
A prescription by a Physician/Dentist should be filled as it is.	23 (28.8%)	36 (45%)	21 (26.3%)	83 (64.3%)	36 (27.9%)	8 (6.2%)	> 0.01
Pharmacists can screen, monitor, and advice for self-treatment with over-the-counter (OTC) products sold without a prescription.	65 (81.3%)	12 (15%)	3 (3.8%)	64 (49.6%)	36 (27.9%)	27 (20.9%)	> 0.01
Lack of trust and confidence in the competency of each other.	56 (70%)	18 (14%)	6 (4.6%)	60 (46.5%)	42 (32.6%)	27 (20.9%)	0.005
Lack of pharmacists' access to the patient's medical record and the medical history, laboratory data, and other information.	53 (66.3%)	18 (22.5%)	9 (11.3%)	63 (48.8%)	41 (31.8%)	25 (19.4%)	0.04
Lack of physicians' trust in pharmacists' clinical abilities and their ability to provide direct patient care.	57 (71.3%)	16 (20%)	7 (8.8%)	67 (51.9%)	37 (28.7%)	25 (19.4%)	0.03
Inability of pharmacists to document patient care recommendations in the medical record due to laws prohibiting this practice.	51 (63.8%)	22 (27.5%)	6 (7.5%)	64 (49.6%)	46 (35.7%)	19 (14.7%)	0.03
Physicians'/ Dentists concern that pharmacist- patient care recommendations will conflict with their care plan for patients, causing patient harm or poor patient outcomes.	47 (58.8%)	27 (33.8%)	6 (7.5%)	58 (45%)	47 (36.4%)	23 (17.8%)	0.03

doi.org/10.32388/EHN30G.2

Statement	Frequency (%)						Chi-square test P value
	Pharmacy N= 80			Medicine/ Dentistry N= 129			
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	
Organizational obstacles such as lack of support from the administration or absence of healthcare policy defining the pharmacist's direct patient care role.	55 (68.8%)	20 (25%)	5 (6.3%)	63 (48.8%)	50 (38.8%)	18 (14%)	0.03
Physicians/Dentists fear being criticized by other members of the healthcare team during collaborative practice.	45 (56.3%)	27 (33.8%)	8 (10%)	59 (45.7%)	47 (36.4%)	22 (17.1%)	0.03

Table 5. Responses of participants to questions on knowledge and competencies of pharmacists

Discussion

It has been demonstrated that most medical errors and incidents leading to patients' health problems are related to poor collaboration (Wai et al., 2020). According to the World Health Organization (WHO), inter-professional education (IPE) is an experience that "occurs when students from two or more professions learn about, from, and with each other" (WHO, 2010).

The remarkable impact of including pharmacists as healthcare team members in the management of chronic diseases, with particular emphasis on hypertension and diabetes, has been clearly demonstrated by a large number of studies (Hatah, Braund, Tordoff, Duffull, 2014; Cheema, Sutcliffe, Singer, 2014; Tan, Stewart, Elliott, George, 2014; Santschi et al., 2014; De La Rosa; Pitts; Chen, 2020; Lee, McCutcheon; Fazel; Cooley; Slack, 2021).

Effective healthcare management requires collaboration between various healthcare professionals. In everyday practice, that kind of attitude and competence may not always be present (Hatah, Braund, Tordoff, Duffull, 2014), which can be ascribed to multiple personal and workplace barriers. Several studies have been published about the attitude towards IPC that have been beneficial to patients with complex, chronic diseases (Pascucci, et al., 2021; Nurchis, et al., 2022). Interprofessional education (IPE) and interprofessional collaboration (IPC) prepare members of the healthcare team to collaborate for the benefit of the patient.

