

INTERNATIONAL PHARMACY EDUCATION SUPPLEMENT

Pharmacy Education and Practice in 13 Middle Eastern Countries

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The Arab world has influenced the art and science of pharmacy for centuries. Pharmacy education and practice is continuing to evolve in the Arabic-speaking traditional Middle East countries, although relatively little information has been published in the English press. Our goal was to provide a high-level synopsis of conditions in this region.

We selected 13 countries for review. Information was obtained by reviewing the available published literature and individual university and program web sites, as well as contacting program or country representatives. Seventy-eight active pharmacy schools in 12 countries were identified. At least 14,000 students (over 75% from Egypt) are admitted into baccalaureate degree programs every year. The 5-year baccalaureate degree remains the first professional degree to practice.

While changes in pharmacy education have been relatively rapid over the past decade, the advancement of pharmacy practice, particularly in the private sector, appears to be slower. Hospital pharmacists often possess an advanced degree and tend to have a higher level of practice compared to that of community pharmacists. Despite the adversities that face academics and practitioners alike, there is a strong desire to advance the science and practice of pharmacy in the Middle East.

Keywords: pharmacy education, Middle East

INTRODUCTION

For hundreds of years, the Arabic world has had a profound influence on the science and art of pharmacy.^{1,2} Pharmacy's independence from medicine can be traced to the opening of the private apothecary in Baghdad circa AD 750.¹ While charlatans, spice and perfume sellers, and drug dealers were common in the 8th century, pharmacy was already beginning to emerge as a respected profession. Mercurial ointments, mortars and pestles, flasks and spatulas, as well as evidence-based pharmacotherapeutics have their roots in Arabic pharmacy. Abu Bakr Mohammad Ibn Zakariya al-Razi (864-930AD) was perhaps one of the first to challenge the medical dogma and quackery of the day, and was a prolific writer of books on medicinal remedies for both professional and lay public audiences.¹ Overall, these early developments have had a significant impact on the subsequent maturation of pharmacy in Europe, and ultimately, the rest of the world.

Pharmacy education and pharmacy practice in Arabic-speaking traditional Middle Eastern countries continues to evolve. However, while there have been recent publications in the English language pharmacy liter-

ature describing the current status of a few countries in this region, we were unable to identify any published reports that provided an overall and comparative summary of the general conditions of pharmacy education and practice. Accordingly, our goal was to undertake such a review and provide a high level synopsis of relevant conditions in this region.

Countries

We selected 13 countries in the Arabic-speaking traditional Middle East region for this review: Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria, United Arab Emirates (UAE) and Yemen. Of these countries, 7 (Bahrain, Kuwait, Oman, Saudi Arabia, Qatar, UAE, Yemen) formed the Gulf Cooperation Council (GCC) in 1981. These countries are in close proximity to each other and share similar cultural and societal characteristics.

Information was first obtained by reviewing the available published literature. Using PubMed and Google and terms including pharmacy, education, school, college, Middle East, public, private, pharmacy practice, and each country name, relevant publications were located and retrieved. The authors also accessed university and program web sites. Finally, the authors contacted program or country representatives for access to unpublished supporting

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documentation and to solicit responses to a list of standard questions regarding program details. Attempts were made to validate information by obtaining data from multiple sources. The 6 authors corresponded regularly and met as a group on a weekly basis to collectively review the resulting database to ensure similarity of approach across countries and clarify issues of interpretation. Several of the authors also have direct education and/or practice experience in many of the countries reviewed.

For the purposes of this paper, a pharmacy school was defined as any pharmacy faculty, college, school, or program that offered one or more types of university degrees in pharmacy or the pharmaceutical sciences. While there are diploma programs in some Middle East countries, we restricted this review to pharmacy degree programs only. To be considered for inclusion, a school was required to have students enrolled in at least one of the professional years of their pharmacy degree program. The first professional degree to practice was defined as the degree offered by a pharmacy school that was designed to meet national entry to practice requirements for pharmacists. Pharmacy schools were defined as public when the associated university was primarily publicly funded (ie, a national institution) and was not under private or independent administrative control. Private schools were those not meeting this definition. Experiential training was defined as practical training in the field (eg, community or hospital pharmacies) for the purpose of meeting the degree (vs. licensure) requirements.

Information obtained by the authors was often unavailable in the refereed literature. Accordingly, the data obtained may not have been peer reviewed and readers will not always be able to directly access the sources. We found that the information located on the university web sites was not always current, complete or accurate. We also found that conditions of pharmacy education within each school and in each country were often in transition. In particular, new pharmacy schools were opening, existing programs were merging, and others may have been approved but student enrollment had yet to occur. Additionally, new degree programs were replacing or augmenting current degree programs within existing pharmacy schools. As well, the conditions in some countries (eg, Iraq, Lebanon, Palestine) were quite volatile; thus, the degree programs are subject to potential disruption at any time. Finally, while every effort was made to accurately capture the available information, we found that program statistics, curricular taxonomy, and reporting standards were often quite variable across programs, schools and countries.

Seventy-eight pharmacy schools were identified in the 13 countries selected. While Bahrain is planning to

introduce a pharmacy degree program, no students are enrolled at this time.³ Accordingly, our review was restricted to the remaining 12 countries. Table 1 provides general pharmacy degree program characteristics according to country and the resources retrieved to obtain this information. Pharmacy schools were initiated as early as 1824 (Cairo), while the majority of programs were introduced after 1970. More than 20 new programs have been started since 2000, and the majority of these appear to be privately funded. The number of pharmacy schools by country varied from 1 (Kuwait and Qatar) to 24 (Egypt). The 12 countries reviewed were found to have a combination of public or private programs and 36 (46%) of all pharmacy schools reviewed were privately funded. Oman and Palestine both appear to have pharmacy schools with shared funding arrangements.

Most pharmacy schools rely on national accreditation, typically by a branch of the government (eg, Ministry of Higher Education) responsible for post secondary education. Accreditation by regional or international agencies is uncommon.

