

An-Najah National University
Faculty of Graduate Studies

**Clinical Pharmacokinetics: Perceptions of Hospital
Pharmacists in Palestine about how it is
Taught and Applied**

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the Degree of Master of Clinical Pharmacy, Faculty of Graduate
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Clinical Pharmacokinetics: Perceptions of Hospital Pharmacists in Palestine about how it is Taught and Applied


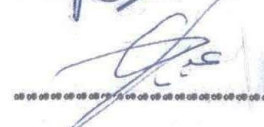
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Dedication

You can never describe the meaning of success without trying it, so I'm dedicating my work to everyone who helped me to not stop and rather continue my journey

الإهداء

الشكر لك ربي على كل تلك السعادات وتلك النجاحات التي كللت بها حياتي ومسيرتي، الشكر لك أن كتبتها لنا ويسرتها وسهلتها وأوصلتنا لها.

أهدي هذه الأطروحة لـ"فلسطين" حيث كانت دراسة الماجستير تجربتي الأولى للدراسة فيها، أهديتها لها ولشعبها لأخبرهم كم هو عظيم نضال من ناضل لأجلها بعمله وبجته ومحاولة مواكبة ما حولنا من دول وقارات مختلفة مع اضمحلال الإمكانيات المادية إلا أن هناك أشخاص كثيرون لم يكن هذا أو ذاك عائقا له.

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I first thank Allah for letting me reach this step, and to be a daughter for such amazing parents Mohammad and Eman who were always with me in every step asking, encouraging and helping.

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Finally I'm asking Allah to give me more successes in my carrier and education.

v
الافرار

أنا الموقعة أدناه، مقدّمة الرسالة التي تحمل العنوان:

Clinical Pharmacokinetics: Perceptions of Hospital Pharmacists in Palestine about how it is Taught and Applied

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Declaration

The work provided in this thesis, unless otherwise referenced, is the
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degree or qualification.

Student's Name:

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List of Abbreviations

APPE	Advanced Pharmacy Practice Experience
ASHP	American Society of Health-System Pharmacists
CPD	Continuous Pharmaceutical Education
CPK	Clinical Pharmacokinetic
HIV	Human Immune Deficiency Virus
IRB	Institutional Review Board
MOH	Ministry Of Health
PC	Pharmaceutical Care
PGE	Postgraduate Pharmacy Education
PK	Pharmacokinetic
P.N	Page Number
SPSS	Statistical Package for the Social Sciences
TDM	Therapeutic Drug Monitoring
WB	West Bank

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Abstract

Background:

The American society of health-system pharmacists (ASHP) defined clinical pharmacokinetic (CPK) as "the application of pharmacokinetic (PK) principles to the safe and effective therapeutic management of drugs in an individual patient". Where the main aims of CPK are optimizing efficacy and reducing toxicity. CPK is one of the main courses in pharmacy curriculum, as graduating pharmacists will be responsible of initiating and adjusting drug doses and making decisions about drugs that need therapeutic drug monitoring (TDM) when they go to their work places. Application of TDM in many studies showed improvement in patient outcomes including achieving drug levels within a fewer number of days, shortening length of hospitalization, reducing mortality and morbidity, shortening febrile period and increasing medication safety.

In this study we looked at pharmacist's perceptions and training background in PK courses contents they received during their undergraduate pharmacy programs. We also aimed to determine the

barriers experienced by the pharmacists when applying PK principles in their current practice and explore the influence of the respondents' characteristics on their perception about clinical PK.

Method:

This is a descriptive cross sectional self-administered questionnaire that targeted licensed hospital pharmacists in most hospitals under the umbrella of the Ministry of Health (MOH) in Palestine, in addition to pharmacists working in most private hospitals in the West Bank (WB) and Jerusalem. The questionnaire was prepared to obtain the relevant answers that contribute to the final results. The data was collected between August and November of 2018.

Results:

In this study a total of 145 questionnaires were distributed among hospital pharmacists in Palestine. Most of the participants were female (78.6%) and the vast majority of participants (71.7%) had taken their first pharmacy degree from Palestine. PK courses were taught in 74.5% of the undergraduate programs with most of the courses (57.9%) covering basic PK principles. In addition 88.3% of participants hadn't received any PK related courses after graduation. While rating the degree to which various barriers hindered the application of PK principles in current practice, we found that the lack of PK related continuing education topics was the highest in importance category (55.2%). Furthermore, we had an agreement between more than half of pharmacists about adequacy,

importance and relevance of PK courses in their undergraduate programs to current practice. Pharmacists who took their pharmacy degree from foreign countries other than Palestine were more agreed about adequacy, efficacy and way of teaching of CPK courses with significant association as ($p < 0.05$).

Conclusions:

Improving the depth and methods by which PK courses are taught, in addition to providing continuous education learning (CEL) for hospital pharmacists in PK will improve pharmacist's perception about PK courses and their application in clinical practice as only 11.7% of pharmacists had taken any related former courses after graduation, also having a CEL for other health care professionals will improve application of clinical pharmacists role as poor understanding of PK by the health care professionals where one of the barriers that faced pharmacists in application PK.

Key Words: pharmacokinetic, clinical pharmacists, barriers, curriculum.

Chapter One

Introduction

1. Introduction

1.1 Background of the Study

The American Society of Health-System Pharmacists (ASHP) defined clinical pharmacokinetic (CPK) as "the application of pharmacokinetic (PK) principles to the safe and effective therapeutic management of drugs in an individual patient". Where the main aims of CPK are optimizing efficacy and reducing toxicity (1). CPK is one of the main courses in pharmacy curriculum, as graduating pharmacists will be responsible of initiating and adjusting drug doses and making decisions about drugs that need therapeutic drug monitoring (TDM) when they go to their work places (2).

In this study we were interested in looking at pharmacists' perceptions and training background in the contents of PK courses they received during their under graduate pharmacy programs, in addition to challenges they faced in learning PK principles. We also aimed to determine the attitudes of the pharmacists and the barriers they experienced when applying PK principles in their current practice. We then finally explored the influence of the respondents' characteristics on their perception about CPK.

1.2 Literature Review

1.2.1 CPK application

The TDM is one of the main roles of clinical pharmacist that apply the principles of CPK. Application of TDM in many studies showed improvement in patient outcomes including achieving drug levels within a fewer number of days, shortening the length of hospitalization, reducing mortality and morbidity, shortening febrile period and increasing medication safety. Furthermore, TDM service results in fewer dosage adjustments and reduces cost which was proved when monitoring aminoglycoside, vancomycin, antiepileptic drugs, theophylline, digoxin, immunosuppressant drugs, antipsychiatry medications, and human immune deficiency virus (HIV) medications (3-6). In an economic study evaluating the benefits of clinical pharmacy services between 1996 and 2000 most studies reported positive financial benefits (7).

The most common drugs that had been calculated by pharmacist students were vancomycin, aminoglycosides, digoxin, valproic acid, while phenobarbital, theophylline, and cyclosporine calculations were all infrequently performed (8).

One of the studies showed that 94.5% of pharmacist students performed a PK calculation and 93% of pharmacist students performed a therapeutic drug monitoring while on advanced pharmacy practice experience (APPE) rotations respectively. Furthermore, 46% of the same

pharmacists reported to complete more than ten PK calculations and 49% pharmacists reported completing more than ten TDM activities in each rotation (8).

A randomized control study of CPK services for patients who have been treated with aminoglycoside showed that CPK services were associated with shorter period of hospitalization, shorter febrile period, more adequate peak level, minimized change in serum creatinine from baseline, and lower direct cost (6, 9). In another control study of theophylline CPK service, it was shown that PK calculations were associated with lower adverse reaction, shorter intensive care unit stay, shorter hospital stay, and shorter period of time to place on oral therapy (10). Finally a PK service for antiepileptic drug showed improvement in seizure free period, reduction in adverse effect, and reduction in emergency room visits (5).

1.2.2 CPK courses

Many studies that compared between the ways by which basic and CPK courses were taught found that using blended methods, online self-assessment quizzes, practice problem sets, weekly face to face problem solving tutorials and practices with actual PK cases showed an improvement in learning and enthusiasm when compared to traditional learning lectures (11, 12). In another study that compares teaching CPK using 3 different games, it was found that games appeared to have a positive impact on grades, cooperation and resulted in more enjoyable

experience, in addition to more valuable contribution to learning by 80% of students (13). also when asking the students about the most preferred way in learning mini lectures and partially complete handout with dissection were the most preferred ways by more than 40% of students (13). Team based learning showed to be associated with higher levels of learning, team learning skills, and professionalism in pharmacy students (14). On the other hand in one study comparing the average final score for two groups show higher average score with traditional classroom 90.7% compared to video conferencing group 87.8% ($p=0.024$) (15). Whereas in another study comparing final examination scores for applied PK course with previous year before inducing games a statically significant increase ($p<0.001$) was found in a scores for applied PK course with games (13). Another study did an interproffisinal PK simulation between pharmacists and nurses, pharmsicts agreed that this method increase their confidence in applying what they have learned in real cases, on the other hand pharmacists agreed that lectures are important to set the fundamental knowledge (16).

Looking at curriculum contents, the drugs aminoglycoside, vancomycin and digoxin were found to be the most popular topics that had been covered. On the other hand other studies which looked into whether CPK courses within the pharmacy curriculum were independent or integrated with other courses showed that the majority were independent courses and students were evaluated mainly by exams and quizzes (11, 12).

1.2.3 Similar study

In a study that was done in Qatar showed that the majority of pharmacists who were working in hospitals had received one to two basic PK courses during their undergraduate studies. Moreover, the majority of the pharmacists indicated that PK courses were important and relevant to their current practice and that the ways that had been used to teach the courses were effective. On the other hand, less than half of the same pharmacists agreed that pharmacy curriculum was appropriate to prepare them for relevant clinical roles. The most common barrier to apply PK principles was reported to be spending more time on dispensing and inventory issues rather than clinical practice, the need for practice, scarce resources, lack of facilities, manual rather than computerized PK calculations and lack of implementation of case studies. Finally pharmacists with less years of experience tended to perceive that the PK courses and skills learnt during their undergraduate studies were more relevant to practice (17).

