An-Najah NationalUniversity
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Palestinian pharmacists' knowledge, attitudes, and practice on influenza: expanding the scope of practice through vaccination

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This thesis was defended successfully on 22 / 5 / 2018 and approved by:

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Dedication

To my lovely parents

To my husband

To my sisters and brothers

To my uncle

To all whom I love

Acknowledgement

Greeting goes to my supervisor Dr. Ramzi Shawahna for hem sincere encouragement, helpful, and close supervision that has been invaluable for me throughout all stages of this study. Thanks go to my family with all my love, specially my mother, father, husband, sisters, and brothers, who provided me with psychological support and encouragement.

الإقرار

أنا الموقع أدناه، مقدم الرسالة التي تحمل عنوان:

Palestinian pharmacists' knowledge, attitudes, and practice on influenza: expanding the scope of practice through vaccination

أقر بأن ما اشتملت عليه هذه الرسالة هو نتاج جهدي الخاص, باستثناء ما تمت الاشارة اليه حيثما ورد, وأن هذه الرسالة كاملة, أو أي جزء منها لم يقدم من قبل لنيل أي درجة او لقب علمي أو بحثي لدى اي مؤسسة تعليمية او بحثية أخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student Name: **اسم الطالب:**

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Abbreviations

Abbreviations	Meaning
WHO	World health organization
IAV	Influenza A virus
HA	Hemagglutinin
NA	Neuraminidase
RNPS	Ribonucleoprotein
EMR	Eastern Mediterranean Region
ILI	Influenza like illness
TIV	Trivalent Inactivated Vaccine
IVS	Inactivated Vaccines
LAIV	Live Attenuated Vaccine
APHA	American Pharmacists Association
CDC	Centers For Disease Control And Prevention

Knowledge and practices of early career community pharmacists regarding diagnosis, prevention, treatment, and vaccination against seasonal influenza: a cross-sectional study in Palestinian pharmacy practice

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Abstract

Background: Seasonal influenza is a highly infectious viral disease that is responsible for thousands of deaths and hospitalizations. Influenza vaccines are offered for sale in community pharmacies in Palestine. The aim of this study was to assess knowledge, attitude and practices of early career pharmacists who practiced community pharmacy in Palestine relative to diagnosis, prevention, treatment, and vaccination against seasonal influenza.

Methods: This cross-sectional observational study used a 10-item knowledge and practice questionnaire among early career community pharmacists (6 knowledge items and participants were required to choose the best answer for each item).

Results: The study tool was completed by 370 early career community pharmacists from different regions of the West Bank of Palestine (Jenin, Nablus, Ramallah, Hebron, Jericho, and Jerusalem). Knowledge score was associated with age (*p* value =0.060), gender (*p* value = 0.064), number of years in practice (*p* value = 0.000), number of influenza vaccines sold during the last year (*p* value = 0.000), having a course/training on influenza vaccines during pharmacy school (*p* value = 0.018 / 0.041), and positive attitudes

towards allowing pharmacists to administer vaccines in the premises of their pharmacies (*p* value = 0.001). Multiple linear regression analysis showed that the predictors of higher knowledge scores were gender (*p* value = 0.004), number of years in practice (*p* value = 0.014), number of influenza vaccines sold (*p* value 0.009), and positive attitudes towards allowing pharmacists to vaccinate (*p* value = 0.007).

When asked about the incubation period of the influenza virus, 139 (37.6%) early career community pharmacists answered the item correctly. 148 (40.0%) early career community pharmacists correctly identified the period considered contagious. Only 35 (9.5%) community pharmacists knew that none of the vaccines formulations given *via* the intramuscular, intravenous, intranasal, oral or rectal routes were capable of causing influenza.

Only 48 (13.0%) early career community pharmacists knew that antiviral therapy could be initiated within 48 h of symptoms onset. Rhinorrhea or running nose was identified as a side effect associated with oseltamivir by 102 (27.6%) early career community pharmacists.

Conclusions: The findings of this study demonstrated the existence of many gaps in knowledge related to influenza among early career pharmacists. These knowledge gaps might be bridged by specifically designed educational/training interventions.

Key words: Community pharmacy; influenza; knowledge; vaccine; Palestine

Highlights

- Pharmacists can provide healthcare to patients with seasonal influenza.
- Knowledge gaps relative to influenza exist among early career community pharmacists.
- Higher knowledge was predicted by having a course/training on influenza vaccines.
- Pedagogic interventions are needed to bridge gaps in knowledge among pharmacists.

Chapter one

Introduction

Chapter One

Introduction

1.1 Background

Influenza virus infections cause serious disease in many countries. There have been 5 pandemic waves occurred during the last decade. Influenza pandemic occur almost every winter, leading to an increase in hospitalizations and deaths. Number of deaths per year according to statistics of the World Health Organization (WHO) is 250,000–500,000 deaths around the world and 3 to 5 million cases of severe illness each year. In the United States, influenza is responsible for annually morbidity and mortality (Chow, Ma, Ling, & Chew, 2006).

Influenza A virus is the most virulent virus, which cause many pandemic waves of influenza, which that is responsible for many deaths and hospitalizations (Dolan et al., 2012). Influenza A virus (IAV) is a human virus that are the major cause of the periodic seasonal influenza, it is associated with an actual human morbidity and mortality and a worldwide economic load annually (Huang et al., 2018).

The annual influenza pandemic has a significant effect on the population deaths estimated by 5-15% in the world wild. The virus can yearly infect this population because the virus has a strong ability to gradually improve and thus escape the immune response(Russell et al., 2008) .

Recently, Influenza has reach an unmatched degree of attention Because of the interruption in the supply and distribution of the vaccine. Influenza almost cause mortality and morbidity and cause many cases of death yearly. Despite the vaccination recommendations targeted to high-risk groups (elderly, young patients, pregnant and people with chronic disease) and their contacts, this cases estimated around 36,000 deaths and over 200,000 hospitalizations occurred during the 1990. In high-risk groups, disease and mortality are greatest and more intensity, and so are associated healthcare costs and productivity losses. Beside to, costs and lost productivity among non-high-risk groups are not little. Many and Deferent vaccination strategies have been proposed to reduce the load of influenza (Molinari et al., 2007).

It has been argued that early diagnosis, rapid detection of the virus, access to treatment, and vaccination are key components shaping the impact of influenza epidemics, pandemics and the subsequent patient related outcomes (Schuchat, Bell, & Redd, 2011). Although difficulty to define the exact incubation period of influenza virus, previous study define that the median incubation period is 2 day and the average is 1-7 day (Burson, Buttenheim, Armstrong, & Feemster, 2016; VanLangen, Engle, Hagerman, & Klepser, 2012).

1.2 Influenza virus

1.2.1 Influenza virus types

Influenza viruses, A, B, and C, three types of influenza have been identified to cause human illness. Despite to a rare of influenza C viruses, they are consider to cause mild upper respiratory tract infections among children younger than 2 years (Kayali, Webby, Samhouri, Mafi, & Bassili, 2013). In the United States, human influenza A and B viruses cause seasonal epidemics of disease nearly every winter, the viruses of influenza circulate worldwide, causing significantly yearly illness and death leading to large economic losses(Molinari et al., 2007).The structure of Influenza viruses are single stranded with negative charge, segmented RNA viruses. Influenza A and B viruses consisting of eight viral RNA segments, whereas influenza C has seven viral RNA segments (Cox, Brokstad, & Ogra, 2004). Influenza A (H1N1 and H3N2) and influenza B viruses are the current subtypes of seasonal influenza viruses circulating in humans (Khan, El Rifay, Malik, & Kayali, 2017). Influenza pandemic almost occur by the emergence of a new and very different influenza virus especially influenza A virus which infect large number of people and most virulent virus. Generally has not thought to cause epidemic by Influenza type C infections, which almost cause a mild respiratory illness.

1.2.2 Influenza A

The first pandemic of influenza A virus in the world was conducted in 2009. Annually, respiratory disease occurs as epidemics and the major causative agents are the influenza A viruses .These viruses are endemic in wild avian species and may containing gens from avian, swine and human. Viruses become capable of crossing the barrier of host species and can infect and generate new virus progeny.

Influenza A viruses consist of integral membrane proteins, the rod-shaped hemagglutinin (HA) and the mushroom-shaped neuraminidase (NA) are the principle Surface antigens and subdivide to subtypes based on this antigens , (HA) is important in viral pathogenesis and is responsible for viral binding to host receptors and enabling entry into the host cell through endocytosis, whereas (NA) protein mediates the release of the newly synthesized genome from the infected cells .The influenza A virus genome consists of eight single-stranded, negative-polarity RNAs that form ribonucleoprotein complexes (RNPs) by association to the RNA polymerase and the nucleoprotein. The RNPs surrounded by a shell of matrix protein M (M1), which is located inside the gene enveloped by a lipid bilayer through the cell membrane, they have multiple regulatory functions concerning viral replication, budding assembly. The virus surface in virus A and B contain two surface glycoproteins: NA and HA. (figure 1)(Cox et al., 2004). The virus enters the cell by receptor-mediated endocytosis and releases the genomic RNPs into the cytoplasm by acid pH-dependent membrane fusion

at the late endosome. In the nucleus of the infected cells, the influenza viruses transcribe and replicate their genome, this operation is dependent on host nucleo-cytoplasmic trafficking and nuclear functions. Upon entry into the nucleus, parental RNPs are first transcribed (primary transcription) and the synthesis of new virus proteins is necessary to proceed to RNA replication(Resa-Infante, Jorba, Coloma, & Ortín, 2011). The M2 protein from influenza A virus is a pH-activated proton channel that interpose acidification of the interior of viral particles entrapped in endosomes. M2 is the purpose and target of the anti-influenza drugs rimantadine and amantadine; lately, resistance to these drugs in humans, pigs and birds has reached more than 90%(Stouffer et al., 2008).

