

CAPITAL UNIVERSITY OF SCIENCE AND  
TECHNOLOGY, ISLAMABAD



**Community Pharmacists  
Workforces Willingness and  
Readiness to Deliver Vaccination  
Services: A Mixed Method Study  
from Pakistan**

by

**Hyder Abbas**

A thesis submitted in partial fulfillment for the  
degree of Master of Philosophy

in the

**Faculty of Pharmacy**

**Department of Pharmacy Practice**

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## CERTIFICATE OF APPROVAL

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## *Abstract*

Vaccination is a cornerstone of public health and plays a critical role in preventing vaccine-preventable diseases. In many countries, community pharmacists contribute to vaccination delivery; however, their role in immunization services remains limited in Pakistan. This study aimed to assess community pharmacists' willingness and readiness to deliver vaccination services and to identify key factors influencing implementation in community pharmacy settings. A convergent mixed-methods cross-sectional study was conducted using the Consolidated Framework for Implementation Research (CFIR). The quantitative phase involved a structured questionnaire administered to 400 licensed community pharmacists practicing in Islamabad, Rawalpindi, Peshawar, and Kohat. Data were analyzed using descriptive statistics and non-parametric tests, including chi-square, Mann–Whitney U, and Kruskal–Wallis tests. The qualitative phase comprised semi-structured interviews with 20 community pharmacists, and thematic analysis was performed to explore perceived barriers and facilitators. Quantitative findings showed that most community pharmacists demonstrated positive attitudes toward pharmacy-based vaccination services. A large proportion supported their role in vaccination education, referral, and patient counseling, and expressed willingness to provide vaccination services. However, readiness was influenced by several organizational and contextual factors, including availability of private consultation rooms, staffing levels, workload, patient volume, perceived infection risk, and expected government support. Significant associations were observed between readiness indicators and pharmacy location, number of staff, and daily patient load. Qualitative findings supported these results and further highlighted barriers such as lack of legal authorization, insufficient training, infrastructure limitations, workload pressure, and concerns regarding management of adverse events, while facilitators included professional motivation, accessibility of community pharmacies, and expectations of regulatory and financial support.

In conclusion, community pharmacists in Pakistan are willing and partially ready to deliver vaccination services; however, effective implementation requires supportive policies, structured training programs, infrastructure development, and clear

regulatory frameworks. Integrating community pharmacies into national immunization strategies may improve vaccine accessibility and strengthen public health outcomes.

**Keywords:** Community pharmacists, Vaccination services, Willingness, Readiness, CFIR framework, Mixed-methods study, Community pharmacy, Pakistan

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# Abbreviations

<b>EPI</b>	Expanded Program on Immunization
<b>HPV</b>	Human Papilloma Virus
<b>IPV</b>	Poliovirus Vaccine
<b>IQR</b>	Interquartile Range
<b>LMICs</b>	low- and Middle-Income Countries
<b>MMR</b>	Measles, Mumps, and Rubella
<b>mRNA</b>	Messenger RNA
<b>PCV</b>	Pneumococcal Conjugate Vaccine
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>VPD</b>	Vaccine Preventable Diseases

# Chapter 1

## Introduction

Vaccination represents one of the most remarkable achievements in public health history, fundamentally transforming disease prevention strategies and contributing to significant reductions in morbidity and mortality worldwide [1]. The concept of immunization dates back centuries, with early practices of variolation evolving into Edward Jenner's groundbreaking smallpox vaccine in 1796, which laid the foundation for modern vaccinology [2]. Today, vaccines constitute a cornerstone of preventive healthcare, offering protection against numerous infectious diseases that once caused devastating epidemics across populations. The mechanism of action involves introducing antigens that stimulate the immune system to produce antibodies, thereby creating immunological memory without causing the actual disease [3]. This preventive approach has proven substantially more cost-effective than treating diseases after they occur, making vaccination programs essential components of national health strategies globally.

The development and utilization of vaccines have undergone tremendous evolution over the past two centuries. Modern vaccines can be classified into several distinct categories based on their composition and mechanism of action [4]. Live attenuated vaccines contain weakened forms of the pathogen that can replicate but do not cause disease in healthy individuals, exemplified by vaccines for measles, mumps, and rubella [5]. Inactivated vaccines utilize killed pathogens that cannot

replicate but still trigger immune responses, such as the injectable polio vaccine and influenza vaccines [6]. Subunit, recombinant, and conjugate vaccines incorporate specific pieces of the pathogen, including proteins or sugars, to stimulate immunity without using whole pathogens, as seen in hepatitis B and human papillomavirus vaccines [7].

Toxoid vaccines contain inactivated toxins produced by bacteria, protecting against diseases like tetanus and diphtheria [4]. More recently, innovative platforms such as messenger RNA vaccines have emerged, representing a paradigm shift in vaccine technology by instructing cells to produce antigens that trigger immune responses [8]. Each vaccine type offers distinct advantages regarding safety profiles, duration of immunity, and suitability for different populations.

The benefits of vaccination extend far beyond individual protection, creating multilayered advantages for communities and healthcare systems. At the individual level, vaccines significantly reduce the risk of contracting potentially life-threatening diseases, preventing serious complications, hospitalizations, and deaths [9].

The concept of herd immunity emerges when a substantial portion of the population becomes immune, indirectly protecting vulnerable individuals who cannot be vaccinated due to medical contraindications or compromised immune systems [10].

Economic benefits are considerable, as vaccination programs save healthcare systems billions of dollars annually by preventing disease outbreaks and reducing treatment costs [11]. Furthermore, vaccines contribute to reducing antimicrobial resistance by preventing infections that would otherwise require antibiotic treatment, addressing a critical global health challenge [12].

The social benefits include enhanced productivity, reduced school and work absenteeism, and improved quality of life across communities [13]. Historical evidence demonstrates that comprehensive vaccination programs have successfully eradicated smallpox globally and brought diseases like polio to the brink of elimination in most countries [14].

Examining vaccination implementation on a global scale reveals substantial progress alongside persistent challenges and disparities. The World Health Organization's Expanded Program on Immunization (EPI), launched in 1974, has achieved remarkable success in increasing vaccine coverage worldwide, with global vaccination rates for diphtheria-tetanus-pertussis reaching approximately 86 percent in recent years [15]. However, significant geographical variations exist, with high-income countries generally achieving higher coverage rates compared to low and middle-income nations [16].

The COVID-19 pandemic underscored both the potential and limitations of global vaccination efforts, demonstrating unprecedented scientific collaboration in vaccine development while simultaneously exposing profound inequities in vaccine access and distribution [17]. Regional initiatives such as the European Union's vaccination strategies and the United States' Vaccines for Children program exemplify comprehensive approaches to ensuring vaccine accessibility [18].

International organizations, including Gavi, the Vaccine Alliance, play crucial roles in supporting immunization programs in resource-limited settings, facilitating access to life-saving vaccines for millions of children [19]. Despite these efforts, vaccine hesitancy has emerged as a significant global challenge, recognized by the World Health Organization as one of the top ten threats to global health [20].

In Pakistan, vaccination programs face a complex landscape characterized by both progress and substantial challenges. The country's EPI was established in 1978, aiming to protect children against major vaccine-preventable diseases [21]. Pakistan has made notable strides in improving immunization coverage over the past decades, yet coverage rates remain suboptimal compared to regional neighbors and global targets [22]. According to recent national health surveys, approximately 66 percent of children aged 12 to 23 months are fully immunized, indicating that one-third of Pakistani children remain inadequately protected against vaccine-preventable diseases [23]. Geographical disparities are pronounced, with rural areas and specific provinces experiencing significantly lower coverage rates than urban centers [24]. Polio eradication efforts in Pakistan have garnered international attention, as the country remains one of the few endemic nations despite

intensive immunization campaigns [25]. Factors contributing to suboptimal vaccination coverage include limited access to healthcare facilities, sociocultural barriers, misconceptions about vaccine safety, security challenges in certain regions, and inadequate cold chain infrastructure [26]. The COVID-19 pandemic further strained the vaccination system, causing disruptions in routine immunization services and highlighting the fragility of existing healthcare delivery mechanisms [27].

The need for strengthening vaccination services in Pakistan cannot be overstated given the persistent burden of vaccine-preventable diseases. Pneumonia and diarrheal diseases remain leading causes of childhood mortality in Pakistan, with many cases attributable to inadequate immunization coverage [28]. The country experiences periodic outbreaks of measles, pertussis, and other vaccine-preventable diseases, causing unnecessary suffering and economic burden on families and the healthcare system [29].

Pakistan's high population growth rate, estimated at approximately 2 percent annually, creates continuous demand for expanded vaccination services to reach growing numbers of infants and children [30]. Maternal and neonatal tetanus continue to pose risks in areas with low coverage of tetanus toxoid vaccination among pregnant women [31].

The re-emergence of certain diseases due to immunity gaps underscores the critical importance of maintaining high vaccination coverage across all demographics [32]. Addressing these challenges requires innovative approaches to expand vaccination service delivery points and engage diverse healthcare providers, including community pharmacists who are strategically positioned to enhance vaccine accessibility [33].

Pakistan's immunization schedule encompasses multiple vaccines administered from birth through childhood, with recent expansions to include newer vaccines. The national program includes vaccines against tuberculosis, hepatitis B, polio, diphtheria, pertussis, tetanus, *Haemophilus influenzae* type b, pneumococcal disease, and measles [34]. The introduction of the pneumococcal conjugate vaccine in 2013 represented a significant milestone in protecting children against pneumonia

and meningitis [35]. Rotavirus vaccine was introduced in select districts through phased implementation to combat severe diarrheal diseases [36].

Seasonal influenza vaccination remains limited primarily to private sector provision, with minimal public sector involvement [37]. Human papillomavirus vaccine, though available, has not been integrated into the national immunization program, limiting cervical cancer prevention efforts [38].

The COVID-19 vaccination campaign in Pakistan mobilized unprecedented resources and infrastructure, demonstrating the country's capacity for large-scale immunization initiatives when adequate political commitment and international support are available [39].

However, vaccine supply chain challenges, storage requirements, and ensuring equitable distribution across diverse geographical areas remain persistent obstacles [40]. Numerous barriers impede the effective delivery of vaccination services through community pharmacies in Pakistan, despite the potential benefits of such an approach. Regulatory constraints constitute a primary obstacle, as current legislation does not explicitly authorize pharmacists to administer vaccines, creating legal ambiguities and limiting professional autonomy [41].

The absence of standardized training programs for pharmacists in immunization techniques, vaccine storage, anaphylaxis management, and documentation practices leaves many practitioners unprepared to assume vaccination responsibilities [42].

Infrastructure limitations in many community pharmacies, including inadequate cold chain facilities, insufficient private consultation spaces, and lack of emergency equipment for managing adverse reactions, pose practical challenges [43].

Financial barriers to the expansion of vaccination services include unclear reimbursement mechanisms, high initial investment costs for infrastructure and workforce training, and uncertainty regarding the long-term economic sustainability of service delivery in resource-constrained settings [44]. Public perception and trust represent additional challenges, as patients may question pharmacists' competence

in vaccination or prefer traditional healthcare providers for immunization services [45].

## 1.1 Research Justification

The proposed study addresses critical knowledge gaps regarding community pharmacists' willingness and readiness to deliver vaccination services in Pakistan, a topic of substantial public health significance given persistent immunization coverage challenges. Despite the potential of community pharmacies to expand vaccination access, no comprehensive mixed-methods investigation has examined Pakistani pharmacists' perspectives, preparedness, and perceived barriers to implementing vaccination services.

This research will generate essential evidence to inform policy decisions regarding regulatory frameworks, training requirements, and implementation strategies for pharmacy-based vaccination programs. Understanding factors influencing pharmacists' willingness to provide vaccination services will enable targeted interventions to enhance readiness and facilitate successful program implementation. The mixed-methods approach will provide both quantitative assessment of readiness levels across representative samples and rich qualitative insights into contextual factors, lived experiences, and nuanced perspectives that shape pharmacists' attitudes toward vaccination service delivery. Findings will contribute to the limited body of literature on pharmacy practice expansion in low and middle-income countries, with potential applicability beyond Pakistan to similar healthcare contexts. Given Pakistan's status as a polio-endemic country with suboptimal routine immunization coverage, innovative approaches leveraging all available healthcare resources, including community pharmacies, are urgently needed. This research directly supports national health priorities by exploring feasible strategies to strengthen immunization systems and progress toward universal health coverage goals. The study's outcomes will benefit multiple stakeholders, including policymakers designing healthcare regulations, educators developing pharmacist training curricula, professional organizations advocating for expanded practice roles, and

ultimately, the Pakistani population who would gain improved access to life-saving vaccination services through community pharmacies.

## **1.2 Aim and Objectives**

### **1.2.1 Aim**

The aim of this study was to assess the willingness and readiness of community pharmacists in Pakistan to deliver vaccination services and to identify key facilitators and barriers influencing the implementation of pharmacist deliver vaccination services.

### **1.2.2 Objectives**

- i. To assess the willingness of community pharmacists to deliver vaccination services, including vaccine administration, patient education, and referral roles, in community pharmacy settings.
- ii. To evaluate the readiness of community pharmacies in terms of infrastructure, staffing, workload, safety measures, and facility requirements for implementing vaccination services.
- iii. To examine community pharmacists' knowledge, awareness, beliefs, and self-efficacy regarding vaccination and the EPI.
- iv. To identify key facilitators and barriers influencing the implementation of community pharmacy based vaccination services, based on organizational, intervention related, and individual characteristics.

# Chapter 2

## Literature Review

### 2.1 Vaccine

A vaccine is a biological preparation that improves immunity to a particular disease [46]. A vaccine typically contains an agent that resembles a disease-causing microorganism and is often made from weakened or killed forms of the microbe, its toxins, or one of its surface proteins [47].

A vaccine is a medical preparation designed to stimulate the immune system to develop protection against specific infectious diseases without causing the illness itself [48]. Vaccines typically contain weakened or inactivated forms of pathogens, their toxins, or specific protein components that trigger an immune response. This immune response leads to the creation of immunological memory, which enables the body to recognize and fight the actual pathogen upon future exposure [49][50].

Vaccine is a cornerstone of public health, effectively preventing diseases such as measles, polio, tuberculosis, and influenza, and has contributed to the near-eradication of some infectious diseases globally [50]. Furthermore, vaccines not only protect vaccinated individuals but also contribute to herd immunity, reducing disease transmission within communities and protecting those who cannot be vaccinated [51].

## 2.2 Benefits of Vaccine

Vaccines provide numerous benefits that extend beyond individual health, enhancing public safety, economic stability, and the well-being of communities [71]. Understanding these benefits is fundamental to emphasizing the importance of vaccination in public health strategies [72].

### 2.2.1 Disease Prevention and Control

Vaccines are proven to be highly effective in preventing infectious diseases [73]. By reducing the incidence of outbreaks for diseases such as measles, polio, and hepatitis, vaccines contribute significantly to global public health [74]. They save millions of lives annually by preventing avoidable illnesses and have been credited for the reduction and, in some cases, eradication of diseases like smallpox [75].

### 2.2.2 Economic Advantages

Vaccination programs can significantly reduce healthcare costs associated with disease treatment [76]. The economic benefits include direct cost savings from prevented healthcare expenses and indirect benefits from increased workforce productivity due to a healthier population [77]. For example, a recent analysis showed that vaccination against herpes zoster is cost-effective for older adults, highlighting that even with significant upfront costs, the long-term benefits outweigh these expenses, particularly for preventive health measures [78].

### 2.2.3 Herd Immunity

Widespread vaccination promotes herd immunity, protecting those who cannot be vaccinated due to medical conditions. This is essential for vulnerable populations,

such as infants, the elderly, and immunocompromised individuals [79]. Achieving high vaccination coverage shields entire communities from outbreaks, thereby stabilizing health systems [80].

#### **2.2.4 Public Health Savings**

Vaccination programs lead to substantial public health savings by reducing the number of hospitalizations and deaths due to vaccine-preventable diseases. For instance, routine immunization against diseases like influenza is crucial during flu season, as these vaccines can prevent significant morbidity and mortality [81]. A concerted vaccine rollout can alleviate pressure on healthcare services, especially during public health emergencies, such as pandemics [82].

#### **2.2.5 Enhanced Accessibility through Community Pharmacists**

The role of community pharmacists is pivotal in increasing vaccine accessibility [83]. As accessible healthcare providers, pharmacists can effectively reach underserved populations with essential vaccinations [84]. This facilitation helps enhance vaccination rates and promote health equity, particularly in communities where access to physicians may be limited [85]. The integration of vaccination services within pharmacies provides a convenient alternative for individuals who might otherwise forego vaccinations [86].

#### **2.2.6 Behavioral Influence and Public Trust**

The engagement of community pharmacists in vaccination efforts can bolster public trust in vaccination campaigns [87]. When pharmacists actively participate in promoting vaccines, they can address misconceptions and fears, which is critical in enhancing vaccine acceptance and uptake in the community [88].

### **2.2.7 Technological Advances and Efficacy**

Modern vaccines, such as mRNA vaccines, demonstrate remarkable efficacy in generating robust immune responses [89]. These technologies allow for rapid development and adaptation of vaccines to combat emerging infectious threats, as seen with COVID-19 [90].

### **2.2.8 Long-term Health Benefits**

Vaccination not only prevents immediate health issues but also provides long-term health benefits. For instance, the HPV vaccine significantly reduces the risk of cervical cancer, which has substantial implications for women's health and reduced healthcare costs associated with cancer treatment [75].

## **2.3 Key Player in Vaccine Framework Program**

National immunization programs play a crucial role in preventing infectious diseases and improving population health outcomes [55]. In many countries, immunization services are implemented through structured national Immunization Program initiatives such as the Expanded Programme on Immunization [72] which aims to ensure equitable access to essential vaccines for children and adults. These programs are responsible for vaccine procurement, distribution, monitoring of immunization coverage, and implementation of vaccination strategies at the national level [73]. Effective national immunization programs contribute significantly to reducing morbidity and mortality associated with vaccine-preventable diseases [74].

Government bodies play a central role in supporting and regulating national vaccination programs. In Pakistan, immunization initiatives are overseen by the Ministry of National Health Services, Regulations and Coordination, which is responsible for developing immunization policies, coordinating vaccination campaigns, and ensuring regulatory compliance. Government support is essential for maintaining vaccine supply chains, strengthening healthcare infrastructure, and

improving vaccination coverage across different regions [19]. Regulatory authorities also ensure the safety, quality, and effectiveness of vaccines before they are distributed to the population [75].

In addition to national authorities, international organizations provide technical, financial, and strategic support to strengthen immunization programs worldwide [76]. Organizations such as the World Health Organization, United Nations Children's Fund, and Gavi, the Vaccine Alliance collaborate with national governments to improve vaccine access, strengthen immunization systems, and increase vaccination coverage in low- and middle-income countries [19, 77, 78].

Healthcare professionals are also essential stakeholders in vaccination programs [79]. Physicians, nurses, and other frontline healthcare workers play a primary role in administering vaccines and educating communities about the benefits of immunization [80].

In recent years, community pharmacists have also been recognized as accessible healthcare providers who can support vaccination services and improve vaccine uptake through patient education and immunization services in community settings [42, 81].

## 2.4 Role of Pharmacists in Vaccination

Pharmacists have emerged as vital contributors to the global healthcare workforce, especially in the area of preventive services such as vaccination [82]. Their evolving role is a response to increasing global health challenges, including pandemics, vaccine hesitancy, and inequitable access to immunization services [83]. Given their extensive reach, strong community presence, and professional training, pharmacists are ideally positioned to contribute to national and global immunization goals [84].

Across many high income countries, the authorization of pharmacists to administer vaccines has been linked to improved vaccine coverage, cost effectiveness, and

enhanced accessibility, particularly in underserved populations [85]. Studies from Canada and Australia, for example, have demonstrated that pharmacist administered vaccines lead to increased immunization rates among adults, particularly for influenza and pneumococcal vaccines [86, 87]. In these settings, pharmacists are often seen not only as immunizers but also as trusted educators, playing a key role in addressing vaccine myths, misinformation, and patient concerns [88].