In the present study, we assessed the knowledge and attitude of final year pharmacy, medical, and dental students towards IPC, and studied the factors that hinder their collaboration in the future. Female participants in our study far exceeded males. This is a usual trend in all medical and health sciences colleges in the UAE. In addition, most participants were Arabs aged 21-23 years. This age range is expected as our inclusion criteria focused on final years (fourth and fifth year) students who are about to graduate. About half of the respondents from the three colleges claimed that they shared common courses. Here, it must be mentioned that participants in our survey were not asked to list the courses they shared. However, when the study plan and time schedule for each college were reviewed, it became clear that the only courses that some students may have shared were elective courses taught by healthcare and non-healthcare faculty. IP learning through undergraduate courses has been frequently reported to influence the knowledge of students and their appreciation of the roles and contributions of each other to the benefit of patients. IPE programs were not part of a mandatory course in the curriculum of UAE universities. It has been shown that in colleges where IPE programs are implemented as an extra-curricular program, such a factor was considered one of the obstacles to IPE (Carlisle, & Taing, 2021).

Inter-professional education has also been defined as learning together to promote collaborative practice. A principal aim of IPE is to foster the environment and to nurture and enhance the personal initiative of each member of the healthcare team to willingly and professionally accept with respect the advice, consultation, and opinion of other members of various health disciplines. This necessitates knowledge and appreciation of the expertise, role, and contribution of the other members of the healthcare team. In this respect, sharing common undergraduate courses and collaboration in research, such as that conducted through graduation projects, would certainly help in breaking the barriers and building bridges of mutual collaboration built on knowledge, attitude, trust, and respect.

In general, the results of the present study demonstrated a reasonable level of knowledge and a positive attitude and perception among participants from the three colleges towards IPE and IPC, and the competencies of each other. However, MD students showed some reservation about pharmacists changing their prescribed brand to a generic. It

has been pointed out earlier that among the obstacles to inter-professional learning, attitude remains the main factor (Katoue, et al., 2017). Moreover, some studies demonstrated a tendency of medical students not to favor sharing knowledge with other healthcare students (Horsburgh, Lamdin, Williamson, 2001; Reid, Bruce, Allstaff, McLernon, 2006). It has also been suggested that students admitted with negative attitudes towards inter-professional learning usually do not perform well in the shared courses, and this further enhances their negative attitudes (Coster et al., 2008). More recently, a study indicated that barriers such as "afraid to provide the wrong information" and "people only share with those who share with them" are important barriers that hinder the process of knowledge sharing (Feroz et al., 2023). Another study also indicated that different obstacles can delay IPE development [Li JTS, etal., 2022). Other studies demonstrated that maximizing patient care can be enhanced by pre-registration IPE, which prepares healthcare professionals for efficient working in a multi-disciplinary team (O'Leary, Salmon, Clifford, 2020; Choudhury, Salam, Mathur, Choudhury, 2020). Pharmacists and physicians have many competencies in common that can be the basis for a profitable IPE. The results of the present study indicated that MD students are aware of the pharmacist-related barriers that are associated with healthcare policies, and with the fear of physicians that pharmacists' recommendations on patient treatment may conflict with their own. Healthcare policies require a courageous, enlightened decision by decision-makers, while IPE and IPC can improve the exposure of each member of the healthcare team to other professions during their training (Tran, Kaila, Salminen, 2018). Training with other professions has also been found to improve the sense of usefulness and to provide clarity in the extent of one's role in a collaborative team (McGuire, Stewart, Akerson, Gloeckner, 2020). A study evaluating the perception of pharmacy and medical students working collaboratively on a telehealth project indicated similar findings to our results, where students from both disciplines showed enhanced appreciation of the other (Bautista, et al., 2020).

Our results are in good agreement with the results of studies conducted in Iraq (Ahmed, 2018) and Malaysia (Aziz, Teck, Yen, 2011), where medical and pharmacy students illustrated positive attitudes toward inter-professional learning and recognized the advantages of shared learning.