1.3 Statement of the Problem and Rational of the Study

The question about perceptions of hospital pharmacists on how CPK was taught and applied still needs to be assessed. However, no study about CPK curriculum and application in Palestine had been done before. To our best of knowledge no research surveyed hospital pharmacists in Palestine about their perceptions on how CPK was taught and applied. As a result, hospital pharmacists' perceptions about CPK teaching and applications will

play an important role in improving ways of teaching CPK that will lead to the better application of CPK in Palestinian hospitals.

1.4 Objectives of the Study

The current study aims to:

- Explore the training background and perceptions of pharmacists in Palestine on the PK course contents they received during their undergraduate pharmacy programs and the challenges they faced in learning PK principles.
- Determine the attitudes of the pharmacists and the barriers they experienced when applying PK principles in their current practice.
- Explore the influence of the respondents' characteristics on their perception about CPK.

1.5 Research Questions

This study is conducted to answer the following questions:

- Is there an adequate content and number of PK courses in the pharmacists' undergraduate studies?
- Do the pharmacists participating in our study have a good perception about PK courses received during their studies?
- Do the PK skills and knowledge that hospital pharmacists gain effect their practice?

- What are the most common barriers that hospital pharmacists encounter while applying PK?

1.6 Significance of the Study

The outcomes of this study will be of significant value to the following:

- Determining the current state of PK courses in undergraduate curriculum.
- Determining the current state of hospital pharmacists' perception towards undergraduate CPK courses.
- Determining the current state of hospital pharmacists' utilization of PK knowledge in their practice.
- Determining the current state of hospital pharmacists' towards barriers of CPK application.
- Ascertaining pharmacists' level of PK knowledge and their application of it. That way, if defects in PK application are identified then resources and courses may be developed in order to improve PK application. Additionally, having clinical pharmacists in hospitals responsible for training can improve the quality of training and internship.
- Aiding decision makers in academia to evaluate current PK courses and edit them by filling in the gaps to offer pharmacist students superior training and education.

Chapter Two

Materials and Methods

2. Materials and Methods

2.1 Introduction

The focus of our study was to look in to hospital pharmacists' perceptions on clinical pharmacokinetic teaching and application. This section of the study describes the research area and design, sampling procedure and sampling size calculation, data collection instrument, ethical approval and statistical analysis.

2.2 Research design

This research is a descriptive cross-sectional self-administered questionnaire that targeted licensed hospital pharmacists in Palestine, which was prepared to obtain the relevant answers that contributed to the final results. The data had been collected between August and November of 2018 after the proposal approval.

2.3 Research setting

Most hospitals under the umbrella of Ministry of Health (MOH), in addition to private hospitals in the West Bank (WB) and Jerusalem in Palestine participated in our study (appendix 5).

2.4 Sampling Procedure

Participants' Inclusion criteria:

- Palestinian nationality only.
- Licensed pharmacist in Palestinian MOH.
- Had at least a bachelor's degree certification or a higher degree.
- Willing to participate and had provided verbal consent to participate in the study.
- Filled the questionnaire form completely by answering all questions.
- Working as full-time hospital pharmacist.

Pharmacists who did not meet our criteria were excluded from the study.

2.5 Sample Size

As indicated by the Palestinian Health Information Center, the total number of licensed hospital pharmacies in WB and Arab coordinator hospitals in Jerusalem is approximately 178. This number was used as a guide to calculate the sample size. To calculate the sample size needed for this study, an automated software program, (Raosoft sample size calculator: (<http://www.raosoft.com/samplesize.html>)) was used with a pre-determined margin of error of 5% and 95% confidence level. The approximated sample size was 122 pharmacists. In order to minimize erroneous results and to

increase the study reliability, the target sample size was set to be 145 pharmacists.

2.6 Survey instruments development and implementation

The questionnaire used in this study was prepared after looking into the available literature about CPK applications, ways of teaching, barriers, and examination of other instruments evaluating attitudes and practices of pharmacists and other health care professionals regarding different aspects in the clinical practice. We also contacted an author who had published a similar study done in Qatar and asked the author to provide us with their instruments and they were cooperative (17).

The questionnaire comprised of four main sections aimed to assess:

1. Demographic and professional characteristics (eight multiple choice items).
2. PK contents learned in undergraduate curriculum (three multiple choice items).
3. Perception towards the PK contents and instructions received in the undergraduate curriculum (six items measured on a five-point likert scale; strongly agree to strongly disagree).
4. Application of PK in current clinical practice (two items measured on five point likert scale) in addition to a scale from 1 to 10 that measured PK implementation difficulties.

5. PK application barriers (five items measured on five point likert scale; ranging from extremely important barrier to extremely unimportant barrier) assessing relevance of the PK courses received and the barriers faced towards application in practice.

Our prepared questionnaire (appendix 4) was piloted among a sample of 10 pharmacists after approval to test the validity of the questionnaire and to detect any defects in the methodology. Then some modifications were done to reach the final form of the questionnaire that helps in obtaining the relevant answer to the research question. Results from the pilot testing were not included in the final analysis of the data.

I then went to all hospitals in person and obtained verbal consents from all participants for filling out the questionnaire. The questionnaire was then given to pharmacists and I followed up after two to three days to collect them and gave the questionnaire to other pharmacists who were not available during our first visit. I left notes to pharmacists who were on vacation and I returned to collect questionnaires from them once they reported back to work. This was all done to maximize response rate to 100%.

2.7 Statistical Analysis

Data were analyzed using the IBM Statistical Package for Social Sciences version 21 (SPSS 21). We reduced number of categories from five to two before analysis as we collected the first three categories including neutral

with agreement group, and the rest two categories were in disagreement group for questions from (14 -21) and (23 – 27). All categorical variables including the respondents' socio demographic and professional characteristics, items assessing the nature of PK courses taught at the undergraduate curriculum, perception towards these courses, PK applications and PK barriers were expressed as frequencies and percentages.

The influence of respondents' professional and demographic factors on perception towards PK teaching and practice was tested using the Chi-square test. Any reading of p-value greater than 0.05 was deemed insignificant.

2.8 Ethical Approval

This study had been approved by the post graduate committee of An-Najah National University, and the hospital's Medical Research Committee (appendix 2).

All aspects of the study protocol were authorized by the Institutional Review Board (IRB) before initiation of this study (appendix 1) and by MOH (appendix 3). Verbal consents were also obtained from the pharmacists prior to the commencement of the study. We confirmed that the collected data will be used for clinical research only and the provided information will be confidential and will not be used for any purpose other than the study. No one will have access to information and data except the researchers.

Chapter Three

Results

3. Results

3.1 Demographic and clinical characteristics of studies pharmacists

In this study a total of 145 questionnaires were distributed among hospital pharmacists in Palestine. Most of the participants were female (78.6%), and the majority of participants (79.3%) were found to be under the age of 40. Most of participants (63.4%) had a basic pharmacy degree, While the rest had doctor of pharmacy or other postgraduate pharmacy education (PGE) (19.3%) and (17.2%) respectively. The vast majority of participants (71.7%) had taken their first pharmacy degree from Palestine and most of the participants (64.1%) had obtained their degree within less than 10 years. Nearly more than half of the participants (53.1%) work in private hospitals, while the reminder (46.9%) work in governmental ones. Furthermore, almost half of the participants (52.4%) have been working as hospital pharmacists for more than 5 years (Table 1).

Table 1: Socio-demographic and practice details of the study participants

Variable	N=145	%
1. What is your gender?		
Male	31	21.4
Female	114	78.6
2. What is your age?		
< 40	115	79.3
≥ 40	30	20.7
3. What is your highest level of education?		
BSc Pharmacy	92	63.4
Pharm.D	28	19.3
Postgraduate pharmacy education	25	17.2
4. What was the country from where you received your first pharmacy degree?		
Palestine	104	71.7
Other	41	28.3
5. How many years passed since you received your highest pharmacy degree?		
< 10	93	64.1
≥ 10	52	35.9
6. How long have you been working as a hospital pharmacist?		
< 5	69	47.6
≥ 5	76	52.4
7. In which of the following hospitals do you currently practice?		
Governmental	68	46.9
Private	77	53.1

3.2 Nature of the pharmacokinetic contents learned by the pharmacists in undergraduate curriculum:

Looking at PK courses 74.5% were found to be taught in undergraduate programs. Half of the PK courses (54.5%) were given as an integrated course. In addition, the majority of the pharmacy curriculums (45.5%) included more than two PK courses, while the rest were found to have two or one (29%) and (25.5%) respectively, Most of the PK courses (57.9%) were found to be basic courses while the rest were clinical or both

(6.2%) and (35.9%) respectively. Moreover, 88.3% of participants had not received any PK related courses after graduation as shown in (Table 2).

Table 2: Undergraduate PK courses details

Variable	N=145	%
1. Have you received pharmacy related former courses after graduation?		
Yes	17	11.7
No	128	88.3
3.How PK courses were within the curriculum		
Standalone	66	45.5
Integrated	79	54.5
4. How many Pharmacokinetic (PK) courses have you received during your undergraduate pharmacy education?		
None	37	25.5
1	42	29.0
More than 1	66	45.5
5. What was the nature of Pharmacokinetic (PK) courses that had been delivered?		
Basic	84	57.9
Clinical	9	6.2
Both	52	35.9

3.3 Perception about PK received in undergraduate study:

When looking at pharmacist's perceptions about PK courses received in undergraduate study we found that more than 55% of pharmacists were disagree about efficacy of teaching methods and adequacy of PK courses contents. In addition more than 60% of them were disagree about depth of PK courses for future clinical roles, usability of their PK knowledge in current practice and adequacy of their current PK skills all of these results shown in (Table 3).