In LMICs, however, the formal integration of pharmacists into immunization strategies remains limited. Regulatory frameworks in these regions often restrict pharmacists from administering injections or participating in vaccination programs [67, 89].

There is a growing recognition that pharmacist led immunization could address key public health challenges, particularly in countries with high rural populations and weak health system infrastructure [90].

Health systems in LMICs such as Pakistan often face systemic barriers shortages of healthcare workers, under resourced primary care, and logistical difficulties in rural or peri urban areas that limit vaccine accessibility [91, 92].

Community pharmacists, due to their broad distribution and frequent contact with patients, represent an underutilized yet highly promising resource for expanding immunization programs [65, 85, 93].

Their inclusion could significantly improve vaccine delivery, particularly in areas where public health infrastructure is insufficient [94].

## 2.5 Role of Community Pharmacists

Over the past two decades, the role of community pharmacists has expanded considerably, particularly in the delivery of public health services such as vaccination [95]. Traditionally seen as dispensers of medication, pharmacists are now increasingly being recognized as accessible, skilled healthcare professionals capable of contributing to disease prevention and health promotion [96]. Their widespread

presence, extended working hours, and frequent patient interactions position them uniquely to support vaccination programs across a variety of healthcare systems [97, 98].

In addition to vaccine administration, pharmacists serve several other critical functions within immunization programs. These include pre-vaccination screening to assess contraindications and eligibility, counseling and educating patients on vaccine safety and efficacy, managing cold chain logistics to ensure proper vaccine storage, and contributing to pharmacovigilance by reporting adverse events following immunization [68, 99]. During public health emergencies such as the COVID-19 pandemic, pharmacists played a central role in mass vaccination campaigns, community education, and vaccine confidence-building initiatives [100].

### **2.5.1 Willingness of Community Pharmacists to Provide Vaccination Services**

Pharmacists are increasingly recognized as important contributors to vaccination services due to their accessibility, medication expertise, and frequent interaction with patients [101]. In many countries, pharmacist-led vaccination programs have been implemented to improve immunization coverage and enhance public access to vaccines [102]. Studies have shown that pharmacists are generally willing to expand their professional roles to include vaccine administration, particularly when appropriate training, regulatory support, and infrastructure are available [103].

Research conducted in different healthcare settings indicates that pharmacists demonstrate positive attitudes toward providing immunization services and acknowledge their potential role in improving vaccination coverage [104]. For instance, a systematic review reported that community pharmacies serve as convenient and accessible vaccination sites, which can significantly increase vaccine uptake among adult populations [81]. Similarly, another study found that pharmacist involvement in immunization services improved patient accessibility and strengthened healthcare delivery systems [105].

However, pharmacists' willingness to provide vaccination services may be influenced by several factors, including training opportunities, workload, regulatory authorization, and availability of appropriate facilities for vaccine storage and administration. Lack of formal training in vaccine administration and insufficient policy support have been identified as potential barriers affecting pharmacists' readiness and willingness to participate in immunization programs [106].

Despite these challenges, evidence suggests that integrating pharmacists into vaccination programs can significantly improve vaccination coverage and strengthen public health outcomes [68].

Pharmacists' willingness to participate in vaccination services highlights their potential role in supporting national immunization programs, particularly in countries where healthcare resources and vaccination infrastructure are limited [107].

### **2.5.2 Community Pharmacists Readiness to Deliver Vaccination Services**

The readiness of pharmacists to deliver vaccination services is an important factor in the successful implementation of pharmacy-based immunization programs. Readiness refers to the availability of trained personnel, adequate infrastructure, organizational support, and the confidence of pharmacists to administer vaccines safely and effectively [108].

Studies have demonstrated that when pharmacists receive appropriate training and institutional support, they are capable of delivering vaccination services efficiently and contributing to improved immunization coverage [109, 110].

Community pharmacists are often highly accessible healthcare professionals, making them well positioned to support vaccination programs. Evidence suggests that pharmacy-based vaccination services can increase vaccine accessibility, reduce patient waiting times, and improve immunization uptake, particularly in underserved communities [81].

However, pharmacist readiness may be influenced by several factors, including training in vaccine administration, availability of cold-chain facilities, regulatory authorization, and organizational infrastructure within community pharmacies. Lack of standardized training programs, insufficient space for vaccine administration, and limited policy support have been identified as barriers that may affect pharmacists' readiness to provide immunization services [106].

### **2.5.3 Barriers to Vaccination Services in Community Pharmacies**

One of the primary barriers is the absence of a robust legal and regulatory framework supporting advanced pharmacy practice. Although the Drug Act of 1976 and Pharmacy Act of 1967 provide basic licensing requirements, they do not define or support the broader clinical or public health roles of community pharmacists [108]. Enforcement of these laws is also inconsistent, leading to a proliferation of unlicensed and non-qualified personnel operating community pharmacies, often referred to as medical stores [109].

Additionally, there is no national policy recognizing pharmacists as immunization providers or essential public health personnel in Pakistan, limiting their formal involvement in preventive health services [110]. This restricts their ability to participate in preventive services such as vaccination, even though international models have demonstrated the effectiveness of pharmacist led immunization programs [111].

#### **2.5.3.1 Lack of Public Awareness and Recognition**

In Pakistan, the public perception of pharmacists is limited to that of dispensers or shopkeepers. A lack of awareness about pharmacists' qualifications and capabilities prevents the general population from seeking health advice or preventive

services from pharmacies [112]. This perception gap significantly reduces pharmacists' role in healthcare decision-making and undermines trust, which is essential for services such as vaccine counseling and administration [113].

### 2.5.3.2 Workforce and Staffing Challenges

Although pharmacy education in Pakistan has expanded with the introduction of the Doctor of Pharmacy (PharmD) program [114], the low deployment of qualified pharmacists in Pakistan's community settings is due to regulatory shortcomings [115] [116], poor public perception of the pharmacist's role, insufficient remuneration, and an academic curriculum that lacks practical training [117].

### 2.5.3.3 Fragmentation of Healthcare System

Pakistan's healthcare system is highly fragmented, with minimal coordination between physicians, pharmacists, nurses, and other healthcare providers [118]. In Pakistan, there are no established interprofessional collaboration models that formally integrate pharmacists into patient care teams or public health initiatives, resulting in their minimal involvement in coordinated clinical and preventive healthcare delivery [119].

### 2.5.3.4 Financial and Business Pressures

Community pharmacies in Pakistan often operate under significant commercial pressures, driven by financial survival rather than clinical service provision. Studies have shown that many community pharmacies focus primarily on the sale and supply of medicines rather than on patient-oriented services, reflecting economic and business dynamics in the sector [112] [120]. The conventional role remains largely dispensing, with limited professional engagement beyond product transactions, and the presence of qualified pharmacists is low, which also weakens the capacity for patient care [112]. This environment contributes to a service model where profit-focused activities are prioritized, and extended patient care services

such as counseling or preventive health interventions are under developed in community pharmacy settings in Pakistan [120].

## 2.6 Strategies to Reduce Barriers in Community Pharmacy Based Vaccination Services

International evidence shows that regulatory authorization and policy support enable pharmacists to effectively deliver vaccination services in community settings. In countries such as the United States and Canada, formal recognition of pharmacists as immunization providers has improved vaccine accessibility and coverage [121] [122]. In contrast, community pharmacists in Pakistan remain largely excluded from vaccination service delivery due to the absence of supportive national policies, despite demonstrated willingness and readiness to provide such services. Reducing these barriers requires attention to multiple interrelated factors, including pharmacists' training and competency, legal authority and scope of practice, public awareness and trust, adequate remuneration and incentives, availability of infrastructure and resources, effective collaboration with other healthcare providers, sufficient workforce presence with robust regulatory oversight, and the integration of community pharmacy services into national health policies and government support mechanisms. [123]. Additionally, limited public recognition of pharmacists' clinical roles continues to hinder acceptance of pharmacist-led vaccination services in Pakistan [120].

# Chapter 3

## Methodology

### 3.1 Methodology Overview

I adopted a mixed-methods research approach, integrating quantitative and qualitative methods. Mixed-methods designs are recommended for examining complex healthcare and implementation-related phenomena due to their ability to combine measurement with contextual explanation [143] [144]. This approach was therefore used to comprehensively examine community pharmacists' willingness and readiness to provide vaccination services in Pakistan.

The quantitative component employed a structured questionnaire to collect numerical data from community pharmacists, allowing systematic measurement and statistical analysis of the study variables [145]. The qualitative component consisted of open-ended, semi-structured interviews with pharmacists to explore their experiences, opinions, and perceived barriers in greater depth, an approach well suited for capturing contextual and experiential insights [146].

The integration of quantitative and qualitative methods enhanced the accuracy and comprehensiveness of the findings, as the quantitative data identified measurable patterns and trends, while the qualitative data provided explanatory insights into the underlying reasons for those patterns [147] [143].

## 3.2 Study Design

The research followed a convergent mixed-method cross-sectional design. The quantitative component consisted of a cross-sectional survey using a structured questionnaire to collect data at one point in time. The qualitative component consisted of semi-structured interviews with open-ended questions to explore pharmacists' experiences and opinions. Both data sets were collected during the same time period and later analyzed separately before integrating the findings to draw overall conclusions.

## 3.3 Study Setting

The study was conducted among community pharmacists working in four major cities of Pakistan: Islamabad (Capital Territory), Rawalpindi (Punjab), Peshawar (Khyber Pakhtunkhwa), and Kohat (Khyber Pakhtunkhwa). These areas were selected to include both urban and rural pharmacy practices, representing diverse working conditions, patient populations, and accessibility levels in Pakistan.

## 3.4 Sample Size

Two parts of the study had different sample sizes. For the quantitative component, approximately 400 community pharmacists participated in the survey. The sample size was determined using the Rao soft® sample size calculator, assuming a 95% confidence level and a 5% margin of error, which is commonly used in cross-sectional survey research to estimate adequate sample sizes for population-based studies [148]. This sample size was considered sufficient to provide reliable and generalizable estimates of community pharmacists' willingness and readiness to provide vaccination services. For the qualitative component, a total of 20 community pharmacists were interviewed individually. The sample size for

the qualitative phase was guided by the principle of data saturation, whereby interviews were continued until no new themes or insights emerged from the data. Data saturation is an accepted criterion for determining sample adequacy in qualitative research, particularly in interview-based studies exploring experiences and perceptions [146].

### **3.5 Sampling Technique**

Different sampling techniques were applied to the two parts of the study, Quantitative part The convenience sampling technique was used. Pharmacists who were available and willing to participate were included in the survey. Qualitative part the purposive sampling technique was used. Pharmacists were selected intentionally based on their experience, role, and willingness to share their detailed views.

### **3.6 Study Population**

The study population consisted of licensed community pharmacists currently working in community pharmacies located in the selected cities of Islamabad, Rawalpindi, Peshawar, and Kohat. Pharmacists from independent, chain, or retail pharmacies were included to ensure a wide representation of the community pharmacy sector.

### **3.7 Inclusion Criteria**

Pharmacists were included in the study if they were registered and licensed by the Pharmacy Council of Pakistan, were actively working in a community pharmacy, had at least six months of professional experience, and were willing to participate in the study by providing written informed consent.

### **3.8 Exclusion Criteria**

Pharmacists were excluded from the study if they were working in hospitals, pharmaceutical industries or academic institutions, were not currently practicing in a community pharmacy, or were students, interns, or trainees without a valid pharmacist license.

### **3.9 Data Collection Procedure**

Data collection was conducted in two phases:

#### **3.9.1 Phase 1: Quantitative Data Collection**

A structured questionnaire titled “Community Pharmacists’ Workforce Willingness and Readiness to Deliver Vaccination Services” was distributed to pharmacists. The questionnaire was completed in person and through online forms (Google Forms). Each participant was informed about the purpose of the study before completing the form. The questionnaire took about 10 minutes to complete. The filled questionnaires were collected and entered into SPSS for analysis.

#### **3.9.2 Phase 2: Qualitative Data Collection**

In this phase, 20 pharmacists were interviewed individually using open-ended questions. The interviews were conducted in English and Urdu, depending on the participant’s comfort. Each interview lasted around 10–15 minutes. Interviews were conducted in a quiet environment and audio recorded with participants’ consent. The recordings were later transcribed (written word by word) and analyzed thematically. Each interview was coded separately (Interview 1, Interview 2, etc.) and analyzed for common ideas and themes.

## **3.10 Data Collection Tools**

### **3.10.1 Quantitative Tool: Structured Questionnaire**

The questionnaire was developed based on literature review and the CFIR. It included five main sections covering demographics, inner setting, outer setting, intervention characteristics, and pharmacists' knowledge and self-efficacy [149]. Responses were measured using Yes/No and 5-point Likert scales [145].

### **3.10.2 Qualitative Tool: Interview Guide**

Qualitative data were collected using a semi-structured interview guide consisting of 10 key themes and 17 open-ended questions. A semi-structured interview approach was selected as it allows the researcher to explore predefined areas of interest while maintaining flexibility to probe participants' responses in greater depth, which is particularly suitable for exploring experiences, perceptions, and contextual factors in health services research [146] [145]. The interview questions were designed to explore pharmacists' perspectives on multiple factors influencing the provision of vaccination services in community pharmacy settings.

These included pharmacy infrastructure, professional roles and responsibilities, governmental and employer support, patient demand, financial compensation, safety concerns, workload, knowledge of the EPI, stakeholder involvement, and strategies to improve public awareness regarding vaccination. The interview guide enabled an in-depth understanding of perceived barriers and facilitators affecting pharmacists' willingness and readiness to deliver vaccination services.

## **3.11 Ethical Consideration**

Ethical approval for this research was obtained from the Ethical Review Board (ERB) of Capital University of Science and Technology (CUST) REC/FoP/ S2025 /01, Islamabad. Before participation:

- i. The study objectives were explained to all participants.
- ii. Participation was voluntary, and participants could withdraw at any time.
- iii. Written informed consent was obtained from every participant.
- iv. Confidentiality and anonymity were maintained.
- v. All collected data, including audio files and questionnaires, were securely stored and used only for research purposes.

### 3.12 Statistical Analysis

Quantitative data were analyzed using Statistical Package for the Social Sciences (SPSS) (version 21). Descriptive statistics were used to summarize the data. Frequencies and percentages were calculated for categorical variables, while median and interquartile range (IQR) were reported for Likert-scale responses.

The reliability of the questionnaire was assessed using Cronbach's alpha, and a value of  $\alpha \geq 0.70$  was considered acceptable.

As the data were not normally distributed, non-parametric statistical tests were used for inferential analysis. The Chi-square test was applied to examine associations between categorical variables. The Mann-Whitney U test was used to compare two independent groups, and the Kruskal-Wallis's test was used to compare more than two independent groups.

A p-value less than 0.05 ( $p < 0.05$ ) was considered statistically significant. Qualitative interview data were analyzed separately using thematic analysis. The findings from both quantitative and qualitative analyses were later combined to provide a comprehensive understanding of the study results.

### 3.13 Methodology Flow Chart

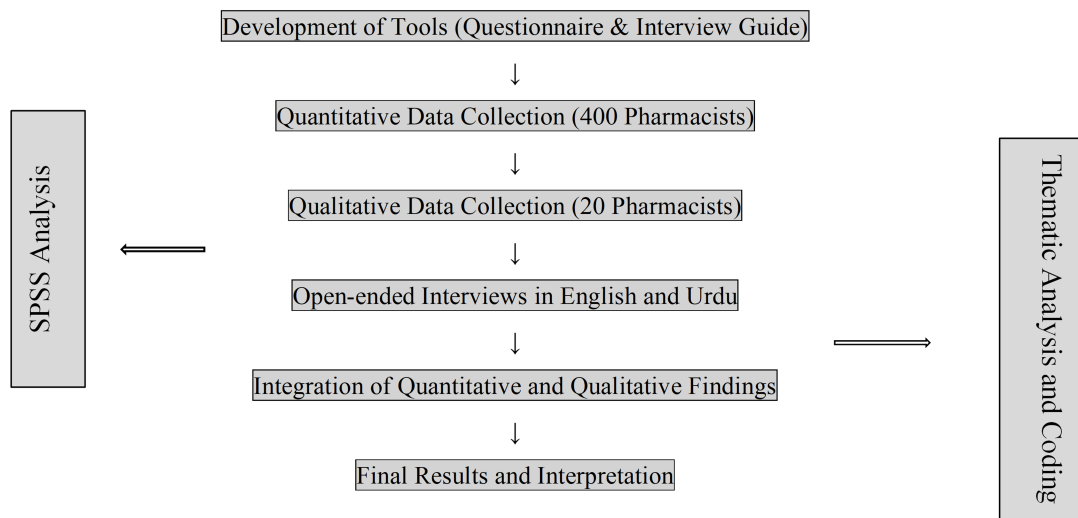


FIGURE 3.1: Methodology Flow Chart

# Chapter 4

## Results

### 4.1 Demographics

#### 4.1.1 Quantitative Part Demographics

The data presented in Table 4.1 indicate that the majority of the participating community pharmacists were young adults, with most respondents aged 20-30 years (79.5%), followed by those aged 31- $\geq$ 40 years (20.5%). In terms of gender distribution, the sample was predominantly male (93.3%), whereas female pharmacists constituted 6.8% of the respondents. Regarding educational attainment, a large proportion held a Pharm D degree (80.5%), while 19.5% possessed an MPhil qualification.

With respect to overall professional experience, 44.0% of pharmacists had been practicing for more than 3 years, 35.8% had 1-3 years of experience, and 20.3% had been practicing for 6 months to 1 year. Experience specifically within community pharmacy settings showed a similar pattern, where 42.5% had worked for 6 months to 1 year, followed by 30.5% with more than 2 years, and 27.0% with 1-2 years of experience.

Most respondents were employed in independent retail pharmacies (87.0%), while 11.5% worked in chain pharmacies and a small fraction (1.5%) in independent

wholesale pharmacies. In terms of geographical distribution, participants were primarily from Peshawar (34.5%), followed by Islamabad (29.3%), Rawalpindi (26.5%), and Kohat (9.8%). The pharmacies were mostly situated in urban areas (71.5%), with 28.5% located in rural regions.

The location of the pharmacy within the local area varied, with a substantial proportion situated in commercial areas (42.3%), followed by residential areas (34.3%), while 20.5% were positioned in front of hospitals, and 3.0% were inside shopping malls. Regarding work schedules, 54.0% of pharmacists worked day shifts, 15.8% worked night shifts, and 30.3% worked during weekends.

In terms of job roles, the largest group of respondents were dispensing pharmacists (43.8%), followed by pharmacy owners (24.8%), managers (10.5%), and other roles (21.0%). Staffing levels varied across pharmacies, with 51.0% reporting more than 4 staff members, 32.5% having 2-3 staff, and 16.5% operating with 1-2 staff members. The average number of patients handled daily also varied, with 52.8% attending to 1-50 patients, 21.8% managing 51-100, and 25.5% handling more than 100 patients per day.

TABLE 4.1: Characteristics of respondents (n = 400)

<b>Quantitative Demographics</b>	<b>N (%)</b>
<b>Age</b>	
20-30	318 (79.5)
31- $\geq$ 40	82(20.5)
<b>Gender</b>	
Female	27(6.8)
Male	373(3.3)
<b>Educational qualification</b>	
Pharm D	322 (80.5)
MPhil	78 (19.5)
<b>Total experience as a pharmacist</b>	
6months-1year	81(20.3)
1-3 years	143(35.8)
>3 years	176(44.0)
<b>Experience at community pharmacy</b>	
6months-1year	170(42.5)

Table 4.1 continued from previous page

<b>Quantitative Demographics</b>	<b>N (%)</b>
1-2 years	108(27.0)
>2 years	122(30.5)
<b>Type of pharmacy setting</b>	
Independent retail pharmacy	348(87.0)
Independent wholesale pharmacy	6(1.5)
Chain pharmacy	46(11.5)
<b>Pharmacy location</b>	
Islamabad	117(29.3)
Rawalpindi	106(26.5)
Peshawar	138(34.5)
Kohat	39(9.8)
<b>Current area of pharmacy location</b>	
Urban area	286(71.5)
Rural area	114(28.5)
<b>Yours Pharmacy location in area</b>	
Commercial area	169(42.3)
Residence area	137(34.3)
shopping mall	12(3.0)
Infront of Hospital	82(20.5)
<b>Time of Working</b>	
Day shift	216(54.0)
Night shift	63(15.8)
Weekend	121(30.3)
<b>Position in community pharmacy</b>	
Pharmacy owner	99(24.8)
Dispensing pharmacist	175(43.8)
Manager	42(10.5)
Other	84(21.0)
<b>Number of staff (including yourself)</b>	
1-2	66(16.5)
2-3	130(32.5)
>4	204(51.0)
<b>Approximate (average) number of patients handled by you daily</b>	
1-50	211(52.8)
51-100	87(21.8)
>100	102(25.5)

### 4.1.2 Qualitative Demographics

The demographic characteristics of the qualitative interview participants are presented in Table 4.2. The majority of the respondents were within the younger age group, with 70% aged 20-30 years, while the remaining 30% were 31- $\geq$ 40 years. All participants in the qualitative phase were male (100%), reflecting a male-dominated workforce in the sampled settings. Regarding educational background, most interviewees held a Pharm D degree (65%), while 35% possessed an MPhil qualification.