The baccalaureate degree currently remains the first professional degree to practice in the countries reviewed (Table 1). Most countries offered baccalaureate degree programs, while only 9 (69%) offered MSc and 6 (46%) offered PhD programs. Five (38%) countries now offer Doctor of Pharmacy (PharmD) degree programs. These PharmD degree programs have been launched within the previous 5 years. Most pharmacy schools offer their degree programs in the English language (Table 1). Arabic is the language of instruction for some schools (eg, in Syria), while Lebanon has schools with French as the language of instruction. Baccalaureate student admission policies in the Middle East differ from those in western environment. Students are placed in pharmacy schools in accordance with available seats and their high school (and occasionally prepharmacy university) academic performance (Table 2). The majority of pharmacy schools do not have direct application processes and non-academic criteria (eg, motivation, planning, citizenship, ethics) are not usually considered in any formal manner. Structured interviews are uncommon. As admission to pharmacy schools does not require a formal application process in most countries, the number of applicants is often unknown. For others, the number of applicants typically exceeds the number of available seats by a factor of 3:1 or greater.

Approximately 14,000 students are admitted into baccalaureate degree programs across the 12 countries every year (Table 2). Admissions by country varied widely from 20 students (Qatar) to 13,000 (Egypt). Over 75% of all baccalaureate students in this region receive

Table 1. General Pharmacy Degree Program Characteristics of 12 Middle East Countries

Country	Pharmacy Schools ^a			Pharmacy Degrees Offered ^b	Language ^c	Accreditation
	Public	Private	Total			
Egypt	13	11	24	BSc, MSc, PhD	English	National ^f
Iraq	7	0	7	BSc, MSc	English	National ^f
Jordan	2	6	8	BSc, BSc-PD, PD, MSc, PhD	English	National ^f
Kuwait	1	0	1	BSc	English	National ^g
Lebanon	1	4	5	BSc, PD, MSc, PhD, DE	English, French	National ^g International (ACPE (LAU only))
Oman	0	2 ^d	2	BSc	English	National ^g
Palestine	3 ^e	0	3	BSc, PD, MSc	English	National ^g
Qatar	1	0	1	BSc, PD	English	International (CCAPP) ^h
Saudi Arabia	5	4	9	BSc, PD, MSc, PhD	English	National ^g
Syria	4	3	7	BSc, MSc, PhD	Arabic, English	National ^g
United Arab Emirates	3	4	7	BSc	English	National ^f
Yemen	2	2	4	BSc, MSc	English	National ^g

^aOnly pharmacy colleges/schools with students in their first professional year) are included

^bBSc – Baccalaureate (includes BP, BSc (Pharm) and similar), BSc-PD – Baccalaureate in PharmD, PD – PharmD, MSc – Master's of Science, Masters in Clinical Pharmacy or similar, PhD – Doctor of Philosophy, DE – Doctorat d'Exercice

^cPredominant language of instruction

^dConsidered private although receives public funding support

^eConsidered public although receives private funding support

^fMinistry of Higher Education and Scientific Research

^gMinistry of Higher Education

^hProvisional accreditation sought in 2008 from Canadian Council for Accreditation of Pharmacy Programs

their education in Egypt. Class sizes also varied widely from 20 students (Qatar University, Qatar) to 1,500 (Cairo University, Egypt). In the latter case, students are split into cohorts to make class sizes more manageable.

The majority of pharmacy schools in the countries we reviewed admit both male and female pharmacy students and have integrated classes (Table 2). Some programs (eg, in Saudi Arabia and the UAE) accept both female and male students, although local customs require that the teaching environment be segregated. There are a few programs (eg, Qatar, UAE and Yemen) that accept female or male students only. Programs that accept both genders usually have a higher proportion of female than male students.

Baccalaureate degree programs across all countries are typically 5 years in duration (Table 3). When required, prepharmacy training (ie, non-professional years) for baccalaureate degree programs ranges from 1-2 years in duration. However, the vast majority of pharmacy schools do not have prepharmacy university course requirements prior to application to their degree program. Students are selected and admitted to the pharmacy program upon entry into the university (Table 2). These students typically

join students from other programs in their early university years. Most programs operate on a 2-semester (15-16 weeks/semester) basis, with some schools offering courses in the summer months and a parallel (ie, evenings or weekend) program for part-time students. The majority of baccalaureate programs require 160-180 credit hours, although the Higher Colleges of Technology in the UAE requires 222 credit hours for their programs (Table 3). Where doctor of pharmacy (PharmD) degree programs exist, the credit-hour requirements range from 197 to 220.

The curricula of the 5-year baccalaureate degree programs generally resemble that of western (ie, those in North America, the United Kingdom, and other regions) accredited programs. Like western programs they are undergoing continuous change for the purpose of quality improvement and to meet local accreditation standards. The first year(s) of the baccalaureate degree program curricula include course work in the basic sciences including general chemistry, organic chemistry, biological and biomedical sciences, mathematics, information and communication technologies, and physical sciences. General education in the humanities, behavioral and social sciences, and communication skills is typically delivered as

Table 2. General FPDP Program Admission Characteristics of 12 Middle East Countries

Country	Admission Policies for FPDP Programs ^a				Student Gender Status ^g	FPDP Students Admit/Year ^{h,i}	No. Pharmacists (Density/1000) ^{j,k}	FPDP Admissions/ Pharmacist Ratio ^l
	Pre-Rx Courses ^b	Academic Criteria ^c	Non-Academic Criteria ^d	Other ^{e,f}				
Egypt	None	GPA	No	None	Integrated (F>M) ¹³	11,000-13,000	138,000 (1.7)	0.08
Iraq	None	GPA	No	None	Integrated (F>M)	250-500	13,775 (0.5)	0.02
Jordan	None	GPA	No	None	Integrated (F>M)	500-1000	8,414 (1.4)	0.06
Kuwait	None	GPA	No	None	Integrated (F>M)	25-50	722 (0.3)	0.03
Lebanon	Variable (0-2 yrs)	GPA (Including University)	No	None	Integrated (F>M)	250-350	4,732 (1.2)	0.05
Oman	None	GPA	No	None	Integrated (F>M)	100-150	1,551 (0.5)	0.06
Palestine	Variable (0-1 yrs)	GPA (Including University)	No	None	Integrated (F>M)	400-500	~1,400 (0.9)	0.29
Qatar	1 yr min.	GPA (Including University)	Yes	Structured interview, PCAT, TOEFL	Female only	20	530 (0.9)	0.04
Saudi Arabia	None	GPA	No	None	Segregated (F>M)	>650	5,485 (0.2)	0.12
Syria	Variable (0-1 yrs)	GPA (Including University)	No	None	Integrated (F>M)	250-500	8,862 (0.5)	0.03
UAE	None ¹⁴	GPA	Yes	TOEFL	Integrated, segregated (M/F) or F only (F>M)	450-550	1,656 (0.4)	0.27
Yemen	Variable (0-2 yrs)	GPA (+/- University)	No	None	Integrated (F>M) or male only	200-250	2,638 (0.1)	0.08
All	Usually none	Primarily GPA	No	None	Integrated (F>M)	14,000-17,500	~188,000	0.02-0.29

