



ORIGINAL ARTICLE

Pharmacist, the pharmaceutical industry and pharmacy education in Saudi Arabia: A questionnaire-based study



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Abstract *Background:* In Saudi Arabia there is an estimated need of more than 100,000 pharmacy graduates to cover all present sectors. The shortage of pharmacists has affected many of these sectors especially the pharmaceutical industry. The contribution of Saudi pharmacists to local pharmaceuticals industry would be extremely beneficial and important for shaping the future of the drug industry within the Kingdom. It is not clear whether future Saudi pharmacists are willing to contribute to local pharmaco-industrial fields. *Methods:* A cross-sectional, questionnaire-based survey was conducted on all final-year pharmacy students in King Saud University (KSU), Riyadh, Kingdom of Saudi Arabia (KSA). *Results:* Out of a total of 130 students registered in the final-year of the pharmacy program in KSU, 122 (93.8%) were able to complete the questionnaire. The results showed that the majority (83%) of Saudi pharmacy students indicated that they had not received practical training in the pharmaceutical companies, while only 17.2% of the students felt that they had the knowledge and the skills to work in the pharmaceutical industry after graduation. The majority of the students (66.7%) chose clinical pharmacy as their future career field while only 10.9% indicated willingness to work in a pharmaceutical industry career. Only 8.2%

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selected working in the pharmaceutical industry. The significant predictor of possibly choosing a career in the local drug industry is a student with a bachelor's degree (compared to Pharm D degree) in pharmacy (OR = 2.7 [95% CI 1.1–6.3]). *Conclusion:* Pharmacy students who are enrolled in the capital city of Riyadh are not properly trained to play an influential role in local drug companies. As a result, their level of willingness to have a career in such important business is not promising (more among Pharm D program). Future research in other pharmacy colleges within Saudi Arabia is needed to confirm such results.

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1. Introduction

The role of the pharmacist is not limited to medication dispensing and patient education, but extends further into discovering, evaluating and manufacturing medications. The World Health Organization (WHO) published reports on the role of the pharmacist in the healthcare system after reviewing papers published from different countries. The report emphasized the importance of the pharmacist's role in pharmaceutical companies and indicated that, without this role, the company should not be allowed to operate (WHO, 1997). In Germany and France, qualified employees in the pharmaceutical industry must also be well trained pharmacists in the field as there are no other degrees that could adequately cover their work responsibilities (Atkinson et al., 2012).

With respect to professional training and education, pharmacy schools predominantly focus on clinical aspects and direct students to hospital pharmacy as a favorable career (Helen Paine, 2008). Many studies were conducted to find out the proportion of the pharmacists working in the industrial field. In the United Kingdom (UK), out of 65,000 employees with different educational backgrounds, only 2000 are qualified and employed in the pharmaceutical industries, which represents only 3–5% of an industrial workforce (Bone, 1999). A survey conducted by a pharmaceutical company in the United States of America (USA) showed that pharmacists represent only 6.8% of America's workforce, but they play a vital role in the company (Riggins, 2000). Another study conducted by another pharmaceutical company in USA found that there was a decline in the enrollment of the pharmacists in the industrial field (Kerridge, 2003). In Europe, the total number of pharmacists working in the industrial field was estimated to be 37,308 (from 28 countries) out of 603,866 industrial employees (from 23 countries) (Atkinson et al., 2012).

In developed countries, great attention is being directed at the industrial field. One conducted study, mentioned that the pharmacy fellowship programs in the United States are categorized as either traditional or industrial. Out of the 131 fellowship programs in accredited U.S. schools of pharmacy, 58 of them focused on developing skills that support careers in the biopharmaceutical and pharmaceutical industry. Most of the industry fellowship programs are provided by academic institutions while some of them are offered by companies. Rutgers University in New Jersey, USA collaborates with 13 business partners to provide more than 70 pharmacy fellowships each year to prepare the students for a pharmaceutical industrial career. Massachusetts College of Pharmacy and

Health Sciences in Boston, MA also collaborates with pharmaceutical industries and provides various fellowship programs in clinical research, drug information, and regulatory affairs (Larochelle et al., 2009).