Table 3: Pharmacists perception about PK received in undergraduate study

Points of perception about PK courses:	Agree		Disagree	
	N	%	N	%
Adequacy of PK courses	79	54.5	66	45.5
Importance of PK courses	94	64.8	51	35.2
Relevance of PK courses	84	58	61	42
Ways of teaching	85	58.6	60	41.4
Efficacy of teaching method	65	44.9	80	55.1
Adequacy of PK courses content	60	41.4	85	58.6
Depth of PK courses for future clinical roles	54	37.3	91	62.7
Use of PK knowledge in current practice	25	17.2	120	82.8
Adequacy of current PK skills	53	36.6	92	63.4

3.3.1 PK course adequacy

Looking at the characteristics of pharmacists who filled the questionnaire and their answers about adequacy of PK courses in their undergraduate programs we found 54.5% of the participants agreed that PK courses were adequate (Table 3). We also found a significant association between adequacy of PK courses and gender ($p<0.05$) as male were more agreed about adequacy of CPK courses content than female, in addition to significant association with country from where the pharmacy degree was obtained ($p<0.05$) as pharmacists who's studied in a foreign countries were more agreed about adequacy of CPK courses contents. Finally pharmacists whose working in a private hospitals were more agreed about adequacy of CPK courses than pharmacists whose working in a governmental hospitals ($p<0.001$), all of these results shown in (Table 4) by using the Chi-Square test.

3.3.2 PK course importance:

Looking at the characteristics of pharmacists who filled the questionnaire and their answers about the importance of PK courses in their undergraduate programs to their current practice 64.9% of them agreed about the importance of these courses (Table 3). We had a significant association with number of PK courses ($p < 0.05$) as pharmacists who had one or more courses were more agreed about PK courses importance as shown by the Chi-Square test in (Table 5).

Table 4: Adequacy of PK courses received in undergraduate program

		N	%	Inadequate		Adequate		χ^2	<i>p</i> -value
				N	%	N	%		
Gender	Male	31	21.4	9	6.2	22	15.2	4.32	0.043
	Female	114	78.6	57	39.3	57	39.3		
Age (years)	< 40	115	79.3	57	39.3	58	40.0	3.67	0.065
	≥ 40	30	20.7	9	6.2	21	14.5		
Educational level	BSc Pharmacy	92	63.4	39	26.9	53	36.6	1.16	0.561
	Pharm.D	28	19.3	15	10.3	13	9.0		
	PGE	25	17.2	12	8.3	13	9.0		
Country from where the pharmacy degree was obtained	Palestine	104	71.7	56	38.6	48	33.1	10.29	0.002
	Other	41	28.3	10	6.9	31	21.4		
Time elapsed since the pharmacy degree was obtained (years)	< 10	93	64.1	43	29.7	50	34.5	0.05	0.863
	≥ 10	52	35.9	23	15.9	29	20.0		
Working experience as a hospital pharmacist (years)	< 5	69	47.6	31	21.4	38	26.2	0.02	1.000
	≥ 5	76	52.4	35	24.1	41	28.3		

Table 4: continue: Adequacy of PK courses received in undergraduate program

		N	%	Inadequate		Adequate		χ^2	<i>p</i> -value
				N	%	N	%		
Type of hospitals	Governmental	68	46.9	41	28.3	27	18.6	11.27	0.001
	Private	77	53.1	25	17.2	52	35.9		
Received former related courses	Yes	17	11.7	5	3.4	12	8.3	2.01	0.199
	No	128	88.3	61	42.1	67	46.2		
How PK courses were within the curriculum	Standalone	66	45.5	33	22.8	33	22.8	0.98	0.403
	Integrated	79	54.5	33	22.8	46	31.7		
Number of PK courses	None	37	25.5	21	14.5	16	11.0	3.51	0.183
	1	42	29.0	20	13.8	22	15.2		
	More than 1	66	45.5	25	17.2	41	28.3		
Nature of PK courses	Basic	84	57.9	39	26.9	45	31.0	0.56	0.799
	Clinical	9	6.2	3	2.1	6	4.1		
	Both	52	35.9	24	16.6	28	19.3		

Table 5: Importance of undergraduate PK courses to current practice

		N	%	Unimportant		Important		χ^2	p-value
				N	%	N	%		
Gender	Male	31	21.4	7	4.8	24	16.6	2.74	0.137
	Female	114	78.6	44	30.3	70	48.3		
Age (years)	< 40	115	79.3	43	29.7	72	49.7	1.20	0.294
	≥ 40	30	20.7	8	5.5	22	15.2		
Educational level	BSc Pharmacy	92	63.4	37	25.5	55	37.9	3.66	0.164
	Pharm.D	28	19.3	9	6.2	19	13.1		
	PGE	25	17.2	5	3.4	20	13.8		
Country from where the pharmacy degree was obtained	Palestine	104	71.7	36	24.8	68	46.9	0.05	0.848
	Other	41	28.3	15	10.3	26	17.9		
Time elapsed since the pharmacy degree was obtained (years)	< 10	93	64.1	31	21.4	62	42.8	0.38	0.588
	≥ 10	52	35.9	20	13.8	32	22.1		
Working experience as a hospital pharmacist (years)	< 5	69	47.6	24	16.6	45	31.0	0.01	0.925
	≥ 5	76	52.4	27	18.6	49	33.8		

Table 5: continuo: Importance of undergraduate PK courses to current practice

		N	%	Unimportant		Important		χ^2	<i>p</i> -value
				N	%	N	%		
Type of hospital	Governmental	68	46.9	21	14.5	47	32.4	1.03	0.384
	Private	77	53.1	30	20.7	47	32.4		
Received former related courses	Yes	17	11.7	5	3.4	12	8.3	0.28	0.788
	No	128	88.3	46	31.7	82	56.6		
How PK courses were within the curriculum	Standalone	66	45.5	21	14.5	45	31.0	0.60	0.487
	Integrated	79	54.5	30	20.7	49	33.8		
Number of PK courses	None	37	25.5	20	13.8	17	11.7	9.36	0.009
	1	42	29.0	9	6.2	33	22.8		
	More than 1	66	45.5	22	15.2	44	30.3		
Nature of PK courses	Basic	84	57.9	29	20.0	55	37.9	0.07	0.959
	Clinical	9	6.2	3	2.1	6	4.1		
	Both	52	35.9	19	13.1	33	22.8		

3.3.3 PK courses relevance:

Looking at the characteristics of pharmacists who filled the questionnaire and their answers about relevance of PK courses in their undergraduate programs, 57.9% of them agreed about their relevance to their practice (Table 3). Furthermore, we had a significant association with number of PK courses ($p < 0.001$) as pharmacists who had one or more courses were more agreed about PK courses relevance to their practice as shown by the Chi-Square test in (Table 6).

3.3.4 Way of teaching PK courses:

Looking at the characteristics of pharmacists who filled the questionnaire and their answers about whether the way of teaching PK courses could be improved in undergraduate programs 58.6% of participants agreed that way of teaching could be taught in a better way (Table 3). Also we found a significant association with country from where the pharmacy degree was obtained as pharmacists who took their pharmacy degree outside Palestine were more agreed a way of teaching of PK courses ($p < 0.05$) as shown by the Chi-Square test in (Table 7).

Table 6: Relevance of undergraduate PK courses

		N	%	Irrelevant		Relevant		χ^2	<i>p</i> -value
				N	%	N	%		
Gender	Male	31	21.4	14	9.7	17	11.7	0.15	0.838
	Female	114	78.6	47	32.4	67	46.2		
Age (years)	< 40	115	79.3	47	32.4	68	46.9	0.33	0.679
	≥ 40	30	20.7	14	9.7	16	11.0		
Educational level	BSc Pharmacy	92	63.4	42	29.0	50	34.5	1.61	0.453
	Pharm.D	28	19.3	11	7.6	17	11.7		
	PGE	25	17.2	8	5.5	17	11.7		
Country from where the pharmacy degree was obtained	Palestine	104	71.7	45	31.0	59	40.7	0.22	0.711
	Other	41	28.3	16	11.0	25	17.2		
Time elapsed since the pharmacy degree was obtained (years)	< 10	93	64.1	37	25.5	56	38.6	0.56	0.487
	≥ 10	52	35.9	24	16.6	28	19.3		
Working experience as a hospital pharmacist (years)	< 5	69	47.6	27	18.6	42	29.0	0.47	0.506
	≥ 5	76	52.4	34	23.4	42	29.0		

Table 6: continuo Relevance of undergraduate PK courses

		N	%	Irrelevant		Relevant		χ^2	<i>p</i> -value
				N	%	N	%		
Type of hospital	Governmental	68	46.9	31	21.4	37	25.5	0.65	0.501
	Private	77	53.1	30	20.7	47	32.4		
Received former related courses	Yes	17	11.7	7	4.8	10	6.9	0.01	0.937
	No	128	88.3	54	37.2	74	51.0		
How PK courses were within the curriculum	Standalone	66	45.5	25	17.2	41	28.3	0.87	0.400
	Integrated	79	54.5	36	24.8	43	29.7		
Number of PK courses	None	37	25.5	25	17.2	12	8.3	13.41	0.001
	1	42	29.0	15	10.3	27	18.6		
	More than 1	66	45.5	21	14.5	45	31.0		
Nature of PK courses	Basic	84	57.9	39	26.9	45	31.0	1.56	0.462
	Clinical	9	6.2	3	2.1	6	4.1		
	Both	52	35.9	19	13.1	33	22.8		

Table 7: Courses could have been taught better

		N	%	Disagree		Agree		χ^2	<i>p</i> -value
				N	%	N	%		
Gender	Male	31	21.4	14	9.7	17	11.7	0.23	0.683
	Female	114	78.6	46	31.7	68	46.9		
Age (years)	< 40	115	79.3	45	31.0	70	48.3	1.16	0.304
	≥ 40	30	20.7	15	10.3	15	10.3		
Educational level	BSc Pharmacy	92	63.4	38	26.2	54	37.2	0.82	0.670
	Pharm.D	28	19.3	10	6.9	18	12.4		
	PGE	25	17.2	12	8.3	13	9.0		
Country from where the pharmacy degree was obtained	Palestine	104	71.7	35	24.1	69	47.6	9.05	0.003
	Other	41	28.3	25	17.2	16	11.0		
Time elapsed since the pharmacy degree was obtained (years)	< 10	93	64.1	38	26.2	55	37.9	0.03	1.000
	≥ 10	52	35.9	22	15.2	30	20.7		
Working experience as a hospital pharmacist (years)	< 5	69	47.6	26	17.9	43	29.7	0.74	0.404
	≥ 5	76	52.4	34	23.4	42	29.0		