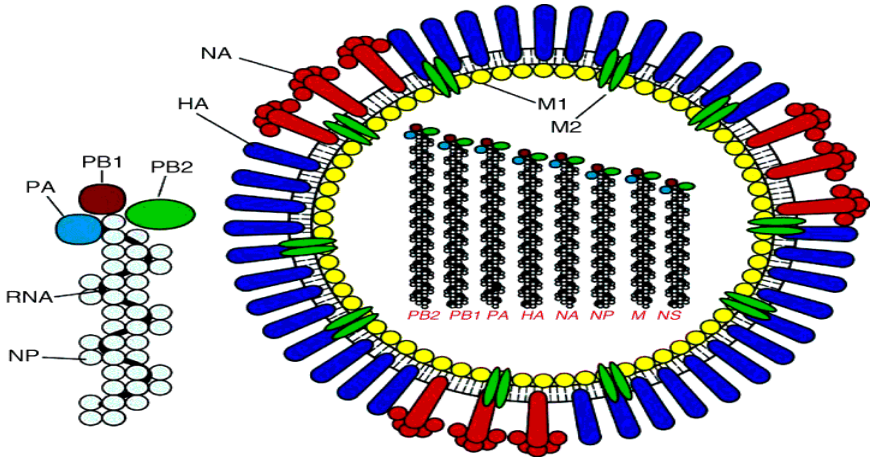

Fig 1: virus A

1.2.3 Influenza in the Eastern Mediterranean region

The Eastern Mediterranean Region (EMR) has affected seasonally with influenza, with the majority of countries having a pattern of infection similar to other northern hemisphere countries peaking in the winter. The central

location of the Eastern Mediterranean Region (EMR) of the World Health Organization (WHO) makes it an important region for influenza A virus circulation. Countries in the region include, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, , Syria, Tunisia, United Arab Emirates (UAE), However, due to their geographic location and spread, some countries (such as Qatar and Oman) have a tropical-like pattern with two peaks per year.

An outbreak of influenza of a new type of A/H1N1 started in Mexico and the United States of America at the end of April 2009(Patient, 2009). The virus then spread throughout the world, causing a pandemic. Most reported cases at the time in the WHO EMR were in Saudi Arabia (14 500 cases) followed by Kuwait, Egypt, and Oman (6 000–8 000 cases). The number of fatalities in the EMR later raised to 1 018 (Khan et al., 2017).

1.2.4 Symptom of influenza

The US influenza-like illness (ILI) definition is consisted of fever>39°C, aches, cough, headache and sore throat(Lemaitre & Carrat, 2010).

In the United States, Influenza virus infection causes great mortality and morbidity each year. Persons almost infected with influenza virus are self-limited, uncomplicated, acute febrile, respiratory symptoms or are asymptomatic. However, hospitalization and death are the complications of infection that may occur in very young persons, in elderly persons, in persons with underlying medical conditions (including diabetes, pulmonary, cardiac

disease and immunosuppression), and in previously healthy persons (Harper et al., 2009).

1.2.5 Treatment and prevention

For influenza prophylaxis, there are two main methods: the use of antiviral drugs and vaccines. In the USA there are several drugs authorized for influenza prophylaxis: the M2 ion channel inhibitors (amantadine and rimantadine) ,because NA is thought to be essential for virus replication in the human it is recommended to use NA inhibitors (oseltamivir and zanamivir)(Cox et al., 2004). In 1999, the neuraminidase inhibitors zanamivir and oseltamivir, both active against influenza A and B, were authorized in the United States. Well-processed studies suggested that treatment with either drug reduces the duration of influenza symptoms in average-risk patients by 1 to 1.5 days. Antiviral therapy must be taken and started within 48 hours of symptom onset to be effective(Rothberg, He, & Rose, 2003) . However, vaccination remains the cornerstone of prophylaxis. Influenza virus can spread from person to another by contact, or through the air from cough or sneezing so for influenza prophylaxis as simple methods should avoid contact, contaminated clothes of infected patient and hand hygiene.

1.2.6 Who should be considered to have Influenza?

During influenza season (the periods when influenza viruses are spread in the community), the diagnosis of influenza should be considered in the following patients (**Target group**):

People ≥65 years old

People with chronic cardiovascular or pulmonary disease

Residents of nursing or chronic care homes

Infants and young children

People with chronic metabolic disorders including diabetes

Immunosuppressed patients including treatment by immunosuppression medicine and infection with human immunodeficiency virus

Pregnant women

Health care workers including doctors, hospital staff, nurses and emergency response workers. (Azevedo et al., 2003; Batırel et al.; Cox et al., 2004; Harper, Fukuda, Uyeki, Cox, & Bridges, 1984; Kretsinger et al., 2006; Ohfuji et al., 2017; Tsagris et al., 2012; Van Essen, Palache, Forleo, & Fedson, 2003).

Immunization against influenza could decrease the incidence of influenza by 70-90% in healthy adults (Elder, O'donnell, McCruden, Symington, & Carman, 1996). Therefore, annual immunization against influenza is highly recommended by different health regulatory agencies. For example, the Advisory Committee on Immunization Practices and the Gynecologists and the American College of Obstetricians suggested that pregnant women should also receive vaccination against both seasonal as well as H1N1 influenza (Dolan et al., 2012; Practice, 2004).

1.3 Vaccine

There are many important methods for controlling and preventing influenza. Flu virus can spread from infected person to a healthy by contact for example .prophylaxis by a simple methods such as avoid contact to infected patient and his contaminated clothes and preserve hand hygiene, would have a significant impact on decreasing the number of cases during an outbreak(Control & Prevention, 2014).

Because the virus can develop itself, the WHO meets to update and develop the vaccine strains to match the strains circulating in the community in the worldwide. Annual Vaccination at the beginning of the influenza season (October–November) is the most effective method to minimize the effect of influenza and its associated complications. The current vaccine is relatively inexpensive and effective. In the USA, the influenza remains the major causes of the highest mortality by a vaccine-preventable disease (McCullough, 2007). The vaccination is a promising strategy for broad-spectrum prevention and control of seasonal and pandemic influenza. Epidemics of Seasonal influenza are caused by new influenza virus forms that appear and improve because of frequent antigenic change (antigenic drift) and reassortment resulting from point mutations that occur during viral replication. The virus changes make it is necessary to modification of the vaccine every year. The virus can escape the host's acquired immunity to influenza because it is continuously undergoing antigenic change. Lastly, although the development in antiviral therapy, vaccination is still the most effective method of prophylaxis. Vaccination is well tolerated by patients and it is induces a good degree of

protection (60–90% efficacy).The effectiveness of vaccines is related to age of patient and the immune competence of the vaccine. Annual vaccination is recommended for those at risk of complications from influenza, due to the virus antigenic changes in circulating strains(Nichol & Treanor, 2006) .

1.3.1 Vaccine types

Live attenuated influenza virus vaccine (LAIV) and trivalent inactivated vaccine (TIV) are improved each year for protection against the expected general influenza strains.

1.3.1.1 Inactivated vaccines

Inactivated vaccines (IVs) have been available since1940s and have been produced by prevalence of the virus in chicken embryo. The allantois fluid is harvested, and the virus is concentrated and highly purified, then inactivated with formaldehyde or β-propiolactone. For persons who have allergy to eggs, Influenza vaccines should not be administered because it is may contain trace amounts of residual egg proteins and thus anaphylactic hypersensitivity. In children younger than age 9, subunit preparations are preferred to minimized reactogenicity, and two half doses are recommended given at least 4 weeks or 1 month apart (Cox et al., 2004) .

1.3.1.2 Live attenuated vaccine

This vaccine available since 1960s contains awakened virus LAIV has not licensed in USA until 2003. It has given to induce systemic immune and

secretory response that more closely similar the immune response observed after natural infection, this vaccine induce wild systemic and mucosal responses. Live attenuated vaccines have limited viral replication in the upper and lower respiratory tract because it has administered intranasal, which results in limited viral replication.

The main differences between the 2 vaccines are: 1- route of administration (LAIV is administered as an intranasal spray, TIV as an intramuscular injection,), 2 - structure (LAIV contains a weakened virus, whereas TIV contains purified hemagglutinin [HA] and neuraminidase); hence, they enhance different responses. TIV trigger a higher mean serum IgG antibody response than does LAIV. At the site of the injection where the virus inter the body, LAIV trigger more IgA mucosal response, thus helping to prevent infection before significant viral replication occurs. The 2 vaccines are generally well tolerated (Nichol & Treanor, 2006), 3- safety concerns, Mild local reactions consisting of tenderness and redness at the injection site often are observed after inactivated influenza vaccination and occur in up to 25% of elderly recipients and <50% of healthy adults**,** LAIV causes temporarily (2-day) respiratory symptoms ,nasal congestion ,runny nose and myalgia (Cox et al., 2004; Nichol & Treanor, 2006).