In Saudi Arabia, there are at least nine public and private pharmacy schools (Kheir et al., 2008). However, the country suffers from a shortage of qualified Saudi pharmacists (King Saud University College Website, 2014). The estimated need is more than 100,000 pharmacy graduates to include all sectors. According to a study done in Saudi Arabia, the most affected sector is the pharmaceutical industry which is suffering from a shortage of trained pharmacy staff (Saudi Arabia, 2008). Another Saudi researcher has described in his article the stages of development of pharmacy education in Saudi Arabia. In 1993, King Saud University developed a new curriculum that included 16 weeks rotations in various areas of the pharmacy profession, including pharmaceutical products and industrial pharmacy. In 2005, they established the doctor of pharmacy program (Pharm D) and the first batch graduated at the end of the 2010/2011 academic year. In both degrees Bachelor of Science in pharmacy (B.Sc. Pharmacy) and Pharm D students need to complete 500 h as Introductory Pharmacy Practice Experience (IPPE) in the following areas: Hospital, community pharmacy, and drug company business and scientific office. In addition, pharm D students need to complete one-year rotation as Advanced Pharmacy Practice Experience (APPE). The author of this article emphasized on the quality of industry-institute interactions to establish resources for research and development. King Saud University has set up six master and three Ph.D. programs to strengthen the relationship with the pharmaceutical industry and improve the research and development in the country (Asiri, 2011).

Due to the fast growing Saudi pharmaceutical industry, our aim was to study the readiness of pharmacy graduates in order to build strong career suites in the job market of the pharmaceutical industry. This work has been presented in part at the international conference on pharmaceutical affairs in Hyderabad, India 2012 (Salhia et al., 2012). No studies have been conducted on Saudi Arabia's pharmacy students on their preferred specialties and post-graduation career paths or whether they aspire to continue their studies as well as the factors that influence these choices. The outcome of this study will help us appreciate the opinion and the willingness of students to be involved in the industrial field. This research can be considered an assessment stage prior to putting efforts in promoting the involvement of fresh graduates into the drug industry job market in the KSA.

2. Material and methods

2.1. Survey description

This is a cross-sectional study on pharmacy students at the King Saud University in Riyadh, studying in their tenth level of their education. All 130 Saudi and non-Saudi students in the final years of both programs (Bachelor and Pharm D) were invited to participate. The reason for selecting students in the final level who are expected to graduate at the end of year 2012/2013 is to make sure they passed more than three-quarters of their study in the pharmacy college. Hence, they would be in a better position to take decisions about their future career plans.

2.2. Data collection method

The survey questionnaire was sent to the responsible department in the academic affairs in both male and female colleges of the pharmacy. Students were eligible to be included in this study if they are in their final education level at the college of pharmacy. The total number of pharmacy students (B.Sc. and Pharm D) in their final level was 130. The questionnaire was anonymous and distributed to all the students before their educational activities (as lectures, workshops or exams) from 6 Mar 2013 to 20 Mar 2013 and 122 students agreed to participate. The self-administrated questionnaire collected data, with respect to the following; demographics, GPA, locations of experiential training, understanding of comprehensiveness of the theoretical and practical education provided, perception of information and the skills to work in pharmaceutical industries, preferred career specialty with reasons, willingness of postgraduate education, perception of the importance of various career specialties, factors influencing their decision in career field selection and knowledge of current pharmaceutical industries and job opportunities in Saudi Arabia.

2.3. Ethical issues

Permission was also taken from the Ethical Research Committee for conducting this study. The confidentiality of

the information supported by the participants assured that it would not be accessed except by the main researcher and only for the purpose of this project. The anonymity of the participants was also assured. The survey envelopes contained the first letter about the confidentiality of the participant's responses and it was indicated that their responses would remain strictly anonymous and confidential. The participants' responses were reported and analyzed in a manner that they cannot be linked or traced to any individual.

