

PHARMACIST VACCINATION PREPAREDNESS

*Submitted in partial fulfilment of the
requirements of the Degree of Master of Pharmacy*

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2024



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Abstract

The World Health Organization (WHO) launched the Immunization Agenda 2030 to improve equity of access to vaccination and increase immunisation coverage rates across all ages and special-risk groups. Concurrently, the International Pharmaceutical Federation (FIP) emphasised the importance of pharmacists' knowledge and skills in supporting professional development and pharmacy education in vaccination. With pharmacists playing an increasingly integral role in vaccine administration, this study aimed to evaluate pharmacists' preparedness in delivering immunisation services, identifying strengths and areas for improvement.

A self-administered questionnaire was developed and validated by a five-member expert panel. The questionnaire, disseminated through the Pharmacy Council, collected data on pharmacists' educational background, training, perceived barriers, facilitators to providing immunisation services, and engagement in continuous professional development activities. Descriptive statistics were employed to analyse the collected data.

Forty-eight pharmacists responded to the questionnaire (30 female, 38 Maltese, 26 practicing in community pharmacy, 22 had 1 to 10 years of experience). Variability in knowledge and confidence regarding vaccine administration was observed; knowledge levels ranged from very low (n=7) to very high (n=4), while confidence levels spanned from very low (n=15) to very high (n=2). A notable 38 pharmacists had not attended recent workshops or training sessions. Comfort with vaccinating patients was generally low, with 28 pharmacists feeling uncomfortable or very uncomfortable. Only 12 pharmacists had experience in vaccinating patients, and 36 had never administered a vaccine. Challenges encountered by pharmacists included lack of practice (n=22), lack of confidence (n=16), lack of knowledge (n=9), lack

of time (n=6) and lack of space (n=3). Infrastructure analysis showed that 24 pharmacies lacked designated vaccination areas, primarily due to space constraints. Thirty-nine pharmacies had the necessary equipment for vaccine storage and administration. Documentation practices were inconsistent, with 30 pharmacists not keeping vaccination records. Continuous education needs were substantial, with 37 pharmacists expressing a need for additional training in areas such as managing anaphylactic reactions, hands on vaccination practice and regulatory compliance. Despite time constraints, 39 pharmacists were still able to dedicate up to 3 hours per week to training. Preferences for training formats varied, with 25 pharmacists favoring hybrid methods, 16 preferring in-person sessions, and 7 choosing online training due to factors such as convenience, interactivity, and time flexibility.

The study highlights the need for targeted training programs and infrastructure improvements to enhance pharmacists' preparedness for vaccine administration, supporting broader public health initiatives. Future research should focus on larger, more diverse samples to validate these findings and develop evidence-based interventions.

Acknowledgements

I would like to express my deepest gratitude to my supervisor, Prof. Lilian M. Azzopardi, for her invaluable guidance, support, and encouragement throughout this research project. Her expertise and insightful feedback have been instrumental in shaping this study.

I am equally grateful to my co-supervisor, Dr. Francesca Wirth, for her unwavering support and constructive suggestions. Her attention to detail and thoughtful critiques have greatly contributed to the quality of this work.

I would also like to extend my appreciation to the pharmacists who participated in this study, without whom this research would not have been possible. Their willingness to share their experiences and insights has been invaluable.

Finally, I would like to thank my family for their constant encouragement and understanding during this journey. Their support has been a source of strength and motivation.

Thank you all for your contributions and support.

Table of Contents

Abstract.....	i
Acknowledgements	iii
List of Tables.....	ix
List of Figures.....	x
List of Abbreviations	xi
Chapter 1: Introduction	
1.1 Background of Vaccination	1
1.2 Historical Evolution of Vaccination	1
1.3 Impact of Vaccination on Public Health.....	3
1.4 Challenges and Controversies in Vaccination	4
1.5 Current Trends and Future Directions in Vaccination.....	5
1.6 Vaccination Trends Across Different Continents Using COVID-19 Data	7
1.7 The Role of Pharmacists in Vaccination	9
1.8 Pharmacists in emergency preparedness and response: The COVID-19 Pandemic ...	10
1.9 WHO's Immunization Agenda 2030	12
1.10 FIP and Other Studies Regarding Pharmacists' Provided Vaccinations.....	13
1.11 Pharmacist-Provided Vaccinations in Malta.....	15
1.12 Challenges Faced by Pharmacists in Providing Vaccination Services.....	16
1.12.1 Lack of Training and Knowledge	16