^aFirst Professional Degree to Practice (FPDP) Programs as designed to meet national entry-to-practice requirements for pharmacists

^bOne or more years of university-level basic science and humanities prerequisite courses prior to admission to the FPDP program

^cHigh school level grade point average (GPA) only unless otherwise indicated

^dNon-academic criteria includes ranking based upon letters of reference, written personal statements and/or similar instruments

^eStructured integrated standardized interview involving pre-established questions and a ranking scheme

^fOther criteria including pharmacy-specific admission tests (eg, PCAT – Pharmacy College Admission Test (USA-based))

^gIntegrated – both genders in same class, Segregated – both genders, but in separate classes, F – female only, M – Male only

^hAdmission statistics are approximate; ranges have been provided as class size and college number within each country varies with time

ⁱExcludes “parallel” program (e.g. part-time evening class) students

^jExtracted from 2006 WHO global distribution of health workers (typically 2001-2004 data) [WHO The World Health Report 2006, p190-198]
<http://www.emro.who.int/emrinfo/index.asp?Ctry=egy> (Egypt), Pharmacy and Pharmaceuticals in Palestine in 2005, Ministry of health website (<http://www.moh.gov.ps/index.asp?deptid=3&pran>)

^kCalculated based upon estimated minimum number or graduates/year

^lCalculated as minimum number of baccalaureates admitted per year divided by estimated pharmacist positions

^mAl-Azhar University offers a segregated program

ⁿTwo schools have 3-year diploma programs followed by 1-year pharmacy degree program (admission required for each)

Table 3. Curriculum Characteristics of Pharmacy Schools in 12 Middle East Countries

Country	Bachelor Degree Credit Hrs ^a	PharmD Degree Credit Hrs ^b	Pre-Pharm Years ^d	Minimum Duration, ^c yrs			
				Baccalaureate Degree		PharmD Degree ^e	
				Professional Program, Years (total)	Practicum, ^e Weeks	Professional Program, Years (total)	Practicum, ^f Weeks
Egypt	170-180	N/A	0	5 (5)	0-20	N/A	N/A
Iraq	180-188	N/A	0	5 (5)	12	N/A	N/A
Jordan	160-165	219	0	5 (5)	17-36	6 (6)	46
Kuwait	162	N/A	0	5 (5)	36 ^g	N/A	N/A
Lebanon	174-193 ^h	197-213	0-2	3-5 (5)	28-72	1-5 (6)	18-28 ⁱ
Oman	150	N/A	0	4.5-5 (4.5-5)	14	N/A	N/A
Palestine	168-180	198	0-1	1-4 (5)	36	6 (6)	28
Qatar	173	207	1	4 (5)	23	1 (6)	40
Saudi Arabia	162-175	205-220	1	4 (5)	15-24	5 (6)	40
Syria	169-178	N/A	0-1	4-5 (5)	13	N/A	N/A
United Arab Emirates	150-222 ^j	N/A	0	4-5 (4-5)	9-35	N/A	N/A
Yemen	155-179 ^h	N/A	0-2	3-5 (5)	10-36	N/A	N/A
Total	Range 150- 222	197-220	0-2	(5)	0-52	(6)	(6)

^aOne credit-hour is equivalent to one contact hour per week x 16 wks

^bN/A – not available

^cMinimum duration at each level; number in brackets reflects minimum cumulative training duration (eg, 1 yr pre-pharmacy plus 4 professional yrs equals 5 yrs cumulative; Master's and PhD programs have been excluded)

^dOne or more years of university-level basic science and humanities prerequisite courses prior to application to the first professional degree to practice (baccalaureate) program

^eNumber reflects total practicum (ie, experiential) contact time expected for graduation (not licensure) purposes; contact-time may not be structured, nor necessarily with trained mentor; where necessary program information converted to wks according to an assumption of 40 contact-hours/week

^fApproximate contact-time in structured community, hospital and specialty rotations

^gConverted from 1440 hrs, based upon 40 hr/wk

^hConverted from 290 credit-hours based upon 10 contact-hours over a 15-week period

ⁱIncludes ~ 23 wks training in final year at the 1+5 yr Lebanese University program

^j222 credit-hours as per Higher Colleges of Technology websites

well. The balance of the curriculum (ie, professional years) includes course work in the biomedical, pharmaceutical and clinical sciences, as well as in behavioral, social, and administrative pharmacy sciences.

The clinical training experiences required for the purpose of graduation from the 5-year baccalaureate degree programs are quite variable between programs and across countries (Table 3). Some programs (eg, in Egypt) do not appear to have a structured practical experience as a requirement for graduation, although the local regulatory body usually requires an internship (typically unstructured and without specific learning objectives) for the purposes of obtaining a license to practice. Other programs have experiential training requirements that range from 10 to 36 weeks. An exception is the program at the Saint Joseph University (Lebanon) that is reported to re-

quire 18 months (ie, 72 weeks) of experiential training. Experiential training requirements for the PharmD degree are expectedly greater with most programs requiring at least 28 weeks of additional practical experience. Most programs appear to follow traditional "knowledge-based" curricula and no specific reference to minimum competencies as stated by an accrediting body are identified. In general, pharmacy schools in this region have historically placed a lesser emphasis on the clinical sciences; however it is apparent that many programs are undertaking significant curricular revision that usually involves an increasing focus on the development of the skills and knowledge necessary for the delivery of competent patient care.

While the baccalaureate degree remains the first professional degree to practice and the duration of the

programs is unlikely to change, there is a trend towards an increase in the structure of the experiential learning. Several programs are beginning to more actively promote critical thinking and problem-solving skills, self-directed and lifelong learning. Use of computer technology for the purposes of online course delivery and management (eg, Blackboard) is becoming more common. This can be particularly useful for segregated programs and for those programs for which travel to campus may be problematic. The use of different teaching methodologies (eg, case- and problem-based learning, role playing, debates, presentations) is being introduced at several schools, although a desire to utilize these teaching methodologies is often hampered by the large class sizes apparent in several programs.