3. Results

Our outcomes are students' interest in postgraduate program in pharmacology and pharmaceutical industry and their career plan in pharmaceutical industrial field after graduation. The total study population was 130 students in their last year studying in college of pharmacy in King Saud University, Riyadh, KSA. All students were invited to complete a questionnaire from 6 to 20 Mar 2013. Out of the 130 students invited, one was absent in all the 15 days of the study and 7 refused to participate either for lack of interest in the research or for a busy schedule. The final surveyed group was composed of 122 students, representing 93.8% of our target population. The mean age of the students was 22.22 ± 1.141 with a range from 21 to 28 years, but the majority was 21 to 22 years old. There are six students did not mention their age. Fifty-nine percent of the students were females and 59.8% were studying for a B.Sc. degree. The average GPA (out of 5) was 3.9 ± 0.54 . The average GPA for Pharm D students was significantly higher than that for B.Sc. Pharm students ($p = 0.006$). [Table 1](#) summarizes the demographic of the study population.

3.1. Students interest in pharmacy as a career

Around 44% of the students were unsure about their desire when they applied to the pharmacy school while 34.4% were willing to join; this college and 21.3% had not selected pharmacy as their first choice. However, when students were asked if they would choose pharmacy if they were to re-select a field of education, 50.8% agreed or strongly agreed that they would select pharmacy, 35.2% were not sure while 13.9% of students disagreed or strongly disagreed that selection of pharmacy was

Table 1 Student demographics ($N = 122$).

Variables		<i>N</i>	%	Cumulative %	
Age	21–22	93	80.2	80.2	
	Older than 22	23	19.8	100	
Gender	Male	50	41	41	
	Female	72	59	100	
Degree	Bachelors	73	59.8	59.8	
	Pharm D	49	40.2	100	
GPA (/5)	4.50–5 (excellent)	19	17.3	17.3	
	3.75–4.49 (very good)	53	48.2	65.5	
	2.75–3.74 (good)	36	32.7	98.2	
	2–2.74 (pass)	2	1.8	100	
		Mean \pm Sd	<i>T</i> test	<i>F</i>	<i>P</i> value
Average GPA	Bachelors	3.81 \pm 0.58	–2.800	107.400	0.006
	Pharm D	4.09 \pm 0.43			

Table 2 Questions suggesting Students' overall interest in pharmacy as a career ($N = 122$).

Questions		<i>N</i>	%	Cumulative %
Reason behind choosing college of pharmacy at application	Wanted it	42	34.4	34.4
	Not sure	54	44.3	78.7
	Did not want it	26	21.3	100
Choosing pharmacy college if they were starting their college over again	Agree/strongly agree	62	50.8	50.8
	Neither agree nor disagree	43	35.2	86
	Disagree or strongly disagree	17	13.9	100
Continue their studies after graduation	Yes	79	65.3	65.3
	No	3	2.5	67.8
	Not sure	39	32.2	100
Academic achievements (from students point of view)	Excellent	11	9	9
	Very good	44	36.1	45.1
	Good	55	45.1	90.2
	Fair	10	8.2	98.4
	Poor	2	1.6	100

the right decision. We asked them if they were planning to join a higher education programs after graduation and the majority of students (65.3%) agreed or strongly agreed, 32.2% were unsure, and only 2.5% were not willing to continue their post-graduate studies. We asked the students to rate their level of academic achievement in the college and 9% rated themselves as excellent, 36.1% as very good, 45.1% as good, while 8.2% and 1.6% rated themselves as fair and poor, respectively (Table 2).