In terms of professional experience, a large proportion of participants (90%) had been practicing as pharmacists for more than 3 years, whereas 10% reported 1-3 years of total professional experience.

Their experience specifically within community pharmacy settings showed similar variation, with 60% having more than 2 years of experience, followed by 25% with 1-2 years, and 15% with 6 months to 1 year of community pharmacy practice.

Most participants were working in independent retail pharmacies (85%), while 15% were employed in chain pharmacies. The geographic distribution of interviewees was evenly divided, with equal representation from Islamabad (25%), Rawalpindi (25%), Peshawar (25%), and Kohat (25%). In terms of the broader area of pharmacy location, 65% of participants worked in urban regions, whereas 35% practiced in rural areas. Within their specific locality, 40% worked in residential areas, 30% in pharmacies located in front of hospitals, 25% in commercial areas, and 5% in shopping malls. Work schedules varied among participants, with 40% working day shifts, 20%-night shifts, and another 40% working during weekends.

The participants held various positions within their pharmacies: pharmacy owners (45%), dispensing pharmacists (10%), managers (10%), and other roles (35%). Staffing strength differed across practice sites, with 55% reporting more than four staff members, 15% having 2-3 staff, and 30% having 1-2 staff. The daily patient load also varied, with the majority (70%) attending to 1-50 patients per day, and 30% handling 51-100 patients daily.

TABLE 4.2: Characteristics of Interviewed Community pharmacists (n = 20)

<b>Qualitative Demographics</b>	N-(%)
<b>Age</b>	
20-30	14(70)
31- $\geq$ 40	6 (30)
<b>Gender</b>	
Male	20(100)
<b>Educational-qualification</b>	
Pharm-D	13(65)
MPhil	7 (35)
<b>Total-experience as a pharmacist</b>	
1-3-years	2 (10)
>3-years	18(90)
<b>Experience-at community pharmacy</b>	
6months-1year	3 (15)
1-2-years	5 (25)
>2-years	12(60)
<b>Type-of pharmacy setting</b>	
Independent-retail pharmacy	17(85)
Chain-pharmacy	3 (15)
<b>Pharmacy-location</b>	
Islamabad	5(25)
Rawalpindi	5(25)
Peshawar	5(25)
Kohat	5(25)
<b>Current-area of pharmacy location</b>	
Urban-area	13(65)
Rural-area	7 (35)
<b>Yours-Pharmacy location in area</b>	
Commercial-area	5 (25)
Residence-area	8 (40)
shopping-mall	1 (5)
Infront-of Hospital	6 (30)
<b>Time-of Working</b>	
Day-shift	8 (40)
Night-shift	4 (20)
Weekend	8 (40)
<b>Position-in community pharmacy</b>	

Table 4.2 continued from previous page

<b>Qualitative Demographics</b>	N-(%)
Pharmacy-owner	9 (45)
Dispensing-pharmacist	2 (10)
Manager	2 (10)
Other	7 (35)
<b>Number-of staff (including yourself)</b>	
1-2	6 (30)
2-3	3 (15)
>4	11(55)
<b>Approximate-(average) number of patients handled by you daily</b>	
1-50	14(70)
51-100	6 (30)

## 4.2 Assessment of Inner Setting, Outer Setting, Intervention Characteristics, and Individual Characteristics Using CFIR Framework

The results from Sections 2 to 5 demonstrate strong overall support for the integration of vaccination services within community pharmacies. Although only about half (49.3%) of the pharmacies reported having a private consultation room (Figure 4.1), an overwhelming majority believed that community pharmacists' referral roles are supported (86.0%), that pharmacists should be part of the vaccination program (89.8%), and that they should educate the public about vaccination (89.3%), with 87.8% expecting government support for staff involved in such services. Most respondents felt that four or more assistants are sufficient to support vaccination activities (66.1%), and more than half agreed that a single pharmacist could manage vaccination services (56.9%). In terms of external setting and policy incentives, 68.0% reported public demand for vaccination at pharmacies, and nearly all agreed that side-effect monitoring and counselling should occur under pharmacist supervision (93.8%) and that pharmacists should be compensated for providing vaccination services (94.3%).

Participants highlighted several concerns, including challenges with follow - up (71.0%), Figure 4.2 managing adverse effects (77.0%), and Figure 4.3 low public awareness of vaccine-preventable disease severity (79.1%).

While many reported that patients sometimes sought vaccination services within the past six months (43.0%), respondents expressed strong support for auditing processes Figure 4.4, with 80.3% viewing audits as effective and 75.8% willing to participate; essential areas for auditing included staff training (84.3%), management of adverse events (78.5%), and regulatory compliance (91.3%).

Regarding intervention characteristics, most participants acknowledged infection risks (75.5%), felt that workload and manpower could affect service delivery (80.3%), and reported potential stigma linked to public misconceptions about vaccine safety (82.3%).

More than half perceived vaccination programs as complex to implement (59.8%), yet strong support existed for upgrading facilities (81.8%), investing in personal protective equipment (74.3%), requiring prior vaccination experience (74.8%), offering greater time flexibility (70.0%), enhancing accessibility (80.3%), and reducing waiting times at pharmacies (77.8%).

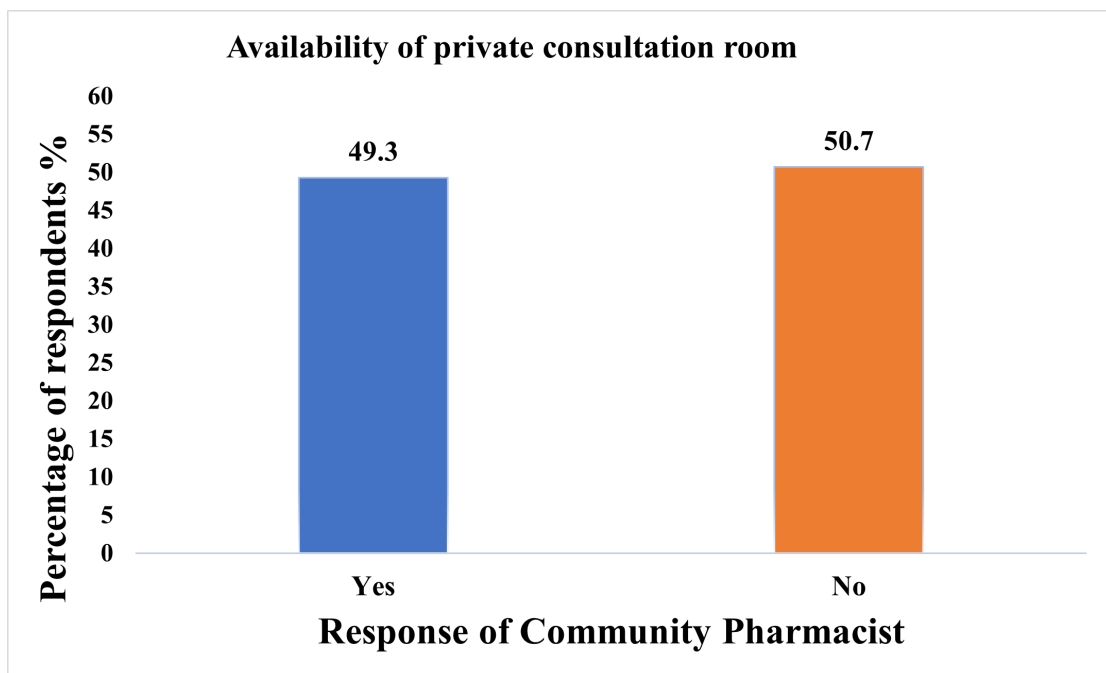


FIGURE 4.1: Availability of private consultation rooms in community pharmacies (n = 400)

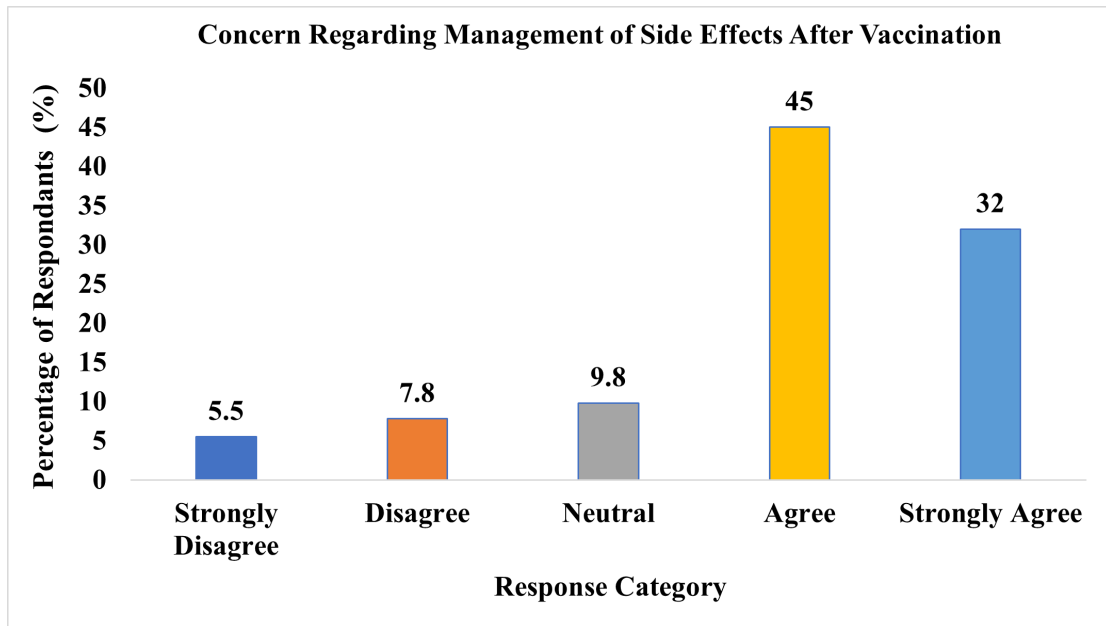


FIGURE 4.2: Distribution of responses regarding concern about managing side effects after vaccination among community pharmacists (n = 400)

Finally, in terms of individual characteristics and self-efficacy, almost all respondents were aware of the EPI (97.5%), and many expressed readiness to engage in vaccination activities, including referrals (46.0%), providing vaccinations (72.3%), and educating the public (69.8%), reflecting high overall preparedness among community pharmacists.

TABLE 4.3: Community pharmacist's responses to CFIR Questionnaire

<b>Section 2 Inner setting of pharmacy and implementation climate</b>	
<b>Is there availability of private consultation room on community pharmacy</b>	
Yes	197 (49.3)
No	203 (50.7)
<b>Do you think can Community pharmacist's referral roles for vaccination services are supported</b>	
Yes	344 (86.0)
No	56 (14.0)
<b>Do you think that the support use of community pharmacists as part of the vaccination program</b>	
Yes	359 (89.8)
No	41 (10.3)
<b>Are you agreed with the role of community pharmacists in vaccination education to patients and the public</b>	

Table 4.3 continued from previous page

<b>Section 2 Inner setting of pharmacy and implementation climate</b>	
Yes	357 (89.3)
No	43 (10.8)
<b>Do you think that community pharmacy staff would be supported by government</b>	
Yes	351 (87.8)
No	49 (12.3)
<b>Four or more pharmacy staffs or assistants are enough for providing help in vaccination services at community pharmacy</b>	
Strongly Disagree	34 (8.5)
Disagree	31 (7.8)
Neutral	71 (17.8)
Agree	183 (45.8)
Strongly Agree	81 (20.3)
<b>Vaccination services at community pharmacy can be managed by one pharmacist</b>	
Strongly Disagree	33 (8.3)
Disagree	70 (17.5)
Neutral	69 (17.3)
Agree	130 (32.5)
Strongly Agree	98 (24.5)
<b>Section 3 Outer setting and external policies and incentives</b>	
<b>Public can request for vaccination at community pharmacy</b>	
Yes	272 (68.0)
No	128 (32.0)
<b>Do you think side effect monitoring and vaccination counselling and education must all be provided by community pharmacies under pharmacist supervision</b>	
Yes	375 (93.8)
No	25 (6.3)
<b>Do you agree that community pharmacists should be compensated for offering vaccination Services</b>	
Yes	377 (94.3)
No	23 (5.8)
<b>What in your opinion are some of the most pressing issues that could arise</b>	
<b>There are challenges with follow up after vaccination</b>	
Strongly Disagree	23 (5.8)
Disagree	42 (10.5)
Neutral	51 (12.8)
Agree	196 (49.0)

Table 4.3 continued from previous page

<b>Section 2 Inner setting of pharmacy and implementation climate</b>	
Strongly Agree	88 (22.0)
<b>Managing side effect after vaccination is a significant concern</b>	
Strongly Disagree	22 (5.5)
Disagree	31 (7.8)
Neutral	39 (9.8)
Agree	180 (45.0)
Strongly Agree	128 (32.0)
<b>There is lack of awareness on the Vaccine preventable disease severity</b>	
Strongly Disagree	22 (5.5)
Disagree	19 (4.8)
Neutral	43 (10.8)
Agree	183 (45.8)
Strongly Agree	133 (33.3)
<b>How often has a customer or patient sought out vaccination at the local pharmacy in the past six months</b>	
Very often	17 (4.3)
Often	58 (14.5)
Sometimes	172 (43.0)
Rarely	103 (25.8)
Never	50 (12.5)
<b>The quality of vaccination and patient compliance could both benefit from an audit</b>	
Very Effective	152 (38.0)
Effective	169 (42.3)
Moderately effective	66 (16.5)
Not Effective	13 (3.3)
<b>If vaccination services are to be implemented at your community pharmacy your % of willing for audit</b>	
Extremely willing	136 (34.0)
Willing	167 (41.8)
Moderately willing	75 (18.8)
Not willing	22 (5.5)
<b>When auditing community pharmacy vaccination services which of the following areas are typically reviewed (yes/no)</b>	
<b>Staff received training related to the administration of vaccines</b>	
Yes	337 (84.3)

Table 4.3 continued from previous page

<b>Section 2 Inner setting of pharmacy and implementation climate</b>	
No	63 (15.8)
<b>Management of vaccine related adverse events</b>	
Yes	314 (78.5)
No	86 (21.5)
<b>Compliance with legal and regulatory requirements</b>	
Yes	365 (91.3)
No	35 (8.8)
<b>Section 4 Intervention characteristics relative advantage and complexity Concern</b>	
<b>Is there risk of infection to health and safety of staff and customer during vaccination services</b>	
Yes	302 (75.5)
No	98 (24.5)
<b>Do you think workload and manpower can effect vaccination services</b>	
Yes	321 (80.3)
No	79 (19.8)
<b>Some pharmacies may face stigma or reduced customer traffic due to misconceptions about vaccine safety</b>	
Yes	329 (82.3)
No	71 (17.8)
<b>Can vaccination program is complicated to implement</b>	
Yes	239 (59.8)
No	161 (40.3)
<b>Do you think upgrade of facilities needed for vaccination</b>	
Yes	327 (81.8)
No	73 (18.3)
<b>Is there need of willingness to invest in personal protective equipment for vaccination</b>	
Yes	297 (74.3)
No	103 (25.8)
<b>Are you agree that community pharmacists must have previous working experience of vaccination</b>	
Yes	299 (74.8)
No	101 (25.3)
<b>Is the time flexibility offered by community pharmacy-based vaccination</b>	
Yes	280 (70.0)

Table 4.3 continued from previous page

Section 2 Inner setting of pharmacy and implementation climate	
No	120 (30.0)
<b>Is community pharmacy-based vaccination providing better accessibility to patients</b>	
Yes	321 (80.3)
No	79 (19.8)
<b>Do you think shorter waiting time for patient to receive vaccination at community pharmacy</b>	
Yes	311 (77.8)
No	89 (22.3)
<b>Section 5 Characteristics of individuals Knowledge and beliefs about the interventions and Self efficacy</b>	
<b>You have awareness about of EPI</b>	
Yes	390 (97.5)
No	10 (2.5)
<b>Do you feel prepared to provide vaccination on community pharmacies now (Select all that apply)</b>	
Willingness to engage in referrals	184 (46.0)
Willingness to provide Vaccination	289 (72.3)
Willingness to educate patients and public	279 (69.8)

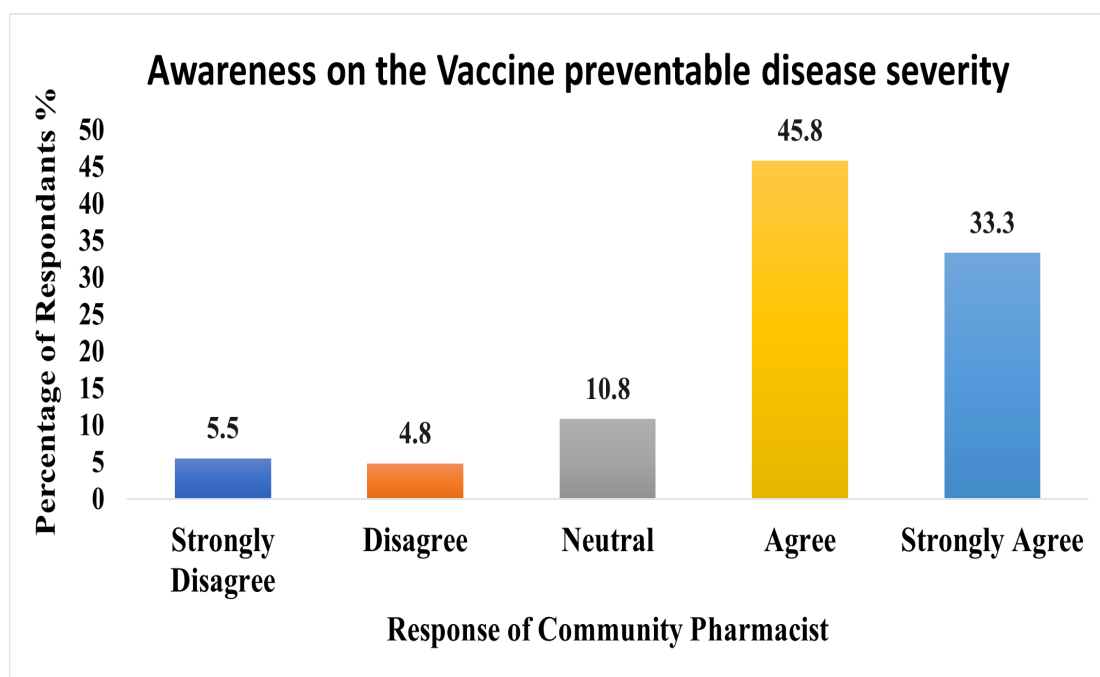


FIGURE 4.3: Distribution of responses regarding lack of awareness of vaccine-preventable disease severity among community pharmacists (n = 400)

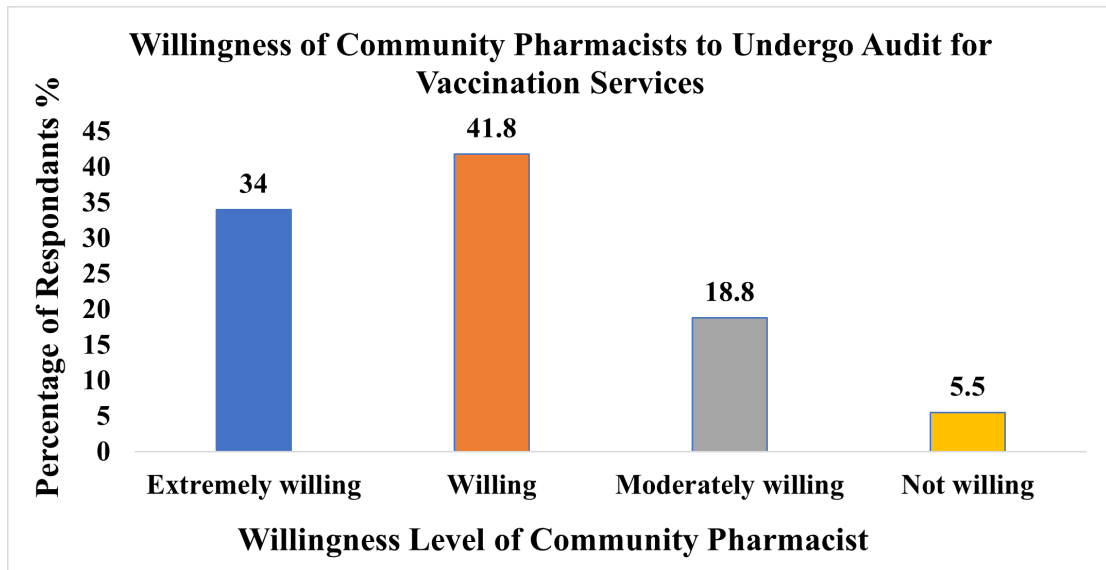


FIGURE 4.4: Willingness of community pharmacists to undergo audit if vaccination services are implemented at community pharmacies (n = 400)

### 4.3 Factors Associated with Availability of Private Consultation Rooms in Community Pharmacies

The results presented in Table 4.4 show the distribution of private consultation room availability across demographic and pharmacy-related characteristics. A significant association was observed for gender ( $p = 0.023$ ), pharmacy location ( $p = 0.000$ ), current area of pharmacy ( $p = 0.000$ ), position in the pharmacy ( $p = 0.000$ ), number of staff ( $p = 0.019$ ), and the number of patients handled daily ( $p = 0.000$ ). No significant associations were found with age, educational qualification, total pharmacist experience, experience at community pharmacy, type of pharmacy setting, or specific location within the area.