1.12.2 Time Constraints.....	17
1.12.3 Legal and Regulatory Uncertainty.....	17
1.12.4 Lack of Space and Infrastructure.....	18
1.12.5 Professional Skepticism.....	19
1.12.6 Fear of Adverse Reactions.....	19
1.12.7 Insufficient Remuneration	20
1.12.8 Misconceptions Among Patients	21
1.12.9 Documentation and Record-Keeping Challenges	21
1.13 Continuous Professional Development and Strategies to Boost Pharmacist-Provided Vaccination Services	22
1.13.1 Comprehensive Training Programs	22
1.13.2 Hands-On Workshops and Simulation Training.....	23
1.13.3 Online Continuing Education Courses	24
1.13.4 Certification and Credentialing Programs	25
1.13.5 Interprofessional Collaboration and Training.....	25
1.13.6 Regular Updates and Refresher Courses	26
1.13.7 Public Health Campaigns and Community Engagement	27
1.13.8 Financial Incentives and Support	27
1.13.9 Professional Networks and Peer Support	28
1.14 Rationale of the Study.....	29

1.15 Aim of the Study	30
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Chapter 2: Methodology

2.1 Study Setting	31
2.2 Study Design	31
2.3 Ethical Considerations	32
2.4 Study Population and Sample	33
2.5 Data Collection Instrument	33
2.5.1 Demographic Information	33
2.5.2 Knowledge and Confidence	34
2.5.3 Barriers and Facilitators	34
2.5.4 Infrastructure and Resources	35
2.5.5 Continuous Education	36
2.5.6 Training Commitment	36
2.6 Data Collection Procedure	36
2.7 Data Analysis	37
2.8 Dissemination of Results.....	37

Chapter 3: Results

3.1 Demographics of Pharmacists.....	39
3.2 Vaccine Administration Knowledge and Confidence	40
3.2.1 Training and Attendance.....	41

3.3 Infrastructure and Resources.....	42
3.4 Documentation and Record-Keeping.....	43
3.5 Continuous Education	44
3.6 Training Commitment	44
3.6.1 Training Preferences and Feasibility	45
3.6.2 Willingness to Pay and Challenges Perceived.....	45
3.7 Overall Challenges and Suggestions.....	47
3.7.1 Challenges in Administering Vaccines	47
3.7.2 Suggestions for Enhancing Capabilities	49

Chapter 4: Discussion

4.1 Reflection on Study Findings.....	51
4.1.1 Knowledge and Confidence	51
4.1.2 Training and Attendance.....	51
4.1.3 Barriers to Vaccine Administration	52
4.1.4 Infrastructure and Resources	53
4.1.5 Documentation and Record-Keeping	53
4.1.6 Continuous Education and Training Commitment.....	54
4.1.7 Training Preferences and Feasibility	55
4.1.8 Willingness to Pay and Perceived Challenges.....	55
4.1.9 Suggestions for Enhancing Capabilities	56

4.2 Validity of Conclusions	57
4.3 Limitations of the Study.....	57
4.4 Recommendations for Further Study	58
4.5 Conclusion	59
References	60
 Appendices	
Appendix 1: Questionnaire for Evaluation of Pharmacists Vaccination Preparedness.....	71
Appendix 2: Faculty Research Ethics Committee Acknowledgement	79
Appendix 3: FIP Abstract Submission and Poster	81

List of Tables

Table 1.1 COVID-19 vaccination trends across different continents	8
Table 3.1 Demographics of pharmacists.....	39
Table 3.2 Training received for vaccination	40
Table 3.3 Attitude and commitment towards learning opportunities.....	44
Table 3.4 Training preferences and willingness to pay.....	46
Table 3.5 Suggestions for enhancing effectiveness and efficiency of vaccination services ..	50

List of Figures

Figure 1.1: Historical Evolution of Vaccines	2
Figure 2.1: Research Design Overview.	31
Figure 3.1: Assessment of knowledge of pharmacists regarding vaccination.	41
Figure 3.2: Assessment of confidence of pharmacists regarding vaccination.	41
Figure 3.3: Attendance at a recent workshop or training session for vaccination.	42
Figure 3.4: Presence of storage for vaccines and sharps disposal.....	43
Figure 3.5: Documentation and record keeping practices.....	43
Figure 3.6: Qualitative depiction of quantitative data on challenges reported by pharmacists in administering vaccines	49