3.2. Students' understanding of current educational strategies and their future education plan

More than half of the students (54.1%) thought that the education in the college of pharmacy was information and practical-based, 41.8% thought that it is mainly knowledge-based while only 4.1% thought that it is predominantly practical-based. The majority of students (82%) agreed that they got training in a hospital pharmacy, but 75.7% think that it was not enough. Around 21% of students disagreed or strongly disagreed that they have experience and skills to work in hospitals after graduation, 45% of the students were unsure while 34% strongly agreed. The majority of the students (83.6%) agreed that they did not get any training for pharmaceutical companies, 41% disagreed or strongly disagreed that they have experience and skills to work in the pharmaceutical industry after graduation, 41.8% were unsure while 17.2% strongly agreed. We asked students about the preferred country to get

higher education degree, and most students (60.3%) preferred to continue their studies in USA followed by KSA (12.4%), UK (11.6%) than Europe (9.1%). Table 3 shows that more than half of the students thought that very little or no information was given about the facilities provided to open pharmaceutical factory.

As shown in Fig. 1, the most preferred specialty among students was clinical pharmacy (48 students) while the least preferred specialties were physical pharmacy and quality control. The specialties related to the pharmaceutical industries got a lower level of interest.

Table 4 shows the opinion of the students about the importance of different pharmacy jobs. Approximately 66% of the students chose the clinical pharmacy as the most important and important career for the pharmacist. Around 55% of students chose hospital pharmacy, 48% chose academic in universities, 22% chose drug information center and only 11% believed that the industrial pharmacy is important. Fig. 2 depicts the students' career plan of the students after graduation. Around 34% wanted to work in a hospital, 25% preferred to work in the university, 8% chose to work in the industry and the same percentage chose to work in their own pharmacy. Fig. 3 shows students' ranking with respect to factors that influence their choice of their future career. Salary and the work environment were selected by 77.3% of students each; 62.5% benefits they expect to get from their work is a factor. Factors "flexible work schedule" and "the geographic location" were selected by 61.4% and 61.3% of students.

Table 3 The important factors when the students choose their career ($N = 122$).

Questions		<i>N</i>	%	Cumulative %
Exposure to information about the facilities provided to establish pharmaceutical factory	Yes, enough information	5	4.1	4.1
	Yes, little information	53	43.8	47.9
	No information at all	63	52.1	100
Interest in postgraduate program in pharmacology and pharmaceutical industry	Yes	61	50.4	50.4
	No	60	49.6	100
Number of Saudi pharmaceutical companies known by name	Median	2		

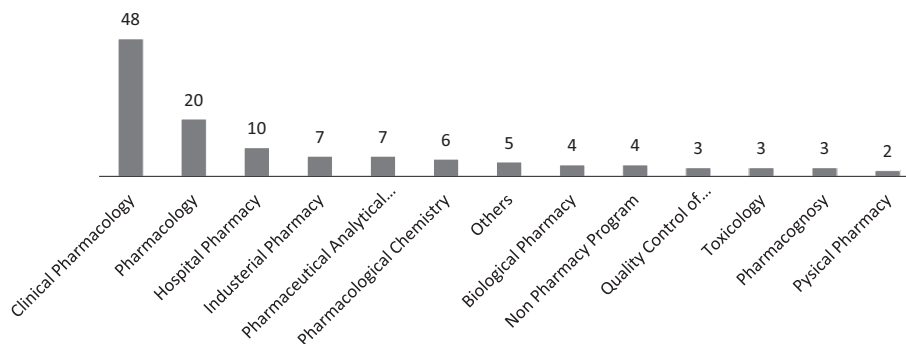


Figure 1 Bar graph showing frequency of students selecting specialty after graduation.

Table 4 The level of the importance of the pharmacy career from student’s point of view (N = 122).