TABLE 4.4: Inner-Setting Factors Associated with Availability of Private Consultation Rooms in Community Pharmacies

Is there availability of private consultation room on community pharmacy?	Yes	No	P value
<b>Gender:</b>			0.023
Female	19 (70.4%)	8 (29.6%)	
Male	178 (47.7%)	195 (52.3%)	
<b>Age (Years):</b>			0.059

Table 4.4 continued from previous page

<b>Is there availability of private consultation room on community pharmacy?</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
20-30	149 (46.9%)	169 (53.1%)	
31- $\geq$ 40	48 (58.5%)	34 (41.5%)	
<b>Educational qualification</b>			0.721
Pharm D	160 (81.2%)	162 (79.8%)	
MPhil	37 (18.8%)	41 (20.2%)	
<b>Total experience as a pharmacist:</b>			0.588
6months-1year	44 (54.3%)	37 (45.7%)	
1-3 years	68 (47.6%)	75 (52.4%)	
>3 years	85 (48.3%)	91 (51.7%)	
<b>Experience at community pharmacy:</b>			0.261
6 months-1year	89 (45.2%)	81 (39.9%)	
1-2 years	46 (23.4%)	62 (30.5%)	
>2 years	62 (31.5%)	60 (29.6%)	
<b>Type of pharmacy setting:</b>			0.159
Independent retail pharmacy	165 (47.4%)	183 (52.6%)	
Independent wholesale pharmacy	4 (66.7%)	2 (33.3%)	
Chain pharmacy	28 (60.9%)	18 (39.1%)	
<b>Pharmacy location</b>			0
Islamabad	63 (32.0%)	54 (26.6%)	
Rawalpindi	67 (34.0%)	39 (19.2%)	
Peshawar	54 (27.4%)	84 (41.4%)	
Kohat	13 (6.6%)	26 (12.8%)	
<b>Current area of pharmacy location?</b>			0
Urban area	157 (54.9%)	129 (45.1%)	
Rural area	40 (35.1%)	74 (64.9%)	
<b>Yours's Pharmacy location in area:</b>			0.284
Commercial area	85 (50.3%)	84 (49.7%)	
Residence area	60 (43.8%)	77 (56.2%)	
shopping mall	8 (66.7%)	4 (33.3%)	
Infront of Hospital	44 (53.7%)	38 (46.3%)	
<b>Position in community pharmacy</b>			0
Pharmacy owner	42 (21.3%)	57 (28.1%)	
Dispensing pharmacist	108 (54.8%)	67 (33.0%)	
Manager	21 (10.7%)	21 (10.3%)	
Other	26 (13.2%)	58 (28.6%)	

Table 4.4 continued from previous page

<b>Is there availability of private consultation room on community pharmacy?</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
<b>Number of staff (including yourself):</b>			0.019
1-2	34 (51.5%)	32 (48.5%)	
2-3	51 (39.2%)	79 (60.8%)	
>4	112 (54.9%)	92 (45.1%)	
<b>Approximate number of patients handled by you daily:</b>			0
1-50	74 (35.1%)	137 (64.9%)	
51-100	52 (59.8%)	35 (40.2%)	
>100	71 (69.6%)	31 (30.4%)	

#### 4.4 Factors Associated with Perceived Support for Community Pharmacists' Referral Roles in Vaccination Services

The results shown in Table 4.5 indicate the distribution of respondents who believed that community pharmacists' referral roles for vaccination services are supported across demographic and practice-related variables. A significant association was observed with pharmacy location ( $p = 0.014$ ) and the specific area where the pharmacy is situated ( $p = 0.007$ ). No significant associations were found with gender, age, educational qualification, total pharmacist experience, community pharmacy experience, type of pharmacy, area type, position, number of staff, or number of patients handled daily

TABLE 4.5: Association Between Demographic and Practice Characteristics and Perceived Support for Community Pharmacists' Referral Roles in Vaccination Services

<b>Do you think can Community pharmacists' referral roles for vaccination services are supported?</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
<b>Gender:</b>			0.899
Female	23 (85.2%)	4 (14.8%)	
Male	321 (86.1%)	52 (13.9%)	

Table 4.5 continued from previous page

<b>Do you think can Community pharmacists' referral roles for vaccination services are supported?</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
<b>Age (Years):</b>			0.853
20-30	274 (86.2%)	44 (13.8%)	
31- ≥ 40	70 (85.4%)	12 (14.6%)	
<b>Educational qualification</b>			0.074
Pharm D	272 (79.1%)	50 (89.3%)	
MPhil	72 (20.9%)	6 (10.7%)	
<b>Total experience as a pharmacist:</b>			0.137
6months-1year	66 (81.5%)	15 (18.5%)	
1-3 years	120 (83.9%)	23 (16.1%)	
>3 years	158 (89.8%)	18 (10.2%)	
<b>Experience at community pharmacy:</b>			0.447
6months-1year	148 (43.0%)	22 (39.3%)	
1-2 years	89 (25.9%)	19 (33.9%)	
>2 years	107 (31.1%)	15 (26.8%)	
<b>Type of pharmacy setting:</b>			0.315
Independent retail pharmacy	296 (85.1%)	52 (14.9%)	
Independent wholesale pharmacy	6 (100.0%)	0 (0.0%)	
Chain pharmacy	42 (91.3%)	4 (8.7%)	
<b>Pharmacy location</b>			0.014
Islamabad	92 (26.7%)	25 (44.6%)	
Rawalpindi	91 (26.5%)	15 (26.8%)	
Peshawar	123 (35.8%)	15 (26.8%)	
Kohat	38 (11.0%)	1 (1.8%)	
<b>Current area of pharmacy location?</b>			0.759
Urban area	245 (85.7%)	41 (14.3%)	
Rural area	99 (86.8%)	15 (13.2%)	
<b>Yours's Pharmacy location in area:</b>			0.007
Commercial area	138 (81.7%)	31 (18.3%)	
Residence area	116 (84.7%)	21 (15.3%)	
shopping mall	10 (83.3%)	2 (16.7%)	
Infront of Hospital	80 (97.6%)	2 (2.4%)	
<b>Position in community pharmacy</b>			0.548
Pharmacy owner	88 (25.6%)	11 (19.6%)	
Dispensing pharmacist	147 (42.7%)	28 (50.0%)	

Table 4.5 continued from previous page

<b>Do you think can Community pharmacists' referral roles for vaccination services are supported?</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
Manager	38 (11.0%)	4 (7.1%)	
Other	71 (20.6%)	13 (23.2%)	
<b>Number of staff (including yourself):</b>			0.855
1-2	57 (86.4%)	9 (13.6%)	
2-3	110 (84.6%)	20 (15.4%)	
>4	177 (86.8%)	27 (13.2%)	
<b>Approximate number of patients handled by you daily:</b>			0.32
1-50	182 (86.3%)	29 (13.7%)	
51-100	71 (81.6%)	16 (18.4%)	
>100	91 (89.2%)	11 (10.8%)	

## 4.5 Comparison of Respondent and Pharmacy Characteristics by Agreement on Pharmacists' Vaccination Education Role

The results in Table 4.6 present the distribution of respondents who believed that community pharmacy staff would be supported by the government across demographic and practice characteristics. Significant associations were observed with type of pharmacy setting ( $p = 0.000$ ) and the current area of pharmacy location ( $p = 0.044$ ). No significant associations were found with gender, age, educational qualification, total pharmacist experience, community pharmacy experience, pharmacy location, specific location within the area, position in the pharmacy, number of staff, or number of patients handled daily.

TABLE 4.6: Community Pharmacists' Agreement on Vaccination Education Role

<b>Are you agreed with the role of community pharmacists in vaccination education to patients and the public.</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
<b>Gender:</b>			0.221

Table 4.6 continued from previous page

<b>Are you agreed with the role of community pharmacists in vaccination education to patients and the public.</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
Female	26 (96.3%)	1 (3.7%)	
Male	331 (88.7%)	42 (11.3%)	
<b>Age (Years):</b>			0.941
20-30	284 (89.3%)	34 (10.7%)	
31- $\geq$ 40	73 (89.0%)	9 (11.0%)	
<b>Educational qualification</b>			0.331
Pharm D	285 (79.8%)	37 (86.0%)	
MPhil	72 (20.2%)	6 (14.0%)	
<b>Total experience as a pharmacist:</b>			0.028
6months-1year	73 (90.1%)	8 (9.9%)	
1-3 years	120 (83.9%)	23 (16.1%)	
>3 years	164 (93.2%)	12 (6.8%)	
<b>Experience at community pharmacy:</b>			0.000
6months-1year	156 (43.7%)	14 (32.6%)	
1-2 years	85 (23.8%)	23 (53.5%)	
>2 years	116 (32.5%)	6 (14.0%)	
<b>Type of pharmacy setting:</b>			0.806
Independent retail pharmacy	310 (89.1%)	38 (10.9%)	
Independent wholesale pharmacy	5 (83.3%)	1 (16.7%)	
Chain pharmacy	42 (91.3%)	4 (8.7%)	
<b>Pharmacy location</b>			0.000
Islamabad	92 (25.8%)	25 (58.1%)	
Rawalpindi	98 (27.5%)	8 (18.6%)	
Peshawar	129 (36.1%)	9 (20.9%)	
Kohat	38 (10.6%)	1 (2.3%)	
<b>Current area of pharmacy location?</b>			0.025
Urban area	249 (87.1%)	37 (12.9%)	
Rural area	108 (94.7%)	6 (5.3%)	
<b>Yours's Pharmacy location in area:</b>			0.015
Commercial area	141 (83.4%)	28 (16.6%)	
Residence area	129 (94.2%)	8 (5.8%)	
shopping mall	11 (91.7%)	1 (8.3%)	
Infront of Hospital	76 (92.7%)	6 (7.3%)	
<b>Position in community pharmacy</b>			0.000

Table 4.6 continued from previous page

Are you agreed with the role of community pharmacists in vaccination education to patients and the public.	Yes	No	P value
Pharmacy owner	93 (26.1%)	6 (14.0%)	
Dispensing pharmacist	157 (44.0%)	18 (41.9%)	
Manager	42 (11.8%)	0 (0.0%)	
Other	65 (18.2%)	19 (44.2%)	
<b>Number of staff (including yourself):</b>			0.296
1-2	62 (93.9%)	4 (6.1%)	
2-3	117 (90.0%)	13 (10.0%)	
>4	178 (87.3%)	26 (12.7%)	
<b>Approximate number of patients handled by you daily:</b>			0.035
1-50	184 (87.2%)	27 (12.8%)	
51-100	75 (86.2%)	12 (13.8%)	
>100	98 (96.1%)	4 (3.9%)	

## 4.6 Lack of Awareness on Vaccine-Preventable Disease Severity

Participants' responses regarding lack of awareness about vaccine-preventable disease severity varied across demographic and professional groups.

All five Likert response categories were selected across gender, age, qualification, experience, pharmacy setting, location, and workload. Significant associations were observed for age ( $p = 0.028$ ), total pharmacist experience ( $p = 0.003$ ), community pharmacy experience ( $p = 0.009$ ), type of pharmacy setting ( $p = 0.004$ ), pharmacy location ( $p = 0.003$ ), number of staff ( $p = 0.000$ ), and number of patients handled daily ( $p = 0.000$ ), while the remaining variables showed non-significant differences.

TABLE 4.7: Awareness of Vaccine Preventable Disease Severity

<b>There is lack of awareness on the Vaccine preventable disease severity</b>	<b>S. D</b>	<b>D</b>	<b>N</b>	<b>A</b>	<b>S. A</b>	<b>P Value</b>
<b>Gender:</b>						0.915
Female	1 (3.7%)	1 (3.7%)	4 (14.8%)	11 (40.7%)	10 (37.0%)	
Male	21 (5.6%)	18 (4.8%)	39 (10.5%)	172 (46.1%)	123 (33.0%)	
<b>Age (Years):</b>						0.028
20-30	19 (6.0%)	13 (4.1%)	28 (8.8%)	155 (48.7%)	103 (32.4%)	
31- $\geq$ 40	3 (3.7%)	6 (7.3%)	15 (18.3%)	28 (34.1%)	30 (36.6%)	
<b>Educational qualification</b>						0.314
Pharm D	18 (81.8%)	12 (63.2%)	37 (86.0%)	146 (79.8%)	109 (82.0%)	
MPhil	4 (18.2%)	7 (36.8%)	6 (14.0%)	37 (20.2%)	24 (18.0%)	
<b>Total experience as a pharmacist:</b>						0.003
6months-1year	8 (9.9%)	4 (4.9%)	6 (7.4%)	39 (48.1%)	24 (29.6%)	
1-3 years	11 (7.7%)	2 (1.4%)	17 (11.9%)	75 (52.4%)	38 (26.6%)	
>3 years	3 (1.7%)	13 (7.4%)	20 (11.4%)	69 (39.2%)	71 (40.3%)	
<b>Experience at community pharmacy:</b>						0.009
6months-1year	15 (68.2%)	8 (42.1%)	16 (37.2%)	80 (43.7%)	51 (38.3%)	
1-2 years	3 (13.6%)	2 (10.5%)	17 (39.5%)	56 (30.6%)	30 (22.6%)	
>2 years	4 (18.2)	9 (47.4%)	10 (23.3%)	47 (25.7%)	52 (39.1%)	
<b>Type of pharmacy setting:</b>						0.004
Independent retail pharmacy	20 (5.7%)	15 (4.3%)	30 (8.6%)	165 (47.4%)	118 (33.9%)	
Independent wholesale pharmacy	1 (16.7%)	0 (0.0%)	3 (50.0%)	1 (16.7%)	1 (16.7%)	

Table 4.7 continued from previous page

There is lack of awareness on the Vaccine preventable disease severity	S. D	D	N	A	S. A	P Value
Chain pharmacy	1 (2.2%)	4 (8.7%)	10 (21.7%)	17 (37.0%)	14 (30.4%)	
<b>Pharmacy location</b>						0.003
Islamabad	7 (31.8%)	8 (42.1%)	11 (25.6%)	61 (33.3%)	30 (22.6%)	
Rawalpindi	1 (4.5%)	1 (5.3%)	13 (30.2%)	45 (24.6%)	46 (34.6%)	
Peshawar	8 (36.4%)	10 (52.6%)	16 (37.2%)	64 (35.0%)	40 (30.1%)	
Kohat	6 (27.3%)	0 (0.0%)	3 (7.0%)	13 (7.1%)	17 (12.8%)	
<b>Current area of pharmacy location?</b>						0.681
Urban area	15 (5.2%)	13 (4.5%)	27 (9.4%)	135 (47.2%)	96 (33.6%)	
Rural area	7 (6.1%)	6 (5.3%)	16 (14.0%)	48 (42.1%)	37 (32.5%)	
<b>Yours's Pharmacy location in area:</b>						0.124
Commercial area	15 (8.9%)	9 (5.3%)	15 (8.9%)	80 (47.3%)	50 (29.6%)	
Residence area	4 (2.9%)	6 (4.4%)	17 (12.4%)	70 (51.1%)	40 (29.2%)	
shopping mall	0 (0.0%)	1 (8.3%)	2 (16.7%)	3 (25.0%)	6 (50.0%)	
Infront of Hospital	3 (3.7%)	3 (3.7%)	9 (11.0%)	30 (36.6%)	37 (45.1%)	
<b>Position in community pharmacy</b>						0.871
Pharmacy owner	6 (27.3%)	3 (15.8%)	12 (27.9%)	45 (24.6%)	33 (24.8%)	
Dispensing pharmacist	11 (50.0%)	9 (47.4%)	22 (51.2%)	73 (39.9%)	60 (45.1%)	
Manager	1 (4.5%)	2 (10.5%)	4 (9.3%)	20 (10.9%)	15 (11.3%)	
Other	4 (18.2%)	5 (26.3%)	5 (11.6%)	45 (24.6%)	25 (18.8%)	

Table 4.7 continued from previous page

There is lack of awareness on the Vaccine preventable disease severity	S. D	D	N	A	S. A	P Value
<b>Number of staff (including yourself):</b>						0
1-2	12 (18.2%)	3 (4.5%)	10 (15.2%)	25 (37.9%)	16 (24.2%)	
2-3	6 (4.6%)	8 (6.2%)	13 (10.0%)	65 (50.0%)	38 (29.2%)	
>4	4 (2.0%)	8 (3.9%)	20 (9.8%)	93 (45.6%)	79 (38.7%)	
<b>Approximate number of patients handled by you daily:</b>						0
1-50	16 (7.6%)	11 (5.2%)	20 (9.5%)	114 (54.0%)	50 (23.7%)	
51-100	5 (5.7%)	5 (5.7%)	14 (16.1%)	32 (36.8%)	31 (35.6%)	
>100	1 (1.0%)	3 (2.9%)	9 (8.8%)	37 (36.3%)	52 (51.0%)	

## 4.7 Factors Associated with Willingness to Participate in Audits for Vaccination Service Implementation

The results in Table 4.8 show the distribution of respondents' willingness to participate in audits if vaccination services were implemented at their community pharmacies.

Significant associations were observed with educational qualification ( $p = 0.000$ ), total pharmacist experience ( $p = 0.045$ ).

Community pharmacy experience ( $p = 0.001$ ), pharmacy location ( $p = 0.000$ ), current area of pharmacy location ( $p = 0.000$ ), and position in the pharmacy ( $p = 0.002$ ).