List of Abbreviations

APhA	American Pharmacists Association
COVID-19	Coronavirus Disease 2019
FIP	International Pharmaceutical Federation
IA2030	Immunization Agenda 2030
IPIP	International Pharmacists-as-Immunizers Partnership
PEPR	Pharmacy Emergency Preparedness and Response
UAE	United Arab Emirates
URECA	University Research Ethics Committee Approval
WHO	World Health Organization

Chapter 1

Introduction

1.1 Background to Vaccination

Vaccination has long stood as one of the most effective public health interventions, significantly reducing the burden of infectious diseases worldwide. The practice of vaccination dates back to the late 18th century when Edward Jenner pioneered the smallpox vaccine, a groundbreaking achievement that led to the eventual eradication of smallpox in 1980. This success story highlights the profound impact that vaccination can have on global health (Plotkin et al., 2022).

In the ensuing decades, the development and deployment of vaccines have expanded dramatically. Diseases such as polio, measles, mumps, rubella, and whooping cough, once common and often deadly, have been controlled or eradicated in many parts of the world with widespread vaccination programs. Vaccination has saved countless lives and reduced the incidence of long-term disabilities associated with these diseases (Andre et al., 2008).

The ripple effects of successful vaccination campaigns have extended beyond individual protection, contributing to the overall health of communities by establishing herd immunity. Herd immunity helps to protect individuals who cannot be vaccinated, such as infants, the elderly, or immunocompromised individuals, by reducing the spread of infectious diseases. The widespread acceptance and implementation of vaccination programs have been a cornerstone in global health strategies (Ashby and Best, 2021).

1.2 Historical Evolution of Vaccination

The concept of vaccination has evolved significantly over the centuries. After Jenner's initial discovery, the 19th and 20th centuries witnessed the development of vaccines for diseases including rabies, typhoid, cholera, and the plague. The mid-20th century marked a golden age

of vaccine development, with the introduction of the polio vaccine in 1955 and the oral polio vaccine in 1961. These vaccines played a crucial role in reducing polio cases globally, leading to its near eradication today (Plotkin et al., 2022). Immunisation has evolved to become a cornerstone of modern public health (Figure 1.1).