The career	The level of importance (1 the most important, 5 the least important)				
	1 N (%)	2 N (%)	3 N (%)	4 N (%)	5 N (%)
Hospital pharmacy	27 (22.7)	39 (32.8)	16 (13.4)	24 (20.2)	13 (10.9)
Clinical pharmacy	51 (42.5)	29 (24.2)	21 (17.5)	9 (7.5)	10 (8.3)
Industrial pharmacy	7 (5.9)	6 (5)	25 (21)	33 (27.7)	48 (40.3)
Academic in the universities	33 (27.3)	25 (20.7)	28 (23.1)	23 (19)	12 (9.9)
Drug information center	7 (5.9)	20 (16.8)	28 (23.5)	29 (24.4)	35 (29.4)

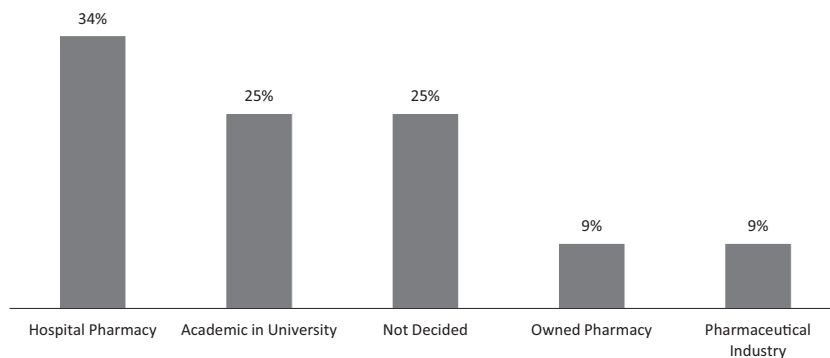


Figure 2 Bar graph showing percentages of students having different career plans after graduation.

3.3. Predictive factors for an interest in postgraduate program in pharmacology and pharmaceutical industry

Logistic regression analysis (SPSS, v.20) was used to identify predictors. In multivariate analysis, we examined six predictors of showing interest in postgraduate program, in pharmacology and pharmaceutical industry. These factors are gender, degree (level of education), GPA, having the knowledge and skills to work in pharmaceutical industries, reading about the facilities to establish a pharmaceutical factory and to get to know at least one pharmaceutical company by name. As seen in Fig. 3 that the main reason is the absence of true connection between industry and the college of pharmacy. A number of male students showed interest in postgraduate program in pharmacology and pharmaceutical industry almost two times more than females who are borderline significant (OR = 1.935 [95% CI 0.928–4.036]). Students with Bachelor

degrees showed more than two times the interest in postgraduate programs in pharmacology and pharmaceutical industry than pharm D students (OR = 2.211 [95% CI 1.053–4.640]). In multivariate analysis, the variable Studying for a Bachelor degree (OR = 2.655 [CI 1.119–6.300]) was found significant.

4. Discussion

During the past few decades, the pharmacy profession has expanded significantly in terms of professional service delivery and now has been recognized as an important profession in the multidisciplinary provision of health care. In contrast to the situation in developed countries, pharmacists in developing countries are still underutilizing their important role in the drug industry.

In one part of this study, we found that the interest of students of pharmacy increased after joining the college program.

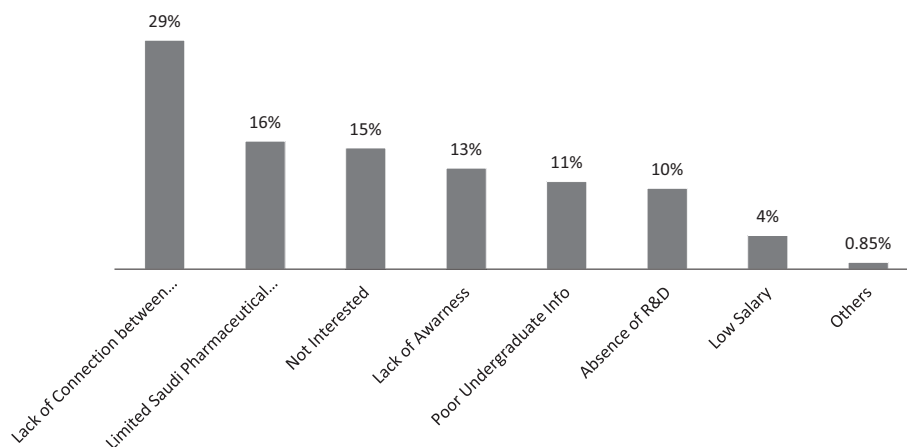


Figure 3 Bar graph showing percentages of factors affecting the unwillingness of pharmacists to choose pharmaceutical industry career.