As a result of the expansion in pharmacy schools and degree programs, the number of opportunities for students wishing to pursue a career in pharmacy is improving. As well, a trend towards an increased emphasis on clinical sciences and pharmacy practice in the curriculum to better prepare baccalaureate graduates for the delivery of competent patient care is a favorable observation. An expansion of degree programs aimed at advanced clinical practice is also apparent. While PharmD degree programs were previously uncommon in this region, these programs are beginning to proliferate. With the exception of the Lebanese American University, these advanced degree programs lack regional or international accreditation, although several have or plan to seek an external review process. In the absence of accreditation from the same agency, direct quality comparisons between programs in this region with those programs offered in accredited western universities are difficult. International collaborations are a favorable trend. While primarily observed for private pharmacy schools and probably market driven, these collaborations can help to improve program standards. Regional or international accreditation would further this goal.

PHARMACY PRACTICE ACROSS ALL COUNTRIES

While there is a large number of baccalaureate (ie, first professional degree to practice) pharmacy graduates each year, the adequacy of internal graduates to meet the needs of any particular country is variable. Demand within a country is based upon pharmacist attrition rate (ie, loss of pharmacists to retirement, immigration or other causes), market demand, the role of the pharmacist in the health care system, and the relatively recent phenomenon of “nationalization” of the workforce. Several countries are actively attempting to reduce their reliance on expatriate pharmacists by opening more pharmacy schools that cater to the training of nationals.

The estimated number and density of pharmacists by country is shown in Table 2. The estimated number of pharmacists in this region is greater than 190,000, while the pharmacist density in any particular country ranges from 0.13 (Yemen) to 1.69 (Egypt). In comparison, Canada has about 21,000 pharmacists with a pharmacist density of 0.67 and the USA has about 250,000 pharmacists with a density of 0.88. Canada admits approximately 1100 students into FPDP programs per annum for an admission/pharmacist ratio of 0.05, while the USA admits approximately ~10,000 students for an admission/pharmacist ratio of 0.04. In comparison, the minimum admission/pharmacist ratio in the countries reviewed ranges from 0.02 (Iraq) to 0.27 (UAE). Within a particular country (eg, Egypt), the number of graduates may meet or exceed that needed for that country. These countries tend to be “exporters” of pharmacists to the surrounding countries. For other countries (eg, Qatar, Saudi Arabia, UAE), there are an insufficient number of local graduates and expatriate pharmacists must be hired.

Pharmacy practice opportunities in the Middle East are similar to those elsewhere in the world. The majority of baccalaureate graduates enter community-based practice sites, followed by hospital, industry, and others (eg, drug regulation, academia). Not all graduates can expect to find employment within the host country. Some countries (eg, Lebanon, Jordan, Egypt) only permit nationals to practice pharmacy within their borders and will not license expatriates. In some countries (eg, Saudi Arabia, UAE, Oman), a “nationalization” impetus may result in graduates obtaining what are deemed to be “preferred” positions (eg, hospital), while expatriate pharmacists may be hired for “less preferred” community practice positions. As the profession evolves in this region, the demand for qualified pharmacists will increase. For example, as clinical pharmacy services in the hospital sector increase, a greater demand for advanced clinical pharmacists can be anticipated. Local pharmaceutical manufacturing is common in some countries (eg, Jordan, Egypt) and with this comes opportunities for employment for pharmacists in production and sales. As the organization and delivery of health care advances, regional support positions in drug/poison information centers and governmental drug regulation agencies are also becoming available. The overall level of pharmacy practice appears to be similar across the countries reviewed, although some differences exist. While the pace of pharmacy education change has been relatively rapid over the past decade, the overall pace of change in pharmacy practice, particularly the private sector, may have been slower.⁴ Most community pharmacies are privately owned, although there are some local and international (eg, Boots) chain stores in operation. While

there are glimpses of advancement (eg, cognitive activities performed independent of dispensing episodes) in the community environment, the majority of positive change has been in the public (ie, institutional) sector. As in the western environment, hospital pharmacists often possess an advanced degree and tend to enjoy a higher level of practice compared to that of the many community pharmacists.

Drug regulations vary by country within this region, as does adherence and enforcement to these regulations. All countries have prescription and nonprescription drugs, however, the characteristics differ by country. In general, more products are available without a prescription in the Middle East region than in the western world. With these “relaxed” regulations comes a greater responsibility for community pharmacists to function in a “triage” role to ensure safe and effective medication use, and to ensure patients seek medical attention when appropriate. The extent to which pharmacists are meeting these responsibilities is unknown and beyond the scope of this paper.

EDUCATIONAL CHALLENGES ACROSS ALL COUNTRIES

The Middle East faces many of the same challenges in pharmacy education that other countries outside of this region encounter. For a variety of reasons (eg, inter-school competition, pressure from governmental agencies; health authority, profession and student demand, expanding role of the pharmacist), some schools are now seeking international review and accreditation. In preparation for this, many schools have undertaken intensive internal review and are revamping many components of their program. On a curricular level, pharmacy schools are revising their curriculums to include a greater focus on patient care skills and more structured experiential training. Several schools have introduced extended-training PharmD degree programs in recognition of the need for advanced practitioners. Enhancements to the teaching and learning environment are being made to improve learning outcomes and ensure graduates are ready for the demands of future practice. These are promising signs and pharmacy education appears to be in a phase of rapid and positive change.

Similar to most countries, the Middle East suffers from a shortage of well-trained faculty and clinical mentors. An inability to offer competitive compensation packages and the academic resources necessary to attract strong personnel hampers their ability to effect the desired changes in their curricula.

While an expansion of private for-profit degree programs can be viewed as favorable (ie, more opportunities for prospective students), this increase must be controlled

to ensure the quality of education meets agreed upon standards. Arguably, some private institutions may be delivering a better education to students than public schools, and these organizations may in fact be advancing pharmacy education in some locations. While national accreditation is better than none, a common regional or international accreditation process would prove to be an even better solution. This is particularly important considering the high volume of expatriate pharmacists trained within and external to this region. Harmonization of first professional degree to practice program standards, educational outcomes, and minimum competencies would help to reduce the inter-country variation that currently exists.