Attitudes of participants from various healthcare disciplines were, in general, positively rated based on their responses. However, some misconceptions persist and can be eliminated through IPE. An interesting example of differences in knowledge and views of students from various healthcare disciplines is represented in the present study by the unfamiliarity of a large number of medical and dental students with the term polypharmacy. On the other hand, the majority (90%) of pharmacy students knew the term. Again, a sizable number of medical and dental students did not agree that the pharmacist is responsible for counseling patients on their drug treatment. Such a misconception must change, especially in light of the global progressive evolution in the role of the pharmacist. Another misconception is that about two-thirds of medical and dental students agreed with the notion that pharmacists should only dispense drugs prescribed by a physician or dentist. Surprisingly, less than 50% of pharmacy students disagreed with this, while about 30% were neutral. This can be attributed to the fact that many other healthcare professionals do not have a clear understanding of the pharmacists' wide range of competencies. However, since the knowledge, skills, and professional attitudes of healthcare professionals are mostly complementary and overlapping, it is rather logical to learn together to promote future collaborative practice. This is further enhanced by the fact that patients seeking healthcare are bound to interact with more than one healthcare professional.

There is also a need to stress professional ethics in undergraduate courses, as our results on whether it is ethically acceptable to associate oneself with the pharmaceutical industry and products were not encouraging. Knowledge of responsible and ethical behavior in dealing with the pharmaceutical industry should be dealt with through common courses such as, among others, professional ethics, and prescribing and dispensing. Most medical and dental students agreed with the question of whether they would consult a pharmacist regarding the best treatment schedule and drug interactions. This implies that medical and dental students have confidence in pharmacists, trust them, and appreciate the pharmacist's knowledge and skills (WHO, 2010).

It must be pointed out that even though medical and dental students believed that they are not superior to pharmacists, our results indicate that a sense of superiority still lingers. Yet, when the same question was directed to pharmacy students, the majority (75%) believed they would be more cooperative. However, the responses of the medical and dental students were positive when it comes to accepting the pharmacist's opinion on dosage regimen, drug interactions, and prescribing two drugs of the same therapeutic class in the same prescription.

Pharmacy students believed that counseling on drug treatment is not the responsibility of the physician or the dentist. They also feel competent enough to provide other healthcare professionals with unbiased, evidence-based information related to drugs and pharmaceutical products. This may reflect confidence in what they have learned in their courses about evidence-based practice and drug literature. However, an interesting result emerges when pharmacy students were asked if they trust the physician's and dentist's opinion. Half of them (47.3%) answered "yes," yet the other half (47.3%) were uncertain. Again, trust among members of the healthcare team must be enhanced through daily practice-proved competence and enhanced communication skills.

It must be mentioned here that there are obstacles to inter-professional learning that is based on sharing common mandatory courses. These include different organization of the study plans of various healthcare colleges, course contents, and timetables of courses to be shared. Moreover, IPC in real practice may be learned better and enhanced through active workshops where medical, dental, pharmacy, and possibly students of other health disciplines such as nurses and non-

healthcare students play the roles of physicians, dentists, pharmacists, nurses, and patients respectively. Various scenarios can be prepared to represent examples that warrant interaction between various healthcare team members. Such scenarios should include scenes representing both positive and negative attitudes and practices of all members. We are presently planning for such an activity, and such an educational strategy would be our future research project.

A study conducted among the National University of Singapore students displayed that overall, students had a high readiness for IPE, but when the readiness of medical students was compared to that of pharmacy and dentistry students, the results indicated that pharmacy and dentistry students have lower readiness (Ahmad et al., 2013). Students' readiness has been the subject of many studies in Indonesia (Tyastuti, Onishi, Ekayanti, Kitamura, 2014), the United Arab Emirates (El-Zubeir, Rizk, Al-Khalil, 2006), and Saudi Arabia (Al-Eisa et al., 2016). Barriers to IPE include, among others, different organization of the study plans of various healthcare colleges, course contents, and timetabling of courses to be shared. Moreover, inter-professional collaboration in real practice may be learned better and enhanced through active workshops where medical, dental, pharmacy, and possibly students of other disciplines such as nurses and non-healthcare students play the roles of physicians, dentists, pharmacists, nurses, and patients respectively. Various scenarios can be prepared to represent examples that warrant interaction between various healthcare team members. Such scenarios should include scenes representing both positive and negative attitudes and practices of all members. We are presently planning for such an activity, and such an educational strategy would be our future research project.