Prior to joining the college of pharmacy, only 34.4% of students were interested to join this college while 21.3% did not. However, after they enrolled and just before their graduation, the majority of the students (more than 50%) thought that studying pharmacy was the best decision while only 13.9% felt that their decision was not a right one. This was not the same picture in developed countries. Figures from the USA showed a more favorable perception. In a national study, in USA, it was found that more than 80% of the graduating students agreed or strongly agreed that they would choose to study pharmacy if they were starting their college over again ([Doctor of Pharmacy Program, 2012](#)). The majority of students in our study rated their level of academic achievement in the college as good and very good by 45.1% and 36.1% respectively. The majority of the students (65.3%) would like to continue their higher education after graduation and most of them (60.3%) preferred to continue their studies in USA. A 2011 study in the United Kingdom, found that only about 2% of 2010 pharmacy graduates continued full-time postgraduate programs ([HESA, 2011](#)). A survey in Australia reported that only 3.6% of 2004 pharmacy graduates continued full-time study, and 8.4% continued part-time study ([Graduate Careers Council of Australia, 2005](#)). Compared to our results, it seems that Saudi students have a higher level of enthusiasm to continue a postgraduate education than their peers do in other countries. The most preferred specialties among students were clinical pharmacy by 48 students (39.3%) followed by pharmacology by 20 students (16.4%) then hospital pharmacy and industrial pharmacy by 10 (8.2%) and 7 (5.7%) students respectively.

In the second part of this study, we have found that, most students (54.1%) thought that education in the college of pharmacy is information and practical based. The majority of the students, 82%, confirmed that they got training in a hospital pharmacy, but 75.7% of them thought that it was not enough and only 34.4% of them felt that they had the knowledge and the skills to work in the hospital after graduation. On the other hand, the majority of the students 83.6% agreed that they did not get any training in a pharmaceutical industry while the rest of the students indicated that they have the knowledge and the skills to work in pharmaceutical industry after graduation. These figures are important indicators that the vast majority

of pharmacy students in Saudi Arabia regard to their educational curriculum at college, does not qualify them to join a career in the pharmaceutical industry. It is clearly appeared that, there is an immediate need for re-evaluation of pharmacy colleges' curriculum in the kingdom. The changes in the curriculum should include learning outcomes related to pharmaceutical industry in order to provide them with the necessary knowledge and skills that could prepare them to join the growing pharmaceutical industry in the country.

The majority of the students (66.7%) chose clinical pharmacy as the most important or somehow important career for the pharmacist but only 10.9% of them chose the industrial pharmacy side. Moreover, most of the students 34.4% indicated that they would prefer working in a hospital while only 8.2% of them chose to work in pharmaceutical companies.

The majority of the students (66.7%) chose clinical pharmacy as the most important or somehow important career for the pharmacist but only 10.9% of them chose the industrial pharmacy. Moreover, most of the students 34.4% want to work in a hospital while only 8.2% chose to work in the pharmaceutical industry.

The most important factors that will affect the students' career choice in the future were found to be salary and work environment; each factor reported by 77.3% of students. In Pakistan, one similar study shows that the preferred area of work of the students upon graduation was clinical pharmacy by 25.5%, industrial pharmacy by 21.6%, hospital pharmacy by 19.6%, and teaching by 15.7%, and the most important factor that influences the student choice of their career was personal interest ([Saad et al., 2012](#)). In one graduating student survey conducted on (4226) pharmacy students from the USA showed that the majority of the students selected community pharmacist, 2557 students followed by hospital pharmacist, 1318 students while only 157 students selected pharmaceutical industry ([American association of college of pharmacy, 2012](#)). An another study in USA, showed that job environment was the most important factor to decide a career by pharmacy students ([Savage et al., 2009](#)). An Malaysia research team, found that most final-year pharmacy students (in public universities) were interested in hospital pharmacy as their future career upon graduation, while the student's (in private universities) choice was community pharmacy

(Hasan et al., 2010). Geographical location, salary, and benefits were the most important factors that influence the student's choice of their career.