COUNTRY-SPECIFIC OBSERVATIONS

Bahrain

Bahrain is a small country with an estimated population of 560,000. While there are no pharmacy schools, Bahrain does have a diploma program for pharmacy technicians. The Medical University of Bahrain-Royal College of Surgeons in Ireland (MUB-RCSI) intends for pharmacy and dentistry programs to join the existing private nursing and medical schools within the next 5 to 10 years.³ There are fewer than 500 pharmacists working in this country, and there is a shortage of qualified pharmacists in all practice sectors.

Egypt

Egypt is the largest country reviewed in terms of geographic area, population (82 million), and number of pharmacy schools (24). Egypt also boasts the oldest pharmacy program, which reputedly began in the Cairo University in 1824. This country has both public and private pharmacy schools and most of the 11 private universities (which offer primarily baccalaureate degrees) were established in the last 10 years. Some programs have begun to offer diplomas in clinical sciences, and public schools have begun to focus on increased clinical pharmacy training. The Egyptian Supreme Council of Universities controls admission volumes and policies. Students must receive science training in high school and final examination results are the primary criteria for selection into a public program. However, private universities have their own admission procedures that comply with the Egyptian Ministry of Higher education's rules and regulations. Both genders are admitted to most schools. There tends to be 2 to 3 times more female than male pharmacy students. Approximately 6,750 students were admitted to public schools in the 2003 academic year. Private schools are permitted to enroll a maximum of 400 students per year. Accordingly, total public/private admissions are estimated to range from 11,000 to 13,000 students per

annum. Egyptian universities produce higher number of pharmacists than required by the country; hence this country has become a major exporter of graduates.⁵

Changes in curriculum and teaching style to increase a patient care emphasis and to introduce problem-based learning and other innovative teaching methods is reported.^{5,6} Learning assessment methods remain traditional (ie, serial written lecture and laboratory examinations and assignments), although there is evidence that the Ministry of Higher Education and Research wishes to see reform of current practices.

There are about 138,000 pharmacists and 60,000 community pharmacies in Egypt.⁷ About 65% of graduates work into community pharmacies, while the balance work in hospitals (18%), industry (12%) and other settings.⁸ Pharmacy practice in the institutional sector is undergoing reform with the opening of new clinical pharmacy units for the purpose of therapeutic drug monitoring and dose adjustment.⁹ Egyptian pharmacists are being trained abroad for the purpose of being recruited to operate these new units.

El-Awady et al have recently published the results of a student attitude and opinion survey regarding Egyptian pharmacy education.⁵ The article provides detailed descriptions of pharmacy education and practice in this country.

Iraq

Iraq has a population of approximately 28 million and 7 public schools of pharmacy. The oldest school was opened in Baghdad University in 1936. The status of pharmacy education today stands in stark contrast to old Iraq when in the 8th century AD, Iraq introduced the first privately owned community pharmacy and where pharmacy first become independent of medicine.¹⁰ Years of an oppressive regime, followed by years of sanctions imposed by the United Nations in the 1990s, followed by war in 2003, had a disastrous impact on Iraq's infrastructure and in almost all aspects of life in this country, and pharmacy education is no exception.

Iraq pharmacy schools suffer a severe lack of academic staff. Pharmacy academics have fled the country due to sectarian violence and personal threats, and the shortage of qualified advanced degree pharmacy academics has resulted in the recruitment of non-pharmacists to teach pharmacy courses in several universities.¹¹ In an attempt to address this issue, some pharmacy schools have begun to hire their top graduates as "academic pharmacist" instructors. Classroom, laboratory, and library facilities are inadequate, student overcrowding is common and resources such as laboratory and computer equipment, supplies, and textbooks are in short supply. The current instability of Iraq also poses challenges for its

graduates who are seeking licensure to work elsewhere (eg, the United States, Canada, and the United Kingdom) as a result of difficulties with qualification verification and an inability to authenticate documents with the appropriate school officials.⁵

Pharmacy practice has also suffered in Iraq and the role of the community pharmacist has been undermined by the presence of unlicensed street vendors. As a result of the drug shortages and a lack of drug regulation enforcement, the country has become a haven to counterfeit medicines and drugs of substandard quality.^{12,13}

Mason has recently published an article on pharmacy education and practice in this country.¹¹ She describes Iraq as being in "pharmaceutical chaos" and provides examples of the many obstacles to the delivery of quality education and pharmaceutical care in this country. To better appreciate the conditions of pharmacy education and practice afforded by the stable environment many of us enjoy, readers should consider reviewing this paper.

Jordan

Jordan has a population of about 6.2 million people and 8 pharmacy schools. The 2 oldest programs started in 1979 and are located in the country's public institutions. Most schools are located in or around the capital city of Amman. All nationally accredited schools offer a baccalaureate degree, while the 2 public schools offer a PharmD or similar degree. All programs are integrated and delivered in English. Evidence of innovation in teaching and learning in some schools is apparent.¹⁴ Admission is based upon high school academic performance and no prepharmacy university credit-hour requirements exist. Female students dominate admissions.

Employment opportunities for graduates are similar to those in other countries. The vast majority of pharmacists work in the private sector, typically as community pharmacists. Institutional positions are also available, as are opportunities with a thriving pharmaceutical industry in this country. While the pharmacy schools accept non-nationals, only Jordanians are eligible for licensure and practice within the country. A pharmacist must own each pharmacy.

Two detailed reviews of pharmacy education and practice in Jordan have been published.^{15,16}

Kuwait

Kuwait, with a population of 2.5 million, has 1 public pharmacy school. The nationally accredited public program at the University of Kuwait has offered a 5-year baccalaureate degree, and had its first student intake in 1997. No prepharmacy university course work is required and the program is taught in English. The program has

close faculty and curricular ties to the United States. No other degree programs are available at this time.

Similar to several other countries reviewed, Kuwait has a large expatriate population, and this group dominates pharmacy practice in the country as well. The country has responded by opening its own pharmacy program and had its first graduation class in 2002.