Table 7: continuo Courses could have been taught better

		N	%	Disagree		Agree		χ^2	<i>p</i> -value
				N	%	N	%		
Type of hospital	Governmental	68	46.9	28	19.3	40	27.6	0.00	1.000
	Private	77	53.1	32	22.1	45	31.0		
Received former related courses	Yes	17	11.7	8	5.5	9	6.2	0.26	0.794
	No	128	88.3	52	35.9	76	52.4		
How PK courses were within the curriculum	Standalone	66	45.5	24	16.6	42	29.0	1.26	0.311
	Integrated	79	54.5	36	24.8	43	29.7		
Number of PK courses	None	37	25.5	19	13.1	18	12.4	2.72	0.268
	1	42	29.0	18	12.4	24	16.6		
	More than 1	66	45.5	23	15.9	43	29.7		
Nature of PK courses	Basic	84	57.9	32	22.1	52	35.9	1.36	0.539
	Clinical	9	6.2	5	3.4	4	2.8		
	Both	52	35.9	23	15.9	29	20.0		

3.3.5 Efficacy of teaching method for PK course:

Looking at the characteristics of pharmacists who filled the questionnaire and their answers about efficacy of teaching method for PK courses in their undergraduate programs 44.8% of participants agreed about efficacy of teaching methods (Table 3). Also we found a significant association with gender ($p < 0.05$) as male pharmacists found to be more agreed about teaching method of PK courses than female, in addition we found a significant association with country from where the pharmacy degree was obtained ($p < 0.05$) as pharmacists who studied outside Palestine were more agreed about teaching methods of PK courses as shown by the Chi-Square test in (Table 8).

3.3.6 Adequacy of PK course contents:

Looking at the characteristics of pharmacists who filled the questionnaire and their answers about adequacy of PK course contents in their undergraduate programs 41.4% of participants agreed about PK courses contents (Table 3). We found a significant association with number of PK courses given ($p < 0.001$) and adequacy of PK courses contents, as pharmacists who took more PK courses were more agreed about adequacy of contents, in addition to a significant association with nature of PK courses ($p < 0.05$) as pharmacists who took clinical PK courses were agreed about adequacy of PK courses contents as shown by the Chi-Square test in (Table 9).

Table 8: The method of teaching was effective

		N	%	Disagree		Agree		χ^2	<i>p</i> -value
				N	%	N	%		
Gender	Male	31	21.4	12	8.3	19	13.1	4.32	0.043
	Female	114	78.6	68	46.9	46	31.7		
Age (years)	< 40	115	79.3	67	46.2	48	33.1	2.14	0.155
	≥ 40	30	20.7	13	9.0	17	11.7		
Educational level	BSc Pharmacy	92	63.4	47	32.4	45	31.0	2.45	0.300
	Pharm.D	28	19.3	19	13.1	9	6.2		
	PGE	25	17.2	14	9.7	11	7.6		
Country from where the pharmacy degree was obtained	Palestine	104	71.7	65	44.8	39	26.9	7.98	0.006
	Other	41	28.3	15	10.3	26	17.9		
Time elapsed since the pharmacy degree was obtained (years)	< 10	93	64.1	50	34.5	43	29.7	0.21	0.729
	≥ 10	52	35.9	30	20.7	22	15.2		
Working experience as a hospital pharmacist (years)	< 5	69	47.6	36	24.8	33	22.8	0.48	0.508
	≥ 5	76	52.4	44	30.3	32	22.1		

Table 8 continuo: The method of teaching was effective

		N	%	Disagree		Agree		χ^2	<i>p</i> -value
				N	%	N	%		
Type of hospital	Governmental	68	46.9	41	28.3	27	18.6	1.36	0.315
	Private	77	53.1	39	26.9	38	26.2		
Received former related courses	Yes	17	11.7	10	6.9	7	4.8	0.10	0.801
	No	128	88.3	70	48.3	58	40.0		
How PK courses were within the curriculum	Standalone	66	45.5	40	27.6	26	17.9	1.45	0.245
	Integrated	79	54.5	40	27.6	39	26.9		
Number of PK courses	None	37	25.5	22	15.2	15	10.3	0.42	0.807
	1	42	29.0	22	15.2	20	13.8		
	More than 1	66	45.5	36	24.8	30	20.7		
Nature of PK courses	Basic	84	57.9	49	33.8	35	24.1	2.07	0.359
	Clinical	9	6.2	3	2.1	6	4.1		
	Both	52	35.9	28	19.3	24	16.6		

Table 9: The content of PK courses was adequate

		N	%	Disagree		Agree		χ^2	<i>p</i> -value
				N	%	N	%		
Gender	Male	31	21.4	18	12.4	13	9.0	0.01	1.000
	Female	114	78.6	67	46.2	47	32.4		
Age (years)	< 40	115	79.3	71	49.0	44	30.3	2.23	0.150
	≥ 40	30	20.7	14	9.7	16	11.0		
Educational level	BSc Pharmacy	92	63.4	56	38.6	36	24.8	1.40	0.480
	Pharm.D	28	19.3	17	11.7	11	7.6		
	PGE	25	17.2	12	8.3	13	9.0		
Country from where the pharmacy degree was obtained	Palestine	104	71.7	66	45.5	38	26.2	3.55	0.064
	Other	41	28.3	19	13.1	22	15.2		
Time elapsed since the pharmacy degree was obtained (years)	< 10	93	64.1	56	38.6	37	25.5	0.27	0.725
	≥ 10	52	35.9	29	20.0	23	15.9		
Working experience as a hospital pharmacist (years)	< 5	69	47.6	39	26.9	30	20.7	0.24	0.736
	≥ 5	76	52.4	46	31.7	30	20.7		

Table 9: continuo: The content of PK courses was adequate

		N	%	Disagree		Agree		χ^2	<i>p</i> -value
				N	%	N	%		
Type of hospital	Governmental	68	46.9	45	31.0	23	15.9	3.01	0.093
	Private	77	53.1	40	27.6	37	25.5		
Received former related courses	Yes	17	11.7	10	6.9	7	4.8	0.00	1.000
	No	128	88.3	75	51.7	53	36.6		
How PK courses were within the curriculum	Standalone	66	45.5	38	26.2	28	19.3	0.05	0.866
	Integrated	79	54.5	47	32.4	32	22.1		
Number of PK courses	None	37	25.5	31	21.4	6	4.1	13.61	0.001
	1	42	29.0	23	15.9	19	13.1		
	More than 1	66	45.5	31	21.4	35	24.1		
Nature of PK courses	Basic	84	57.9	55	37.9	29	20.0	9.97	0.005
	Clinical	9	6.2	1	0.7	8	5.5		
	Both	52	35.9	29	20.0	23	15.9		

3.3.7 Adequacy of depth of PK course for future clinical roles:

Looking at the characteristics of pharmacists who filled the questionnaire and their answers about adequacy of depth of PK course for future clinical roles in their undergraduate programs only 37.3% agreed about this (Table 3). We also found a significant association with country from where the pharmacy degree was obtained ($p < 0.05$) as pharmacists who took their pharmacy degree from outside Palestine were more agreed about adequacy of depth of PK courses for clinical roles as shown by the Chi-Square test in (Table 10).

Table 10: The depth of the PK courses was adequate to prepare pharmacists for future clinical roles

		N	%	Disagree		Agree		χ^2	p-value
				N	%	N	%		
Gender	Male	31	21.4	17	11.7	14	9.7	1.06	0.402
	Female	114	78.6	74	51.0	40	27.6		
Age (years)	< 40	115	79.3	77	53.1	38	26.2	4.19	0.056
	≥ 40	30	30	20.7	14	9.7	16		
Educational level	BSc Pharmacy	92	63.4	59	40.7	33	22.8	0.59	0.751
	Pharm.D	28	19.3	18	12.4	10	6.9		
	PGE	25	17.2	14	9.7	11	7.6		
Country from where the pharmacy degree was obtained	Palestine	104	71.7	72	49.7	32	22.1	6.59	0.013
	Other	41	28.3	19	13.1	22	15.2		
Time elapsed since the pharmacy degree was obtained (years)	< 10	93	64.1	60	41.4	33	22.8	0.34	0.594
	≥ 10	52	35.9	31	21.4	21	14.5		
Working experience as a hospital pharmacist (years)	< 5	69	47.6	45	31.0	24	16.6	0.34	0.608
	≥ 5	76	52.4	46	31.7	30	20.7		

Table 10 continuo: The depth of the PK courses was adequate to prepare pharmacists for future clinical roles

		N	%	Disagree		Agree		χ^2	<i>p</i> -value
				N	%	N	%		
Type of hospital	Governmental	68	46.9	47	32.4	21	14.5	2.22	0.169
	Private	77	53.1	44	30.3	33	22.8		
Received former related courses	Yes	17	11.7	12	8.3	5	3.4	0.51	0.598
	No	128	88.3	79	54.5	49	33.8		
How PK courses were within the curriculum	Standalone	66	45.5	42	29.0	24	16.6	0.04	0.865
	Integrated	79	54.5	49	33.8	30	20.7		
Number of PK courses	None	37	25.5	26	17.9	11	7.6	2.43	0.304
	1	42	29.0	28	19.3	14	9.7		
	More than 1	66	45.5	37	25.5	29	20.0		
Nature of PK courses	Basic	84	57.9	59	40.7	25	17.2	4.89	0.088
	Clinical	9	6.2	5	3.4	4	2.8		
	Both	52	35.9	27	18.6	25	17.2		

3.4 PK practice

3.4.1 Use of PK knowledge in current practice:

Looking at the characteristics of pharmacists who filled the questionnaire and their answers about use of PK knowledge in current practice only 17.2% of them agreed that they had used PK knowledge in their practice (Table 3). However, none of the variables were found to be significantly associated as shown by the Chi-Square test in (Table 11).