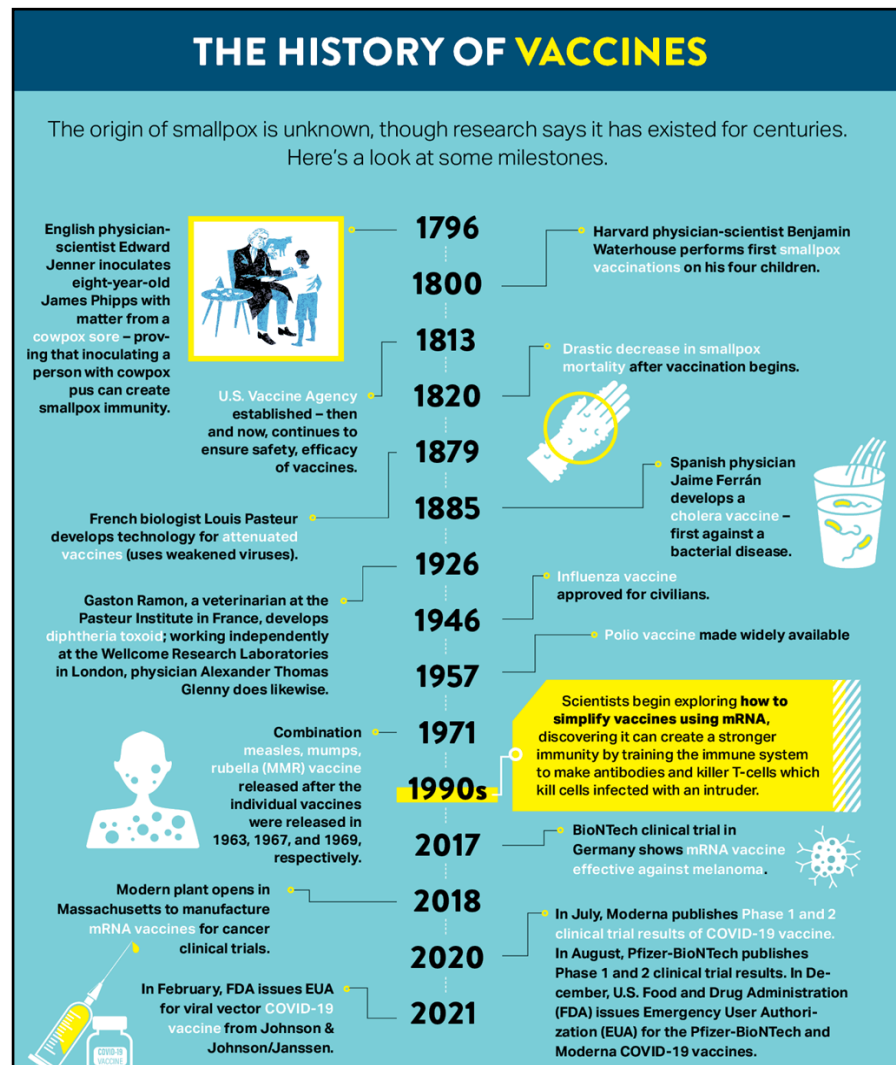


Figure 1.1 Historical Evolution of Vaccines

Adopted from: Today's Medical Developments. The history of vaccines: Medical science advancements [Online]. 2021 [Cited 2024 Aug 25]. Available from: <https://www.todaysmedicaldevelopments.com/article/the-history-of-vaccines-medical-science-advancements/>

The advent of recombinant DNA technology in the 1970s and 1980s opened new avenues for vaccine development. This era saw the creation of the hepatitis B vaccine, which was one of the first vaccines developed using genetic engineering techniques. The late 20th and early 21st centuries have seen further advancements, including vaccines for human papillomavirus, rotavirus, and pneumococcal disease (Rappuoli et al., 2011).

1.3 Impact of Vaccination on Public Health

The impact of vaccination on public health cannot be overstated. According to the World Health Organization (WHO), vaccination prevents an estimated two to three million deaths each year globally. Vaccines have controlled the spread of infectious diseases and have played a critical role in improving overall life expectancy and quality of life.¹

In the context of the impact of vaccination on global health goals, recent studies continue to emphasise the profound benefits of immunisation efforts. A study by Mina et al. revealed that measles vaccination prevents measles and helps to maintain broader immunity against other infectious diseases. The researchers found that measles infection can lead to a significant reduction in the immune system's ability to remember previously encountered pathogens, a phenomenon termed "immune amnesia". This highlights the crucial role of measles vaccination programs in preserving overall immune function and reducing the risk of multiple infectious diseases beyond measles (Mina et al., 2019).

¹ World Health Organization (WHO). Immunization Agenda 2030: a global strategy to leave no one behind [Online]. Geneva: WHO; 2023 [Cited 2023 Dec 20]. Available from: <https://www.who.int/teams/immunization-vaccines-and-biologicals/strategies/ia2030>

Vaccines have profoundly influenced public health by significantly decreasing both illness and death rates from infectious diseases. Globally, vaccines are attributed to preventing nearly six million deaths each year and saving approximately 386 million life years and 96 million disability-adjusted life years. For instance, in 2009, the United States' vaccination efforts against 13 diseases avoided nearly 20 million disease cases and around 42,000 deaths. This success is reflected in the dramatic reductions in disease rates; by 2017, diseases like diphtheria, tetanus, and polio dropped by over 90% from pre-vaccine levels due to high vaccination coverage. Such substantial declines in disease incidence highlight the crucial role vaccines play in enhancing public health by controlling and often eliminating life-threatening diseases (Rodrigues & Plotkin, 2020).

1.4 Challenges and Controversies in Vaccination

Despite the clear benefits, vaccination programs face several challenges and controversies. Vaccine hesitancy, the delay in acceptance or refusal of vaccines despite the availability of vaccination services, has emerged as a significant global health threat. Factors contributing to vaccine hesitancy include misinformation, cultural beliefs, and mistrust in healthcare systems and pharmaceutical companies (Smith et al., 2011; Pourrazavi et al., 2023).

Over the past two decades, behavioral scientists have explored strategies to boost vaccine acceptance among various groups, including parents, adolescents, and adults. The complexity of promoting vaccination has been highlighted, which involves addressing social influences on individual decision-making and requires coordinated efforts from policymakers, leaders, and the public. Effective interventions often depend on the source and emotional impact of the messaging. Behavioral insights, such as nudge interventions, have

proven useful in increasing vaccine uptake. Moreover, the commitment of healthcare providers and strong political leadership are crucial for fostering public trust and overcoming vaccine hesitancy, which is essential for successful vaccination campaigns (Nuwarda et al., 2022).