1.3.2 Role of pharmacists in vaccination

Recently, Vaccination is one of the greatest global achievements and performance. Unfortunately, only 20% to 60% of at-risk adults take a vaccine for vaccine-preventable diseases according to the Centers for

Disease Control and Prevention (CDC). Pharmacists, as health care providers, have a role to increase the immunization average. Pharmacists also were recognized for their ability to share with others in the community to reach the most of the patients at risk.

The American Pharmacists Association (APHA), divided the pharmacist's role in immunization into three major components: encourage patients to get an immunization, bring to their community pharmacy other health professionals who immunize in pharmacies (i.e., acting as immunization facilitators), and administering vaccine. Large number of people who are susceptible to a preventable infection accept the pharmacist's recommendation about immunization, the percent of this people is about 50% to 94%. More recent studies have assessed and shown benefit of the pharmacist's role in increasing immunization rates through vaccine administration (Goode, Mott, & Stanley, 2007).

Pharmacists provide a highly appropriate and accessible way for seasonal influenza vaccination that viewed favorably by patients. Through administration of the flu vaccine, Pharmacists can have a good effect on public health by increasing vaccination ratio among high-risk patients, first-time or occasional vaccine recipients, and patients who may not furthermore have a chance to be vaccinated (Papastergiou, Folkins, Li, & Zervas, 2014). Pharmacists increasingly take on immunization roles for their communities: advocates, facilitators and immunizers. People have exceptional access to pharmacist at a wide variety of hours. Large percent of people who receive and accept a pharmacist's recommendation about vaccination. Large number

of doses of influenza vaccine are administered in pharmacies yearly. In 25 states of the USA, pharmacists are licensed to give vaccine in their community(Grabenstein, 1998).

In the United States, around 50,000 adults die every year from vaccine-preventable diseases. Most traditional vaccine providers (e.g., physician offices) administer vaccinations during standard clinic time, but community pharmacies offer extra time that permit the patients to receive vaccine at suitable times for them(Goad, Taitel, Fensterheim, & Cannon, 2013). Many people trust the pharmacists and accept their recommendation about vaccine, Community pharmacists are easily accessible providers of healthcare services. In modern healthcare systems, the role of pharmacist expand more than just dispensing medications. Previous studies showed that patients for example, primary healthcare physicians wanted pharmacists to play a larger role in caring for patients than what they are doing today(McAuley, Miller, Klatte, & Shneker, 2009) .

Medical literature said that pharmacies have the ability to effect on people who previously difficult-to-reach for administration vaccine in clinical, including the medically underserved (Crawford et al., 2011; Westrick, 2010). Pharmacies may be especially influence in vaccination high-risk older adults, who are more likely to use pharmacy services for prescription medication than the general population(Francis & Hinchliffe, 2010) . Approximately 38% of US pharmacy schools supply immunization education and training to pharmacy students as part of their study plan. Without immunization training and education, the immunization rate may decreased for some

groups of people, especially difficult-to-reach consumers and those with wrong understanding or don’t have a knowledge about immunization(Bain & Cullison, 2009).

In Palestine, there are more than 4,000 pharmacists and the ratio is 11.8 pharmacists for every 10,000 people(Sweileh, Sa’ed, & Al-Haddad, 2016) . The majority of pharmacists in the Palestinian pharmacy practice are community pharmacists working in the private sector. A considerable percentage of community pharmacists practicing in Palestine are early career pharmacists who have graduated recently from different universities in Palestine and been in practice for less than 5 years.

The number of pharmacy graduates in Palestine is increasing dramatically with fewer opportunities to establish new community pharmacies. Therefore, expanding the role of pharmacist in providing healthcare services to patients is becoming an urgent need. It was reported that patients suffering influenza and influenza-like illnesses interact first with community pharmacists (Magruder, Lewis, Najmi, & Florio, 2004) . Therefore, pharmacists are in key position to influence future influenza epidemics as they interact with patients with influenza early in the course of the virus(VanLangen et al., 2012) .

Community pharmacists in Palestine are allowed to sell vaccines to their clientele, however, they are not legally allowed to administer vaccines to their clientele in the premises of their pharmacies. Despite the absence of jurisdictions permitting pharmacists to vaccinate the public, administration of vaccines is commonly practiced by many community pharmacists in

Palestine including early career pharmacists. To assume their role in providing healthcare services for patients, pharmacists should be acquainted with basic and advanced information on influenza in regards to diagnosis, management, and immunization. Currently, information of pharmacists' attitudes, knowledge, and practices on influenza is lacking.

1.4 Objective

This study was conducted with the aim of assessing knowledge, attitude and practice of early career pharmacists who practice community pharmacy in Palestine relative to diagnosis, prevention, treatment, and immunization against influenza. In this study, early career were pharmacists who obtained licensure to practice pharmacy and have been in practice for 5 years or less.

1.5 Signification

Results of this study might provide grounds for future pedagogic and/or training interventions to expand future roles of early career community pharmacists in providing healthcare services for patients with influenza.

1.6 Problem statement

It was reported that patients suffering influenza and influenza-like illnesses interact first with pharmacists. This has been gauged by the sales of over-the-counter medications for influenza-like illnesses. Therefore, pharmacists are in key position to influence future influenza epidemics as they interact with patients with influenza early in the course of the virus.

Unfortunately, pharmacists in Palestine are not legally allowed to vaccinate clients. To assume their role in providing healthcare services for patients, pharmacists should be acquainted with basic and advanced information on influenza in regards to diagnosis, management, and vaccination. Currently, information of pharmacists' knowledge and attitudes on influenza is lacking and In Palestine, the number of pharmacy graduates is increasing dramatically with less opportunities for new community pharmacies. Results of this study might provide grounds for future pedagogic and training interventions to expand future roles of pharmacists in providing healthcare services for patients with influenza.

Chapter Two
Literature Review

Chapter Two

Literature Review

2.1 Previous studies showed that both patients as well as primary healthcare physicians wanted pharmacists to play a larger role in caring for patients than what they are doing today. In the US for example, pharmacists play a major role in vaccinating the general public(Pharmacists, 2003) .

2.2 in modern legal and regulatory changes have confirm an expanding of the role of pharmacists' practice in Canada. Pharmacist in hospital- and community are able to accept, refuse to fill, adjust or replace prescriptions. Pharmacists may also give drug therapy for some self-limiting conditions, translate laboratory tests, and administer injections and vaccine. As with physicians, pharmacists must exercise all prescribing and other activities within the practice framework and must take responsibility insurance.

In this study also suggested that all pharmacists in their college receive Programs that teach pharmacists how to administer injections, and procedures for vaccination delivery (Tannenbaum & Tsuyuki, 2013).

2.3 in 1999 more than 300,000 vaccine doses were administered by over 2500 pharmacists suggested in report by the American Pharmaceutical Association (APHA) , Allowing pharmacists to give vaccination, however, does not remove all hindrance of the vaccine delivery process. Pharmacists explain the major three hindrance to the provision of immunization services average are lack of time, worry about legal responsibility, and lack of reimbursement as(Steyer, Ragucci, Pearson, & Mainous III, 2004) .

2.4 Another study in Canada suggested that the expanding the pharmacist's role of practice to include administration of vaccine for adult patients is generally accepted by Canadian health care providers and the public. Agreement of this expanded role of pharmacist practice may participate of improvements in vaccine coverage rates by improving vaccine accessibility (MacDougall et al., 2016).

2.5 VanLangen evaluated knowledge of pharmacy students regarding influenza using an electronic survey (VanLangen et al., 2012). The study concluded that there should be more focus on general vaccination information and appropriate use of antiviral drugs in future education interventions.

2.6 Dolan et al assessed knowledge, attitudes, and practices of pharmacists regarding immunization and treatment of pregnant women with seasonal and H1N1 influenza (Dolan et al., 2012). The study identified gaps in knowledge of safety of vaccination against influenza in pregnancy and recommended educational efforts on the safety and efficacy of immunization against influenza and treatment of infections during pregnancy.

2.7 Kaya et al assessed knowledge and attitudes of patients with asthma, parents and physicians relative to immunization against influenza (Kaya, Altınel, Karakaya, & Çetinkaya, 2017), The study showed that 1 out of 3 physicians did not believe in the effectiveness of influenza vaccines.

2.8 In England study fined that using of community pharmacies a program of influenza vaccination can increase vaccination rates and is acceptable to patients (Warner, Portlock, Smith, & Rutter, 2013).

2.9A study was conducted in USA to determine whether the pharmacists give vaccines ,can help increasing influenza vaccine rates in states ,and this study suggested that allowing pharmacists to give vaccinations is associated with higher influenza vaccination rates for people aged 65 years and older (Steyer et al., 2004).