With respect to students' knowledge and attitudes toward industrial pharmacy in Saudi Arabia, more than half of the students (52.1%) never read or heard about the facilities provided by Saudi government to establish pharmaceutical factories. The median number of companies known by the students was two (Riyadh Pharma and Saudi Pharmaceutical Industries & Medical Appliances Corporation [SPIMACO]). Many students (29.1%) found the reason pharmacists were reluctant of the pharmaceutical industry career was the lack of connection between university and pharmaceutical industries.

In a study conducted on pharmacists by pharmaceutical companies in USA, the results showed that 91% of responding pharmacist hold (B.Sc. in pharmacy) degrees and only 9% of them hold doctor of pharmacy (Pharm D) degree. (5) Results of this American study conformed with our current issues in Saudi Arabia that found that students in Pharm D programs mainly focus on clinical practice. The outcome can be evident upon reviewing the course curriculum of both programs (B.Sc. pharmacy and Pharm D). The fifth year program for B.Sc. pharmacy program mainly related to the pharmaceutical industries while the Pharm D program is the gate to the clinical practice (Doctor of Pharmacy Program, 2012, Study plan for pharm D, 2014). B.Sc. students should study courses related to the industry certainly showed more interest in a career in the pharmaceutical industry than Pharm D students. In addition to academic courses, training is crucial segment. The college should arrange several field visits, organized orientation session into pharmaceutical companies and Saudi FDA. Furthermore encouraging students to attend and participate in conferences and workshops. This emphasizes the notion that the more we increase the knowledge and skills relevant to the drug industry in the country, the more we would expect Saudi pharmacists to select a career in this crucial field.

In the USA, there is collaboration between the universities with different pharmaceutical companies to provide them with pharmacy fellowships each year to prepare the students for a pharmaceutical industry career (8). Our study suggested that B.Sc. pharmacy students were more interested in postgraduate program in pharmacology and pharmaceutical industry. Therefore, we should focus on those students and give them real opportunities to join that field as many of them have favorable attitudes toward improving drug industry in the nation.

There are several methodological issues in this study that needs to be discussed here. Firstly, the survey was conducted though one University in Saudi Arabia, and hence generalizing the results to all pharmacy colleges might not be problematic given that curriculums in pharmacy are not standardized across Saudi Universities and varies considerably particularly in-between public (e.g. King Saud University) and private colleges. Another limitation is that the questionnaire was not formally checked for criterion validity and for test-retest reliability. However, the aim of this questionnaire was to assess students' perception and plans, rather than assessing the actual curriculum being taught by the university. Therefore, further research work is needed to strengthen this study includes surveying the full number of students enrolled in a several Saudi Universities to obtain higher response rate.

5. Conclusions

We conclude from this study that, the majority of the students should have good training programs in the pharmaceutical industry in order to build skills to work in such growing pharmaceuticals industry right after graduation. The majority of students chose clinical pharmacy as the most important career for the pharmacist, and this is because they have had some training in hospitals. The most important factors that will influence the student's career choice in the future are salary and the work environment. It is an important finding because higher salary will be found in this business. We also see from the study that there is a lack of information about the Kingdom's drug companies. More than half of the students never read or heard about the facilities provided by the Saudi governments to establish pharmaceutical factories. The main reason of reluctance of pharmacists from the pharmaceutical industry career was found to be a lack of connection between university and pharmaceutical companies. Almost half of the students were interested in postgraduate programs in pharmacology and the pharmaceutical industry. Bachelor degree students were more interested in postgraduate programs in pharmacology and the pharmaceutical industry than pharm D students. Further research should be done to find the percentage of pharmacists who are currently working in the industrial field, their roles, salaries and level of satisfaction.

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