More than half of the pharmacists in Kuwait work in the government-funded hospital sector. Clinical pharmacy services are limited, but efforts are being made to increase direct patient responsibilities of the hospital pharmacists. While community pharmacies are readily accessible to the public, the poor image of pharmacists in this country prevents them from being fully utilized in health care facilities.¹⁷

Detailed reviews of pharmacy education and practice in Kuwait have been published.^{16,17}

Lebanon

With a population of about 4 million, Lebanon has 5 pharmacy schools.¹⁸ Pharmacy education in Lebanon dates back to 1889 when the Saint Joseph University of Beirut launched a pharmacy diploma program. This particular university is affiliated with pharmacy schools in France and is unique to this region in that its language of instruction is French (1 of 2 in this country) as it awards the graduates of its 5-year degree program with a Doctorate 'exercice en pharmacie'.¹⁹⁻²¹

Two pharmacy schools offer PharmD degrees in this country. The Lebanese University is the only public university in Lebanon and offers the only 6-year PharmD degree taught in French in the region.²² All other programs are delivered in English and the Lebanese American University is the only US-accredited doctor of pharmacy program outside of the United States.^{18,23-25} Graduates of this program are eligible to take the North American Pharmacy Licensure Examination (NAPLEX) and can be licensed to practice in the United States.²⁶

All programs require experiential training in a hospital, drug information, and community setting. Baccalaureate degree graduates are then permitted to take the National Competency Assessment Examination (colloquium) and successful examinees are licensed to practice in Lebanon. The Lebanese Order of Pharmacists regulates pharmacy practice in this country and graduates must be registered in order to practice.²⁷ There are about 4700 registered Lebanese pharmacists working in different practice areas.²⁸ Employment opportunities exist in approximately 1800 Lebanese community pharmacies.¹⁸ Many Lebanese cannot afford physicians' fees and rely heavily on the community pharmacist for medical advice and treatment. Pharmacists struggle to meet these needs

while balancing the prescription regulations enacted by the Lebanese Ministry of Health.

There are at least 25 drug manufacturing companies in Lebanon and about 100 pharmaceutical wholesalers who import brand name patented and generic products from various laboratories. Pharmacy graduates are primarily employed in the sales and marketing sector of this industry. Others work in hospital pharmacies where their role is primarily distribution, compounding, formulary management, and cost control.¹⁸ Like most countries in this region, opportunities in governmental regulatory agencies and academia are uncommon.²⁷

Advanced clinical pharmacy is not routinely practiced in Lebanon despite the introduction of clinical pharmacy into this country's curricula, and the accreditation requirement for clinical pharmacy practice in the hospital sector.²⁷ A lack of new pharmacy practice opportunities and an increasing number of pharmacy graduates are elements that led to a significant decrease in job vacancies in Lebanon. Therefore, many Lebanese pharmacists consider working abroad, if opportunities become available.

A detailed review of pharmacy education and practice in Lebanon has been published.¹⁸

Oman

The Sultanate of Oman, population approximately 3.3 million, has 2 pharmacy schools. While considered private programs, the Oman Medical College and the College of Pharmacy in the University of Nizwa are partially supported by the local government as a part of its educational reform policies.^{29,30} The 2 programs are nationally accredited by Omani Ministry of Higher Education. The Pharmacy Program at Oman Medical College has established an affiliation with the West Virginia University School of Medicine (USA) and its first group of predominantly national graduates received degrees in 2007.

Both pharmacy schools offer a baccalaureate degree only. Similar to most programs in the region, admission is based upon high school scholastic performance and no prepharmacy university training is required prior to admission. Oman also offers a 3-year pharmacy diploma program that is available exclusively for Omani nationals. In 1991, the Oman Assistant Pharmacists Institute (OAPI) began this program in response to the nation's desire to reduce its dependence on expatriate pharmacy personnel. Through an agreement with 2 UK universities, the Omani Ministry of Higher Education has arranged for the annual enrolment of up to 8 OAPI graduates into the second year of 4-year Master of Science (MSc) in Clinical Pharmacy degree programs. As a consequence of these efforts, Omani graduates are beginning to replace expatriate pharmacists and assistant pharmacists in the preferred public

sector employment sites, including hospitals and health centers. While the volume of national graduates is still insufficient to meet local needs, Oman estimates that by 2010, full “Omanization” of the pharmacy sector will be complete.

Palestine

Palestine has a population of approximately 3.8 million and 3 pharmacy schools. Since 1948, Palestine has been subjected to a series of political, economic, and social crises. In the midst of this turmoil, Palestinians still recognize the value of education and skilled job training and this country has some of the highest university enrollment rates in the region and the world. Academics and students face significant daily challenges resulting from the devastating social, political, and economic circumstances, and universities have suffered both human and material losses under occupation.³¹ Much of the pharmacy education and professional development progress observed in the past decade is being reversed due to the deteriorating conditions, and restrictions on freedom of movement have spawned the use of distance-based education techniques.^{31,32}

Pharmacy schools have only been present in this country since the early 1990s. Of the 3 public programs, only An-Najah National University offers a PharmD degree. Female pharmacy students outnumber males three- to fourfold, although male students occupy 55% of pharmacist positions. The Palestinian Ministry of Health and the Palestinian Pharmacy Association report that there are 700 pharmacies with 1400 community pharmacists working in these pharmacies. The balance of pharmacists work primarily in hospital settings or in one of the more than 10 local pharmaceutical industry companies. Many graduates from the baccalaureate and advanced degree programs now work in other Middle East countries or elsewhere where conditions are more favourable.

Qatar

Qatar has a population of approximately 1.5 million people, of which approximately 80% are expatriates. Qatar has one public pharmacy school that opened in 2007. The new program at this country’s only national (and segregated) university is currently for female students only.³³ While a PharmD degree program was approved in early 2007, the program is not expected to commence for at least 2 years.

The 5-year baccalaureate program is one of the few in the region that requires a minimum of 1 year of general sciences before competitive application. Also unique is the requirement to complete a US-based pharmacy college admission test (PCAT) as a component of the

application process.³³ Structured interviews, personal statements, and references are also required. The pharmacy school is pursuing provisional international accreditation from the Canadian Council on Accreditation of Pharmacy Programs in 2008.

As there are as yet no graduates from the new pharmacy degree program, all pharmacists practicing in Qatar have been trained elsewhere. Most pharmacists are expatriates and the majority of pharmacists received their degrees in Egypt, India, or Jordan.³⁴ Practice opportunities resemble those in other regional countries and are primarily in private community pharmacies, publicly funded hospitals, and public health and private clinics. There is minimal pharmaceutical industry activity.

A new pharmacy technician program has also recently opened in the capital city of Doha. Operated by a branch campus of the College of North Atlantic (Canada), graduates of the program are being trained to support local pharmacists in the delivery of competent health care.

Saudi Arabia

Saudi Arabia has a population of about 28 million people, with at least 9 active public or private pharmacy schools, and a complement of new or planned programs poised to begin enrollment within the next few years.