2.10 study by Denise R. Sokos said that pharmacists often play key roles on prophylaxis therapies, such as vaccination. Pharmacists should be familiar with the composition, immunogenicity, dosage, administration, efficacy, contraindications, adverse reactions, precautions, and cost-effectiveness of each vaccine; Health-system pharmacists have the opportunity and liability to protect those at highest risk of pneumococcal disease and influenza by using standing-order vaccination programs (Sokos, 2005).

2.11 John Papastergiou conducted a study to describe the characteristics of patients receiving influenza vaccination in community pharmacies and risk factors and to determine how patient thinks about vaccination by pharmacists. study suggested that pharmacists supply suitable and easily way for seasonal flu vaccination that favorable by patients. In this study explained that the administration of influenza vaccine by pharmacists has the good effect of public health and improve vaccination rate through high risk patients and patient who receive vaccine for the first time or for occasionally, or patient who receive no vaccine before. It is hoped that expanding pharmacist vaccination services to include administration of other common vaccines would receive similar positive reception by patients and improve overall access to vaccination(Papastergiou et al., 2014) .

2.12 In New York, study conducted by Natalie D. Crawford to understand individual and neighborhood characteristics of pharmacy team support for in-pharmacy vaccination. In 2008 New York State (NYS) allowed for pharmacists to administer vaccination. Many NYS pharmacies share in the Expanded Syringe Access Program (ESAP), which allows provision of non-prescription syringes to help prevent transmission of HIV, and are uniquely positioned to offer vaccination services to low-income communities (Crawford et al., 2011) .

2.13 study in USA explained that Approximately 50,000 adults die annually from vaccine-preventable diseases in the United States and Study analyzed the types of vaccines administered and patient populations vaccinated during off-clinic hours in a national community pharmacy, and their implications for vaccination access and convenience .Most traditional vaccine providers (e.g., physician offices) administer vaccinations during standard clinic hours, but community pharmacies offer expanded hours that allow patients to be vaccinated at convenient times. As a result, A large proportion of adults being vaccinated receive their vaccines during evening, weekend, and holiday hours at the pharmacy, when physicians are likely unavailable. Younger, working-aged, healthy adults, in particular, accessed a variety of immunizations during off-clinic hours. With the low rates of adult and adolescent vaccination in the United States, community pharmacies are creating new chance for vaccination that expand access and convenience(Goad et al., 2013) .

2.14 Jenny A. Van Amburgh Pharm.D. Nancy M. Waite Pharm. D discussed that the influenza vaccination rate increased from 28% at baseline (before starting program) to 54% after starting program patients who not received vaccine were younger and lived in more urban areas than who received vaccine patients; vaccinated patients had a higher rate of diabetes mellitus and cardiovascular disease. This study suggested that training of pharmacists on vaccination program increased the influenza immunization rate in high-risk patients (Amburgh, Waite, Hobson, & Migden, 2001).

2.15 KR Knoell and AL Leeds where study the effect of pharmacist interventions on the rate at which elderly outpatients were offered influenza vaccination, and suggested that a combination of pharmacist-initiated interventions significantly increased the number of elderly patients who were received vaccinations during scheduled clinic visits (Knoell & Leeds, 1991).

2.16 John D Grabenstein suggested that Pharmacists increasingly have a major role in vaccination for their communities, and many patients trust with them and accept their recommendation about vaccination. In 25 states, pharmacists are authorized to administer immunizations, and patient can easily reach to pharmacist's community for vaccination. In 1997 More than 1000 pharmacists were trained to immunize(Grabenstein, 1998).

2.17 Another study discussed that adults who are recommended to receive seasonal influenza vaccines, less than half of them are receive. Most physicians are ready refer certain patients to other community vaccinators like public clinics or pharmacies (79%); to participate with public health in

holding community vaccination clinics and set up vaccination clinics with other practices (Hurley et al., 2011).

2.18 A study was conducted in Suginami and Nerima, Tokyo to examine whether the personal recommendation and advocacy of influenza vaccination by community pharmacists to elderly people affected the vaccination rate and number of influenza patients. This study suggested that the recommendation by community pharmacists about vaccination among elderly people increase the vaccination rate and decrease the number of patients with influenza(Usami et al., 2009).

2.19 study conducted to describe the development, application, and assessment pharmacy practice experience integrated within campus-based influenzaClinics.

The clinics provided influenza vaccinations to 2,292 and 2,877 individuals in 2010 and 2011, respectively. Third-year students were assessed and improvement was seen in knowledge and self-ratings of perceptions and attitudes toward administering immunizations. Combining pharmacy practice experiences within campus-based influenza clinics was an effective way to provide students with direct patient care experience and preventive health services knowledge(Conway, Johnson, & Hagemann, 2013) .

2.20 In USA, immunization in Community pharmacy become recently commonplace, with success in increasing rates of immunizations. Vaccination services by community pharmacists are provide a convenient and accessible option for receiving immunizations. This study explain that

there are many example of community pharmacists serving in these vaccination roles with successful outcomes.

With the appropriate training/education, accessibility, and effective provision of immunizations in community pharmacies, pharmacists have the major effect to increase immunization rates and public-health efforts. Pharmacists play a major role in immunization as immunizers and facilitator .community pharmacists encourage patients to receive vaccination, enable other providers to immunize, and directly vaccinate the patients that they serve (Bach & Goad, 2015).

Chapter Three
Methodology

Chapter Three

Methodology

3.1 Design

This study was conducted in a cross-sectional observational design using a questionnaire that was designed to be completed by early career community pharmacists practicing in different regions of the West Bank of Palestine (Jenin, Naplus, Tulkarim, Hepron, Jerosalim, Jericho, Ramallah). The potential study participants were visited in their places of work. After explaining the objectives of the study to the early career community pharmacists, they were invited to take part in the study and respond to items in a questionnaire. The study participants could complete the questionnaire in about 15 min. No financial incentives were offered to the participants in this study.

3.2 The sample size required for this study

An online sample size calculator (www.raosoft.com) was used to estimate the number of pharmacists needed for this study. In the West Bank of Palestine, there are approximately 1,100 community pharmacies, the majority of which employ at least one early career community pharmacist. For this study, we aimed to recruit one early career pharmacist from each community pharmacy. The number of participants required for this study estimated at a 95% confidence interval and a default margin of error of 5% was 285.

3.3The study tool

The study tool was a questionnaire based on previous studies conducted elsewhere (Dolan et al., 2012; VanLangen et al., 2012). Community pharmacists(approximately one early career community pharmacists from each pharmacy were visited) were asked to provide their sociodemographic and practice details like age, gender, academic degrees, country from where the first pharmacy degree was obtained, number of years in practice, approximate number of influenza vaccines they have sold during the last year, if they have had a course and training on influenza vaccines during their pharmacy school program, if they believed that pharmacists should be allowed to administer vaccines in the premises of their community pharmacies. The questionnaire also contained 6 knowledge items and participants were required to choose the best answer for each item. The 6 items were related to the time of virus incubation, the period considered contagious, the formulation of vaccination capable of causing influenza, initiation of antiviral therapy, individuals at higher risk of influenza, and the side effects of antiviral drugs used to treat influenza. Participants were also required to indicate their perceived roles in managing influenza. They were also asked to provide reasons for vaccinating their clientele within the premises of their pharmacies. Finally, the study participants were asked if they were concerned with using thimerosal as a vaccine preservative in pregnant women.

Participants were given 1 point for each correct answer, 0 point for each incorrect answer and -.5 point for each I do not know answer and the final score was computed in percentage correct and could range from 0% to 100%.

3.4 Reliability

To test for the reliability of the study tool, the test-retest method was used. This method tested the stability of the scores obtained using this tool over a short period of time. In this study, we asked 25 pharmacy students to respond to the questionnaire twice. A time interval of 30 min – 1 h was let between the two rounds(Shawahna et al., 2017a, 2017b). The scores obtained in each round were correlated using Pearson's correlation. A Pearson's correlation coefficient (r) of > 0.80 was set *a priori* to indicate good correlation. The relatedness of the items or the internal consistency was tested using the Cronbach's α. Items were said to be internally consistent when $0.70 \leq$ Cronbach's $\alpha \leq 0.95$.

3.5 Data analysis

Data were entered in IBM-SPSS for Windows, version 21.0 (IBM). Correct and incorrect answers of each knowledge item were compared using Pearson's Chi-Square (χ^2) or Fisher's exact test. Correlations were investigated using Spearman's rank correlation. The Kolmogorov–Smirnov test was used to check if the data were normally distributed or not. As the data were not normally distributed, the Mann–Whitney *U* test was used to compare scores of the groups. To determine which independent

sociodemographic and practice variables were associated with higher knowledge scores, a multiple linear regression analysis was performed. To control for confounders, we only retained the sociodemographic and practice variables that had a *p* value o f < 0.05 in the Mann–Whitney *U* test. The adjusted R^2 with a *p* value of < 0.05 was used to indicate the goodness of fit of the regression. In all analyses, statistical significance was considered when the *p* value was < 0.05.

3.6 Ethical approval

The protocol and ethics of this study were approval by the Institutional Review Board (IRB) Committee of An-Najah National University (Protocol #26/March/2017). All community pharmacists who took part in this study provided verbal consent before responding to the questionnaire.