Our results are in general agreement with those of studies in which most healthcare undergraduate students have been reported to have positive perceptions of IP learning (Coster et al., 2008; Cooper, Carlisle, Gibbs, Warkins, 2001; Hind et al., 2003). It is surprising that ethnicity influenced the responses of participants to barriers to IPE. Our results indicated that significantly more Arab than non-Arab pharmacists believed that barriers to IP collaboration include lack of time, lack of trust in physicians/dentists, poor knowledge of IP collaboration, fear of inability to provide unbiased evidence-based information, and fear of being publicly criticized for poor ability and performance. Despite such differences between ethnic groups, both the knowledge and attitudes of our students towards IPE and IPC are encouraging, and efforts are needed to organize educational activities between authorities in various healthcare disciplines to establish a center for IPE.

Limitations

A major limitation of this study was that we did not include nurses, even though nurses are important members of the healthcare team. Another limitation is the sample size, which was relatively small due to the limitation of prospective student enrollment imposed by the accreditation commission of the Ministry of Higher Education.

Conclusions

We propose that in the future, there should be some mandatory courses common among the different colleges, such as pharmacology, pathophysiology, microbiology, and biochemistry. However, the schedule times of each college and the organization of study plans should be considered because, in many previous instances, there was an intention to do so, but due to the above constraints, it was hindered. At the Sharjah medical campus, students may share elective courses such as languages, social studies, statistics, physics, Islamic studies, history, etc. In addition, workshops should be designed and implemented for pharmacy, medical, dental, and nursing students as a sort of practical extracurricular activity or can be projected as theatrical plays showing positive and negative scenarios of IPE and IPC. A more practical intervention could be through IPE sessions in which students of various health and medical disciplines are distributed into groups, with each group including students of various disciplines to discuss a scenario that covers the roles of each member of the team. Such sessions must be evaluated at the end, where the activity and its various aspects are evaluated by the facilitators of the session and the students.

Statements and Declarations

Acknowledgments

We are indebted to Prof. Abduelmula R. Abduelkarem for his invaluable efforts with the statistical analysis.

Conflict of Interest

The authors declare no conflict of interest.

Funding

None.

References

- Accreditation Council for Pharmacy Education (ACPE) - Standards 2016. ACPE_Standard 11_IPE(2), PDF (raom.org). Accesed 20-12-2023 (Accessed, March 5, 2021).
- Ahmad MI, Chan SW, Wong LL, Tan ML, Liaw SY. Are first-year healthcare undergraduates at an Asian university ready for inter-professional education? J. Interprof. Care. 2013; 27(4): 341-343. https://www.ncbi.nlm.nih.gov/pubmed/23421343. doi: 10.3109/13561820.2013.769094
- Ahmed FT. The attitudes of final year medical and pharmcy students to inter-professional learning in Iraq. Nat. J. Physiol. Pharmac. Pharmacol. 2018; 8(1):75-81. https://www.ejmanager.com/mnstemps/28/28-1506701604.pdf?t=1544498745
- Al-Eisa, E., Alderaa, A., AlSayyad, A., AlHosawi, F., AlAmoudi, S., AlTaib, S., Mahmoud, AlGhanim, Alghadir A, Anwer, S. The perceptions and readiness toward inter-professional education among female undergraduate health-care students at King Saud University. J. Phys. Ther.

