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Chemistry; is it vital for undergraduate pharmacy students?

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ABSTRACT:

Introduction: Pharmacists learn chemistry during their undergraduate education at pharmacy colleges. Learning Chemistry is not an easy task. However, it helps pharmacists to understand many aspects about drugs. This article aimed to explore attitudes of working pharmacists about chemistry learning.
Aim: This article aimed to explore attitudes of working pharmacists about chemistry learning.
Method: Self-administered questionnaire was distributed, in October 2021, to 40 private community pharmacies in Alkoms city, Libya. Data analysis was conducted by using Excel an SPSS.A
Results: Thirty pharmacists participated in this study. The response rate was 75%. Most participants were males.
Conclusion: Participants admitted that chemistry helps them their daily pharmacy activities, although it was not easy to learn chemistry.
There mixed attitudes towards chemistry learning varied according work expertise and gender. Medicinal chemistry and biochemistry were the most beneficial branches of chemistry.

Key wards: Chemistry, Pharmacy, Learning, Pharmacists, Libya

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INTRODUCTION

Pharmacy and Chemistry are two disciplines that related to each other in such a way that in some countries the public call the pharmacist a 'chemist'. Indeed, the traditional role of the pharmacist is to prepare and dispense medicines. Thus, pharmacists must acquire the knowledge of drug chemical solubility, stability and compatibility with other ingredients. (1)

As the role of pharmacists has devolved to more clinical area of pharmacy practice, more and complicated knowledge and skills that are chemistry based have been added to pharmacy curriculum. Therefore, before graduated as a pharmacist, several chemistry branches must be passed by pharmacy students. These branches include organic and inorganic chemistry, analytical chemistry, biochemistry and medicinal chemistry. (2)

Medicinal chemistry provides pharmacists the ability to understand the chemical bases of drug action. Thus, they will be able to answer questions such as why and how about drug behavior in the body. They became the chemical experts within healthcare teams.

While studying chemistry is interesting for many pharmacy students, it is not for other many students. Many students find chemistry is difficult and complicated to learn. (2) There are several reasons for students find chemistry learning is challenging. One reason is students, particularly first year students, cannot link chemistry with their future carrier as pharmacists. Therefore, they may have less motivation to study chemistry which may affect their understanding of chemistry curriculum. (2, 3) Language is also another reason for difficulty. (2, 4) For example, in Libya students study chemistry by Arabic language in the high school period, but at university the language in use is English.

Gender may also could be a reason for learning difficulty. According to Semerzier, female students had more difficulty than male students regarding chemistry learning. (5)

Chemistry learning may not be interesting to many students. (6) Without interest, students will have low desire and passion to learn. Interest in learning is dependent on self- concept and motivation as well as other external factors. (7) Students may lose their interest if they were not able to understand technical words used in chemistry lectures. (4)

Aims of the study

This study aimed to explore pharmacists' views on learning chemistry during their study at faculty of pharmacy. More precisely, this study found pharmacists estimation of difficulty, interest and benefit of learning chemistry. The study also explored their opinions on what areas they think that chemistry helps them in their profession and what branches of chemistry is/are more beneficial.

Methods

This was a descriptive, exploratory questionnaire-based study. A short questionnaire which had only seven questions was distributed to 40 private community pharmacies in Alkoms city, Libya. The questionnaire was handled to 40 pharmacists on October 15, 2021, and it was collected one week later. A short questionnaire has the advantage of high response rate particularly with healthcare professionals where time constrains may cause low response rate. (8) The pharmacies were randomly selected and the participants were deemed consisted if they fill the questionnaire.
The first two questions collected the years of experience and the gender of the participants, questions 3, 4 and 5 collected participants' opinions about difficultness, interest and benefit of chemistry learning, respectively. Question 6 sought participants' views on the reasons of benefit of learning chemistry. Question number 7 was about which branch(es) among chemistry discipline was (or were) the most beneficial.

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Data analysis

Data was entered into Excel sheet and analyzed using SPSS Version 22.

Chi square test was used to find the relation between different study variables within each other. P value of 0.05 was considered statistically significant.

Results

1. Demographic data

Thirty questionnaires were filled, making a response rate of 75%. There were 22 (73.3%) male respondents and eight (26.7%) females. Most of the participants had work experience between 2-5 years (46.6%), 30% had less than two years work experience and only 23.3% had more than five years work experience.

2. Pharmacists' views on learning chemistry

The majority of the participants (83.4%) reported that learning chemistry at faculty of pharmacy was 'difficult' or 'somewhat difficult'. Only 36.6% of the respondents think that learning chemistry was interesting. The fast majority (93.3%) of them believe that studying chemistry was 'beneficial' or 'somewhat beneficial' to their profession as pharmacist.

Table 1 shows answer to questions 6 and 7. Question 6 was about the reason why they think learning chemistry was beneficial and question 7 was about which branch with chemistry was more beneficial.

The majority (60%) of the participants think that leaning chemistry helps them to understand the chemical structure of drugs and 36.7% said it helps them to identity drug class. See Table 1 for more details. Medicinal chemistry and biochemistry were the most beneficial branches according to the study participants

3. Estimation of difficulty, interest and benefit of learning chemistry

Fisher's exact test was used for more data analysis. For statical reason answers with somewhat was considered Yes answers. Although there were no statistically significant differences between the tested variables, the results of this study shows that there were differences according to work experience, gender and estimation of difficulty, interest and benefit.