Chapter Four
Results

Chapter Four

Results

4.1 Sociodemographic and practice details of the participants

The questionnaire was completed by 370 early career community pharmacists practicing in more than 200 locations in the West Bank of Palestine.The sociodemographic and practice details of the participants who took part in this study are shown in Table 1.

Table 1: The sociodemographic and practice details of the early career community pharmacists (*n = 370*) who participated in the study

Variable	n	%
Age (years)		
< 30	261	70.5
≥ 30	109	29.5
Gender		
Male	75	20.3
Female	295	79.7
Academic degree		
BSc in Pharmacy	314	84.9
Postgraduate (Pharm.D., MSc, or PhD)	56	15.1
Place from where the basic pharmacy degree was earned		
Palestine	345	93.2
Other	25	6.8
Number of years in practice		
< 3	141	38.1
≥ 3	229	61.9
Approximate number of influenza vaccines sold per year		
< 30	294	79.5
≥ 30	76	20.5
Have you had a course on influenza vaccines during your pharmacy degree program?		
Yes	190	51.4
No	180	48.6
Have you had training on influenza vaccines during your pharmacy degree program?		
Yes	28	7.6
No	342	92.4
Do you believe that pharmacists should be allowed to administer influenza vaccines in their pharmacy premises?		
Yes	219	59.2
No	151	40.8

BSc: Bachelor of Science, MSc: Master of Science, Pharm.D: Doctor of Pharmacy, PhD: Doctor of Philosophy

In this study, the more than 70% of the early career pharmacists were less than 30 years old and about 85% of them had a BSc in Pharmacy. Nearly 80% of the respondents were female pharmacists. Approximately 93% of the study participants earned their pharmacy degree from a university in Palestine. About 38% of the early career pharmacists were in practice for less than 3 years. About 21% of the participants sold more than 30 influenza vaccines in the last year. About 51% of the study participants had had a course and about 8% had had training on influenza vaccines during their pharmacy degree program. Finally, about 60% of the study participants believed that pharmacists should be legally allowed to administer influenza vaccines in the premises of their pharmacies.

4.2 Reliability and internal consistency of the test tool

The test tool showed excellent stability of scores over a short period of time as indicated by a Pearson's *r* of 0.94 (95% CI of 0.91-0.97; *p* value < 0.001). The knowledge items used in this study showed good internal consistency as indicated by a Cronbach's α of 0.81.

4.3 Knowledge of issues related to influenza

When asked about the incubation period of the influenza virus, 139 (37.6%) early career community pharmacists answered the item correctly. Answering this item correctly was significantly associated with number of years in practice (p-value = 0.020), selling 30 or more vaccines last year (p-value = 0.008), and having training on vaccines during pharmacy degree program (p-

value = 0.004). The period considered contagious was correctly identified by 148 (40.0%) early career community pharmacists. Answering this item correctly was significantly associated with number of years in practice (p-value = 0.008), selling 30 or more vaccines last year (p-value = 0.028), and positive attitudes towards allowing the community pharmacist to vaccinate clientele (p-value = 0.000). Only 35 (9.5%) community pharmacists knew that none of the vaccines formulations given *via* the intramuscular, intravenous, intranasal, oral or rectal routes were capable of causing influenza. Answering this item correctly was significantly associated with being 30 years and older (p-value = 0.020), male gender (p-value = 0.006), number of years in practice (p-value = 0.018), and positive attitudes towards allowing the community pharmacist to vaccinate clientele (p-value = 0.050). Again, only 48 (13.0%) early career community pharmacists knew that antiviral therapy could be initiated within 48 h of symptoms onset. Answering this item correctly was significantly associated with selling 30 or more vaccines last year (p-value = 0.003), and positive attitudes towards allowing the community pharmacist to vaccinate clientele (p-value = 0.011). Rhinorrhea or running nose was identified as a side effect associated with oseltamivir by 102 (27.6%) early career community pharmacists. Answering this item correctly was not significantly associated with any of the studied variables. The categories of persons at higher risk from influenza were identified by the majority of the early career community pharmacists (339, 91.6%). Answering this item correctly was significantly associated with female gender (p-value = 0.000), obtaining a degree from a university abroad

(p-value = 0.047), selling 30 or more vaccines last year (p-value = 0.038), having a course on vaccines during pharmacy degree program (p-value = 0.004), and positive attitudes towards allowing the community pharmacist to vaccinate clientele (p-value = 0.036). Details are shown in Table 2.

Table 2: Association between the sociodemographic and practice details of the study participants (*n = 370*) and knowledge of each item

					Correct answer		Incorrect answer					
#	**Item**	**Variable**	**N**	**%**	**n**	**%**	**n**	**%**	**χ2**	**p-value**	**Correlation**	**p-value**
1	The time of viral incubation in days	**Age (years)**										
		< 30	231	62.43	94	25.4	167	45.1	0.91	0.349	0.05	0.341
		≥ 30	139	37.57	45	12.2	64	17.3				
		Gender										
		Male	231	62.43	22	5.9	53	14.3	2.72	0.110	0.09	0.100
		Female	139	37.57	117	31.6	178	48.1				
		Academic degree										
		BSc in Pharmacy	231	62.43	124	33.5	190	51.4	3.27	0.074	-0.09	0.071
		Postgraduate (Pharm.D, MSc, or PhD)	139	37.57	15	4.1	41	11.1				
		Place from where the basic pharmacy degree was earned										
		Palestine	231	62.43	127	34.3	218	58.9	1.24	0.289	0.06	0.266
		Other	139	37.57	12	3.2	13	3.5				
		Number of years in practice										
		< 3	231	62.43	42	11.4	99	26.8	5.88	0.020	0.13	0.015

		≥ 3	139	37.57	97	26.2	132	35.7				
		Approximate number of influenza vaccines sold per year										
		< 30	231	62.43	100	27.0	194	52.4	7.71	0.008	0.14	0.005
		≥ 30	139	37.57	39	10.5	37	10.0				
		Have you had a course on influenza vaccines during your pharmacy degree program?										
		Yes	231	62.43	80	21.6	110	29.7	3.43	0.069	-0.10	0.064
		No	139	37.57	59	15.9	121	32.7				
		Have you had training on influenza vaccines during your pharmacy degree program?										
		Yes	231	62.43	18	4.9	10	2.7	9.22	0.004	-0.16	0.002
		No	139	37.57	121	32.7	221	59.7				
		Do you believe that pharmacists should be allowed to administer influenza vaccines in their pharmacy premises?										
		Yes	231	62.43	84	22.7	135	36.5	0.14	0.744	-0.02	0.707
		No	139	37.57	55	14.9	96	25.9				
2	Period considered contagious	**Age (years)**										
		< 30	221	59.73	103	27.8	157	42.4	0.51	0.870	0.01	0.820
		≥ 30	149	40.27	46	12.4	64	17.3				
		Gender										
		Male	221	59.73	30	8.1	45	12.2	0.45	1.000	0.00	0.941
		Female	149	40.27	119	32.2	176	47.6				
		Academic degree										

		BSc in Pharmacy	221	59.73	126	34.1	188	50.8	0.59	0.901	0.01	0.909
		Postgraduate (Pharm.D, MSc, or PhD)	149	40.27	23	6.2	33	8.9				
		Place from where the basic pharmacy degree was earned										
		Palestine	222	60	133	35.9	211	57.0	4.50	0.119	0.11	0.039
		Other	148	40	15	4.1	11	3.0				
		Number of years in practice										
		< 3	222	60	44	11.9	98	26.5	8.13	0.008	0.15	0.005
		≥ 3	148	40	105	28.4	124	33.5				
		Approximate number of influenza vaccines sold per year										
		< 30	221	59.73	109	29.5	185	50.0	6.60	0.028	0.13	0.015
		≥ 30	149	40.27	40	10.8	36	9.7				
		Have you had a course on influenza vaccines during your pharmacy degree program?										
		Yes	221	59.73	83	22.4	107	28.9	2.61	0.203	-0.07	0.159
		No	149	40.27	66	17.8	114	30.8				
		Have you had training on influenza vaccines during your pharmacy degree program?										
		Yes	221	59.73	14	3.8	14	3.8	2.25	0.369	-0.06	0.283
		No	149	40.27	135	36.5	207	55.9				

		Do you believe that pharmacists should be allowed to administer influenza vaccines in their pharmacy premises?									
		Yes	221	59.73	68	18.4	150	40.5	18.34	0.000	0.21	0.000
		No	149	40.27	81	21.9	71	19.2				
3	Vaccination formulations capable of causing influenza	**Age (years)**										
		< 30	334	90.27	19	5.1	242	65.4	6.06	0.020	0.13	0.014
		≥ 30	36	9.73	17	4.6	92	24.9				
		Gender										
		Male	334	90.27	14	3.8	61	16.5	8.55	0.006	-0.15	0.003
		Female	36	9.73	22	5.9	273	73.8				
		Academic degree										
		BSc in Pharmacy	334	90.27	34	9.2	280	75.7	2.85	0.138	-0.09	0.092
		Postgraduate (Pharm.D, MSc, or PhD)	36	9.73	2	0.5	54	14.6				
		Place from where the basic pharmacy degree was earned										
		Palestine	334	90.27	33	8.9	312	84.3	0.16	0.723	0.02	0.693
		Other	36	9.73	3	0.8	22	5.9				
		Number of years in practice										
		< 3	334	90.27	7	1.9	134	36.2	5.89	0.018	0.13	0.015
		≥ 3	36	9.73	29	7.8	200	54.1				
		Approximate number of influenza vaccines sold per year										