TABLE 4.8: Community Pharmacists' Willingness to Participate in Vaccination Audit

If vaccination services are to be implemented at your community pharmacy, your % of willing for audit?	Extremely willing	Willing	Moderately willing	Not willing	P Value
<b>Gender:</b>					0.494
Female	9 (33.3%)	11 (40.7%)	7 (25.9%)	0 (0.0%)	
Male	127 (34.0%)	156 (41.8%)	68 (18.2%)	22 (5.9%)	
<b>Age (Years):</b>					0.796
20-30	105 (33.0%)	134 (42.1%)	62 (19.5%)	17 (5.3%)	
31- $\geq$ 40	31 (37.8%)	33 (40.2%)	13 (15.9%)	5 (6.1%)	
<b>Educational qualification</b>					0.000
Pharm D	99 (72.8%)	139 (83.2%)	70 (93.3%)	14 (63.6%)	
MPhil	37 (27.2%)	28 (16.8%)	5 (6.7%)	8 (36.4%)	
<b>Total experience as a pharmacist:</b>					0.045
6months-1year	25 (30.9%)	40 (49.4%)	11 (13.6%)	5 (6.2%)	
1-3 years	43 (30.1%)	55 (38.5%)	39 (27.3%)	6 (4.2%)	
>3 years	68 (38.6%)	72 (40.9%)	25 (14.2%)	11 (6.3%)	
<b>Experience at community pharmacy:</b>					0.001
6months-1year	60 (44.1%)	75 (44.9%)	25 (33.3%)	10 (45.5%)	
1-2 years	25 (18.4%)	42 (25.1%)	36 (48.0%)	5 (22.7%)	
>2 years	51 (37.5%)	50 (29.9%)	14 (18.7%)	7 (31.8%)	
<b>Type of pharmacy setting:</b>					0.285
Independent retail pharmacy	120 (34.5%)	146 (42.0%)	66 (19.0%)	16 (4.6%)	

Table 4.8 continued from previous page

<b>If vaccination services are to be implemented at your community pharmacy, your % of willing for audit?</b>	<b>Extremely willing</b>	<b>Willing</b>	<b>Moderately willing</b>	<b>Not willing</b>	<b>P Value</b>
Independent wholesale pharmacy	1 (16.7%)	4 (66.7%)	1 (16.7%)	0 (0.0%)	
Chain pharmacy	15 (32.6%)	17 (37.0%)	8 (17.4%)	6 (13.0%)	
<b>Pharmacy location</b>					<b>0.000</b>
Islamabad	21 (15.4%)	54 (32.3%)	32 (42.7%)	10 (45.5%)	
Rawalpindi	31 (22.8%)	55 (32.9%)	18 (24.0%)	2 (9.1%)	
Peshawar	64 (47.1%)	43 (25.7%)	22 (29.3%)	9 (40.9%)	
Kohat	20 (14.7%)	15 (9.0%)	3 (4.0%)	1 (4.5%)	
<b>Current area of pharmacy location?</b>					<b>0.000</b>
Urban area	80 (28.0%)	125 (43.7%)	65 (22.7%)	16 (5.6%)	
Rural area	56 (49.1%)	42 (36.8%)	10 (8.8%)	6 (5.3%)	
<b>Yours's Pharmacy location in area:</b>					<b>0.343</b>
Commercial area	47 (27.8%)	76 (45.0%)	39 (23.1%)	7 (4.1%)	
Residence area	55 (40.1%)	53 (38.7%)	22 (16.1%)	7 (5.1%)	
shopping mall	4 (33.3%)	6 (50.0%)	1 (8.3%)	1 (8.3%)	
Infront of Hospital	30 (36.6%)	32 (39.0%)	13 (15.9%)	7 (8.5%)	
<b>Position in community pharmacy</b>					<b>0.002</b>
Pharmacy owner	36 (26.5%)	47 (28.1%)	13 (17.3%)	3 (13.6%)	
Dispensing pharmacist	53 (39.0%)	85 (50.9%)	32 (42.7%)	5 (22.7%)	

Table 4.8 continued from previous page

If vaccination services are to be implemented at your community pharmacy, your % of willing for audit?	Extremely willing	Willing	Moderately willing	Not willing	P Value
Manager	18 (13.2%)	12 (7.2%)	8 (10.7%)	4 (18.2%)	
Other	29 (21.3%)	23 (13.8%)	22 (29.3%)	10 (45.5%)	
<b>Number of staff (including yourself):</b>					0.384
1-2	21 (31.8%)	33 (50.0%)	12 (18.2%)	0 (0.0%)	
2-3	45 (34.6%)	53 (40.8%)	25 (19.2%)	7 (5.4%)	
>4	70 (34.3%)	81 (39.7%)	38 (18.6%)	15 (7.4%)	
<b>Approximate number of patients handled by you daily:</b>					0.161
1-50	76 (36.0%)	81 (38.4%)	43 (20.4%)	11 (5.2%)	
51-100	27 (31.0%)	36 (41.4%)	21 (24.1%)	3 (3.4%)	
>100	33 (32.4%)	50 (49.0%)	11 (10.8%)	8 (7.8%)	

## 4.8 Association Between Participant Characteristics and Perceived Infection Risk in Vaccination Services

The results in Table 4.9 show the distribution of responses regarding perceived risk of infection to staff and customers during vaccination services. Significant associations were found with age ( $p = 0.020$ ), pharmacy location ( $p = 0.000$ ), number of staff ( $p = 0.002$ ), and number of patients handled daily ( $p = 0.000$ ). No significant associations were observed with gender, educational qualification, total pharmacist experience, community pharmacy experience, type of pharmacy,

area of pharmacy location, specific pharmacy location within the area, or position in the pharmacy.

TABLE 4.9: Infection Risk During Community Pharmacy Based Vaccination Services

<b>Is there risk of infection to health and safety of staff and customer during vaccination services.</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
<b>Gender:</b>			0.776
Female	21 (77.8%)	6 (22.2%)	
Male	281 (75.3%)	92 (24.7%)	
<b>Age (Years):</b>			0.020
20-30	232 (73.0%)	86 (27.0%)	
31- $\geq$ 40	70 (85.4%)	12 (14.6%)	
<b>Educational qualification</b>			0.794
Pharm D	244 (80.8%)	78 (79.6%)	
MPhil	58 (19.2%)	20 (20.4%)	
<b>Total experience as a pharmacist:</b>			0.520
6months-1year	63 (77.8%)	18 (22.2%)	
1-3 years	111 (77.6%)	32 (22.4%)	
>3 years	128 (72.7%)	48 (27.3%)	
<b>Experience at community pharmacy:</b>			0.371
6months-1year	123 (40.7%)	47 (48.0%)	
1-2 years	82 (27.2%)	26 (26.5%)	
>2 years	97 (32.1%)	25 (25.5%)	
<b>Type of pharmacy setting:</b>			0.898
Independent retail pharmacy	262 (75.3%)	86 (24.7%)	
Independent wholesale pharmacy	5 (83.3%)	1 (16.7%)	
Chain pharmacy	35 (76.1%)	11 (23.9%)	
<b>Pharmacy location</b>			0.000
Islamabad	100 (33.1%)	17 (17.3%)	
Rawalpindi	87 (28.8%)	19 (19.4%)	
Peshawar	84 (27.8%)	54 (55.1%)	
Kohat	31 (10.3%)	8 (8.2%)	
<b>Current area of pharmacy location?</b>			0.192
Urban area	221 (77.3%)	65 (22.7%)	
Rural area	81 (71.1%)	33 (28.9%)	
<b>Yours's Pharmacy location in area:</b>			0.137
Commercial area	136 (80.5%)	33 (19.5%)	

Table 4.9 continued from previous page

<b>Is there risk of infection to health and safety of staff and customer during vaccination services.</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
Residence area	95 (69.3%)	42 (30.7%)	
shopping mall	10 (83.3%)	2 (16.7%)	
Infront of Hospital	61 (74.4%)	21 (25.6%)	
<b>Position in community pharmacy</b>			0.226
Pharmacy owner	68 (22.5%)	31 (31.6%)	
Dispensing pharmacist	138 (45.7%)	37 (37.8%)	
Manager	34 (11.3%)	8 (8.2%)	
Other	62 (20.5%)	22 (22.4%)	
<b>Number of staff (including yourself):</b>			0.002
1-2	49 (74.2%)	17 (25.8%)	
2-3	85 (65.4%)	45 (34.6%)	
>4	168 (82.4%)	36 (17.6%)	
<b>Approximate number of patients handled by you daily:</b>			0.000
1-50	144 (68.2%)	67 (31.8%)	
51-100	67 (77.0%)	20 (23.0%)	
>100	91 (89.2%)	11 (10.8%)	

## 4.9 Factors Associated with Workload-Related Challenges in Vaccination Delivery

The results in Table 4.10 show the distribution of responses regarding whether workload and manpower can affect vaccination service delivery.

Significant associations were found with total pharmacist experience ( $p = 0.016$ ), pharmacy location ( $p = 0.000$ ), specific pharmacy location within the area ( $p = 0.025$ ), and number of patients handled daily ( $p = 0.011$ ).

No significant associations were observed with gender, age, educational qualification, community pharmacy experience, type of pharmacy, area of pharmacy location, position in the pharmacy, or number of staff.

TABLE 4.10: Workload and Manpower Constraints Affecting Implementation of Vaccination Services in Community Pharmacies

<b>Do you think workload and manpower can effect vaccination services.</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
<b>Gender:</b>			0.868
Female	22(81.5%)	5(18.5%)	
Male	299(80.2%)	74(19.8%)	
<b>Age (Years):</b>			0.710
20-30	254(79.9%)	64(20.1%)	
31- $\geq$ 40	67(81.7%)	15(18.3%)	
<b>Educational qualification</b>			0.411
Pharm D	261(81.3%)	61(77.2%)	
MPhil	60(18.7%)	18(22.8%)	
<b>Total experience as a pharmacist:</b>			0.016
6months-1year	68(84.0%)	13(16.0%)	
1-3 years	123(86.0%)	20(14.0%)	
>3 years	130(73.9%)	46(26.1%)	
<b>Experience at community pharmacy:</b>			0.931
6months-1year	135(42.1%)	35(44.3%)	
1-2 years	87(27.1%)	21(26.6%)	
>2 years	99(30.8%)	23(29.1%)	
<b>Type of pharmacy setting:</b>			0.451
Independent retail pharmacy	279(80.2%)	69(19.8%)	
Independent wholesale pharmacy	6(100.0%)	0(0.0%)	
Chain pharmacy	36(78.3%)	10(21.7%)	
<b>Pharmacy location</b>			0.000
Islamabad	97(30.2%)	20(25.3%)	
Rawalpindi	92(28.7%)	14(17.7%)	
Peshawar	93(29.0%)	45(57.0%)	
Kohat	39(12.1%)	0(0.0%)	
<b>Current area of pharmacy location?</b>			0.071
Urban area	236(82.5%)	50(17.5%)	
Rural area	85(74.6%)	29(25.4%)	
<b>Yours's Pharmacy location in area:</b>			0.025
Commercial area	147(87.0%)	22(13.0%)	
Residence area	106(77.4%)	31(22.6%)	
shopping mall	9(75.0%)	3(25.0%)	
Infront of Hospital	59(72.0%)	23(28.0%)	

Table 4.10 continued from previous page

<b>Do you think workload and manpower can effect vaccination services.</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
<b>Position in community pharmacy</b>			0.906
Pharmacy owner	80(24.9%)	19(24.1%)	
Dispensing pharmacist	142(44.2%)	33(41.8%)	
Manager	34(10.6%)	8(10.1%)	
Other	65(20.2%)	19(24.1%)	
<b>Number of staff (including yourself):</b>			0.934
1-2	53(80.3%)	13(19.7%)	
2-3	103(79.2%)	27(20.8%)	
>4	165(80.9%)	39(19.1%)	
<b>Approximate number of patients handled by you daily:</b>			0.011
1-50	160(75.8%)	51(24.2%)	
51-100	69(79.3%)	18(20.7%)	
>100	92(90.2%)	10(9.8%)	

## 4.10 Participants' Awareness Levels Regarding the National EPI Program

Table 4.11 shows that awareness of the EPI was high across all respondent groups, and most demographic variables showed no significant association. Only the number of staff at the pharmacy demonstrated a statistically significant relationship ( $p = 0.015$ ), with larger-staff pharmacies showing slightly higher awareness levels.

TABLE 4.11: Community Pharmacist's awareness about EPI

<b>You have awareness about of EPI.</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
<b>Gender:</b>			0.091
Female	25(92.6%)	2(7.4%)	
Male	365(97.9%)	8(2.1%)	
<b>Age (Years):</b>			0.968
20-30	310(97.5%)	8(2.5%)	
31- $\geq$ 40	80(97.6%)	2(2.4%)	
<b>Educational qualification</b>			0.443

Table 4.11 continued from previous page

<b>You have awareness about of EPI.</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
Pharm D	313(97.2%)	9(2.8%)	
MPhil	77(98.7%)	1(1.3%)	
<b>Total experience as a pharmacist:</b>			0.138
6months-1year	77(95.1%)	4(4.9%)	
1-3 years	142(99.3%)	1(0.7%)	
>3 years	171(97.2%)	5(2.8%)	
<b>Experience at community pharmacy:</b>			0.193
6months-1year	163(95.9%)	7(4.1%)	
1-2 years	107(99.1%)	1(0.9%)	
>2 years	120(98.4%)	2(1.6%)	
<b>Type of pharmacy setting:</b>			0.465
Independent retail pharmacy	338(97.1%)	10(2.9%)	
Independent wholesale pharmacy	6(100.0%)	0(0.0%)	
Chain pharmacy	46(100.0%)	0(0.0%)	
<b>Pharmacy location</b>			0.364
Islamabad	112(28.7%)	5(50.0%)	
Rawalpindi	103(26.4%)	3(30.0%)	
Peshawar	136(34.9%)	2(20.0%)	
Kohat	39(10.0%)	0(0.0%)	
<b>Current area of pharmacy location?</b>			0.546
Urban area	278(97.2%)	8(2.8%)	
Rural area	112(98.2%)	2(1.8%)	
<b>Yours's Pharmacy location in area:</b>			0.627
Commercial area	165(97.6%)	4(2.4%)	
Residence area	134(97.8%)	3(2.2%)	
shopping mall	11(91.7%)	1(8.3%)	
Infront of Hospital	80(97.6%)	2(2.4%)	
<b>Position in community pharmacy</b>			0.812
Pharmacy owner	96(24.6%)	3(30.0%)	
Dispensing pharmacist	172(44.1%)	3(30.0%)	
Manager	41(10.5%)	1(10.0%)	
Other	81(20.8%)	3(30.0%)	
<b>Number of staff (including yourself):</b>			0.015
1-2	61(92.4%)	5(7.6%)	
2-3	128(98.5%)	2(1.5%)	
>4	201(98.5%)	3(1.5%)	

Table 4.11 continued from previous page

<b>You have awareness about of EPI.</b>	<b>Yes</b>	<b>No</b>	<b>P value</b>
<b>Approximate number of patients handled by you daily:</b>			0.659
1-50	205(97.2%)	6(2.8%)	
51-100	86(98.9%)	1(1.1%)	
>100	99(97.1%)	3(2.9%)	

## 4.11 Association Between Participant Characteristics and Prepared to Provide Vaccination on Community Pharmacies

Table 4.12 presents respondents' preparedness to deliver vaccination services in community pharmacies across three domains: willingness to provide vaccination, engage in referrals, and educate patients and the public, stratified by demographic and pharmacy-related characteristics. Among gender groups, female pharmacists reported preparedness to provide vaccination (59.3%), engage in referrals (55.6%), and educate patients (63.0%), while male pharmacists reported corresponding proportions of 73.2%, 45.3%, and 70.2%. Pharmacists aged 20-30 years reported preparedness to provide vaccination (69.8%), engage in referrals (47.2%), and educate patients (68.9%), whereas those aged  $\geq 31$  years reported 81.7%, 41.5%, and 73.2%, respectively.

By educational qualification, Pharm D holders reported preparedness to provide vaccination (76.8%), engage in referrals (84.2%), and educate patients (77.8%), while MPhil holders reported 23.2%, 15.8%, and 22.2%.

Preparedness to provide vaccination increased across total professional experience categories, reported by 61.7% of pharmacists with 6 months-1 year experience, 67.1% with 1-3 years, and 81.3% with more than 3 years. Across pharmacy settings, preparedness to provide vaccination was reported in independent retail (71.6%), independent wholesale (66.7%), and chain pharmacies (78.3%).

Preparedness varied by pharmacy location and area type. Urban pharmacies reported preparedness to provide vaccination (73.4%), engage in referrals (49.7%), and educate patients (67.5%), while rural pharmacies reported 69.3%, 36.8%, and 75.4%, respectively.

Pharmacies located in residential areas and in front of hospitals reported higher proportions across all three domains compared with those in shopping malls.

Preparedness also differed by staffing levels and patient load, with pharmacies employing more than four staff and those handling more than 100 patients daily reporting higher proportions of preparedness across the three domains.

TABLE 4.12: Community Pharmacist's readiness to provide vaccination

<b>Do you feel prepared to provide vaccination on community pharmacies now?</b>	<b>Provide Vaccination</b>	<b>Engage in referrals</b>	<b>Educate Patients</b>
<b>Gender:</b>			
Female	59.3%	55.6%	63.0%
Male	73.2%	45.3%	70.2%
<b>Age (Years):</b>			
20-30	69.8%	47.2%	68.9%
31- $\geq$ 40	81.7%	41.5%	73.2%
<b>Educational qualification</b>			
Pharm D	76.8%	84.2%	77.8%
MPhil	23.2%	15.8%	22.2%
<b>Total experience as a pharmacist:</b>			
6months-1year	61.7%	60.5%	72.8%
1-3 years	67.1%	44.8%	65.0%
>3 years	81.3%	40.3%	72.2%
<b>Experience at community pharmacy:</b>			
6months-1year	39.4%	45.1%	42.7%
1-2 years	26.0%	28.3%	23.3%
>2 years	34.6%	26.6%	34.1%

Table 4.12 continued from previous page

Do you feel prepared to provide vaccination on community pharmacies now?	Provide Vaccination	Engage in referrals	Educate Patients
<b>Type of pharmacy setting:</b>			
Independent retail pharmacy	71.6%	44.5%	69.8%
Independent wholesale pharmacy	66.7%	33.3%	50.0%
Chain pharmacy	78.3%	58.7%	71.7%
<b>Pharmacy location</b>			
Islamabad	28.0%	37.0%	29.4%
Rawalpindi	26.0%	29.9%	29.7%
Peshawar	39.4%	27.2%	29.0%
Kohat	6.6%	6.0%	11.8%
<b>Current area of pharmacy location?</b>			
Urban area	73.4%	49.7%	67.5%
Rural area	69.3%	36.8%	75.4%
<b>Yours's Pharmacy location in area:</b>			
Commercial area	65.7%	49.1%	66.3%
Residence area	79.6%	40.9%	70.8%
shopping mall	50.0%	50.0%	58.3%
Infront of Hospital	76.8%	47.6%	76.8%
<b>Position in community pharmacy</b>			
Pharmacy owner	26.0%	21.2%	26.5%
Dispensing pharmacist	39.8%	51.6%	42.7%
Manager	11.4%	8.7%	10.0%
Other	22.8%	18.5%	20.8%
<b>Number of staff (including yourself):</b>			
1-2	59.1%	53.0%	50.0%
2-3	66.9%	40.0%	60.0%
>4	79.9%	47.5%	82.4%
<b>Approximate number of patients handled by you daily:</b>			
1-50	71.6%	42.7%	62.6%
51-100	70.1%	54.0%	63.2%
>100	75.5%	46.1%	90.2%