3.4.2 Adequacy of current PK skills in allowing pharmacists to provide optimal patient care:

Looking at the characteristics of pharmacists who filled the questionnaire and their answers about adequacy of current PK skills in allowing them to provide optimal patient care 36.6% of them agreed that their PK skills were adequate to provide optimal patient care (Table 3). Also we found a significant association with country from where the pharmacy degree was obtained ($p < 0.05$) as pharmacists who took their pharmacy degree from outside of Palestine were more agreed about their current PK skills to provide optimal patient care (Table 12).

Table 11: Use of PK knowledge in current practice

		N	%	Little bit of time		Great deal of time		χ^2	p-value
				N	%	N	%		
Gender	Male	31	21.4	23	15.9	8	5.5	2.03	0.181
	Female	114	78.6	97	66.9	17	11.7		
Age (years)	< 40	115	79.3	93	64.1	22	15.2	1.39	0.290
	≥ 40	30	20.7	27	18.6	3	2.1		
Educational level	BSc Pharmacy	92	63.4	75	51.7	17	11.7	1.94	0.377
	Pharm.D	28	19.3	22	15.2	6	4.1		
	PGE	25	17.2	23	15.9	2	1.4		
Country from where the pharmacy degree was obtained	Palestine	104	71.7	88	60.7	16	11.0	0.89	0.464
	Other	41	28.3	32	22.1	9	6.2		
Time elapsed since the pharmacy degree was obtained (years)	< 10	93	64.1	78	53.8	15	10.3	0.22	0.652
	≥ 10	52	35.9	42	29.0	10	6.9		
Working experience as a hospital pharmacist (years)	< 5	69	47.6	57	39.3	12	8.3	0.00	1.000
	≥ 5	76	52.4	63	43.4	13	9.0		

Table 11 continuo: use of PK knowledge in current practice

		N	%	Little bit of time		Great deal of time		χ^2	<i>p</i> -value
				N	%	N	%		
Type of hospital	Governmental	68	46.9	54	37.2	14	9.7	1.01	0.381
	Private	77	53.1	66	45.5	11	7.6		
Received former related courses	Yes	17	11.7	14	9.7	3	2.1	0.00	1.000
	No	128	88.3	106	73.1	22	15.2		
How PK courses were within the curriculum	Standalone	66	45.5	56	38.6	10	6.9	0.37	0.660
	Integrated	79	54.5	64	44.1	15	10.3		
Number of PK courses	None	37	25.5	28	19.3	9	6.2	2.15	0.354
	1	42	29.0	37	25.5	5	3.4		
	More than 1	66	45.5	55	37.9	11	7.6		
Nature of PK courses	Basic	84	57.9	74	51.0	10	6.9	4.24	0.111
	Clinical	9	6.2	7	4.8	2	1.4		
	Both	52	35.9	39	26.9	13	9.0		

Table 12: Current PK skills are adequate and enable me to provide optimal patient care

		N	%	inadequate		adequate		χ^2	<i>p</i> -value
				N	%	N	%		
Gender	Male	31	21.4	18	12.4	13	9.0	0.49	0.531
	Female	114	78.6	74	51.0	40	27.6		
Age (years)	< 40	115	79.3	73	50.3	42	29.0	0.00	1.000
	≥ 40	30	20.7	19	13.1	11	7.6		
Educational level	BSc Pharmacy	92	63.4	57	39.3	35	24.1	0.33	0.854
	Pharm.D	28	19.3	19	13.1	9	6.2		
	PGE	25	17.2	16	11.0	9	6.2		
Country from where the pharmacy degree was obtained	Palestine	104	71.7	72	49.7	32	22.1	5.30	0.024
	Other	41	28.3	20	13.8	21	14.5		
Time elapsed since the pharmacy degree was obtained (years)	< 10	93	64.1	60	41.4	33	22.8	0.13	0.857
	≥ 10	76	52.4	46	31.7	30	20.7		
Working experience as a hospital pharmacist (years)	< 5	69	47.6	46	31.7	23	15.9	0.59	0.492
	≥ 5	76	52.4	46	31.7	30	20.7		

Table 12 continuo: Current PK skills are adequate and enable me to provide optimal patient care

		N	%	inadequate		adequate		χ^2	<i>p</i> -value
				N	%	N	%		
Type of hospital	Governmental	68	46.9	47	32.4	21	14.5	1.77	0.227
	Private	77	53.1	45	31.0	32	22.1		
Received former related courses	Yes	17	11.7	8	5.5	9	6.2	2.23	0.180
	No	128	88.3	84	57.9	44	30.3		
How PK courses were within the curriculum	Standalone	66	45.5	45	31.0	21	14.5	1.17	0.303
	Integrated	79	54.5	47	32.4	32	22.1		
Number of PK courses	None	37	25.5	24	16.6	13	9.0	1.14	0.558
	1	42	29.0	29	20.0	13	9.0		
	More than 1	66	45.5	39	26.9	27	18.6		
Nature of PK courses	Basic	84	57.9	58	40.0	26	17.9	2.80	0.247
	Clinical	9	6.2	5	3.4	4	2.8		
	Both	52	35.9	29	20.0	23	15.9		

3.4.3 Extent of PK knowledge and skills application and difficulty of implementation:

Looking after the extent of PK knowledge and skills application and difficulty of implementation on a scale of 1 to 10 (1 being the lowest and 10 being the highest) we found that the majority of hospital pharmacists (30.3%) were almost neutral as the highest chosen scale was 5. Further, 55.8% of the participants thought that PK application is not difficult as shown in (Figure 1).

3.5 Barriers of PK principles application in current practice:

Looking at rating barriers of PK principles application in current practice we found that poor understanding of PK by the health care professionals other than pharmacists was the most extremely important barrier (27.6%). Whereas lack of PK-related continuing education topic was the highest in important category (55.2%). On the other hand, most of participants (33.8%) were neutral about the lack of a role model at work place who knows and applies PK (Figure 2).

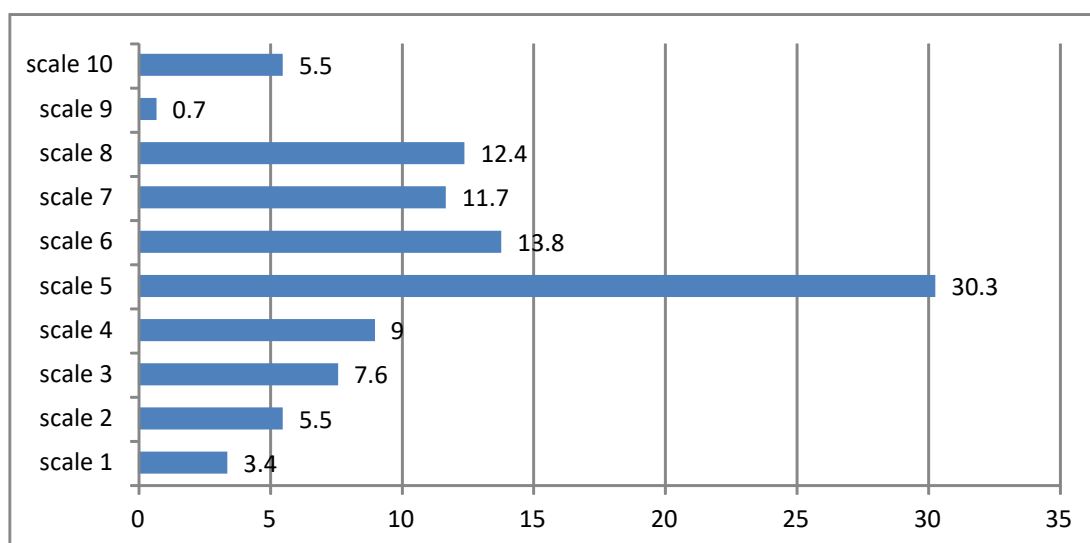


Figure 1: Extent of pharmacokinetics knowledge and skills application and difficulty for implementation.

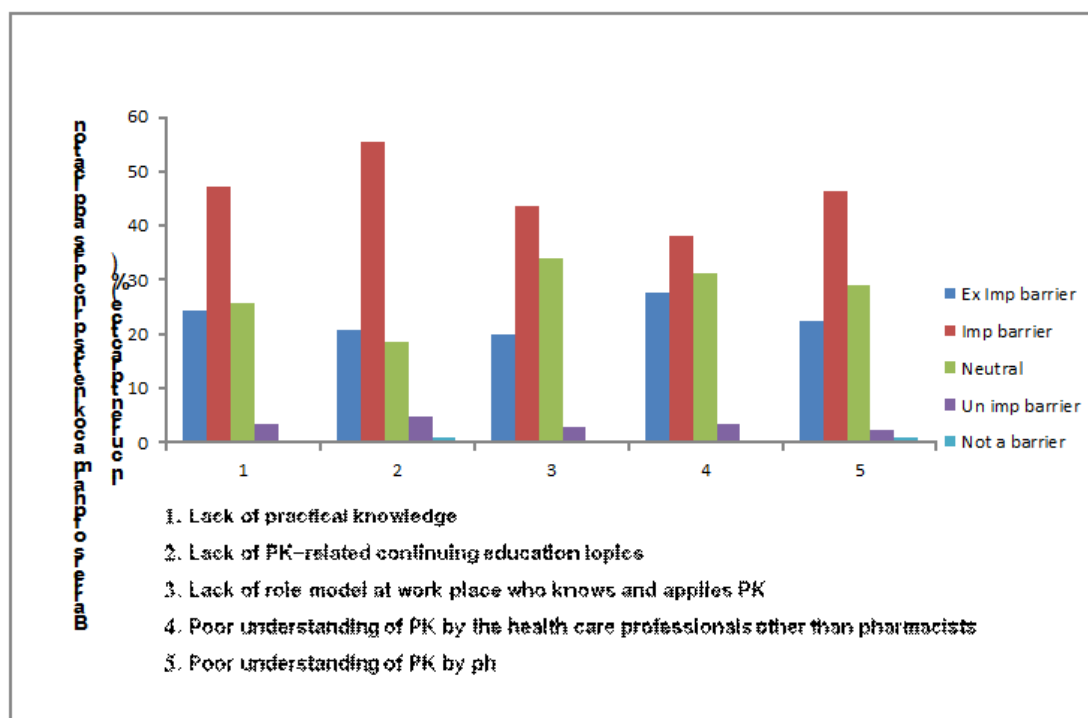


Figure 2: Barriers of pharmacokinetics principles application in current practice.