		< 30	334	90.27	26	7.0	268	72.4	1.28	0.278	0.06	0.259
		≥ 30	36	9.73	10	2.7	66	17.8				
		Have you had a course on influenza vaccines during your pharmacy degree program?										
		Yes	334	90.27	16	4.3	174	47.0	0.76	0.483	0.05	0.384
		No	36	9.73	20	5.4	160	43.2				
		Have you had training on influenza vaccines during your pharmacy degree program?										
		Yes	334	90.27	3	0.8	25	6.8	0.03	0.745	-0.01	0.855
		No	36	9.73	33	8.9	309	83.5				
		Do you believe that pharmacists should be allowed to administer influenza vaccines in their pharmacy premises?										
		Yes	334	90.27	27	7.3	192	51.9	4.13	0.050	-0.11	0.042
		No	36	9.73	9	2.4	142	38.4				
4	Initiation of antiviral therapy	**Age (years)**										
		< 30	322	87.03	29	7.8	232	62.7	2.72	0.126	0.09	0.100
		≥ 30	48	12.97	19	5.1	90	24.3				
		Gender										
		Male	322	87.03	6	1.6	69	18.6	2.06	0.180	0.07	0.152
		Female	48	12.97	42	11.4	253	68.4				
		Academic degree										
		BSc in Pharmacy	322	87.03	39	10.5	275	74.3	0.56	0.516	0.04	0.455

		Postgraduate (Pharm.D, MSc, or PhD)	48	12.97	9	2.4	47	12.7			
		Place from where the basic pharmacy degree was earned									
		Palestine	322	87.03	47	12.7	298	80.5	1.91	0.226	-0.07	0.168
		Other	48	12.97	1	0.3	24	6.5				
		Number of years in practice									
		< 3	322	87.03	20	5.4	121	32.7	0.30	0.634	-0.03	0.588
		≥ 3	48	12.97	28	7.6	201	54.3				
		Approximate number of influenza vaccines sold per year									
		< 30	322	87.03	30	8.1	264	71.4	9.72	0.003	0.16	0.002
		≥ 30	48	12.97	18	4.9	58	15.7				
		Have you had a course on influenza vaccines during your pharmacy degree program?									
		Yes	322	87.03	31	8.4	159	43.0	3.87	0.063	-0.10	0.049
		No	48	12.97	17	4.6	163	44.1				
		Have you had training on influenza vaccines during your pharmacy degree program?									
		Yes	322	87.03	6	1.6	22	5.9	1.92	0.235	-0.07	0.167
		No	48	12.97	42	11.4	300	81.1				
		Do you believe that pharmacists should be allowed to administer influenza vaccines in their pharmacy premises?									

		Yes	322	87.03	20	5.4	199	53.8	7.01	0.011	0.14	0.008
		No	48	12.97	28	7.6	123	33.2				
5	Side effects of oseltamivir	**Age (years)**										
		< 30	268	72.43	72	19.5	189	51.1	0.00	1.000	0.00	0.990
		≥ 30	102	27.57	30	8.1	79	21.4				
		Gender										
		Male	268	72.43	20	5.4	55	14.9	0.04	0.886	0.01	0.845
		Female	102	27.57	82	22.2	213	57.6				
		Academic degree										
		BSc in Pharmacy	268	72.43	81	21.9	233	63.0	3.26	0.076	0.09	0.071
		Postgraduate (Pharm.D, MSc, or PhD)	102	27.57	21	5.7	35	9.5				
		Place from where the basic pharmacy degree was earned										
		Palestine	268	72.43	93	25.1	252	68.1	0.96	0.356	0.05	0.330
		Other	102	27.57	9	2.4	16	4.3				
		Number of years in practice										
		< 3	268	72.43	37	10.0	104	28.1	0.20	0.720	0.02	0.655
		≥ 3	102	27.57	65	17.6	164	44.3				
		Approximate number of influenza vaccines sold per year										
		< 30	268	72.43	77	20.8	217	58.6	1.36	0.252	0.06	0.245
		≥ 30	102	27.57	25	6.8	51	13.8				

		Have you had a course on influenza vaccines during your pharmacy degree program?										
		Yes	268	72.43	50	13.5	140	37.8	0.31	0.642	0.03	0.581
		No	102	27.57	52	14.1	128	34.6				
		Have you had training on influenza vaccines during your pharmacy degree program?										
		Yes	268	72.43	8	2.2	20	5.4	0.02	1.000	-0.01	0.902
		No	102	27.57	94	25.4	248	67.0				
		Do you believe that pharmacists should be allowed to administer influenza vaccines in their pharmacy premises?										
		Yes	268	72.43	53	14.3	166	44.9	3.05	0.097	0.09	0.081
		No	102	27.57	49	13.2	102	27.6				
6	Persons at high risk from influenza	**Age (years)**										
		< 30	31	8.378	240	64.9	21	5.7	0.13	0.837	-0.02	0.722
		≥ 30	339	91.62	99	26.8	10	2.7				
		Gender										
		Male	31	8.378	59	15.9	16	4.3	20.57	0.000	0.24	0.000
		Female	339	91.62	280	75.7	15	4.1				
		Academic degree										
		BSc in Pharmacy	231	62.43	128	34.6	207	55.9	0.62	0.469	-0.04	0.495
		Postgraduate (Pharm.D, MSc, or PhD)	139	37.57	11	3.0	24	6.5				

		Place from where the basic pharmacy degree was earned									
		Palestine	31	8.378	319	86.2	26	7.0	4.72	0.047	-0.11	0.030
		Other	339	91.62	20	5.4	5	1.4				
		Number of years in practice									
		< 3	31	8.378	125	33.8	16	4.3	2.62	0.123	0.08	0.106
		≥ 3	339	91.62	214	57.8	15	4.1				
		Approximate number of influenza vaccines sold per year									
		< 30	31	8.378	274	74.1	20	5.4	4.63	0.038	-0.11	0.031
		≥ 30	339	91.62	65	17.6	11	3.0				
		Have you had a course on influenza vaccines during your pharmacy degree program?									
		Yes	31	8.378	182	49.2	8	2.2	8.84	0.004	-0.16	0.003
		No	339	91.62	157	42.4	23	6.2				
		Have you had training on influenza vaccines during your pharmacy degree program?									
		Yes	31	8.378	23	6.2	5	1.4	3.55	0.072	0.10	0.060
		No	339	91.62	316	85.4	26	7.0				
		Do you believe that pharmacists should be allowed to administer influenza vaccines in their pharmacy premises?									
		Yes	31	8.378	195	52.7	24	6.5	4.66	0.036	0.11	0.031
		No	339	91.62	144	38.9	7	1.9				

4.4 Association between the sociodemographic and practice details of the early career community pharmacists and their overall knowledge items

Mann-Whitney *U* test showed that the overall knowledge scores were associated with being in practice for 3 or more years (*p* value = 0.000), selling 30 or more influenza vaccines in the last year (*p* value = 0.000), having a course on influenza during pharmacy program (*p* value = 0.018), having training on influenza during pharmacy program (*p* value = 0.041), and having positive attitudes towards allowing community pharmacists to administer vaccines in their pharmacy premises (*p* value = 0.001). Other variables were not significantly associated with the overall knowledge scores. Details are shown in Table 3.

Table 3: Association between the sociodemographic and practice details of the study participants (*n = 370*) and overall knowledge scores

Variable	n	%	Mean rank	P value
Age (years)				
< 30	261	70.5	179.0	0.060
≥ 30	109	29.5	201.0	
Gender				
Male	75	20.3	165.8	0.064
Female	295	79.7	190.5	
Academic degree				
BSc in Pharmacy	314	84.9	185.8	0.906
Postgraduate (Pharm.D, MSc, or PhD)	56	15.1	184.0	
Place from where the basic pharmacy degree was earned				
Palestine	345	93.2	184.1	0.327
Other	25	6.8	205.0	
Number of years in practice				
< 3	141	38.1	161.1	0.000
≥ 3	229	61.9	200.5	
Approximate number of influenza vaccines sold per year				
< 30	294	79.5	174.8	0.000
≥ 30	76	20.5	226.8	
Have you had a course on influenza vaccines during your pharmacy degree program?				
Yes	190	51.4	197.8	0.018
No	180	48.6	172.5	
Have you had training on influenza vaccines during your pharmacy degree program?				
Yes	28	7.6	223.6	0.041
No	342	92.4	182.4	
Do you believe that pharmacists should be allowed to administer influenza vaccines in their pharmacy premises?				
Yes	219	59.2	207.9	0.001
No	151	40.8	170.1	

To control for confounders and to check which sociodemographic and practice variables were predictors of higher knowledge, a multiple linear regression analysis was conducted. The model included the sociodemographic and practice variables with a p value of < 0.05 in the Mann-Whitney U test. These variables were number of years in practice, number of influenza vaccines sold in the last year, having a course on vaccines during the pharmacy degree program, having training on vaccines during the pharmacy degree program, and showing positive attitudes towards allowing pharmacists to administer vaccines in their pharmacy premises. Table 4 shows the results of the multiple linear regression analysis.