Until recently, Saudi Arabia had only 1 pharmacy school (King Saud University), but several new programs have opened to increase the number of national graduates. To address the need for advanced practitioners, a PharmD degree is now offered in the majority of pharmacy schools. Pharmacy degree programs appear to be available for both genders. However, programs tend to be segregated and there is some debate regarding general education inequities between the sexes.³⁵

Similar to several other countries in the region, Saudi Arabia suffers from a shortage of qualified practitioners and academic personnel. According to the Saudi Arabia Manpower Council, at least 17,000 pharmacists are needed by 2026.³⁶ The country hopes to achieve a pharmacist density of 0.48/1000 inhabitants. Only 11% of existing pharmacists in the public and private sectors are Saudi, so Saudi Arabia is also actively pursuing “Saudization” (ie, re-nationalization) of the profession.

Most graduates in this country elect to practice in the hospital sector where services are well developed and clinical pharmacists are well remunerated.¹⁶ Similar to other Middle East countries, community pharmacy practice is not as advanced, nor are the pharmacists as well paid. Accordingly, positions in the private sector tend to be filled by expatriates. The government is attempting to address this issue, particularly in the context of the country’s nationalization efforts.

Syria

Syria, with a population of approximately 20 million, has 7 pharmacy schools. Four schools are publicly funded and the balance of private programs have only recently begun enrolling students. Arabic is the principal language of instruction in this country. Few schools require pre-pharmacy university credit hours and admission is typically based on high school academic criteria and placement tests. All programs award its graduates a baccalaureate degree, although some describe intentions to pursue development of entry-level (first professional degree) PharmD programs under guidance from academic partners in the United States.

Similar to other countries in the region, graduates pursue careers in community and hospital practice, the pharmaceutical industry, and marketing. Pharmaceutical sciences and pharmaceuticals production has experienced major development in Syria over the past decade and the national pharmaceutical industry now generate drugs meeting the majority of the population's needs. Conversely, almost 70 government-funded hospitals and 1,500 health centers form the core of Syria's public health service that is struggling with meeting demands of patient care delivery. Private health care providers supplement with a wide range of ambulatory and secondary health care services in almost 400 small hospitals and more than 12,000 pharmacies and clinics. However, in all sectors, there is a shortage of skilled health workers and inequitable distribution between urban and rural areas. The government obliges non-specializing physicians, pharmacists, and dentists to practice in rural sites for at least 2 years following graduation.³⁷

United Arab Emirates

The UAE has a population of approximately 4 million and 7 pharmacy schools. Pharmacy education in UAE dates back to 1992 with the establishment of Dubai Pharmacy College. After 1992, more pharmacy programs were launched to meet the high demand for pharmacists in this country. Pharmacy schools in the UAE have baccalaureate degree programs but no PharmD programs at this time. The curricula are designed to give pharmacy students a solid foundation in core pharmacy abilities. The programs use a variety of methods of teaching and learning including problem-based learning, self-directed learning, and case-based learning. Many of the colleges foster technological innovation, development and research through the use of well-equipped scientific and computer laboratories, drug information centers, pharmaceutical care units, and audiovisual units.³⁸ Pharmacists in the UAE practice in community hospital sectors as well as in drug information centers, the pharmaceutical indus-

try (marketing, sales or research), regulatory agencies, academia (as instructors), wholesale companies, nutrition outlets and other environments. UAE pharmacy schools have graduated approximately 300 pharmacists to date, which is well below the number of pharmacists needed to meet their needs. Accordingly, pharmacists are being recruited from other countries to meet the current demand in all practice areas. Pharmacy practice in this country is still in the early development phase and pharmacist skills and training appear to be underutilized.

Yemen

Yemen has a population of approximately 23 million and 4 pharmacy schools. There are 2 private schools, with a third program (the second Lebanese International University campus in the country) planned for a future launch in Aden. All schools offer 5-year baccalaureate degrees with or without prepharmacy requirements. Admission is primarily based on high school academic performance. There are no PharmD programs in this country. English is the language of instruction and all schools are nationally accredited.

While employment opportunities resemble those of other countries in this region, a high proportion of graduates seek more lucrative positions with the pharmaceutical industry or government. Yemen has over 2,250 pharmacies, and while over 450 small hospitals and clinics have opened in the past 3 years, the increasing demand for modern health services is not being met. Yemeni pharmacists have described frustration with the lack of optimal public practice opportunities and competition with foreign pharmacists for desired positions in private industry. Barriers to professional satisfaction have been linked to perceived deficiencies in practical experience training within pharmacy curriculums and government restrictions on the abilities of new graduates to open private pharmacies.

SUMMARY

In many respects, pharmacy education and practice in the Middle East is a mirror of the status of the region itself. Some countries are quite stable and pharmacy as an academic discipline has enjoyed growth and maturation that resembles that in other parts of the world. In contrast, in those Middle East countries burdened by war, military occupation, and/or a poor economy, pharmacy academics has stalled or even regressed. Advancements in pharmacy practice lag behind the improvements to pharmacy education in this region, and the overall level of services provided is low, particularly in the community sector. Positive developments tend to be primarily restricted to institutional practice, although practice in this sector is also several years behind those countries (eg, the United

States and Canada) that have seen continuous progression over the past 2 decades. Despite the adversity that faces academics and practitioners alike, there is a strong and uniform desire to advance the science and practice of pharmacy. For this reason, we are optimistic that the future of pharmacy education and practice in the Middle East will be as positive as it is elsewhere in the world.

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Note: additional references for the information contained in this article are available from the authors.