Chapter Four

Discussion

4. Discussion

4.1 Demographic and clinical characteristics

The socio-demographic characteristics of the participants was found to be similar to other countries as the majority of participants were female (18-21), whereas in some studies the majority of the participants were males (17, 22). Most of the participants were found to be less than 40 years of age such as many studies which show similar results (18), specifically in the age range between 30 and 40 years (17, 20, 21). On the other hand, studies conducted in India and Pakistan showed that the predominant pharmacists age was younger, as the mean age was less than 35 years (19, 22). This difference in participant's age in India and Pakistan may be due to the fact that they are still listed as developed countries so the bachelor pharmacy degree started to be obtained in their university after many years compare to other countries.

Almost most of the studies showed that most participants held bachelors degree in pharmacy (17, 18, 23), whereas diploma degree holders were the predominant in India (22). Additionally, years of practice experience were more than 5 years in many studies (17, 18). Most of the studies showed that the majority of pharmacists obtained their degrees outside their country, which is the opposite to what our study shows as more than two third of the pharmacists obtained their degrees from

Palestine. The reason behind having a larger percent of Palestinian pharmacists obtaining their degrees from Palestine is most probably due to Palestine being occupied and therefore no foreign employees can come to work in Palestine in addition to the difficulties that students face when studying abroad (17, 18).

In Pakistan, 88% of the pharmacists work in governmental hospitals (19), whereas in our study more than half of the participants work in private hospitals. Also most of the participants in our study (64.1%) had earned their degrees less than 10 years ago, and about half of them (52.4%) have been working as hospital pharmacists for more than 5 years.

4.2 Nature of the PK contents learned by the pharmacists in undergraduate curriculum:

The PK courses were found to be in 74.5% of the undergraduate programs (17), where half of the courses (54.5%) were integrated courses (24). Whereas other researchers in other studies found that the majority of the PK courses were standalone courses (12, 17, 25), The majority of pharmacy curriculum had less or equal to two courses and most of the courses were found to be basic, which was in line with our findings (17). This variation in pharmacy curriculum between universities and countries shows the importance of having a standard continuous professional development (CPD), interpretation of case studies and training for all hospital pharmacists about the application of CPK in hospitals, as only

11% of Palestinian hospital pharmacists had ever taken pharmacy related courses after graduation which was mainly about antibiotics and oncology.

4.3 Perception about PK received at the undergraduate study

4.3.1 PK course adequacy

Looking back to PK course adequacy in many studies we found that more than half agreed that the content was inadequate (17, 19), whereas in our study more than half of the participants agreed about the adequacy of the content. Furthermore, when looking at the characteristics of pharmacists and their answers about adequacy of PK courses in their undergraduate programs 48.3% disagreed, and the response significantly associated with age ($p>0.05$) (19). Also 56% of pharmacists were disagreed about undergraduate pharmacy curriculum (19), which is almost similar to what we found in our study as 45.5% found to be disagree about adequacy of PK courses received in undergraduate program.

4.3.2 PK course importance

More than half of hospital pharmacists agreed that PK courses are important to our current practice (17), as many studies proved that clinical pharmacists role in the hospital showed improvement in patient outcomes including achieving drug level within lesser numbers of days, shorter length of hospitalization, reduced mortality and morbidity, shorter febrile period and increase in medication safety (3-6), this shows the importance of these courses as 65% of the hospital pharmacists in our study agree to

this and we found that number of courses was statically significant ($p<0.05$) as pharmsicts who had one or more courses were more agreed about PK courses importance.

4.3.3 PK courses relevance

A study in Qatar showed that 70% of participants agreed that PK courses where relevant to current practice (17), which is almost similar to our result as nearly 60% of our participants agreed to this. Moreover, this study found that pharmacists with less years of experience agreed that content of courses was relevant to practice (17), whereas in our study pharmsicts who had one or more courses were more agreed about PK courses relevance to their practice.

4.3.4 The way of teaching PK courses

Looking into the way PK courses are taught, most participants agreed that the methods used to teach the PK courses in their undergraduate pharmacy studies were effective (17). Another study found that team based learning was associated with high clinical examination score (90.7%) compared to smaller group and at least lecture format (86.6%) (14). In our study, country from where the pharmacy degree was obtained was significantly associated with the way of teaching of undergraduate programs ($p<0.05$) as pharmacists who took their pharmacy degree outside Palestine were more agreed about teaching ways of PK courses.

4.3.5 Efficacy of teaching method for PK course

In one study where games were used in applied PK course, the final examination score significantly increased compared to the previous years (13). Gender and country from where the pharmacy degree was obtained were significantly associated ($p < 0.05$) as male pharmacists found to be more agreed about teaching method of PK courses than female, in addition pharmacists who studied outside Palestine were more agreed about teaching methods of PK courses.

4.3.6 Adequacy of PK course contents

In one study, more than half of the participants disagreed about reaching the pharmacy curriculum of pharmacy practice to the defined standard (19). Furthermore, another study showed that the majority of the pharmacists were disagreed about the theoretical and practical balance of the curriculum, as age and years of practice were significantly associated with pharmacists agreements (19), which is almost similar to what we have as more than half of the pharmacists (58.6%) disagreed about the adequacy of contents. As we found a significant association with number of PK courses given ($p < 0.001$) and adequacy of PK courses contents, as pharmacists who took more PK courses were more agreed about adequacy of contents, in addition to a significant association with nature of PK courses ($p < 0.05$) as pharmacists who took clinical PK courses were agreed about adequacy of PK courses contents.

4.3.7 Adequacy of depth of PK course for future clinical roles

Looking back to a study done in Qatar they found that almost 40% of participants agreed about depth of pharmacy curriculum to prepare them for their future clinical roles whereas 30% of them were neutral (17), which is similar to what we found in our study as only 37.3% were agreed. On the other hand in Pakistan more than half of the participants disagreed about their undergraduate pharmacy curriculum's depth (19). Furthermore, they agreed that introducing doctor of pharmacy program will help in having better clinical pharmacy graduates (19). Another study that focused on pharmacy students during their internship year found that 76% of them agreed about the pharmaceutical care content for their future clinical roles (26). In addition to another study more than half of the pharmacists disagreed about the balance between theoretical and practical distribution of the undergraduate curriculum (19), and this finding was significantly associated with age (19). In our study we found a significant association with country from where the pharmacy degree was obtained ($p < 0.05$) as pharmacists who took their pharmacy degree from outside Palestine were more agreed about adequacy of depth of PK courses for clinical roles.

4.4 PK practice

4.4.1 Use of PK knowledge in current practice

Looking at other studies we found a study that focused on pharmacy students during their internship year found that 76% of them agreed about the pharmaceutical care content for their future clinical roles (26). While in our study when looking at the characteristics of pharmacists who filled the questionnaire and their answers about use of PK knowledge in current practice only 17.2% of them agreed that they had used PK knowledge in their practice. However, none of the variables were found to be significantly associated.

4.4.2 Adequacy of current PK skills in providing optimal patient care

Looking back to the definition of pharmaceutical care (PC) according to Hepler & Strand (1989), PC is responsible for the provision of medicine therapy for the purpose of a definite outcome that improves a patient's quality of life (27). This definition shows us that CPK and drug monitoring is a part of PC. In a study that evaluated the experiential training, more than half of the pharmacy students disagreed about the adequacy of experiential training in helping them to apply PC when they graduate (26). Many studies found that different health care and PC systems in addition to the tradition of different countries lead to the huge differences shown between universities training in teaching worldwide (28). While in our study when looking at the characteristics of pharmacists

who filled the questionnaire and their answers about adequacy of current PK skills in allowing them to provide optimal patient care 36.6% of them agreed that their PK skills were adequate to provide optimal patient care. Also we found a significant association with country from where the pharmacy degree was obtained ($p < 0.05$) as pharmacists who took their pharmacy degree from outside of Palestine were more agreed about their current PK skills to provide optimal patient care.

4.4.3 Extent of PK skills and knowledge application and difficulty of implementation:

When we looked back to a study that described PK knowledge utilization in current practice almost 25% of the pharmacists used them most of the time, while the higher percentage 30% agreed that PK knowledge is occasionally used. On the other hand only 30% agreed that their PK skills were just adequate and almost 50% of them said that it could be improved (17). In our study we found that the majority of hospital pharmacists (30.3%) were almost neutral as the highest scale chose was 5, and 9 was the lowest one (0.7%).

4.5 Barriers of applying PK principles in current practice:

The list of reported barriers hindering the application of PK principles in practice include lack or small number of clinical pharmacists in hospitals, poor understanding of the clinical pharmacists job, lack of facilities, no clear job description, lack of training and support, lack of case

study implantation while training and studying, knowledge gap, low accepting rate of pharmacists recommendations, manual rather than computed PK calculations, and lack of time due to dispensing and inventory issue (17, 18, 21, 26, 29, 30). While another study found that the rate of acceptance of pharmacists recommendations is near 50%, more than half was accepted by senior prescribers (31), also oral recommendations found to be accepted better by prescribers (31).

While investigating the rating barriers of the application of PK principles in current practice we found that poor understanding of PK by the health care professionals other than pharmacists was the extremely important barrier (27.6%). On the other hand, lack of PK related continuing education topic was the highest in important category (55.2%). Also most of participants (33.8%) were neutral about lack of a role model at work place who knows and applies PK.

Chapter Five

Strength and Limitations, Conclusions and Recommendations

1.1 Strength and limitations of the study

To our knowledge, this is the first study to report hospital pharmacists' perceptions towards PK application in clinical practice in Palestine. The study was a nationwide study that included more than 90% of hospital pharmacists working under MOH and private hospitals in WB and Jerusalem.

The study has some important limitations which appear with all researches working with surveys:

- Dishonest and unconscientiously answers. This is due to desirability bias or attempting to protect privacy or tending to give more favorable answers toward PK practice. All surveys were given to hospital pharmacy managers to give to their employees or given in person by myself.
- Unanswered questions which was overcome by reviewing all surveys once handed to us and making sure that surveys were completed.
- Different understanding and interpretation. Questions were written as simple as possible to overcome this problem and any further inquiries (75%) were addressed as necessary.