The analysis showed that having a training was no longer significantly associated. The rest of the variables were predictors of higher knowledge scores as shown in Table 4.

Table 4: Multiple linear analysis of association between sociodemographic and practice variables of the participant community pharmacists (*n = 370*) and their knowledge of influenza

Variable	Unstandardized Coefficients	SE	Standardized Coefficients	T	P value
Number of years in practice	4.74	1.93	0.13	2.46	0.014
Approximate number of influenza vaccines sold per year	6.16	2.36	0.14	2.61	0.009
had a course on influenza vaccines during pharmacy degree program	-4.73	1.83	-0.13	-2.58	0.010
had training on influenza vaccines during pharmacy degree program	-3.06	3.57	-0.04	-0.86	0.391
believed that pharmacists should be allowed to administer influenza vaccines in their pharmacy premises	5.18	1.89	0.14	2.73	0.007

In this model, the tolerance and variance inflation factor (VIF) were used to assess the multicollinearity. The tolerance values were in the range of 0.75 to 0.95. VIF values were in the range of 1.05 to 1.33.

4.5 Perceived role of early career community pharmacists in caring for patients with influenza and vaccinating the public against influenza

When the early career community pharmacists were asked on their perceived role in influenza, about 47% indicated that community pharmacists can play a role in providing prophylactic medications, about 39% indicated that community pharmacists can play a role in providing the patient with the treatment of influenza, and about 35% indicated that community pharmacists can play a role in providing the patients with over-the-counter medications. The detailed response distribution of the community pharmacists on their perceived roles are shown in Table 5.

Table 5: Distribution of responses of the early career community pharmacists on the perceived roles that community pharmacists can play in caring for patients with influenza and vaccinating the public against influenza

Item	n*	%*
Role of the pharmacist in influenza		
Administer vaccines	52	14.1
Conduct diagnostic tests	32	8.6
Provide prophylactic medications	172	46.5
Provide influenza treatment	144	38.9
Triage patients	11	3.0
Provide over-the-counter medications	128	34.6
If you do vaccinate patients against influenza in your pharmacy, what are the reasons?		
It complies with health recommendations	184	49.7
It is the right thing to do	40	10.8
I like the individual patient contact	54	14.6
It expands my scope of practice	60	16.2
It provides professional development for pharmacists	52	14.1
It increases business	42	11.4
It expands my skill set	54	14.6
It strengthens relationship with local physicians	6	1.6
I am required by my employer	12	3.2
If you do not vaccinate patients against influenza in your pharmacy, what are the reasons?		
I have liability concerns	184	49.7
I have concerns about the preservatives used in vaccines	45	12.2
I have concerns about safety of vaccines for patients	112	30.3
Corporate (employer) policy doesn't allow/encourage pharmacists to immunize	76	20.5
Difficulty obtaining physician order	41	11.1
Patients are not interested	18	4.9
Thimerosal is used as a preservative in vaccines and I am concerned that it might be harmful to be administered on pregnant women.		
True	201	54.3
False	129	34.9
I don't know	40	10.8

*As the participants could select more than one choice, the number does not sum to 370 and the percentages do not sum to 100%.

About 50% of the early career community pharmacists indicated that vaccinating clients against influenza complies with international recommendations as a reason for vaccinating their clients in the premises of their pharmacies. About 16% of the early career community pharmacists indicated that vaccinating clients in their pharmacies expanded their scope of practice, about 15% indicated that it expanded their skill sets, and about the same percentage liked individual patient contact. However, liability and safety concerns were the major reasons indicated for not vaccinating clients in community pharmacies (Table 5). In this study, about 54% of the early career community pharmacists were concerned giving vaccines containing thimerosal to pregnant women.

Chapter Five
Discussion

Chapter Five

Discussion

Knowledge and concern regarding influenza has dramatically increased in recent years partly by the increasing media attention, hospitalizations due to recent pandemics, notably of the 2009 H1N1 influenza virus, and the number of deaths caused by the wide spread of the influenza virus. Because community pharmacists continue to be the most accessible and trusted providers of healthcare providers in many societies, patients with influenza often visit community pharmacies seeking information, triaging, and in many cases treatment. Clients also often visit community pharmacies seeking vaccination against influenza. To cater to the needs of the clientele, community pharmacists should possess adequate knowledge of influenza. In this study, we evaluated for the first-time knowledge of early career community pharmacists on influenza, assessed the effects of various sociodemographic and practice variables on knowledge and determined the predictors of higher knowledge of influenza in the Palestinian pharmacy practice. We also assessed the perceived roles that early career community pharmacists can play in caring for patients with influenza and vaccinating their clientele as it has been argued that community pharmacists might impact the shape future epidemics and pandemics of influenza(VanLangen et al., 2012) .

The tool used in this study was developed and validated in other settings(Dolan et al., 2012; VanLangen et al., 2012). The internal

consistency of the items used and the stability of scores over a short time interval were reassessed in this study. The tool was shown to be reliable and the items were shown to be internally consistent. When evaluating knowledge, we thought it was necessary to include the “I don’t know” option because of the wide belief that admitting that a gap in knowledge exists is the first step to bridge it(Roberts et al., 2011; Roth et al., 2016).

The findings of this study highlight the existence of many knowledge gaps that need to be bridged with appropriately designed educational interventions. Similarly, this study identifies opportunities and calls for improvements in the perceived roles that community pharmacists can play in catering to the needs of patients with influenza as well as increasing accessibility to vaccines and immunization rates. Probably, one of the most eye-opening finding in this study is that a large percentage (90.5%) of the community pharmacists believed in myths regarding the capability of some vaccination formulations to cause influenza. This myth should urgently be dispelled because physicians and community pharmacists are trusted healthcare providers who, like teachers, could influence patients’ immunization decisions (Abdullahi et al., 2014; Kaya et al., 2017; Masika, Ogembo, Chabeda, Wamai, & Mugo, 2015; McKee & Bohannon, 2016). This was concordant with the percentage of the early career pharmacists who indicated that the role of pharmacists in influenza was to administer vaccines (only about 14%) and the percentage of early career pharmacists who had liability concerns (about 50%) and those who had safety concerns of the vaccines themselves (about 30%) and the preservatives used in the vaccines

(about 12%). In this study, about 55% of the participants were concerned with using vaccines containing thimerosal as a preservative in pregnant women. Conflicting reports on the safety of this preservative in pregnancy and in children were published. While some studies reported that even at low concentrations of thimerosal were thought to be associated with neurodevelopmental abnormalities (Dórea, 2017a, 2017b), other researchers ruled out any link between thimerosal and autism or any other neurodevelopmental abnormalities(Spencer, TRONDSEN PAWLOWSKI, & Thomas, 2017). Needless to say that vaccines are associated with potential risks, however, their potential benefits far outweigh their potential risks and today vaccines are considered one of the most successful advances of medicine in modern times (Spencer et al., 2017). Community pharmacists are thought to be advocates of immunization as pharmacists advising their clientele to receive influenza vaccines was long shown to bring health as well as economic r elated benefits(Grabenstein, Hartzema, Guess, Johnston, & Rittenhouse, 1992; Newall, Scuffham, Kelly, Harsley, & MacIntyre, 2008) . These benefits include avoiding the death of many vulnerable victims, averting many hospitalizations, and bringing huge economic savings. Probably, this shortcoming can be overcome with appropriately designed educational interventions. It is thought that community pharmacists need to be educated in order to counsel their clientele on the benefits of immunization against influenza. Queeno showed that counseling inpatients by pharmacists increased the acceptance rate of pneumococcal and influenza vaccination (Queeno, 2017). Similarly, Buchan et al showed that the rate of

influenza vaccine uptake was higher in Canada under jurisdictions that allowed pharmacists to administer influenza vaccine(Buchan et al., 2017). In a recent review, Burson et al found that pharmacy-based immunization services were facilitated in part by changes in state regulations and jurisdictions as well as by educational and training programs that enabled pharmacists to directly administer vaccines to their clientele (Burson et al., 2016). The studies reviewed by Burson et al showed that the services offered were highly acceptable to both patients and pharmacists and were able to enhance accessibility to vaccines and immunization rates. In this study, this was supported as the pharmacists who sold more vaccines during the last year and those who believed th at they should be allowed to vaccinate their clientele performed better in the knowledge test compared to their counterparts who thought pharmacists should not be allowed to vaccinate clientele. Probably, increasing exposure to people with influenza and clientele seeking vaccination against influenza increased knowledge of pharmacists on influenza. This is in line with a previous study conducted in Palestine in which pharmacists had more knowledge of women's issues in epilepsy when they interacted with a larger number of patients with epilepsy (Shawahna et al., 2017a). Similarly, pharmacists who have had a course and training on vaccines during their pharmacy school program performed better than their peers who did not have a course/training on vaccines. Again, this was in line with another study conducted in Palestine in which pharmacists had more knowledge on pharmacotherapy of epilepsy when they had had training on epilepsy and antiepileptic drugs during their pharmacy degree

program (Shawahna et al., 2017a). About 87% of the community pharmacists did not know that antiviral therapy could be initiated within 48 h of symptoms onset. Probably, it is widely thought that the majority of individuals infected with influenza exhibit uncomplicated, self-limited, and/or acute febrile respiratory symptoms that do not even require treatment (Harper, Bradley et al. 2009). In this study, the early career community pharmacists indicated that their role was to provide prophylactic medications (about 47%), provide treatment (about 39%), and provide over-the-counter medications (about 35%). However, many antivirals were shown to be safe and effective in treating influenza including oseltamivir(Nicholson et al., 2000). About 72% of the pharmacists did not know that oseltamivir was associated with rhinorrhea. Screening for side effects and altering patients and/or their caring physicians is one of the main roles that community pharmacists can play in modern healthcare delivery systems. Inability to do so might jeopardize healthcare delivery as patients might stop or lose faith in treatment.