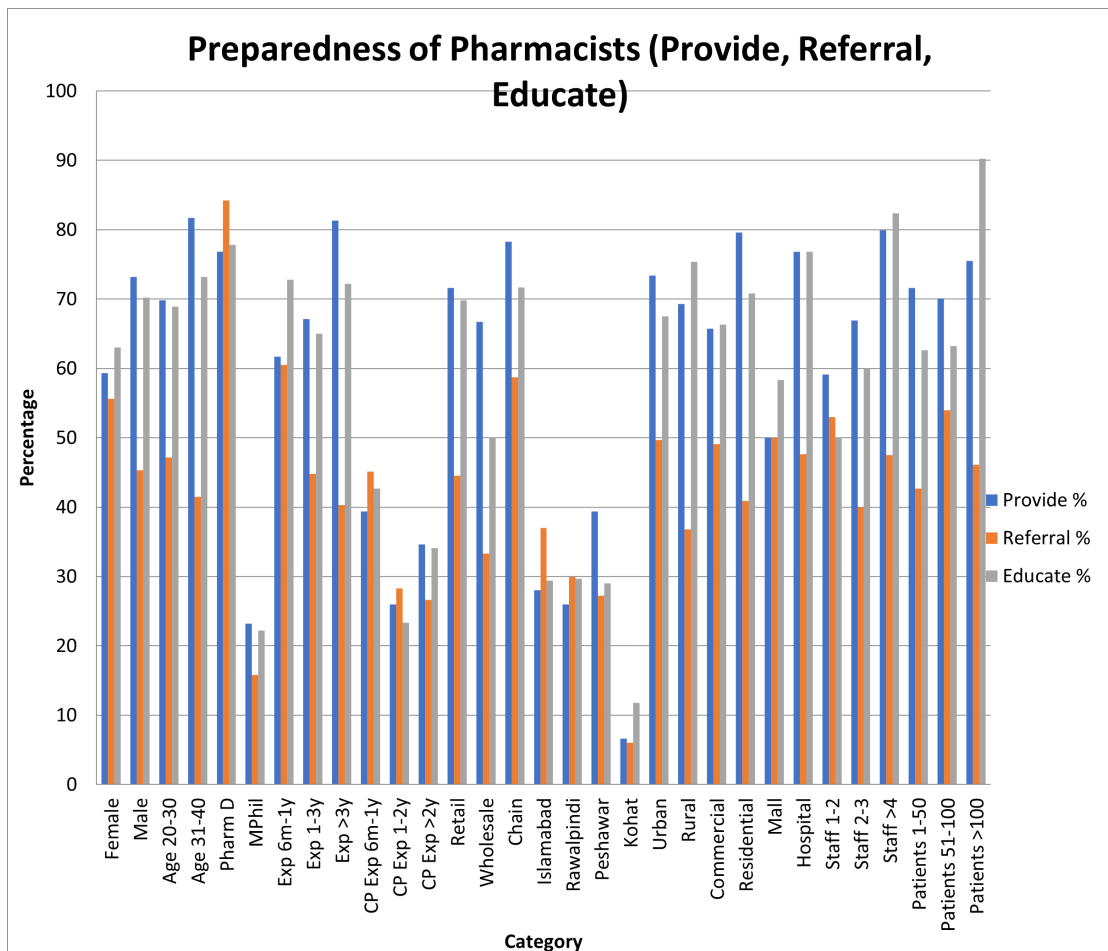


FIGURE 4.5: Preparedness of Community Pharmacist’s to deliver Vaccination

## 4.12 Analysis of Consultation Room Availability Using Mann Whitney and Kruskal Wallis Tests

Table 4.13 shows the comparison of respondents’ characteristics with the availability of a private consultation room at community pharmacies. A significant association was found with gender ( $p = 0.023$ ), where males reported higher mean ranks compared to females. Significant differences were also observed across pharmacy location ( $p = 0.000$ ), current area of pharmacy (urban/rural) ( $p = 0.000$ ), position within the pharmacy ( $p = 0.000$ ), number of staff ( $p = 0.019$ ), and average number of patients handled daily ( $p = 0.000$ ), indicating variation in consultation room

availability across these groups. No significant differences were noted for age, educational qualification, total experience, experience at community pharmacy, type of pharmacy setting, or the specific pharmacy area (commercial /residential/ hospital/ shopping mall)

TABLE 4.13: Inner Setting Differences Based on Availability of Private Consultation Rooms in Community Pharmacies

<b>Is there availability of private consultation room on community pharmacy?</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Gender:</b>			
Female	1(1)	158.26	0.023
Male	2(1)	203.56	
<b>Age:</b>			
20-30	2(1)	205.29	0.060
31- $\geq$ 40	1(1)	181.93	
<b>Educational qualification:</b>			
Pharm D	2(1)	199.62	0.721
MPhil	2(1)	204.13	
<b>Total experience as a pharmacist</b>			
6 months - 1 year	1(1)	190.36	0.589
1-3 years	2(1)	203.90	
>3 years	2(1)	202.41	
<b>Experience at community pharmacy</b>			
6months-1year	1(1)	194.29	0.261
1-2 years	2(1)	213.81	
>2 years	1(1)	197.36	
<b>Type of pharmacy setting</b>			
Independent retail pharmacy	2(1)	204.17	0.159
Independent wholesale pharmacy	1(1)	165.67	
Chain pharmacy	1(1)	177.26	
<b>Pharmacy location?</b>			
Islamabad	1(1)	191.31	0.000
Rawalpindi	1(1)	172.58	
Peshawar	2(1)	220.74	
Kohat	2(1)	232.33	
<b>Current area of pharmacy location?</b>			
Urban area	1(1)	189.21	0.000
Rural area	2(1)	228.82	

Table 4.13 continued from previous page

<b>Is there availability of private consultation room on community pharmacy?</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Position in community pharmacy</b>			
Pharmacy owner	2(1)	214.15	0.000
Dispensing pharmacist	1(1)	175.57	
Manager	1.50(1)	199.00	
Other	2(1)	237.10	
<b>Number of staff (including yourself):</b>			
1-2	1(1)	195.97	0.019
2-3	2(1)	220.54	
>4	1(1)	189.20	
<b>Approximate (average) number of patients handled by you daily</b>			
1-50	2(1)	228.86	0.000
51-100	1(1)	179.46	
>100	1(1)	159.78	
<b>Yours's Pharmacy location in area</b>			
Commercial area	1(1)	198.41	0.285
Residence area	2(1)	211.41	
shopping mall	1(1)	165.67	
Infront of Hospital	1(1)	191.68	

### 4.13 Assessment of Support for Pharmacist Referral Roles Across Demographic and Professional Characteristics

Table 4.14 presents the comparison of respondents' characteristics with their views on whether community pharmacists' referral roles for vaccination services are supported. No significant differences were observed across gender, age, qualification, total experience, community pharmacy experience, type of pharmacy, current area, staff number, or daily patient load ( $p > 0.05$ ). However, significant variation was

found for pharmacy location ( $p = 0.014$ ) and specific location of the pharmacy within the area ( $p = 0.007$ ), indicating differing perceptions among these groups.

TABLE 4.14: Differences in Perceived Support for Pharmacist's Referral Roles Across Practice and Demographic Characteristics

<b>Do you think can Community pharmacists' referral roles for vaccination services are supported?</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Gender:</b>			
Female	1(0)	202.13	0.900
Male	1(0)	200.38	
<b>Age:</b>			
20-30	1(0)	200.17	0.853
31- $\geq$ 40	1(0)	201.77	
<b>Educational qualification:</b>			
Pharm D	1(0)	203.56	0.074
MPhil	1(0)	187.88	
<b>Total experience as a pharmacist</b>			
6months-1year	1(0)	209.54	0.138
1-3 years	1(0)	204.67	
>3 years	1(0)	192.95	
<b>Experience at community pharmacy</b>			
6months-1year	1(0)	198.38	0.448
1-2 years	1(0)	207.69	
>2 years	1(0)	197.09	
<b>Type of pharmacy setting</b>			
Independent retail pharmacy	1(0)	202.39	0.316
Independent wholesale pharmacy	–	172.50	
Chain pharmacy	1(0)	189.89	
<b>Pharmacy location?</b>			
Islamabad	1(0)	215.24	0.014
Rawalpindi	1(0)	200.80	
Peshawar	1(0)	194.24	
Kohat	1(0)	177.63	
<b>Current area of pharmacy location?</b>			
Urban area	1(0)	201.17	0.760
Rural area	1(0)	198.82	
<b>Position in community pharmacy</b>			
Pharmacy owner	1(0)	194.72	0.549

Table 4.14 continued from previous page

<b>Do you think can Community pharmacists' referral roles for vaccination services are supported?</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
Dispensing pharmacist	1(0)	204.50	
Manager	1(0)	191.55	
Other	1(0)	203.45	
<b>Number of staff (including yourself):</b>			
1-2	1(0)	199.77	0.855
2-3	1(0)	203.27	
>4	1(0)	198.97	
<b>Approximate (average) number of patients handled by you daily</b>			
1-50	1(0)	199.99	0.321
51-100	1(0)	209.28	
>100	1(0)	194.07	
<b>Yours's Pharmacy location in area</b>			
Commercial area	1(0)	209.19	0.007
Residence area	1(0)	203.16	
shopping mall	1(0)	205.83	
Infront of Hospital	1(0)	177.38	

#### 4.14 Comparison of Respondent and Pharmacy Characteristics by Agreement on the Educational Role of Community Pharmacists in Vaccination

Table 4.15 presents a non-parametric comparison of respondents' demographic and pharmacy-related characteristics by their agreement with the educational role of community pharmacists in vaccination. Median values with in IQR, mean ranks, and p-values are reported. Statistically significant differences were observed for total pharmacist experience, experience at community pharmacy, pharmacy location, current area, specific pharmacy location within the area, position in the pharmacy, number of staff, and daily patient load ( $p < 0.05$ ). No significant

differences were found across gender, age, educational qualification, or type of pharmacy setting ( $p > 0.05$ ).

TABLE 4.15: Comparison of Respondent and Pharmacy Characteristics by Agreement on the Educational Role of Community Pharmacists in Vaccination

<b>Are you agreed with the role of community pharmacists in vaccination education to patients and the public.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Gender:</b>			
Female	1(0)	186.41	0.221
Male	1(0)	201.52	
<b>Age:</b>			
20-30	1(0)	200.38	0.941
31- $\geq$ 40	1(0)	200.95	
<b>Educational qualification:</b>			
Pharm D	1(0)	201.98	0.332
MPhil	1(0)	194.38	
<b>Total experience as a pharmacist</b>			
6months-1year	1(0)	195.47	0.000
1-3 years	1(0)	221.59	
>3 years	1(0)	188.84	
<b>Experience at community pharmacy</b>			
6months-1year	1(0)	198.75	0. .028
1-2 years	1(0)	211.17	
>2 years	1(0)	192.64	
<b>Type of pharmacy setting</b>			
Independent retail pharmacy	1(0)	200.84	0.806
Independent wholesale pharmacy	1(0)	212.33	
Chain pharmacy	1(0)	196.39	
<b>Pharmacy location?</b>			
Islamabad	1(0)	221.74	0.000
Rawalpindi	1(0)	194.09	
Peshawar	1(0)	192.04	
Kohat	1(0)	184.13	
<b>Current area of pharmacy location?</b>			
Urban area	1(0)	204.87	0.025
Rural area	1(0)	189.53	

Table 4.15 continued from previous page

<b>Are you agreed with the role of community pharmacists in vaccination education to patients and the public.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Yours's Pharmacy location in area</b>			
Commercial area	1(0)	212.14	0.015
Residence area	1(0)	190.68	
shopping mall	1(0)	195.67	
Infront of Hospital	1(0)	193.63	
<b>Position in community pharmacy</b>			
Pharmacy owner	1(0)	191.12	0.000
Dispensing pharmacist	1(0)	199.57	
Manager	—	179.00	
<b>Other</b>	1(0)	224.24	
Number of staff (including yourself):			
1-2	1(0)	204.59	0.035
2-3	1(0)	206.59	
>4	1(0)	186.84	
<b>Approximate (average) number of patients handled by you daily</b>			
1-50	1(0)	204.59	0.035
51-100	1(0)	206.59	
>100	1(0)	186.84	

## 4.15 Assessment of Attitudes Toward Awareness Deficiency About Vaccine-Preventable Disease Severity

The median score for lack of awareness regarding vaccine-preventable disease severity remained similar across all groups (Median = 4, IQR 1–2). Statistically significant differences were observed for pharmacy location ( $p = 0.012$ ), specific pharmacy area ( $p = 0.012$ ), number of staff ( $p = 0.001$ ), and number of patients handled daily ( $p = 0.000$ ). No significant differences were found for gender, age,

qualification, total pharmacist experience, community pharmacy experience, type of pharmacy setting, urban/rural location, or pharmacy position.

TABLE 4.16: Perceived Awareness Deficiency of Vaccine-Preventable Disease Severity

<b>There is lack of awareness on the Vaccine preventable disease severity</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Gender:</b>			
Female	4(1)	206.35	0.293
Male	4(1)	200.08	
<b>Age:</b>			
20-30	4(1)	201.51	0.711
31- $\geq$ 40	4(2)	196.58	
<b>Educational qualification:</b>			
Pharm D	4(1)	201.94	0.587
MPhil	4(1)	194.56	
<b>Total experience as a pharmacist</b>			
6months-1year	4(1)	191.09	0.102
1-3 years	4(1)	189.88	
>3 years	4(1)	213.46	
<b>Experience at community pharmacy</b>			
6months-1year	4(1)	191.47	0.093
1-2 years	4(1)	194.87	
>2 years	4(1)	218.07	
<b>Type of pharmacy setting</b>			
Independent retail pharmacy	4(1)	204.17	0.080
Independent wholesale pharmacy	3(2)	118.42	
Chain pharmacy	4(2)	183.42	
<b>Pharmacy location?</b>			
Islamabad	4(1)	186.20	0.012
Rawalpindi	4(1)	227.80	
Peshawar	4(1)	188.72	
Kohat	4(1)	210.87	
<b>Current area of pharmacy location?</b>			
Urban area	4(1)	203.19	0.428
Rural area	4(2)	193.74	
<b>Yours's Pharmacy location in area</b>			
Commercial area	4(1)	186.20	0.012

Table 4.16 continued from previous page

<b>There is lack of awareness on the Vaccine preventable disease severity</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
Residence area	4(1)	227.80	
shopping mall	4.50(2)	188.72	
Infront of Hospital	4(1)	210.87	
<b>Position in community pharmacy</b>			
Pharmacy owner	4(1)	200.64	0.925
Dispensing pharmacist	4(1)	198.22	
Manager	4(1)	210.89	
<b>Other</b>	4(1)	199.89	
<b>Number of staff (including yourself):</b>			
1-2	4(1)	160.73	0.001
2-3	4(1)	194.43	
>4	4(1)	217.24	
<b>Approximate (average) number of patients handled by you daily</b>			
1-50	4(0)	182.75	0.000
51-100	4(2)	196.39	
>100	5(1)	240.73	

## 4.16 Willingness of Community Pharmacists to Undergo Audit for Vaccination Services

For willingness to undergo an audit if vaccination services are implemented, no significant differences were found across gender, age, total experience, pharmacy setting, staff size, daily patient load, or pharmacy-area type (all  $p > 0.05$ ).

Significant associations emerged for educational qualification ( $p = 0.014$ ), experience at community pharmacy ( $p = 0.001$ ), pharmacy location ( $p < 0.001$ ), and urban vs. rural areas ( $p < 0.001$ ). Median willingness remained 2 (IQR 1–2) across groups.

TABLE 4.17: Willingness of Community Pharmacists to Undergo Audit for Vaccination Services

<b>If vaccination services are to be implemented at your community pharmacy, your % of willing for audit?</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Gender:</b>			
Female	2(2)	200.87	0.985
Male	2(1)	200.47	
<b>Age:</b>			
20-30	2(1)	202.63	0.440
31- $\geq$ 40	2(1)	192.24	
<b>Educational qualification:</b>			
Pharm D	2(2)	207.09	0.014
MPhil	2(2)	173.28	
<b>Total experience as a pharmacist</b>			
6months-1year	2(1)	200.14	0.117
1-3 years	2(2)	214.56	
>3 years	2(1)	189.25	
<b>Experience at community pharmacy</b>			
6months-1year	2(1)	194.29	0.001
1-2 years	2(1)	233.11	
>2 years	2(1)	180.28	
<b>Type of pharmacy setting</b>			
Independent retail pharmacy	2(1)	198.50	0.635
Independent wholesale pharmacy	2(1)	214.92	
Chain pharmacy	2(2)	213.75	
<b>Pharmacy location?</b>			
Islamabad	2(1)	240.39	0.000
Rawalpindi	2(1)	199.44	
Peshawar	2(1)	180.08	
Kohat	1(1)	155.96	
<b>Current area of pharmacy location?</b>			
Urban area	2(2)	214.60	0.000
Rural area	2(1)	165.11	
<b>Yours's Pharmacy location in area</b>			
Commercial area	2(2)	212.81	0.231
Residence area	2(1)	187.27	
shopping mall	2(1)	193.71	

Table 4.17 continued from previous page

<b>If vaccination services are to be implemented at your community pharmacy, your % of willing for audit?</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
Infront of Hospital	2(1)	198.23	
<b>Position in community pharmacy</b>			
Pharmacy owner	2(1)	185.93	0.211
Dispensing pharmacist	2(1)	201.09	
Manager	2(2)	194.26	
<b>Other</b>	2(2)	219.57	
<b>Number of staff (including yourself):</b>			
1-2	2(1)	193.80	0.833
2-3	2(1)	199.95	
>4	2(2)	203.02	
<b>Approximate (average) number of patients handled by you daily</b>			
1-50	2(2)	198.93	0.759
51-100	2(2)	208.03	
>100	2(1)	197.33	

## 4.17 Non-Parametric Analysis of Perceived Infection Risk Among Pharmacy Staff

Median scores for perceived infection risk remained 1 (IQR 0–1) across all groups.

Significant differences were found for age ( $p = 0.020$ ), pharmacy location ( $p = 0.000$ ), number of staff ( $p = 0.002$ ), and daily patient load ( $p = 0.000$ ). No significant associations were observed with gender ( $p = 0.776$ ), qualification ( $p = 0.794$ ), pharmacy setting ( $p = 0.898$ ), or community pharmacy experience ( $p = 0.372$ ).

TABLE 4.18: Perceived Infection Risk Among Pharmacy Staff

<b>Is there risk of infection to health and safety of staff and customer during vaccination services.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Gender:</b>			
Female	1(0)	195.94	0.776

Table 4.18 continued from previous page

<b>Is there risk of infection to health and safety of staff and customer during vaccination services.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
Male	1(0)	200.83	
<b>Age:</b>			
20-30	1(1)	205.59	0.020
31- $\geq$ 40	1(0)	180.77	
<b>Educational qualification:</b>			
Pharm D	1(0)	199.95	0.794
MPhil	1(1)	202.78	
<b>Total experience as a pharmacist</b>			
6months-1year	1(0)	195.94	0.521
1-3 years	1(0)	196.26	
>3 years	1(1)	206.05	
<b>Experience at community pharmacy</b>			
6months-1year	1(1)	206.79	0.372
1-2 years	1(0)	199.65	
>2 years	1(0)	192.48	
<b>Type of pharmacy setting</b>			
Independent retail pharmacy	1(0)	200.93	0.898
Independent wholesale pharmacy	1(0)	184.83	
Chain pharmacy	1(0)	199.33	
<b>Pharmacy location?</b>			
Islamabad	1(0)	180.56	0.000
Rawalpindi	1(0)	187.35	
Peshawar	1(1)	229.76	
Kohat	1(0)	192.53	
<b>Current area of pharmacy location?</b>			
Urban area	1(0)	196.95	0.192
Rural area	1(1)	209.39	
<b>Yours's Pharmacy location in area</b>			
Commercial area	1(0)	190.55	0.138
Residence area	1(1)	212.81	
shopping mall	1(0)	184.83	
Infront of Hospital	1(1)	202.72	
<b>Position in community pharmacy</b>			
Pharmacy owner	1(1)	214.13	0.227
Dispensing pharmacist	1(0)	193.79	

Table 4.18 continued from previous page

<b>Is there risk of infection to health and safety of staff and customer during vaccination services.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
Manager	1(0)	189.60	
<b>Other</b>	1(1)	203.88	
<b>Number of staff (including yourself):</b>			
1-2	1(1)	203.02	0.002
2-3	1(1)	220.73	
>4	1(0)	186.79	
<b>Approximate (average) number of patients handled by you daily</b>			
1-50	1(1)	215.01	0.000
51-100	1(0)	197.48	
>100	1(0)	173.07	

## 4.18 Non-Parametric Analysis of Workload - Related Barriers to Vaccination Service Delivery

Median workload impact scores were 1 (IQR 0–1) across all participant groups. Significant associations were observed for total experience ( $p = 0.017$ ), pharmacy location ( $p = 0.000$ ), pharmacy area ( $p = 0.026$ ), and daily patient load ( $p = 0.011$ ). No significant differences were found for gender ( $p = 0.868$ ), age ( $p = 0.710$ ), qualification ( $p = 0.411$ ), pharmacy setting ( $p = 0.452$ ), or number of staff ( $p = 0.934$ ).