A. Difficulty estimation based on experience and gender

Fisher's exact test shows that 88.9 %, 85.7% and 71.4 % of those with work experience less than 2 years, 2 - 5 years and more than 5 years, think it is difficult to learn chemistry, respectively.

Regarding gender and estimation of difficulty, 86.3% of males and 75% of females think it is difficult to learn chemistry. However, this difference between males and females was not statistically significant.

B. Interest estimation based on experience and gender

Regarding how is interesting to learn chemistry according to work experience, 77.8%, 85.7% and 85.7% of those with work experience less than 2 years, 2 - 5 years and more than 5 years, think learning chemistry at pharmacy was interesting.

Gender shows effect on estimation of interest, 86.3% of males and 75% of females think it was interesting to learn chemistry.

C. Benefit estimation based on experience and gender

Regarding work experience and estimation of benefit, 100%, 92.8% and 85.7 of those with work experience less than 2 years, 2 - 5 years and more than 5 years, think learning chemistry at pharmacy was benefit.

Regarding gender and estimation of benefit, 90.9% of males and 100% of females think it is beneficial to learn chemistry.

D. Relation between estimation of difficulty with interest and benefit

The majority (80%) of the respondents who said Yes for difficulty were more likely to say it is also benefit. Five participants said it is not difficult, but it is interesting.

Similarly, 92% of the participants said it is difficult and benefit. Five participants said it benefit but it is not difficult.

E. Relation between estimation of benefit and interest

Fisher's exact test also shows (P value 0.023) that 83.3 % of the participants believe that learning chemistry is beneficial and interesting. Only 5 participants said it is not beneficial nor interesting.

Discussion

As far as authors of this paper know, this is the first study to explore pharmacists' attitudes towards learning chemistry at pharmacy among Libyan pharmacists.

The present study sightseen difficulty, interest, and benefit of learning chemistry at pharmacy college. It also explored pharmacists' opinions on areas of benefit, and which branch they see it is more benefit. (1)

Results of this study shows that pharmacist thoughts about learning chemistry during their study at pharmacy was difficult, not interesting, and beneficial. (7) These results are consistent with results reported by Smith et.al. (9) Whom participants saw chemistry quite difficult and demanded more laboratory work then theoretical work.

Participants of the present study believe that learning chemistry at pharmacy helps them in identing chemical structure of drugs, hence they can identify drug class, it is drug-drug interactions and predict side effects. (1)

Pharmacist studied different branches of chemistry at faculty of pharmacy. Medicinal chemistry and biochemistry were the most beneficial branches according to the study participants. (10) Their preferences of these branches of chemistry may be related to areas of benefits as they could see medicinal and biochemistry as background of their understanding of how drugs may behave in the body and cause side effects.

Regarding the relationship between participants' estimation of difficulty, interest and benefit of learning chemistry, Chi square test shows that pharmacists' estimation of difficulty increases as their work experience decreases. This may indicate that comparing new generations of students with previous generations, the newer would find learning chemistry is more difficult than the previous generation. This is consistent with P. Aronsson, et al. as they stated that "many teachers within Swedish universities believe that the students who are currently entering university are less prepared compared to those entering university some years ago." (3)

In addition, gender of the students may have effect on estimation of difficulty, where female participants reported higher level of difficulty in learning chemistry than male respondents. This is consistent with a previous study. (5) The authors of that study found that female students had more difficulty in learning chemistry than male students.

Work experience and gender also had effect on respondents' estimation of interest. As experience decreased (newer generation of students), and gender was female, the estimation of interest was low. It may be important to notice here that those (less experience and female gender) also reported higher level of difficulty. It is not clear, however, how much their estimation of interest, which was low, may had been affected more by these

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three variables (i.e., experience, gender, estimation of difficulty). Nevertheless, teaching chemistry would more interesting if teachers tend to provide less complicated lectures and use other ways of teaching. (10, 11)

Pearson's chi-squared test shows that participants who said learning chemistry was difficult, they would say it was interesting and beneficial. This is not consistent with Smith et.al. (9) They found positive correlation between estimation of difficulty and "seeing no point" in pharmacy students studying chemistry. It is difficult to explain why our results are different from Smith et.al.

Conclusions

Participants of the present study believe that learning chemistry at pharmacy helps them in identing chemical structure of drugs, hence they can identify drug class, it is drug-drug interactions and predict side effects. Medicinal chemistry and biochemistry were the most beneficial branches according to the study participants. New generation of pharmacists see learning chemistry was more difficult than older generation. This should encourage investigation by chemistry educators about the specific needs of new pharmacy students. Teacher of chemistry should adopt less complex and more clearer methods of education. Connected chemistry learning to everyday life of pharmacists may increase pharmacy students' interest in learning chemistry.

Table 1. Reasons for benefit and most beneficial branch

Q6 reasons	Chemical structure	Drug class	Drug-drug interaction	Side effects
No*	18	11	10	5
Percent	60.0	36.7	33.3	16.7
Q7 branch	Analytical	Organic	Medicinal	Bio-chemistry
No*	3	5	17	17
Percent	10.0	16.7	56.7	56.7

No: number

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