Logistical challenges in vaccine distribution, particularly in low- and middle-income countries, pose significant barriers. Issues such as inadequate cold chain infrastructure, limited healthcare access, and political instability can hinder vaccination efforts. Additionally, the development of vaccines for emerging diseases, such as the Ebola virus and Coronavirus Disease 2019 (COVID-19), has highlighted the need for rapid and coordinated global responses to infectious disease outbreaks (Kartoglu et al., 2020).

1.5 Current Trends and Future Directions in Vaccination

Recent trends in vaccination highlight significant progress and ongoing challenges. The COVID-19 pandemic has driven unprecedented vaccine development, leading to the rapid creation and deployment of several vaccines. This success has accelerated research and innovation in vaccine technology, including mRNA vaccines, which could benefit future disease outbreaks. However, the pandemic caused substantial setbacks in routine immunisations, with 25 million children missing vaccines in 2021, revealing gaps in global vaccination coverage. This disruption points to the need for resilient vaccination programs and increased investment in global health infrastructure.¹

The rise of antimicrobial resistance and emerging pathogens, such as new subtypes of avian influenza, emphasises the need for continual updates to vaccines and surveillance systems. Efforts are underway to address these challenges, including trials for vaccines against

diseases like malaria and Ebola, which are still not widely available. Furthermore, climate change poses a growing threat, potentially increasing disease incidence, such as malaria, by up to 60,000 additional deaths annually by 2050. Addressing these issues requires a collaborative approach, combining advances in vaccine science with comprehensive strategies to improve global health and vaccine access (Aqib et al., 2023).

Future directions in vaccination research focus on developing universal vaccines that provide broad protection against multiple strains of a virus, such as the influenza virus. For example, researchers are exploring novel vaccine technologies, such as mRNA and vector-based vaccines, which have shown potential for inducing broader and longer-lasting immune responses compared to traditional vaccines (Krammer, 2020).

Efforts are underway to create vaccines for non-infectious diseases, including certain types of cancer and autoimmune diseases. Advances in immunotherapy and vaccine platforms are enabling the development of therapeutic vaccines that target specific antigens associated with these conditions, potentially offering new treatment options (Melief et al., 2015). Currently, CRISPR/Cas9-based gene editing technology is primarily utilised in basic research involving viruses. Compared to other gene editing methods, CRISPR/Cas9 stands out for its efficiency, specificity, versatility, simplicity, and cost-effectiveness. This technology holds significant promise for a wide range of applications, including the creation of vaccine candidates through genome modification of pathogens by gene deletion, substitution, or insertion. Additionally, editing functional genes can enhance the understanding of viral pathogenesis and interactions between viruses and their hosts. CRISPR/Cas9 has already been employed to develop antiviral vaccines for animals. However, a prolonged evaluation period is necessary to determine the long-term effectiveness and stability of these modifications. While the

potential for clinical applications in humans exists, it may take some time before these advancements are realised (Teng et al., 2021).

1.6 Vaccination Trends Across Different Continents Using COVID-19 Data

The global COVID-19 vaccination effort has demonstrated significant regional disparities in vaccine coverage and booster uptake, reflecting the complex and multifaceted nature of global public health initiatives. While vaccination campaigns have been generally successful in reducing spread of the virus and mitigating severe outcomes, the extent of coverage varies widely across continents. These differences are influenced by a variety of factors, including availability of vaccines, strength and reach of healthcare infrastructure, effectiveness and consistency of public health policies, and diverse public attitudes toward vaccination, which can be shaped by cultural, social, and economic contexts.²

Logistical challenges, such as distribution difficulties in remote areas and vaccine storage requirements, have played a critical role in shaping the uneven uptake of vaccines and boosters. Table 1.1 provides a snapshot of vaccination rates and booster uptake across different continents, offering insights into the successes achieved and the challenges that continue to impede the global fight against the virus. This data highlights the ongoing need for targeted efforts to address these disparities and ensure equitable access to vaccines and boosters worldwide.²

² Mathieu E, Ritchie H, Rod  s-Guirao L, Appel C, Giattino C, Hasell J, Macdonald B, Dattani S, Beltekian D, Ortiz-Ospina E, Roser M. Coronavirus Pandemic (COVID-19) [Online]. [Cited 23 July 2024]. Available from: <https://ourworldindata.org/covid-vaccinations>

Table 1.1 COVID-19 vaccination trends across different continents

Continent	Fully Vaccinated (% of Population)	Number Fully Vaccinated (millions)	Booster Dose Uptake (% of Population)	Number with Boosters (millions)
North America	75%	376	40%	200
Europe	70%	529	35%	185
Asia	60%	2400	20%	480
South America	65%	277	25%	69.25
Africa	20%	270	<5%	13.5
Australia	80%	20	45%	9