TABLE 4.19: Workload and Manpower Barriers to Vaccination Services

<b>Do you think workload and manpower can effect vaccination services.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Gender:</b>			
Female	1(0)	198.04	0.868
Male	1(0)	200.68	
<b>Age:</b>			
20-30	1(0)	201.25	0.710
31- $\geq$ 40	1(0)	197.59	

Table 4.19 continued from previous page

<b>Do you think workload and manpower can effect vaccination services.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Educational qualification:</b>			
Pharm D	1(0)	198.89	0.411
MPhil	1(0)	207.15	
<b>Total experience as a pharmacist</b>			
6months-1year	1(0)	193.10	0.017
1-3 years	1(0)	188.97	
>3 years	1(1)	213.27	
<b>Experience at community pharmacy</b>			
6months-1year	1(0)	202.18	0.931
1-2 years	1(0)	199.89	
>2 years	1(0)	198.70	
<b>Type of pharmacy setting</b>			
Independent retail pharmacy	1(0)	200.66	0.452
Independent wholesale pharmacy	—	161.00	
Chain pharmacy	1(0)	204.48	
<b>Pharmacy location?</b>			
Islamabad	1(0)	195.19	0.000
Rawalpindi	1(0)	187.42	
Peshawar	1(1)	226.22	
Kohat	—	161.00	
<b>Current area of pharmacy location?</b>			
Urban area	1(0)	195.97	0.072
Rural area	1(1)	211.88	
<b>Yours's Pharmacy location in area</b>			
Commercial area	1(0)	187.04	0.026
Residence area	1(0)	206.26	
shopping mall	1(1)	211.00	
Infront of Hospital	1(1)	217.10	
<b>Position in community pharmacy</b>			
Pharmacy owner	1(0)	199.38	0.907
Dispensing pharmacist	1(0)	198.71	
Manager	1(0)	199.10	
<b>Other</b>	1(0)	206.24	
<b>Number of staff (including yourself):</b>			
1-2	1(0)	200.39	0.934

Table 4.19 continued from previous page

<b>Do you think workload and manpower can effect vaccination services.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
2-3	1(0)	202.54	
>4	1(0)	199.24	
<b>Approximate (average) number of patients handled by you daily</b>			
1-50	1(0)	209.34	0.011
51-100	1(0)	202.38	
>100	1(0)	180.61	

## 4.19 Awareness of the EPI Among Community Pharmacists

The awareness of the EPI showed a median score of 1 across all demographic and professional groups. No statistically significant differences were observed for gender, age, education, experience, pharmacy setting, or location, except for the number of staff, where a significant difference was noted ( $p = 0.015$ ). Mean rank values ranged across groups but remained within similar ranges.

TABLE 4.20: Comparison of Respondent Characteristics by Awareness of the EPI

<b>You have awareness about of EPI.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
<b>Gender:</b>			
Female	1(0)	210.31	0.091
Male	1(0)	199.79	
<b>Age:</b>			
20-30	1(0)	200.53	0.968
31- $\geq$ 40	1(0)	200.38	
<b>Educational qualification:</b>			
Pharm D	1(0)	201.09	0.443
MPhil	1(0)	198.06	
<b>Total experience as a pharmacist</b>			
6months-1year	1(0)	205.38	0.139

Table 4.20 continued from previous page

<b>You have awareness about of EPI.</b>	<b>Median IQR</b>	<b>Mean Rank</b>	<b>P value</b>
1-3 years	1(0)	196.90	
>3 years	1(0)	201.18	
<b>Experience at community pharmacy</b>			
6months-1year	1(0)	203.74	0.193
1-2 years	1(0)	197.35	
>2 years	1(0)	198.78	
<b>Type of pharmacy setting</b>			
Independent retail pharmacy	1(0)	201.25	0.466
Independent wholesale pharmacy	–	195.50	
Chain pharmacy	–	195.50	
<b>Pharmacy location?</b>			
Islamabad	1(0)	204.05	0.366
Rawalpindi	1(0)	201.16	
Peshawar	1(0)	198.40	
Kohat	–	195.50	
<b>Current area of pharmacy location?</b>			
Urban area	1(0)	201.09	0.547
Rural area	1(0)	199.01	
<b>Yours's Pharmacy location in area</b>			
Commercial area	1(0)	200.23	0.628
Residence area	1(0)	199.88	
shopping mall	1(0)	212.17	
Infront of Hospital	1(0)	200.38	
<b>Position in community pharmacy</b>			
Pharmacy owner	1(0)	201.56	0.813
Dispensing pharmacist	1(0)	198.93	
Manager	1(0)	200.26	
<b>Other</b>	1(0)	202.64	
Number of staff (including yourself):			
1-2	1(0)	210.65	0.015
2-3	1(0)	198.58	
>4	1(0)	198.44	
<b>Approximate (average) number of patients handled by you daily</b>			
1-50	1(0)	201.19	0.659

Table 4.20 continued from previous page

You have awareness about of EPI.	Median IQR	Mean Rank	P value
51-100	1(0)	197.80	
>100	1(0)	201.38	

## 4.20 Phase 2: Qualitative Interviews

Most pharmacists reported that their pharmacies lacked private consultation rooms, with limited space identified as a barrier to ensuring patient privacy during vaccination services.

Staffing constraints were commonly highlighted, as limited personnel increased workload and made it difficult to manage both routine dispensing and vaccination activities, although some pharmacists believed that one trained pharmacist supported by an assistant could provide vaccination services effectively.

Referral systems for vaccination were described as weak due to poor coordination between community pharmacies, hospitals, and government facilities, despite high levels of patient trust in pharmacists.

Participants emphasized the need for government support in the form of financial assistance, provision of PPE and equipment, and regular monitoring. Patient demand for pharmacy-based vaccination was generally low because of limited public awareness, although demand increased during disease outbreaks. Pharmacists considered fair compensation important for motivation but noted challenges related to patient willingness to pay due to free vaccination services at government centers.

While pharmacists reported being capable of post-vaccination counselling and side-effect monitoring, gaps in training, infrastructure, and follow-up systems were identified. Community pharmacy-based vaccination was perceived to improve accessibility through reduced waiting times and flexible operating hours, while concerns about occupational risks highlighted the importance of PPE use and staff immunization.

Overall, pharmacists reported moderate readiness to provide vaccination services, identifying training, facility upgrades, stakeholder involvement, and public awareness initiatives as key supportive factors.

TABLE 4.21: Responses of Community Pharmacist's in Interview n (20)

Responses To Questions	Pharmacists
<p><b>1.Can you describe whether your pharmacy has a private consultation room? How important do you think this space is for vaccination services?</b></p>	
<p><i>No, our pharmacy does not have a consultation room. The space is too small, and patients would not feel comfortable receiving vaccines here.</i></p>	Pharmacist 1
<p><i>Currently, there is no private consultation room in the pharmacy, but with proper guidance and financial support, renovations could be made to include one. Such a space is very important because patients expect privacy and comfort when receiving vaccinations. Without it, many may hesitate.</i></p>	Pharmacist 12
<p><b>Q2: How many staff do you feel are needed to provide vaccination services effectively? What challenges might arise with limited staff?</b></p>	
<p><i>Currently, we have only one pharmacist. It would be very difficult to manage both dispensing and vaccination.</i></p>	Pharmacist 2
<p><i>If the staff is limited, the workload increases, which makes it difficult to maintain quality service. More staff would help balance routine pharmacy work along with vaccination services.</i></p>	Pharmacist 4
<p><i>For safe vaccination, one trained pharmacist and one assistant are enough. The pharmacist can administer the vaccine while the assistant helps with patient handling and record-keeping. If staff are limited, the workload increases, service becomes slower, and the quality of care may decline.</i></p>	Pharmacist 6
<p><b>Q3: In your opinion, how well are pharmacists' referral roles for vaccination services supported?</b></p>	
<p><i>Currently, referral systems are weak, but if the government officially recognizes pharmacists in referral roles, it will strengthen their contribution. Such recognition will help patients access vaccination more easily.</i></p>	Pharmacist 7
<p><i>There is no proper collaboration between pharmacies and hospitals for referrals. This lack of coordination limits pharmacists' ability to formally guide patients to vaccination centers.</i></p>	Pharmacist 9

Table 4.21 continued from previous page

Responses To Questions	Pharmacists
<i>Currently, referral support is almost nonexistent. However, patients still trust pharmacists and often ask them for guidance. This trust shows pharmacists could play an important role if proper systems were developed.</i>	Pharmacist 11
<b>Q4: What kind of support do you expect from the government for vaccination services in pharmacies?</b>	
<i>Government support is required in the form of subsidies for PPE and vaccination equipment. Without such financial assistance, many small pharmacies will find it difficult to sustain safe vaccination services.</i>	Pharmacist 8
<i>Government support should include regular monitoring and audits. This will ensure quality and build public trust in pharmacy-based vaccination.</i>	Pharmacist 10
<b>Q5. Do patients in your community request vaccination at your pharmacy? Can you share any recent experiences?</b>	
<i>Most patients associate pharmacy with just dispensing medicine. They have little expectation that vaccinations will be available in pharmacies, which reflects a lack of public awareness.</i>	Pharmacist 13
<i>Awareness is very low in the community, and patients usually do not believe that pharmacists can administer vaccines. This limits demand for vaccination services in pharmacies.</i>	Pharmacist 15
<i>Patients' requests for vaccines increase during disease outbreaks such as measles or influenza, showing demand rises with health crises.</i>	Pharmacist 17
<b>Q6. What are your views on compensating pharmacists for providing vaccination services?</b>	
<i>Fair compensation will recognize pharmacists as equal healthcare providers. This recognition would motivate them and strengthen their role in public health.</i>	Pharmacist 14
<i>A challenge is that vaccination is already free at government centers, so patients may be unwilling to pay for the same service at pharmacies.</i>	Pharmacist 16
<i>Insurance companies should include pharmacy-based vaccination in reimbursement plans to encourage pharmacist participation.</i>	Pharmacist 18
<b>Q7: How do you see the role of pharmacists in side effect monitoring and counselling after vaccination? What challenges have you experienced?</b>	
<i>Follow-up after vaccination is not currently part of pharmacy culture, which limits effective monitoring.</i>	Pharmacist 19
<i>Pharmacists are capable of monitoring side effects, but we need proper training.</i>	Pharmacist 1

Table 4.21 continued from previous page

Responses To Questions	Pharmacists
<i>The participant explained that pharmacists play a crucial role in monitoring and counselling, which improves patient confidence. However, challenges such as lack of infrastructure and systemic support reduce their ability to do so. Strengthening this role would enhance patient safety and trust.</i>	Pharmacist 20
<b>Q8: How can community pharmacy-based vaccination improve accessibility for patients?</b>	
<i>Community pharmacies can save patients time and improve access, since they don't need to wait in long queues like in hospitals.</i>	Pharmacist 4
<b>Q9: How does the flexible timing of community pharmacies affect patient's ability to get vaccinated?</b>	
<i>Flexible hours are a big advantage; patients can come in the evening.</i>	Pharmacist 1
<i>Many patients cannot leave work during the day; Pharmacy hours solve this problem and increase the convenience of getting the vaccine.</i>	Pharmacist 3
<i>Flexible pharmacy hours allow mothers to bring children after school for vaccination, making it more convenient for families.</i>	Pharmacist 5
<b>Q10: What risks to staff or customers do you foresee in providing vaccination at community pharmacies?</b>	
<i>Pharmacists may face the risk of exposure to blood-borne infections while administering vaccines. Proper protective measures and equipment are essential to minimize such risks.</i>	Pharmacist 8
<i>If pharmacy staff are not immunized themselves, they may face risks when handling vaccines or patients. Staff vaccination is therefore essential.</i>	Pharmacist 10
<b>Q11: How do workload and staffing levels affect your ability to provide vaccination services?</b>	
<i>If there is only one pharmacist and they are absent, vaccination services cannot continue. Reliable staffing is essential for continuity.</i>	Pharmacist 11
<b>Q12: What upgrades or changes in facilities are needed to support vaccination services?</b>	
<i>Facilities should include first aid supplies and resuscitation kits. These are necessary to manage emergencies during vaccination.</i>	Pharmacist 12
<i>Facilities should be upgraded with fire safety and proper waste management systems. These measures ensure safety for both staff and patients.</i>	Pharmacist 14
<i>Pharmacies need proper temperature monitoring devices to ensure vaccine storage and safety.</i>	Pharmacist 16

Table 4.21 continued from previous page

Responses To Questions	Pharmacists
<b>Q13: How do you see the role of personal protective equipment (PPE) in safe vaccination delivery?</b>	
<i>Reusable PPE could help reduce costs. However, it requires proper sterilization to maintain safety standards.</i>	Pharmacist 13
<i>PPE is important, but in practice, staff sometimes neglect it if there is weak supervision.</i>	Pharmacist 15
<i>PPE should not be limited to COVID-19 but should remain a permanent requirement for all vaccination services.</i>	Pharmacist 17
<b>Q14: What is your awareness of the EPI?</b>	
<i>Pharmacists should be trained to collaborate effectively with EPI campaigns to expand vaccination coverage.</i>	Pharmacist 18
<i>EPI mainly focuses on polio, measles, BCG, and other childhood vaccines.</i>	Pharmacist 2
<b>Q15: How prepared do you feel personally to provide vaccination services in your pharmacy?</b>	
<i>I feel capable, but an orientation session would boost my confidence further.</i>	Pharmacist 19
<i>I feel prepared in theory, but I lack practical vaccination training.</i>	Pharmacist 1
<i>Training increases pharmacists' confidence and skills. Lack of training reduces readiness to provide vaccination services.</i>	Pharmacist 3
<b>Q16: Which stakeholders (e.g., government, professional bodies, pharmacy owners, NGOs) should be involved in supporting community pharmacy vaccination?</b>	
<i>Support should involve government, pharmacy owners, professional bodies, and NGOs like WHO and UNICEF for technical and training assistance.</i>	Pharmacist 4
<b>Q17: In your opinion, what strategies could be effective in raising public awareness about pharmacist-led vaccination services?</b>	
<i>Pharmacists can raise awareness by organizing free health camps, where people can receive education about the importance of vaccines.</i>	Pharmacist 5
<i>Collaborating with local community leaders can increase trust in pharmacist-led vaccination. Community engagement ensures that people feel confident and informed about the service.</i>	Pharmacist 7
<i>Pharmacists can distribute brochures with prescriptions to educate patients. This low-cost strategy can spread awareness directly to medicine users.</i>	Pharmacist 9

## 4.21 Result Summary

The qualitative findings demonstrate that community pharmacists show a positive attitude and willingness toward providing vaccination services; however, their readiness is limited by several practical and systemic challenges. One of the most prominent findings was the lack of appropriate infrastructure, particularly private consultation rooms, which pharmacists considered essential for ensuring patient privacy, comfort, and acceptance of vaccination services. Without such spaces, pharmacists felt that patient confidence and service quality would be compromised.

Workforce-related challenges also strongly influenced service delivery. Many pharmacists reported working alone or with limited staff, making it difficult to balance routine dispensing responsibilities with vaccination services. Although some pharmacists believed that vaccination could be managed with minimal staff if roles were clearly defined, overall staffing shortages were perceived to increase workload, slow service delivery, and affect continuity of care.

Another important finding was the absence of structured referral systems and weak coordination between community pharmacies, hospitals, and government healthcare facilities. Despite this, pharmacists reported a high level of trust from patients, who frequently sought their advice regarding vaccination. This indicates that pharmacists already function as informal referral points and could play a stronger role if formally integrated into vaccination pathways.

Government support emerged as a critical enabling factor. Pharmacists highlighted the need for financial assistance, provision of PPE and vaccination equipment, regulatory recognition, and routine monitoring to ensure safety and quality. The lack of such support was seen as a major barrier, particularly for smaller community pharmacies with limited resources.

Public awareness was identified as another key issue. Most pharmacists reported low demand for vaccination services at pharmacies because patients typically associate pharmacies with medication dispensing rather than preventive services.

However, increased demand during disease outbreaks demonstrated that community need exists and can be activated when awareness and perceived risk are higher.

Compensation was viewed as essential for motivating pharmacists and recognizing them as healthcare providers. At the same time, pharmacists expressed concern that free vaccination services at government centers might discourage patients from paying for pharmacy-based services, highlighting the potential role of insurance or reimbursement mechanisms.

Pharmacists also recognized their professional role in post-vaccination counselling and side-effect monitoring but reported limited capacity to perform these tasks effectively due to inadequate training, lack of follow-up systems, and insufficient infrastructure. Safety concerns, including exposure to blood-borne infections, further emphasized the importance of PPE use and staff immunization. Overall, the qualitative output suggests that while community pharmacists possess the willingness, basic knowledge, and patient trust necessary to deliver vaccination services, successful implementation depends on addressing infrastructural gaps, improving staffing and training, strengthening referral and follow-up systems, enhancing public awareness, and ensuring formal policy and financial support from key stakeholders.

# Chapter 5

## Discussion

Vaccination played a crucial role to prevent some diseases from spreading in the community for hundreds of years. Expanding the scope of practice of pharmacists to include vaccination could be streamlined to potentially allow optimal opportunities for the community to receive the required vaccination. Several studies reported that providing vaccination service in the community setting could help increasing the availability of the vaccines, accelerating the vaccination process, increasing the number of vaccinated people, and reducing the risk of developing complications and new infectious diseases in addition to cost-saving [150] [151] [152] [153]. Therefore, it is essential to investigate community pharmacists' willingness and readiness to deliver vaccination and the associated barriers to provide the vaccination service.

The study explored community pharmacists' willingness and readiness to deliver vaccination services in Pakistan using a CFIR-guided mixed-methods approach. Overall, the findings indicate that community pharmacists demonstrate positive attitudes toward pharmacy-based vaccination services [154] however, actual readiness is strongly influenced by organizational capacity, external policy support, and perceived complexity of service delivery [149] [155] [156].

The findings related to the inner setting of community pharmacies provide important insight into the readiness of pharmacies to support vaccination services. In

this study, 49.3% of community pharmacies reported the availability of a private consultation room, while 50.7% lacked such a facility, indicating that privacy infrastructure remains inconsistent across settings. Similar findings have been reported in previous studies their lack of private area to provide the vaccine (56.8%) [156]. This finding indicates that privacy infrastructure remains insufficient in a substantial proportion of pharmacies, which may limit confidential vaccine counseling and on-site immunization. Similar studies from LMICs have identified inadequate physical space as a major barrier to the expansion of pharmacist-led vaccination services, particularly in retail-oriented pharmacy environments [86] [131]. Privacy has been shown to influence patient trust and willingness to receive vaccination in community pharmacies, underscoring the importance of consultation rooms for service implementation [42].

Despite these infrastructural limitations, the implementation climate appeared favorable, particularly with regard to professional support for pharmacists. A large majority of respondents (86.0%) believed that community pharmacists' referral roles for vaccination services are supported, indicating a positive perception of pharmacists' integration within the broader healthcare system. This finding is consistent with international evidence, as a systematic review and meta-analysis by [157] demonstrated that pharmacist-led immunization programs incorporating active referral and advocacy increased vaccination uptake nearly threefold (RR = 2.95;  $P < 0.001$ ), while a comprehensive systematic review by [158] reported widespread professional and system-level support for community pharmacy-based immunization services, with pharmacies delivering up to 25% of adult influenza vaccinations and a substantial proportion of vaccinations occurring during extended service hours.