Sci. 2016; 28(4):1142-1146. https://www.ncbi.nlm.nih.gov/pubmed/27190442. doi: 10.1589/jpts.28.1142
- Aziz Z, Teck LC, Yen PY. The attitudes of medical, nursing and pharmacy students to inter-professional learning. Procedia - Soc Behav Sci. 2011; 29(1): 639-645. https://core.ac.uk/download/pdf/82659576.pdf.
- Bautista CA, Huang I, Stebbins M, et al. Development of an interprofessional rotation for pharmacy and medical students to perform telehealth outreach to vulnerable patients in the COVID-19 pandemic. J Interprof Care. 2020;34(5):694–697. doi: 10.1080/13561820.2020.1807920.
- Carlisle, C., & Taing, M.-W. (2021). Interprofessional education between dentistry and pharmacy students: delivery, barriers and facilitating implementation. Australian Dental Journal,66(4), 351–357. https://doi.org/10.1111/adj.12856.
- Cheema E, Sutcliffe P, Singer DR. The impact of interventions by pharmacists in community pharmacies on control of hypertension: a systematic review and meta-analysis of randomized controlled trials. Br J Clin Pharmacol. 2014; 78(6):1238-1247. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4256613/ doi: 10.1111/bcp.1245218.
- Choudhury RI, Salam MAU, Mathur J, Choudhury SR. How interprofessional education could benefit the future of healthcare - medical students' perspective. BMC Med Educ. 2020;20(1):1–4. doi: 10.1186/s12909-020-02170-w.
- Cooper H, Carlisle C, Gibbs T and Warkins C. Developing an evidence base for interdisciplinary learning: a systematic review. J.Adv. Nurs. 2001; 35(2):228-237. PMID: 11442702. https://www.ncbi.nlm.nih.gov/pubmed/11442702.
- Coster S, Norman I, Murrels T, Kitchen S, Meerebeau E, Sooboodoo E, et al. Inter-professional attitudes amongst undergraduate students in the health professions: a longitudinal questionnaire survey. Int. Nurs. Stud. 2008; 45(11):1667-681. https://www.ncbi.nlm.nih.gov/pubmed/18423644 doi: 10.1016/j.ijnurstu.2008.02.008.
- De La Rosa, M.; Pitts, S.; Chen, P.H. An interprofessional collaboration of care to improve clinical outcomes for patients with diabetes. J. Interprof. Care 2020, 34, 269–271.
- El-Zubeir M, Rizk DE, Al-Khalil RK. Are senior UAE medical and nursing students ready for inter-professional learning? Validating the RIPL scale in a Middle Eastern context. J. Interprof. Care. 2006; 20(6):619-632. https://www.ncbi.nlm.nih.gov/pubmed/17095440 doi: 10.1080/13561820600895952.
- Feroz Z, Alghamdi A, Memon I, Alhabdan KA, Almehrij F, Alshahrani B, Abanmi M. Assessment of Barriers to Knowledge Sharing Among Medical Students in Riyadh, Saudi Arabia. Cureus. 2023 Sep 21;15(9):e45665. doi: 10.7759/cureus.45665.
- Guraya, S. Y., & Barr, H. (2018). The effectiveness of interprofessional education in healthcare: A systematic review and meta-analysis. Kaohsiung J Med Sci 34(3), 160–165. https://doi.org/10.1016/j.kjms.2017.12.009.
- Hatah E, Braund R, Tordoff J, Duffull S. A systematic review and meta-analysis of pharmacist led fee-for-services medication review. Br. J. Clin. Pharmacol. 2014; 77(1):102-115. https://www.ncbi.nlm.nih.gov/pubmed/23594037 doi: 10.1111/bcp.1214016.
- Hind M, Norman I, Cooper S, Gill E, Hilton R, Judd P, Jones SC. Inter-professional perceptions of health care students. J. Interprof. Care. 2003; 17:21-34. https://www.ncbi.nlm.nih.gov/pubmed/12772467. PMID: 12772467.
- Horsburgh M, Lamdin R and Williamson E. Multi-professional learning: the attitudes of medical, nursing and pharmacy students to shared learning. Med. Educ. 2001; 35: 876- 883. https://www.ncbi.nlm.nih.gov/pubmed/11555226.
- Katoue MG, Awad AI, Al-Jarallah A, Al-Ozairi E, Schwinghammer TL. Medical and pharmacy students' attitudes towards physician-pharmacist collaboration in Kuwait. Pharm. Prac. (Granada) 2017; 15(3): 1-10. https://www.ncbi.nlm.nih.gov/pubmed/28943986 doi: 10.18549/ Pharm Pract.2017.03.1029.
- Lee, J.K.; McCutcheon, L.R.M.; Fazel, M.T.; Cooley, J.H.; Slack, M.K. Assessment of Interprofessional Collaborative Practices and Outcomes in Adults with Diabetes and Hypertension in Primary Care: A Systematic Review and Meta-analysis. JAMA Netw.Open 2021, 4, e2036725.
- Li JTS, Chau JPC, Wong SYS, Lau ASN, Chan WCH, Yip PPS, Yang Y, Ku FKT, Sze FYB, King IKC and Lee VWY (2022) Interprofessional education—situations of a university in Hong Kong and major hurdles to teachers and students. Front. Educ. 7:653738. doi: 10.3389/feduc.2022.653738.
- McGuire LE, Stewart AL, Akerson EK, Gloeckner JW. Developing an integrated interprofessional identity for collaborative practice: Qualitative evaluation of an undergraduate IPE course. J Interprof Educ Pract. 2020;20:100350. doi: 10.1016/j.xjep.2020.100350.
- Nurchis, M.C.; Sessa, G.; Pascucci, D.; Sassano, M.; Lombi, L.; Damiani, G. Interprofessional Collaboration and Diabetes Management in Primary Care: A Systematic Review and Meta-Analysis of Patient-Reported Outcomes. J. Pers. Med. 2022, 12, 643.
- O'Leary N, Salmon N, Clifford AM. 'It benefits patient care': the value of practice-based IPE in healthcare curriculums. BMC Med Educ. 2020;20(1):1–11. doi: 10.1186/s12909-020-02356-2.
- Olsen, A. A., Lupton-Smith, C. P., Rodgers, P. T., & McLaughlin, J. E. (2021). Characterizing research about interprofessional education within pharmacy. American Journal of Pharmaceutical Education, 85(8). https://doi.org/10.5688/ajpe8541.
- Pascucci, D.; Sassano, M.; Nurchis, M.C.; Cicconi, M.; Acampora, A.; Park, D.; Morano, C.; Damiani, G. Impact of interprofessional collaboration on chronic disease management: Findings from a systematic review of clinical trial and meta-analysis. Health Policy 2021, 125, 191–202.
- Reid R, Bruce D, Allstaff K, McLernon D. Validating the Readiness for Inter-Professional Learning Scale (RIPLS) in the postgraduate context: Are health professional ready for IPL? Med Educ. 2006; 40(5):415-422. https://www.ncbi.nlm.nih.gov/pubmed/16635120. doi: 10.1111/j.1365-2929.2006. 02442.x.