REFERENCES

1. Hamarneh S. The rise of professional pharmacy in Islam. *Med Hist*. 1962;1:59-66.
2. Al-Ghazal SK. The valuable contributions of Al-Razi (Rhazes) in the history of pharmacy during the Middle Ages. *JISHIM*. 2003;2:9-11.
3. Royal College of Surgeons in Ireland Medical University of Bahrain. Available at: www.rcsi-mub.com/default.asp?action=article&id=156&keywords=pharmacy. Accessed November 10, 2008.
4. Adan EA. Iraqi applicants present special challenges for center. The Center Bulletin 2007 March. Available from: URL: http://www.cpees.org/bulletin_0307.pdf. Accessed November 10, 2008.
5. El-Awady EE, Moss S, Mottram D, and O'Donnell J. Student perspectives on pharmacy curriculum and instruction in Egyptian schools. *Am J Pharm Educ*. 2006;70(1):Article 9.
6. Mottram D, El-Awady EE, S. Moss S, and O'Donnell J. An evaluation of student response to changes in pharmacology teaching and delivery at an Egyptian School of Pharmacy. *Pharm Educ*. 2007;7:97-102.
7. 2006 Statistics, Ministry of Health and Population of Egypt, Cairo, Egypt. Available at <http://www.mohp.gov.eg/>. Accessed November 10, 2008.
8. Quality Assurance and Accreditation Project, Faculty of Pharmacy, Helwan University, B. Pharm Sciences, Annual Self evaluation Report (2004/05). Available at <http://web.helwan.edu.eg/pharmacyen/qaap.html>. Accessed November 16, 2008.
9. Achievements of the Egyptian Ministry of Health and Population, Cairo, Egypt. Available at <http://www.mohp.gov.eg/sec/about/engazat/12.doc>. Accessed November 10, 2008.
10. Jafar SA. Pharmacy in Baghdad. *PJ*. 2000;265:273-274. Available at: <http://www.pjonline.com/Editorial/20000819/articles/baghdad.html>. Accessed November 10, 2008.
11. Mason P. Life as a student in Iraq what impact has the war had in pharmacy. *PJ* 2005; 15-16. Available at: http://www.pjonline.com/pdf/tp/2005/tp_2005_p15iraq.pdf. Accessed November 10, 2008.
12. Maliki vows revenge for Mustansiriyyah University massacre. *Iraq Updates* 2007 January 17. Available http://www.iraquupdates.com/p_articles.php/article/13557. Accessed November 10, 2008.
13. Mason P. Pharmaceutical Chaos: emails from an academic pharmacist in Iraq. *PJ* 2005;274:115-6. Available at: <http://www.pjonline.com/editorial/20050129/articles/p115iraq.html>. Accessed November 10, 2008.
14. Bulatova NR, Aburuz S, Yousef AM. An Innovative Pharmaceutical Care practical course. *Adv Health Sci Educ Theory Pract*. 2007;12:211-22.
15. Al-Wazaify M and Albsoul-Younesl A. Pharmacy education in Jordan. *Am J Health-Syst Pharm*. 2005;62:2548-2551.
16. Al-Wazaify M, Matowe L, Albsoul-Younes A, Al-Omran OA. Pharmacy education in Jordan, Saudi Arabia and Kuwait. *Am J Pharm Educ*. 2006;70(1):Article 18.
17. Matowe L, Al-Kandery AA, Bihzad SM. Pharmacy in Kuwait. *Am J Health-Syst Pharm*. 2003;60:1591-1592.
18. Dib JG, Saade S, and Merhi F. Pharmacy practice in Lebanon. *Am J Health-Syst Pharm*. 2004;61:794-5.
19. Cursus, diplômes et formations à la FP. Faculte de Pharmacie. Université Saint-Joseph de Beyrouth. Available from: <http://www.fp.usj.edu.lb/files/formphar.htm>. Accessed November 10, 2008.
20. La pharmacie à l'USJ depuis 1883. Faculte de Pharmacie Université Saint Joseph de Beyrouth. Available from: <http://www.fp.usj.edu.lb/files/hist.htm>. Accessed December 17, 2007.
21. Sites des facultés de pharmacie partenaires. Faculte de Pharmacie. Université Saint-Joseph de Beyrouth. Available at: <http://www.fp.usj.edu.lb/files/liens.htm>. Accessed November 10, 2008.
22. Faculte de Pharmacie, Université Libanaise. Available at: <http://www.ul.edu.lb/francais/faculte.htm>. Accessed November 10, 2008.
23. Faculty of Pharmacy, Beirut Arab University. Available at: <http://www.bau.edu.lb/pharmacy.htm>. Accessed November 10, 2008.
24. Bachelor of pharmacy curriculum. Lebanese International University. Available from: http://www.liu.edu.lb/beirut/bach_pharm.html. Accessed November 10, 2008.

25. Academic Catalog. Lebanese American University. Available from: http://www.lau.edu.lb/academics/AcadCat_2007-2008.pdf. Accessed November 10, 2008.
26. Admissions generales. Universite Saint-Joseph de Beyrouth. Available from: <http://www.fp.usj.edu.lb/files/admissions.htm>. Accessed November 10, 2008.
27. Salameh P, Hamdan I. Pharmacy manpower in Lebanon: An exploratory look at work-related satisfaction. *Res Social Admin Pharm.* 2007;3:336-50.
28. Pharmaciens. Ordre des Pharmaciens du Liban. Available at: <http://www.opl.org.lb/newpharmacist.htm>. Accessed November 10, 2008.
29. Pharmacy Program, Oman Medical College. Available at: <http://www.omc.edu.om/pharmacyprogram.htm>. Accessed November 10, 2008.
30. College of Nursing and Pharmacy, University of Nizwa. Available at: <http://www.unizwa.com/2006/e-index.php?id=28>. Accessed November 10, 2008.
31. Moughrabi F. Palestinian universities under siege. *International Higher Education: the Boston College Center for International Higher Education.* 2004;36:9-10.
32. Hammond K. Palestinian universities and the Israeli occupation. *Pol Futures Educ.* 2007;5:264-70.
33. Qatar University College of Pharmacy. Available at: www.qu.edu.qa/colleges/pharmacy. Accessed November 18, 2008.
34. El Hajj M, Jewesson P. Medication Use Process Survey (MUPS) Study: Pharmacist stakeholder opinions (initial Report). Available at: <http://www.qu.edu.qa/pharmacy/documents/MUPSSStudyManuscriptVersionFINALMHPJ.pdf>. Accessed November 10, 2008.
35. Hamdan A. Women and education in Saudi Arabia Challenges and Achievements. *Int Educ J.* 2002;6:42-64.
36. King Saud University College of Pharmacy website. Available from: http://colleges.ksu.edu.sa/phrm/index.php?mod=view_content&content_id=515. Accessed November 10, 2008.
37. World Health Organization Regional Health Systems Observatory. Health System Profile – Syria. 2006 Available at: www.emro.who Accessed November 10, 2008.
38. Ajman University of Science and Technology Faculty of Pharmacy & Health Sciences Bachelor of Pharmacy. Available at: http://website.ajman.ac.ae/aust/Progs_offered_detail.asp?FacId=6&ProgId=1. Accessed November 10, 2008.