North America including the U.S. and Canada benefitted from early vaccine access and strong infrastructure. Europe has high vaccination rates in Western Europe and lower rates in Eastern Europe. Asia has varied rates, with high coverage in East Asia and lower coverage in South Asia and Southeast Asia. South America shows notable progress in Chile and Uruguay, and challenges in Venezuela. Africa has low coverage due to supply, infrastructure, and hesitancy issues. Australia has high rates due to effective public health measures.²

1.7 The Role of Pharmacists in Vaccination

Pharmacists have evolved into essential healthcare providers in the realm of vaccination, extending their traditional roles in medication management to encompass critical responsibilities in vaccine administration, education, advocacy, and public health collaboration. One of the key contributions of pharmacists is their ability to administer vaccines. This expanded role significantly enhances access to immunisation services, especially in communities with limited healthcare resources or geographic barriers. By providing convenient access to vaccinations in pharmacies, pharmacists play a crucial role in improving vaccine coverage rates and reducing preventable diseases (Isenor et al., 2016).

Education is another cornerstone of the pharmacist's role in vaccination. Pharmacists are well-positioned to educate patients and caregivers about the importance of immunisation, addressing concerns about vaccine safety, efficacy, and the benefits of herd immunity. Through personalised consultations, pharmacists can empower individuals to make informed decisions about vaccination, contributing to higher acceptance rates and public confidence in immunisation programs (Houle et al., 2014).

The International Pharmaceutical Federation (FIP) has emphasised the importance of pharmacists in vaccination efforts, highlighting their role in improving immunisation coverage and addressing vaccine hesitancy. By providing training and resources, pharmacists

can enhance their knowledge and skills in vaccine administration, ultimately contributing to better public health outcomes (FIP, 2022).³

Pharmacists have traditionally been involved in the dispensing of medications and providing medication-related advice. However, their role has significantly expanded in recent years to include a variety of clinical services, one of the most prominent being vaccine administration. This expansion is driven by several factors, including the need to increase vaccination rates, the convenience of accessing vaccines in community pharmacies, and pharmacists' extensive knowledge of medications and patient care. As a result, pharmacists are now integral to achieving vaccination goals set by public health organisations (Rahim et al., 2023).

1.8 Pharmacists in emergency preparedness and response: The COVID-19 Pandemic

The COVID-19 pandemic has shown the critical role of pharmacists in emergency preparedness and response, further elevating their status as essential healthcare providers capable of mobilising swiftly to deliver mass vaccination campaigns. The COVID-19 crisis highlighted infrastructure gaps within pharmacies, such as insufficient storage capabilities and staffing levels, emphasising the need for enhanced resource allocation and logistical support to optimise vaccine distribution and administration. Addressing these gaps requires investments in physical infrastructure and comprehensive training programs to equip

³ International Pharmaceutical Federation (FIP). FIP Vaccination Reference Guide: Knowledge and Skills to Support Professional Development and Inform Pharmacy Education in Vaccination [Online]. The Hague: International Pharmaceutical Federation; 2022 [Cited 2024 May 09]. Available from: <https://www.fip.org/file/5158>

pharmacists with the necessary skills for vaccine storage, logistics, and patient communication (Aruru et al., 2021; Jia et al., 2021; Kambayashi et al., 2023).

Le et al. conducted a systematic review and meta-analysis to assess the impact of pharmacists' involvement on immunisation uptake and related outcomes. The comprehensive analysis included a wide range of studies evaluating the role of pharmacists in vaccine administration and education. The findings demonstrated that pharmacist-led immunisation services significantly enhanced vaccination rates across various populations. Pharmacists' involvement improved access to vaccines and contributed to increased patient adherence to vaccination schedules and overall vaccination coverage. The study highlighted pharmacists' effectiveness in addressing vaccine hesitancy through targeted education and counseling, thereby strengthening public confidence in immunisation programs (Le et al., 2022).

Pharmacists have played a crucial role in vaccination effort across Europe, albeit with varying degrees of involvement depending on national policies and logistical constraints. In countries such as Switzerland, the UK, and Ireland, pharmacists have been actively engaged in the direct administration of COVID-19 vaccines, leveraging their clinical expertise and patient trust. However, challenges such as vaccine supply issues and legislative hurdles have limited pharmacists' participation in many European nations. Despite these constraints, pharmacists have significantly contributed by educating and training healthcare professionals and patients, participating in critical care, and supporting routine clinical services during the pandemic. A pressing need to expand pharmacists' roles to include more direct vaccine administration, supported by legislative changes and increased training is noted to enhance mass vaccination efforts. Improving pharmacists' skills, confidence, and remuneration, while delegating routine tasks to support staff, are essential in maximising pharmacists'

contribution to vaccination campaigns and preparing for future public health challenges (Paudyal et al., 2021).