- Santschi V, Chiolero A, Colosimo AL, Platt RW, Taffé P, Burnier M, et al. Improving blood pressure control through pharmacist interventions: a meta-analysis of randomized controlled trials. J. Am. Heart Assoc. 2014;3(2): e000718. https://www.ncbi.nlm.nih.gov/pubmed/24721801 doi: 10.1161/JAHA.113.00071820.
- Tan E, Stewart K, Elliott R, George J. Pharmacist services provided in general practice clinics: a systematic review and meta-analysis. Res Social Adm Pharm. 2014;10(4):608-622. https://www.ncbi.nlm.nih.gov/pubmed/24161491 doi: 10.1016/j.sapharm.2013.08.00619.
- Tran C, Kaila P, Salminen H. Conditions for interprofessional education for students in primary healthcare: a qualitative study. BMC Med Educ. 2018;18(1):1–9. doi: 10.1186/s12909-018-1245.
- Tyastuti D, Onishi H, Ekayanti F, Kitamura K. Psychometric item analysis and validation of the Indonesian version of the readiness for Inter-Professional Learning Scale (RIPLS). J. Interprof. Care. 2014; 28(5): 426-432. https://www.ncbi.nlm.nih.gov/pubmed/24731139. doi: 10.3109/13561820.2014.907778
- Wai, A. K., Lam, V. S., Ng, Z. L., Pang, M. T., Tsang, V. W., Lee, J. J., et al. (2020). Exploring the role of simulation to foster interprofessional teamwork among medical and nursing students: a mixed-method pilot investigation in Hong Kong. J. Interprof. Care. 35, 890–898. doi: 10.1080/13561820.2020.1831451
- WHO (World Health Organization). Framework for action on inter-professional education and collaborative practice. 2010. http://www.who.int/hrh/resources/framework_action/en/inde (Accessed, March 5, 2018).

Declarations

Funding: No specific funding was received for this work.
Potential competing interests: No potential competing interests to declare.