- Difficulty in conveying feelings and emotions as facial expression, body language and reactions are not transmitted in survey type research. Thus having scaled answers results in more assert able responses.
- Open ended questions were difficult to analyze.
- Recall bias as hospital pharmacists were asked about their curriculum while studying their undergraduate studies.
- Dunning Krueger effect might be involved where individuals with poor competency will tend to overestimate their own level of skills (32).

1.2 Conclusion

In this study we found that female employees were the predominant in Palestinian hospitals, more than two thirds of the participants earned their pharmacy degree from Palestine within less than 10 years and nearly half of them had been working as hospital pharmacists for more than 5 years. Furthermore, more than 80% of the pharmacists had never taken any course or education after graduation in any PK specific topic or other pharmaceutical topics in general.

We also found that PK courses were given as dedicated courses in more than 70% of undergraduate pharmacy curriculums. Forty five percent of the participants indicated that their pharmacy curriculums contained more than one PK course of which 58% were considered as basic courses.

Furthermore, more than half of the participants agreed that PK courses were adequate, important and relevant. On the other hand the majority of the participants (58.6%) agreed that teaching methods could be improved.

Moreover, when examining the application of PK in practice, only 20% of the participants said that they had been using their knowledge in practice and nearly 35% of them agreed that their current skills are enough to provide optimal patients care. Lastly 27.6% of the participants stated that the poor understanding of PK by health care professionals other than pharmacists was an extremely important barrier in applying PK principles in practice.

1.3 Recommendations

CPK course contents should be deeper and include a practice laboratory portion to maximize student's skills in applying PK principles and equations while training and working in hospitals. Also improving the way of teaching PK courses and using multi way of teaching like team work, quizzes, games, and case studies will improve the quality of learning.

Additionally, implementing continuous education learning (CEL) for hospital pharmacists in PK will improve pharmacist's perception about PK principles and their application in clinical practice.

Finally, the most important step will be to apply clinical pharmacist's role in all hospitals departments, in addition to CEL for all health care professional about the significance of the clinical pharmacist role in decreasing morbidity, mortality and improving patient's quality of care.

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Appendices

Appendix 1

Agreement about thesis topic

<p>An-Najah National University Faculty of medicine & Health Sciences Department of Graduate Studies</p>		<p>جامعة النجاح الوطنية كلية الطب وعلوم الصحة دائرة الدراسات العليا</p>
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IRB Approval Letter


Study Title:
 "Clinical Pharmacokinetics: Perceptions of Hospital Pharmacists in Palestine about How It Was Taught and How It Is Applied"

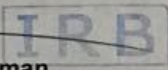
Submitted by:
 Rafeef Mohammad Aqel, Dr. Naser Shraim

Date Reviewed:
 2nd April 2018.

Date Approved:
 29th April 2018.

Your Study titled "Clinical Pharmacokinetics: Perceptions of Hospital Pharmacists in Palestine about How It Was Taught and How It Is Applied" with archived number (14) April 2018 was reviewed by An-Najah National University IRB committee and was approved on 29th April 2018.

Hasan Fitian, MD

 IRB Committee Chairman
 An-Najah National University



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Appendix 2

Institutional Review Board (IRB) Approval

An-Najah National University
Faculty of Graduate Studies
Dean's Office

جامعة النجاة الوطنية
كلية الدراسات العليا
مكتب العميد

التاريخ: 2018/5/29

حضرة الدكتور سماع الجابي المحترمة
منسق برنامج ماجستير الصيدلة السريرية
تحية طيبة وبعد،

الموضوع: الموافقة على عنوان الأطروحة وتحديد المشرف

قرر مجلس كلية الدراسات العليا في جلسته رقم (359)، المنعقدة بتاريخ 2018/5/24، الموافقة على مشروع الأطروحة المقدم من الطالب/ة رفيف محمد احمد عقل، رقم تسجيل 11659077، تخصص ماجستير الصيدلة السريرية، عنوان الأطروحة: (حرائك الدوائية السريرية: تصورات صيادلة المستشفيات في فلسطين عن كيفية تدريسها وكيفية تطبيقها)
(Clinical Pharmacokinetics: Perceptions of Hospital Pharmacists in Palestine about how it is Taught and Applied)

بإشراف: د. نصر شريم

يرجى اعلام المشرف والطالب بضرورة تسجيل الأطروحة خلال اسبوعين من تاريخ اصدار الكتاب. وفي حال عدم تسجيل الطالب/ة للأطروحة في الفترة المحددة له/ا ستقوم كلية الدراسات العليا بإلغاء اعتماد العنوان والمشرف وتفضلوا بقبول وافر الاحترام،،،

د. محمد سليمان
عميد كلية الدراسات

نسخة: د. رئيس قسم الدراسات العليا للعلوم الطبية والصحية المحترم
ق.أ.ع. القبول والتسجيل المحترم
مشرف الطالب
ملف الطالب

ملاحظة: على الطالب/ة مراجعة الدائرة المالية (محاسبة الطلبة) قبل دفع رسوم تسجيل الأطروحة للضرورة

فلسطين، نابلس، ص.ب 7،707 هاتف: /2345115، 2345114، 2345113 (09)(972) *فاكسيل: 2342907(09)(972)
Nablus, P. O. Box (7) *Tel. 972 9 2345113, 2345114, 2345115 هاتف داخلي (5) 3200

Appendix 3

Palestinian ministry of health approval

State of Palestine
Ministry of Health - Nablus
General Directorate of Education in Health

دولة فلسطين
وزارة الصحة - نابلس
الإدارة العامة للتعليم الصحي

الرقم: ٥١٨/٨٦/١٤
التاريخ: ٥/٦/١٤

السيد د. محمد علي (الطبيب) /
ر. ج. ر. م.
٥ (١٤٦)

الأخ مدير عام الإدارة العامة للمستشفيات المحترم،،،
الأخ مدير مجمع فلسطين الطبي المحترم،،،
محبة وامعزاء...

الموضوع: تسهيل مهمة طلاب - جامعة النجاح

يرجى تسهيل مهمة الطالبة: رفيف ع. ماجستير صيدلة سريرية/ جامعة النجاح، في عمل بحث: عدم اليقين في عمل البحث. قدم البحث في ٥/٦/١٤

معنوان "حرك الدواء السريرية: تصورات صيدلة المستشفيات في فلسطين عن كيفية تدريسها وكيفية تطبيقها"، من خلال السماح للطالبة بجمع معلومات من خلال مقابلة الصيدلة لتعبئة استبانة وجمع معلومات تتعلق بالبحث، وذلك في:

- جميع مستشفيات الضفة الغربية
- مجمع فلسطين الطبي

علما ان البحث تحت اشراف د. نصر شريم. كما انه سيتم الالتزام بمعايير البحث العلمي والحفاظ على سرية المعلومات.

د. أمل /
الإدارة العامة للتعليم الصحي
مدير عام التعليم الصحي

جامعة النجاح الوطنية
١٣-٠٦-٢٠١٨
صدر: ...
مدير عام التعليم الصحي

نسخة: نائب الرئيس للشؤون الأكاديمية المحترم/ جامعة النجاح

Appendix 4

Questionnaire

Clinical Pharmacokinetic: Perceptions of Hospital Pharmacists in Palestine about How It Was Taught and How It Is Applied

I am a master student in An-Najah National University/ college of pharmacy, I am conducting a graduation research on the perceptions of hospital pharmacists in Palestine about clinical pharmacokinetic how it was taught and how it is applied, the aim of our research is to (1) explore the training background and perceptions of pharmacists in Palestine on the PK course contents they received during their undergraduate pharmacy programs and the challenges they faced in learning PK principles; (2) determine the attitudes of and the barriers experienced by the pharmacists when applying PK principles in their current practice and; (3) explore the influence of the respondents characteristics on their perception about clinical PK.

This survey is intended to help us answer these important questions. I will be very grateful to if you can help us in this important study and appreciate highly if you agree dedicate a small portion of your precious time to fill the questionnaire below.

The information gathered will be kept confidential and will be used for the study purposes only.

Thank you for your cooperation

Rafeef Mohammad Aqel

Demographics:

1. What is your gender?
 - ☐ Female
 - ☐ Male
2. What is your age?
 - ☐ 20 – 30
 - ☐ 31 – 40
 - ☐ 41 – 50
 - ☐ > 50
3. What is your highest level of education?
 - ☐ Bachelor
 - ☐ Masters
 - ☐ PharmD
 - ☐ PhD
 - ☐ Others (specify)-----
4. What was the country from where you received your first pharmacy degree?
 - ☐ Egypt
 - ☐ Jordan
 - ☐ Syria
 - ☐ Sudan
 - ☐ Palestine
 - ☐ Indian
 - ☐ Others (specify)-----

5. How many years passed since you received your highest pharmacy degree?

- ☐ < 5 years
- ☐ 6 – 10 years
- ☐ 11– 15 years
- ☐ > 15 years

6. How long have you been working as a hospital pharmacist?

- ☐ <5 years
- ☐ 6-10 years
- ☐ 11-15 years
- ☐ > 15 years

7. Where did you practice pharmacy before you moved to Palestine?

(Please choose all that applies).