The findings of this study should be interpreted taking into consideration a number of limitations. First, this study was conducted in a cross-sectional observational design. In this study, we did not intervene with an educational/training tool to investigate if it can improve knowledge of the pharmacists on influenza. Second, pharmacists in Palestine are not allowed to administer vaccines to clientele in the premises of their pharmacies. Pharmacists would probably have answered differently, especially, on the questions related to their perceived role in case they were legally allowed to

administer vaccines. Third, the number of items used in this tool was limited. However, the tool used was shown to be reliable and internally consistent. Fourth, the items used to test knowledge were not case-based. Performance of the pharmacists might have been different if questions were based on practice cases.

5.1 Conclusion

In conclusion, community pharmacists are in key position to cater to the needs of patients with influenza and clientele seeking immunization against influenza. The findings of this study showed the existence of many gaps in knowledge related to influenza among early career community pharmacists. These knowledge gaps might be bridged by specifically designed educational interventions.

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Appendix

Appendix (1) Data collection form (Questionnaire)

1. Your age in years:
2. Gender:☐Male ☐Female
3. Academic degrees: ☐ BSc Pharmacy☐Phar.D. ☐MSc Pharmacy ☐PhD Pharmacy ☐Other, (please specify) …….
4. Country from where the basic pharmacy degree was obtained?
5. Number of years in practice? …….....
6. Approximate number of influenza vaccines you sold the last year? ……..
7. Have you had a course on vaccines in general during your YES No□ pharmacy degree program?
8. Have you had a training on vaccines during your pharmacy degree program? □ Yes□ No
9. Do you think that pharmacists should be allowed to administer vaccines in their pharmacy premises? □ Yes □ No

1. **The time of incubation in days** :

A. 1-4
B. 5-10
C. 11-14
D. 15-21
E. I don’t know

2. Period considered contagious:

A. Point of contact with infected person until fever subsides

B. One day before symptom development to 5 days after onset

C. One day before symptom development to 2 weeks after onset

D. At time of symptom onset until resolution of symptoms

E. As long as cough is present

F. I don’t know

3. Vaccination formulations capable of causing influenza:

A. IM

B. IV

C. Intranasal

D. Oral

E. Rectal

F. None of the above

4. Initiation of antiviral therapy:

A. Before exposure

B. Within 24 h of symptom onset

C. Within 48 h of symptom onset

D. Within 72 h of symptom onset

E. No set time period; administer as long as the patient is sick

F. There are no medications effective in treating influenza

G. I dont know

5. Oseltamivir is commonly associated with:

A. Rhinorrhea (running nose)

B. Constipation

C. Increased risk of thrombosis

D. I don’t know

6. Persons at high risk from influenza include :

A. Adults 65 years and older

B. Children younger than 5 years old

C. Pregnant women

D. All of the above

E. None of the above

7. Role of the pharmacist in influenza: (select all that apply)

A. Administer vaccine

B. Conduct diagnostic tests

C. Provide prophylactic medications

D. Provide influenza treatment

E. Triage patient

F. Provide over-the-counter medication

G. I don’t know .

8. In case you vaccinate patients against influenza in your pharmacy, what are the reasons? (select all that apply)

A. It complies with health guidelines

B. It is the right thing to do

C. I like the individual patient contact

D. It expands my scope of practice

E. It provides professional development for pharmacists

F. It increases business

G. It expands my skill set

H. It strengthens relationship with local physicians

I. I am required by my employer

9. In case you DO NOT vaccinate patients against influenza in your pharmacy, what are the reasons? (select all that apply)

A. I have liability concerns

B. I have concerns about the preservatives used in vaccines

C. I have concerns about safety of vaccines for patients

D. Corporate (employer) policy doesn’t allow/encourage pharmacists to immunize

E. Difficulty obtaining physician order

F. Patients are not interested

10. Thimerosal is used as a preservative in vaccines and I am concerned that it might be harmful to be administered on pregnant women.

A. True

B. False

C. I don’t know

Appendix 2 IRB Approval

An-Najah
National University
Faculty of medicine
&Health Sciences
Department of Graduate
Studies

جامعة النجاح
الوطنية
كلية الطب وعلوم الصحة
دائرة الدراسات العليا

IRB Approval Letter

Study Title: **Evaluation of knowledge of pharmacists on influenza**

Submitted by:
Dr.Ramzi Shawahneh
Date Reviewed:
21/March/2017
Date Approved:
26/March/2017
Your Study titled: "**Evaluation of knowledge of pharmacists on influenza:**" with archived number (14) March was reviewed by An-Najah National University IRB committee and was approved on 26/March/2017.

Hassan Fitian, MD
IRB Committee Chairman
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جامعة النجاح الوطنية
كلية الدراسات العليا

معرفة الصيادلة الفلسطينيين وسلوكهم وممارستهم للأنفلونزا: توسيع نطاق الممارسة من خلال التطعيم

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قدمت هذه الاطروحة استكمالا لمتطلبات الحصول على درجة الماجستير في الصيدلة السريرية بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين.
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الملخص

الانفلونزا هو مرض فيروسي شديد العدوى ويسبب الكثير من الوفيات وخاصة كبار السن والأطفال والحوامل والمرضى المصابين بالأمراض المزمنة حيث تقدر عدد الوفيات حسب احصائيات منظمة الصحة العالمية حوالي 250000–500000 سنويا، وزاد الاهتمام بالإنفلونزا بشكل كبير في السنوات الأخيرة بسبب الازدياد الكبير في عدد الوفيات وظهور الأوبئة لا سيما فيروس الانفلونزا أ. يتم الوقاية من الانفلونزا باستخدام لقاحات الانفلونزا، هذه اللقاحات يمكن ان تتواجد بشكل عام في الصيدليات. ان صيادلة المجتمع ما زالوا هم أكثر مقدمي خدمات الرعاية الصحية وذلك لسهولة وصول المرضى وثقتهم الكبيرة في الصيادلة.

هذه الدراسة عبارة عن دراسة وصفية تم تطبيقها على صيادلة المجتمع في الصيدليات العامة في مناطق مختلفة من الضفة الغربية في فلسطين حيث تم مشاركة 370 صيدلي في الدراسة اغلبهم من الصيادلة الخريجين حديثا، في فلسطين يوجد حوالي 1100 صيدلية حيث توظف اغلبها صيدلي واحد ع الأقل من الخريجين حديثا والذي بلغ عدد المشاركين منهم في الدراسة حوالي 285 صيدلي. وتم استخدام استبيان مكون من 12 سؤال يمكن للمشاركين في الدراسة اكمال الاستبيان خلال 15 دقيقة. تم تحليل البيانات بواسطة البرنامج الاحصائي spss.

ارتبطت نسبة معرفة الصيادلة بلقاحات الانفلونزا مع العمر (p value = 0.066) , الجنس (p value = 0.064),عدد سنوات الخبرة (p value = 0.000),عدد اللقاحات التي صرفت خلال العام الماضي (p value = 0.000),تدريب /دورات بإعطاء لقاحات الانفلونزا خلال دراسة علم

الصيدلة (p value = 0.018/0.041) ,المواقف الإيجابية تجاه السماح للصيادلة بإعطاء اللقاح داخل مبنى صيدلياتهم (p value = 0.001).

عندما تم سؤال الصيادلة عن فترة حضانة المرض لفيروس الانفلونزا 38% من الصيادلة اجابوا إجابة صحيحة. وعند السؤال عن الفترة التي تحدث فيها العدوى 40% الذين اجابوا إجابة صحيحة .9.5% فقط من الصيادلة من عرفوا انه لا يوجد شكل صيدلاني للقاح الانفلونزا يمكن ان يسبب الانفلونزا. و13% فقط من عرفوا انه يجب إعطاء المضاد الفيروسي خلال 48 ساعة من ظهور الاعراض.

أظهرت نتائج الدراسة وجود العديد من الفجوات المعرفية لدى الصيادلة والتي يجب سدها بالتدخلات التعليمية بشكل مناسب وتبين الدراسة الدعوات الى ادخال تحسينات وتوسيع دور الصيادلة في المجتمع من خلال إعطاء لقاح الانفلونزا.