1.9 WHO's Immunization Agenda 2030

In 2020, the World Health Organization (WHO) launched the Immunization Agenda 2030, a strategic initiative aimed at reducing mortality and morbidity from vaccine-preventable diseases, improving equity of access to vaccination, and increasing immunisation coverage rates across all ages and special-risk groups. This global strategy highlights the critical role of immunisation in public health and the need for robust systems to deliver vaccines effectively to diverse populations. Achieving these ambitious goals requires the concerted efforts of various healthcare providers, including pharmacists, who are increasingly recognised as key players in the delivery of immunisation services. Pharmacists' widespread presence in communities and their established trust with patients position them uniquely to improve vaccination uptake and educate the public about the benefits of immunisation. The WHO has set seven strategic priorities of Immunisation Agenda 2030 (IA2030) to help increase immunisation coverage, namely strengthening routine immunization systems, increasing vaccine equity, enhancing vaccination coverage, improving vaccine quality and safety, accelerating research and development for new vaccines, fostering global solidarity and partnerships, and ensuring robust monitoring and evaluation systems.¹

The success of the Immunisation Agenda 2030 will depend on the efforts of healthcare providers and the support from governments, international organisations, and civil society. Collaborative partnerships and sustained funding are essential to build the infrastructure needed to deliver vaccines globally. Public trust in vaccines must be maintained and enhanced

through transparent communication and engagement with communities, addressing vaccine hesitancy and misinformation.¹

1.10 FIP and Other Studies Regarding Pharmacist Provided Vaccinations

The International Pharmaceutical Federation (FIP) emphasises the vital role pharmacists play in immunisation, particularly in increasing vaccine coverage and accessibility.³ Pharmacists' accessibility, often being the most readily available healthcare professionals, positions them uniquely to offer immunisation services to a broad segment of the population, including those who may otherwise face barriers to vaccination.

Understanding pharmacists' readiness to provide immunisation services is paramount to optimising public health interventions. Readiness includes pharmacists' knowledge, and skills related to vaccine administration and confidence, infrastructure, and engagement in continuous professional development (Andre et al., 2008). Evaluating these aspects can help to identify strengths and areas for improvement, thereby informing strategies to enhance the contribution of pharmacists to public health initiatives.

Pharmacists' involvement in vaccination is not limited to times of crisis. A scoping review by Agomo examined the role of community pharmacists in public health and found that pharmacists contribute significantly to vaccination efforts, particularly in improving access and coverage. This review highlighted the need for tailored training programs and standardised practices to ensure pharmacists are adequately prepared to contribute to vaccination efforts (Agomo, 2012).

In a survey conducted among Canadian pharmacists by Gerges et al., researchers explored attitudes towards expanding their role to include administering adult immunisations. The

study revealed that most pharmacists recognised their potential to enhance immunisation rates and improve public access by administering vaccines within their practice settings. Despite widespread support for pharmacist-administered immunisations, concerns such as the need for certification, education, and reimbursement challenges were identified as barriers to implementation. These findings showed the willingness of Canadian pharmacists to extend their scope of practice into immunisation services, contingent upon adequate professional development and certification in vaccine administration (Gerges et al., 2022).

Pharmacists' participation in immunisation programs has been shown to improve vaccination rates and health outcomes. A study by Isenor et al. demonstrated that pharmacists' involvement in influenza vaccination significantly increased vaccination rates and improved patient access to vaccines (Isenor et al., 2016). This finding by Isenor et al. is consistent with other research indicating that pharmacists can play a crucial role in increasing vaccine uptake, particularly in underserved populations.

The integration of pharmacists into broader public health frameworks remains essential for enhancing community health outcomes. A study by Violette et al. highlighted successful collaborations through initiatives such as the International Pharmacists-as-Immunizers Partnership (IPIP), which promotes pharmacist-administered immunisations worldwide. Such partnerships expand access to vaccines and demonstrate pharmacists' capacity to deliver immunisation services effectively across diverse populations (Violette et al., 2019).