- ☐ No previous practice.
- ☐ Egypt
- ☐ India
- ☐ Palestine
- ☐ Jordan
- ☐ Pakistan
- ☐ Philippines
- ☐ Sudan
- ☐ Saudi Arabia
- ☐ UAE (United Arab Emirates)
- ☐ Others (specify)-----

8. In which of the following hospitals do you currently practice:

- ☐ مجمع رام الله الطبي
- ☐ مستشفى رفيديا
- ☐ مستشفى قلقيلية الحكومي
- ☐ مستشفى الخليل الحكومي
- ☐ مستشفى جنين الحكومي
- ☐ مستشفى بيت جالا الحكومي
- ☐ مستشفى طوباس الحكومي
- ☐ مستشفى محمد علي المحتسب
- ☐ مستشفى طولكرم الحكومي
- ☐ مستشفى اريحا الحكومي
- ☐ مستشفى يطا الحكومي
- ☐ مستشفى سلفيت الحكومي
- ☐ مستشفى د.كمال للطب النفسي
- ☐ المستشفى الوطني الحكومي
- ☐ Others (specify)-----

9. How would you describe the PK courses you have receive in your undergraduate program:

- ☐ Fully adequate
- ☐ Adequate
- ☐ Some gaps
- ☐ Little
- ☐ Not adequate

10. Have you received pharmacy related courses after graduation:

- ☐ No
- ☐ Yes (please describe briefly –name and duration of the course)

Undergraduate Pharmacokinetic Courses:

11. PK courses that had been studied were:

- ☐ Standalone courses
- ☐ Integrated courses with other pharmacy courses such as pharmacotherapy, pharmaceuticals, or pharmacology

12. How many Pharmacokinetic (PK) courses have you received during your undergraduate pharmacy education:

- ☐ None
- ☐ 1
- ☐ 2
- ☐ More than 2

13. The nature of PK courses that had been delivered were:

- ☐ Basic courses
- ☐ Clinical course
- ☐ Both

Perception about PK Received at the Undergraduate Studies:

To what extent do you agree or disagree with the following statements:

14. Undergraduate PK courses I received are IMPORTANT to my current practice

- ☐ Strongly agree
- ☐ Agree

- Neutral
- Disagree
- Strongly disagree

15. Undergraduate PK courses are RELEVANT to my current practice

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

16. The PK courses I received at my undergraduate pharmacy studies could have been taught better.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

17. The method used to teach PK courses at my pharmacy undergraduate studies were effective.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

18. The content of the PK courses I received at my pharmacy undergraduate studies was adequate

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

19. The depth of the PK courses taught at the undergraduate pharmacy studies was appropriate to prepare me for my future clinical roles

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

PK Practice:

20. How much of the time do you utilize the PK knowledge gained through your undergraduate pharmacy courses in your current practice

- ☐ Most of the time
- ☐ A great deal of the time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the time

21. How adequate do you consider your current PK skills in allowing you to provide optimal patient care:

- ☐ Fully adequate
- ☐ Adequate
- ☐ Some gaps
- ☐ Little
- ☐ Not adequate

22. In a scale of 1 to 10 (1 being the lowest) and (10 being the highest) to what extent you think the application of PK knowledge and skills is difficult to implement

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10

PK application barrier:

Can you rate these barriers about applying PK principles in your current practice?

23. Lack of practical knowledge

- ☐ Extremely important barrier
- ☐ Important barrier
- ☐ Neutral
- ☐ Unimportant barrier
- ☐ Not a barrier at all

24. Lack of PK-related continuing education topics

- ☐ Extremely important barrier
- ☐ Important barrier
- ☐ Neutral
- ☐ Unimportant barrier
- ☐ Not a barrier at all

25. Lack of role model at work place who knows and applies PK

- ☐ Extremely important barrier
- ☐ Important barrier
- ☐ Neutral
- ☐ Unimportant barrier
- ☐ Not a barrier at all

26. Poor understanding of PK by the health care professionals other than pharmacists

- Extremely important barrier
- Important barrier
- Neutral
- Unimportant barrier
- Not a barrier at all

27. Poor understanding of PK by pharmacists

- Extremely important barrier
- Important barrier
- Neutral
- Unimportant barrier
- Not a barrier at all

Appendix 5

List of Hospitals Name

	اسم المدينة	اسم المستشفى
1	بيت لحم	مستشفى د.كمال للطب النفسي
2		مستشفى اليمامة
3		مستشفى الجمعية العربية
4		مستشفى بيت جالا الحكومي
5		مستشفى العائلة المقدسة
6		مستشفى الكارتياس
7	رام الله	مستشفى الرعاية العربية
8		مستشفى الهلال الاحمر
9		مستشفى الاستشاري العربي
10		مجمع رام الله الطبي
11		مستشفى مسلم
12		مستشفى خالد
13	طوباس	مستشفى طوباس الحكومي
14	جنين	مستشفى الأمل
15		المستشفى الميداني الأردني
16		مستشفى الشفاء
17		مستشفى جنين الحكومي
18		مستشفى الرازي
19	قلقيلية	مستشفى قلقيلية الحكومي
20		مستشفى الوكالة
21	الخليل	مستشفى يطا الحكومي
22		مستشفى الميزان
23		مستشفى الأهلي
24		مستشفى الهلال
25		مستشفى الخليل الحكومي
26	اريجا	مستشفى اريحا الحكومي
27	نابلس	مستشفى نابلس التخصصي
28		مستشفى النجاح
29		مستشفى رفيديا
30		المستشفى الوطني الحكومي
31		مستشفى الاتحاد
32		المستشفى العربي التخصصي
33		المستشفى الانجيلي

34	سلفيت	مستشفى سلفيت الحكومي
35	طولكرم	مستشفى الهلال
36		مستشفى الزكاة
37		مستشفى طولكرم الحكومي
38	القدس	مستشفى المقاصد
39		مستشفى المطمع
40		St John Eye Hospital
41		مستشفى الهلال

جامعة النجاح الوطنية

كلية الدراسات العليا

حرائك الدواء السريرية: تصورات صيادلة المستشفيات في فلسطين عن

كيفية تدريسها وتطبيقها

إعداد

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إشراف

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قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في الصيدلة السريرية،
بكلية الدراسات العليا، في جامعة النجاح الوطنية، في نابلس - فلسطين.

2020

ب

حرائك الدواء السريرية: تصورات صيادلة المستشفيات في فلسطين عن كيفية تدريسها وتطبيقها

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الملخص

الخلفية:

الجمعية الأمريكية لنظام الصحة الصيدلاني عرفت الحركية الدوائية السريرية بأنها تطبيق مبادئ الحركية الدوائية للوصول إلى خطة علاجية آمنة وفعالة لكل مريض بعينه، حيث أن الأهداف الأساسية للحركية الدوائية السريرية هي الوصول لأفضل فعالية للدواء وأقل سمية له.

الحركية الدوائية السريرية هي من المقررات الأساسية في خطة الصيدلة، حيث أن الخريج الصيدلاني سيكون مسؤول في مكان عمله عن البدء بعلاج المريض وتعديل الجرعات واتخاذ القرارات حول الأدوية التي تحتاج إلى رصد عند بدئها وفي أثناء علاج المريض بها.

وقد أظهرت العديد من الدراسات العلمية أن رصد مستويات الأدوية العلاجية للمريض أدى إلى تحسن في المخرجات النهائية للمريض من الوصول إلى المستوى المطلوب للدواء في أقل عدد من الأيام، وأقل فترة مبيت في المستشفى، كذلك أدت إلى تقليل نسب الإعاقة والوفيات، تقليل فترة إصابة المريض بارتفاع درجة الحرارة، بالإضافة إلى زيادة الأمان الدوائي.

في هذه الدراسة قمنا بإلقاء نظرة على تصورات الصيادلة والخلفية التدريبية لهم بخصوص محتوى مقرر الحركية الدوائية السريرية خلال خطة دراستهم الجامعية للباكالوريوس، وكذلك تحديد العقبات التي تواجههم عند تطبيق مبادئ الحركية الدوائية السريرية في ميادين العمل واكتشاف تأثير الخصائص الشخصية للصيادلة على توقعاتهم حول الحركية الدوائية السريرية.

المنهجية:

هذا البحث عبارة عن استقصاء مقطعي عن طريق استبيان استهدف الصيادلة العاملين في المستشفيات المرخصة تحت مظلة وزارة الصحة أو القطاع الخاص في الضفة الغربية والقدس، للوصول إلى إجابات ذات علاقة بالنتائج النهائية للبحث، حيث تم جمع العينات خلال الفترة من آب - تشرين الثاني 2018.

النتائج:

في هذه الدراسة قمت بتوزيع 145 استبانة على صيادلة المستشفيات في فلسطين و تبين أن الأغلبية العاملة في المستشفيات من الصيادلة نساء (78.6%) بالإضافة الى أن الأغلبية كانت شهادة درجة البكالوريوس قد أخذت من فلسطين (71.7%). وعند إلقاء نظرة على مقررات الحركية الدوائية وجدنا أن (74.5%) كانت ضمن الخطة الدراسية لبكالوريوس الصيدلة وأن ما يقارب (57.9%) منها كانت عبارة عن مقرر الحركية الدوائية.

وكذلك تبين أن (88.3%) من المشاركين لم يقوموا بأخذ أي دورات حول الموضوع بعد تخرجهم، وعند تقييم العقوبات التي تعيق تطبيق مبادئ الحركية الدوائية السريرية على أرض الواقع في الميادين المتوفرة حالياً كانت قلة المواضيع والدورات التعليمية حول هذا الموضوع بعد تخرجهم.

وكان هناك توافق بين أغلب الصيادلة > 50 % حول كفاية وأهمية وعلاقة مقرر لحركية الدوائية في خطة البكالوريوس وميادين العمل الحالية.

وكذلك وجدنا أن الدولة التي أخذت منها شهادة البكالوريوس لها ارتباط في كفاية وفعالية و طريقة تدريس مقرر الحركية الدوائية السريرية حيث أن القيمة الاحتمالية كانت أقل من (0.05).

الخلاصة:

لابد من تطوير طرق تعليم وتدريب مقررات الحركة الدوائية والتعمق فيها، والعمل على توحيد الخطة الدراسية مع الجامعات الأخرى عن طريق تطوير المقررات بشكل مهني متفق عليه، بالإضافة إلى استمرارية التعليم المستمر لصيادلة المستشفيات حول الحركة الدوائية السريرية وتطبيقاتها سيحسن تصورات الصيادلة حول تطبيق الحركة الدوائية السريرية في ميادين العمل الحالية. بالإضافة إلى العمل على تفعيل دور الصيدلاني الإكلينيكي في المستشفيات الفلسطينية وإعطاء المحاضرات التثقيفية حول أهمية دور الصيدلاني الإكلينيكي في تخفيض نسبة الوفيات والعجز وتحسين الخطة العلاجية للمريض لجميع الكادر الطبي العامل في المستشفيات مما سيؤدي إلى تحسين بيئة العمل الحالية وتطويرها.

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