Agreement with the role of community pharmacists in vaccination education to patients and the public was high in the present study, with 89.3% of respondents expressing support. This positive perception was consistently observed across gender groups, with 96.3% of female pharmacists and 88.7% of male pharmacists reporting agreement, and no statistically significant difference was identified ( $p = 0.221$ ). These findings align closely with evidence from other settings.

A cross-sectional study conducted in Jordan during the COVID-19 pandemic by [156] reported that 86.6% of community pharmacists demonstrated high willingness to engage in vaccination services, while 87.5% believed they possessed adequate knowledge of vaccines and 92.0% considered themselves more accessible than other healthcare professionals. Similarly, population-level data from the United States analyzed by [122] showed sustained increases in adult vaccination rates following expanded pharmacist involvement, highlighting the impact of pharmacist-led education, counseling, and recommendation on vaccination behavior. Collectively, these findings reinforce the view that community pharmacists are widely recognized as credible and effective educators in immunization programs, supporting their expanded role in public health promotion.

Perceived lack of awareness regarding the severity of vaccine-preventable diseases was high in the present study, with 79.1% of respondents either agreeing (45.8%) or strongly agreeing (33.3%) that awareness is insufficient, while only 10.3% disagreed and 10.8% remained neutral. This finding is consistent with evidence from other settings indicating persistent gaps in understanding the seriousness of vaccine-preventable diseases. A nationally representative study from the United States by [159] reported that although awareness of influenza as a vaccine-preventable disease was high (94.0%), awareness of other serious conditions such as human papillomavirus was substantially lower (63.4%), suggesting uneven recognition of disease severity among adults. Similarly, a web-based survey among community pharmacists in Uganda by [160] found that only 56.55% correctly identified vaccine-preventable diseases as serious, despite universal acknowledgment of the general benefits of vaccination. Together, these findings indicate that inadequate awareness of disease severity remains a critical barrier to optimal vaccine acceptance and uptake, underscoring the importance of targeted educational interventions. In this context, community pharmacists can play a pivotal role in improving public understanding by providing clear, evidence-based education on the risks and consequences of vaccine-preventable diseases.

A high level of professional readiness for audit and quality assurance was observed among community pharmacists in the present study. More than three-quarters of

respondents (75. 8%) reported being either extremely willing (34. 0%) or willing (41. 8%) to undergo audit if vaccination services were implemented, while resistance was minimal (5. 5% not willing). This strong acceptance of audit processes indicates a mature implementation climate characterized by accountability and openness to regulatory oversight, which is essential for the safe and sustainable delivery of pharmacy-based vaccination services. Comparable findings have been reported internationally, where community pharmacies demonstrate high engagement with monitoring and governance systems; for instance, Australian pharmacy vaccination programs achieved 82% participation in cold-chain audits and high completeness of vaccination reporting through national immunization registers, reflecting operational readiness for audit-linked quality assurance [161]. Similarly, national data from Australia showed high engagement with vaccination reporting and monitoring systems, with 62% of pharmacists regularly using the national immunization register, 71% reporting vaccinations via automated uploads, and an estimated 82% completeness of reporting, reflecting readiness for audit-linked quality assurance in community pharmacy vaccination services [162].

The findings from this study, a substantial proportion of respondents (75. 5%) perceived a risk to the health and safety of staff and customers during the provision of vaccination services in community pharmacies, indicating that infection control is a major concern under the intervention characteristics domain. Similar safety-related concerns have been reported in other community pharmacy settings. A cross-sectional study from Jordan found that 64. 8% of community pharmacists identified safety and infection-related issues as barriers to providing vaccination services during the COVID-19 pandemic [156]. Likewise, a survey conducted in Uganda reported that 64. 83% of community pharmacists expressed concerns related to vaccine safety and management of adverse events, reflecting apprehension regarding occupational exposure and infection risk [160]. In contrast, evidence from countries with established pharmacy-based vaccination programs suggests that actual safety risks are minimal when appropriate protocols are followed. For example, a Canadian community pharmacy influenza vaccination program reported no cases (0%) of occupational infection or needlestick

injury among pharmacists [121], while an early U. S. implementation study similarly documented 0% infection events associated with pharmacist-administered vaccinations [163]. Collectively, these findings suggest that while perceived infection risk among community pharmacists is high, as observed in the present study, effective training, infection-control measures, and standardized operating procedures can substantially mitigate actual health and safety risks in community pharmacy-based vaccination services.

In the present study, a large majority of community pharmacists (80. 3%) agreed that workload and manpower can affect the delivery of vaccination services in community pharmacies, indicating that staffing capacity and operational burden are key determinants of service feasibility. This finding reflects the perceived complexity associated with integrating vaccination into routine pharmacy practice, particularly in settings with limited human resources. Similar concerns have been widely reported in the international literature. A national survey from the United States found that 57–63% of community pharmacists identified increased workload and insufficient staffing as major barriers to providing immunization services [164]. Likewise, a Canadian study evaluating pharmacist-led influenza vaccination services reported that 58% of pharmacists experienced workload pressure during vaccination periods, especially in pharmacies with limited support staff [121]. Evidence from LMICs further supports these findings; a cross-sectional study conducted in Jordan reported that 61. 9% of community pharmacists perceived workload and time constraints as significant barriers to vaccination service implementation [156]. Collectively, these findings are consistent with the high level of concern observed in the present study and suggest that while community pharmacy-based vaccination offers clear advantages in accessibility, successful implementation requires adequate staffing, task delegation, and workflow optimization to reduce workload-related constraints.

Awareness of the EPI among community pharmacists was very high, with 97. 5% of respondents reporting that they were aware of EPI. Although direct evidence focusing solely on community pharmacists' awareness of EPI is limited, closely related international studies assessing knowledge of national immunization programs

and routine vaccination schedules core components of EPI report similarly high levels of awareness. A cross-sectional study conducted in Uganda found that 96.2% of community pharmacists were aware of the national immunization program and routine vaccination schedules [160].

Likewise, a multi-country survey assessing pharmacists' immunization knowledge reported that over 90% of respondents demonstrated adequate knowledge of routine vaccines included in national immunization programs [165].

These findings align closely with the high level of EPI awareness observed in the present study and support the view that community pharmacists possess the foundational knowledge required to contribute effectively to immunization education and service delivery in alignment with public health objectives set by the World Health Organization.

Community pharmacists demonstrated a substantial level of preparedness to undertake vaccination-related responsibilities. A large proportion reported willingness to provide vaccination services (72.3%) and to educate patients and the public (69.8%), while a comparatively smaller proportion expressed willingness to engage in referral activities (46.0%). This pattern suggests stronger self-efficacy for direct service provision and patient education than for formal referral-based roles within community pharmacy practice.

Similar trends have been reported internationally. A national survey from the United States found that over 70% of community pharmacists were willing to administer vaccines and felt confident in providing vaccination counselling, whereas engagement in referral and coordination activities was less frequently reported [164]. Likewise, a Canadian evaluation of pharmacist-led influenza vaccination services reported that approximately 68–72% of pharmacists felt prepared to administer vaccines and educate patients, supporting the high level of preparedness observed in the present study [121].

In the Pakistani context, these findings indicate a strong foundation for expanding pharmacist-led vaccination services, particularly in administration and education,

provided that appropriate training, regulatory authorization, and integration with national immunization frameworks are ensured.

## 5.1 Limitations of the Study

This study has several limitations that should be considered when interpreting the findings. The quantitative component employed a cross-sectional design, capturing responses at a single point in time, which limits the ability to establish causal relationships or assess changes in willingness and readiness over time. Convenience sampling was used for the survey, and although a large sample size was achieved, this approach may have introduced selection bias and limited the generalizability of the findings, as pharmacists with greater interest in vaccination services may have been more likely to participate. The study was conducted in only four cities, which may not fully represent community pharmacy practices in other regions of Pakistan, particularly rural or underserved areas where infrastructure and regulatory enforcement may differ. Additionally, reliance on self-reported data introduces the possibility of social desirability and recall bias, potentially leading to overestimation of willingness, preparedness, or awareness. The qualitative component included a relatively small number of participants, all of whom were male, limiting exploration of gender-based perspectives. Finally, the study assessed perceived willingness and readiness rather than actual implementation of vaccination services, meaning that practical, legal, and logistical challenges encountered during real-world delivery were not directly observed; nevertheless, the mixed-methods design and use of the CFIR framework provided a comprehensive understanding of key factors influencing community pharmacists' readiness to deliver vaccination services in Pakistan.

# Chapter 6

## Conclusion and Future Recommendation

### 6.1 Conclusion

This study assessed the willingness and readiness of community pharmacists to deliver vaccination services in community pharmacy settings in Pakistan using a CFIR-guided mixed-methods approach. The findings provide comprehensive evidence that community pharmacists generally demonstrate positive attitudes and strong willingness to participate in vaccination-related activities, including patient education, referral, and vaccine administration. This reflects a growing recognition among pharmacists of their potential role in strengthening national immunization efforts.

The quantitative findings revealed high levels of agreement regarding pharmacists' involvement in vaccination services; however, readiness to implement such services was influenced by multiple organizational and contextual factors. Limited availability of private consultation rooms, workload and manpower constraints, high patient volume, perceived infection risks, and the need for facility upgrades were identified as key challenges. Significant associations between readiness indicators and pharmacy-related characteristics such as location, staffing levels, and daily

patient load highlight the importance of organizational capacity in determining service feasibility.

Qualitative findings complemented the quantitative results by providing deeper insights into pharmacists lived experiences and perceptions. Participants emphasized the absence of formal legal authorization, lack of structured immunization training, insufficient infrastructure, and concerns about managing adverse events as major barriers.

At the same time, pharmacists expressed strong professional motivation, confidence in their clinical knowledge, and willingness to support vaccination services if adequate regulatory, training, and financial support were provided.

Overall, the study concludes that while community pharmacists in Pakistan are willing and partially prepared to deliver vaccination services, successful implementation requires coordinated efforts at policy and practice levels. Establishing clear regulatory frameworks, providing standardized training programs, improving pharmacy infrastructure, and ensuring appropriate remuneration are essential to enhance readiness. Integrating community pharmacies into national immunization strategies has the potential to improve vaccine accessibility, reduce the burden on existing healthcare facilities, and contribute to improved public health outcomes in Pakistan.

## **6.2 Future Recommendations**

Future initiatives should focus on formally integrating community pharmacists into national vaccination programs through clear policies, legal recognition, and standard guidelines. Targeted training and certification programs are needed to enhance practical vaccination skills, cold chain management, and adverse event monitoring. Infrastructure improvements, including private consultation areas and appropriate storage and emergency equipment, should be supported. Sustainable reimbursement mechanisms and government incentives are essential to

encourage pharmacist participation, while public awareness campaigns can improve acceptance of pharmacy-based vaccination. Future research should evaluate pilot implementation of pharmacist-led vaccination services to assess real-world feasibility and impact across different regions of Pakistan.

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# Appendix A

## Consent form

**Study Title:** Community Pharmacists Workforces Willingness and Readiness to Deliver Vaccination Services: A Mixed Method Study from Pakistan

**Subject:** Acceptance of oral and written consent for participation in the study of Pharmacist providing vaccination services

**Principal Investigator:** Hyder Abbas

Faculty of Pharmacy, Capital University of Science and Technology

Gmail address: [peerhaider05@gmail.com](mailto:peerhaider05@gmail.com)

### **Purpose of the Study:**

You are invited to participate in a research study exploring pharmacist's provide vaccination services in Pakistan. This study aims to Assess pharmacists' willingness to administer vaccines, identify barriers and facilitators to vaccination delivery in community pharmacies and Improve access to immunization services in Pakistan.

### **Procedures:**

If you agree to participate, you will:

1. Complete a brief survey (10-minutes).
2. Optionally participate in interview (20–30 minutes) to share detailed perspectives.

### **Consent:**

I have read and understood the purpose, procedures, risks, and benefits of the study. I agree to participate voluntarily and understand that I may withdraw at any time. Both oral and written consent are acceptable for this study, ensuring flexibility for participants.

Participant

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher:

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# Appendix B

## Transcript for Qualitative part

### SECTION 1. DEMOGRAPHIC INFORMATION:

1. **Gender:**  Female  Male
2. **Age (Years):**  20-30  31- ≥ 40
3. **Educational qualification:**  Pharm D  MPhil  Other
4. **Total experience as a pharmacist:**  6months-1year  1-3 years  >3 years
5. **Experience at community pharmacy:**  6months-1year  1-2 years  >2 years
6. **Year of pharmacy establish:**  < 1 year  1-5 years  6-10 years  >10 years
7. **Type of pharmacy setting:**  
 Independent retail pharmacy  Independent wholesale pharmacy  Chain pharmacy
8. **Pharmacy location?**  
 Islamabad  Rawalpindi  Peshawar  Kohat
9. **Current area of pharmacy location?**  Urban area  Rural area
10. **Yours's Pharmacy location in area:**  
 Commercial area  Residence area  shopping mall  Infront of Hospital
11. **Time of Working:**  Day shift  Night shift  Weekend
12. **Position in community pharmacy:**  
 Pharmacy owner  Dispensing pharmacist  Manager  Other
13. **Number of staff (including yourself):**  1-2  2-3  >4
14. **Approximate (average) number of patients handled by you daily:**  1-50  51-100  >100

### Section 2. Qualitative part interview questions:

#### Theme 1:

1) Can you describe whether your pharmacy has a private consultation room? How important do you think this space is for vaccination services

Ans: \_\_\_\_\_

2) How many staff do you feel are needed to provide vaccination services effectively? What challenges might arise with limited staff?

Ans: \_\_\_\_\_

#### Theme 2:

3) In your opinion, how well are pharmacists' referral roles for vaccination services supported?

**Ans:** \_\_\_\_\_

4) What kind of support do you expect from the government for vaccination services in pharmacies?

**Ans:** \_\_\_\_\_

**Theme 3:**

5) Do patients in your community request vaccination at your pharmacy? Can you share any recent experiences?

**Ans:** \_\_\_\_\_

**Theme 4:**

6) What are your views on compensating pharmacists for providing vaccination services?

**Ans:** \_\_\_\_\_

7) How do you see the role of pharmacists in side effect monitoring and counselling after vaccination? What challenges have you experienced?

**Ans:** \_\_\_\_\_

**Theme 5:**

8) How can community pharmacy-based vaccination improve accessibility for patients?

**Ans:** \_\_\_\_\_

9) How does the flexible timing of community pharmacies affect patients' ability to get vaccinated?

**Ans:** \_\_\_\_\_

**Theme 6:**

10) What risks to staff or customers do you foresee in providing vaccination at community pharmacies?

**Ans:** \_\_\_\_\_

11) How do workload and staffing levels affect your ability to provide vaccination services?

Ans: \_\_\_\_\_

**Theme 7:**

12) What upgrades or changes in facilities are needed to support vaccination services?

Ans: \_\_\_\_\_

13) How do you see the role of personal protective equipment (PPE) in safe vaccination delivery?

Ans: \_\_\_\_\_

**Theme 8:**

14) What is your awareness of the Expanded Program on Immunization (EPI)?

Ans: \_\_\_\_\_

15) How prepared do you feel personally to provide vaccination services in your pharmacy?

Ans: \_\_\_\_\_

**Theme 9:**

16) Which stakeholders (e.g., government, professional bodies, pharmacy owners, NGOs) should be involved in supporting community pharmacy vaccination?

Ans: \_\_\_\_\_

**Theme 10:**

17) In your opinion, what strategies could be effective in raising public awareness about pharmacist-led vaccination services?

Ans: \_\_\_\_\_

**Community Pharmacists Workforces Willingness and Readiness to Delivery Vaccination Services: A  
Mixed Method Study from Pakistan**

**Dear Pharmacist,**

We are surveying to assess Community Pharmacists' Willingness and Readiness to Delivery Vaccination Services in Pakistan. We invite you to complete this 10-minutes questionnaire; your response is precious.

We assure you that your personal information will be kept confidential, and the responses obtained will be used solely for research purposes.

We sincerely appreciate your participation in this study. Thank you.

**TOOL FOR DATA COLLECTION**

**SECTION 1. DEMOGRAPHIC INFORMATION**

1. **Gender:**     Female    Male
2. **Age (Years):**    20-30    31- > 40
3. **Educational qualification:**    Pharm D     MPhil    Other
4. **Total experience as a pharmacist:**         6months-1year         1-3 years     >3 years
5. **Experience at community pharmacy:**     6months-1year         1-2 years     >2 years
6. **Year of pharmacy establish:**    < 1 year    1-5 years         6-10 years    >10 years
7. **Type of pharmacy setting:**  
 Independent retail pharmacy    Independent wholesale pharmacy    Chain pharmacy
8. **Pharmacy location?**  
 Islamabad     Rawalpindi     Peshawar     Kohat
9. **Current area of pharmacy location?**    Urban area     Rural area
10. **Yours's Pharmacy location in area:**  
 Commercial area     Residence area     shopping mall    Infront of Hospital
11. **Time of Working:**     Day shift     Night shift     Weekend
12. **Position in community pharmacy:**  
 Pharmacy owner    Dispensing pharmacist     Manager    Other
13. **Number of staff (including yourself):**    1-2     2-3     >4
14. **Approximate (average) number of patients handled by you daily:**    1-50     51-100    >100

**SECTION 2. Inside setting of pharmacy and implementation climate**

Facilitators and barriers	Yes	No
Is there availability of private consultation room on community pharmacy?		
Do you think can Community pharmacists' referral roles for vaccination services are supported?		

Do you think that the support use of community pharmacists as part of the vaccination program?		
Are you agreed with the role of community pharmacists in vaccination education to patients and the public.		
Do you think that community pharmacy staff would be supported by government?		

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Four or more pharmacy staffs or assistants are enough for providing help in vaccination services at community pharmacy?					
Vaccination services at community pharmacy can be managed by one pharmacist.					

## SECTION 3. Outer setting and external policies and incentives

Facilitators and barriers	Yes	No
Public can request for vaccination at community pharmacy?		
Do you think side effect monitoring, and vaccination counselling and education must all be provided by community pharmacies under pharmacist supervision?		
Do you agree that community pharmacists should be compensated for offering vaccination Services?		

What, in your opinion, are some of the most pressing issues that could arise?	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
There are challenges with follow-up after vaccination					
Managing side effect after vaccination is a significant concern					

There is lack of awareness on the Vaccine preventable disease severity					
--	--	--	--	--	--

How often has a customer or patient sought out vaccination at the local pharmacy in the past six months?	Very often	Often	Sometimes	Rarely	Never
--	------------	-------	-----------	--------	-------

The quality of vaccination and patient compliance could both benefit from an audit.	Very Effective	Effective	Moderately effective	Not Effective
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If vaccination services are to be implemented at your community pharmacy, your % of willing for audit?	Extremely willing	Willing	Moderately willing	Not willing
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When auditing community pharmacy vaccination services, which of the following areas are typically reviewed? (yes/no)	Yes	No
Staff received training related to the administration of vaccines		
Management of vaccine-related adverse events		
Compliance with legal and regulatory requirements		

#### SECTION 4. Intervention characteristics relative advantage and complexity Concern

Facilitators and barriers	Yes	No
Is there risk of infection to health and safety of staff and customer during vaccination services.		
Do you think workload and manpower can effect vaccination services.		

Some pharmacies may face stigma or reduced customer traffic due to misconceptions about vaccine safety.		
Can vaccination program is complicated to implement.		
Do you think upgrade of facilities needed for vaccination.		
Is there need of willingness to invest in personal protective equipment for vaccination.		
Are you agree that community pharmacists must have previous working experience of vaccination.		
Is the time flexibility offered by community pharmacy-based vaccination.		
Is community pharmacy-based vaccination providing better accessibility to patients.		
Do you think shorter waiting time for patient to receive vaccination at community pharmacy.		

**SECTION 5. Characteristics of individuals Knowledge and beliefs about the interventions and Self-efficacy**

Statement	Yes	No
You have awareness about of Expanded Program on Immunization (EPI).		

**Do you feel prepared to provide vaccination on community pharmacies now?**

*(Select all that apply)*

- Willingness to engage in referrals for vaccination services
- Willingness to provide Vaccination in community pharmacy
- Willingness to educate patients and the public about Vaccination

**THANK YOU FOR BEING HERE ON OUR JOURNEY**