A survey was conducted by Carpenter et al. among rural community pharmacists in the Southern United States to assess their readiness and interest in administering COVID-19 vaccines. The study found that a significant proportion of pharmacists were actively

preparing to provide COVID-19 vaccinations, with many pharmacies equipped to administer a substantial number of doses daily. Despite readiness, a notable portion of pharmacists had not received specific COVID-19 vaccine training, and some expressed hesitancy toward receiving the vaccine themselves. The findings show the critical role of rural pharmacists in vaccine distribution efforts, particularly in addressing vaccine hesitancy and enhancing accessibility in underserved communities (Carpenter et al., 2022).

1.11 Pharmacist-Provided Vaccinations in Malta

In response to the COVID-19 pandemic, the Chamber of Pharmacists in Malta introduced specialised training programs aimed at equipping pharmacists with the skills to administer COVID-19 vaccines. The training initiative focused on pharmacist-led courses encompassing comprehensive modules in vaccinology, immunology, and clinical considerations pertinent to vaccine administration. The Malta Chamber of Pharmacists emphasised the potential for pharmacists to enhance community health outcomes through expanded vaccination competencies and updated knowledge, particularly considering pandemic-related issues and policy developments.⁴

The Department of Pharmacy at the University of Malta has integrated vaccination administration skills into its undergraduate curriculum for the past decade. Recognising the importance of pharmacist involvement in vaccine delivery, the curriculum was updated in academic year 2021-22 to emphasise competency-based learning. This evolution aims to ensure that pharmacy students acquire theoretical knowledge and develop practical skills necessary for administering vaccines effectively. By incorporating hands-on training and

⁴ Malta Daily. Training for Maltese pharmacists willing to administer COVID-19 vaccines [Online]. April 2021 [Cited 2024 July 13]. Available from: <https://maltadaily.mt/training-for-maltese-pharmacists-willing-to-administer-covid-19-vaccines/>

competency assessments, the university prepares students to contribute to public health initiatives and adapt to evolving healthcare needs upon graduation.⁵

1.12 Challenges Faced by Pharmacists in Providing Vaccination Services

Despite the benefits of involving pharmacists in vaccination programs, several challenges need to be addressed to optimise pharmacists' contribution in public health. These challenges span from lack of training to regulatory and infrastructural barriers. Each challenge presents unique hurdles that need comprehensive strategies to overcome.

1.12.1 Lack of Training and Knowledge

One of the most significant barriers to pharmacists' participation in vaccination programs is the lack of adequate training and knowledge. A survey conducted in Tanzania found that pharmacists often lacked sufficient education on vaccines and vaccination techniques, which hindered their ability to effectively participate in immunisation efforts. This gap in training can lead to uncertainty and errors in vaccine administration, which ultimately affects public trust and vaccination rates (Kamuhabwa & Chavda, 2012).

To address this issue, comprehensive training programs focusing on vaccine-preventable diseases, immunisation schedules, administration techniques, and handling adverse reactions are being developed and implemented. Continuing education and certification programs can

⁵ Wirth F, Azzopardi LM. Providing vaccination practical training in undergraduate pharmacy education. Poster session presented at: EAFP Annual Conference: Optimizing pharmacy workforce: Relevance, Active and Lifelong Learning [Internet]; 2024 May; Bergen, Norway. [Cited 2024 July 13]. Available from: <https://www.um.edu.mt/library/oar/handle/123456789/122894>

help pharmacists stay updated with the latest advancements in vaccination (Khatiwada et al., 2022).

1.12.2 Time Constraints

Pharmacists often face time constraints due to their primary responsibilities, such as dispensing medications, counseling patients, and managing pharmacy operations. A study by Aruru et al. indicated that these time pressures limit pharmacists' ability to engage in additional services like vaccination. As a result, pharmacists may struggle to allocate the necessary time for patient education, vaccine administration, and post-vaccination monitoring, which are critical for a successful vaccination program (Aruru et al., 2021).

To mitigate this challenge, pharmacies could consider employing additional staff or utilising pharmacy technicians to handle routine tasks, freeing up pharmacists to focus on vaccination services. Implementing efficient scheduling systems and integrating vaccination services into the regular workflow can help to manage time constraints (Gysel et al., 2022).

1.12.3 Legal and Regulatory Uncertainty

Legal and regulatory uncertainties regarding pharmacists' roles in vaccination can be major barriers. A study in Jordan by Jarab et al. highlighted that ambiguous laws and regulations surrounding pharmacists' authority to administer vaccines create hesitancy among pharmacists and healthcare institutions. This uncertainty can lead to reluctance in adopting vaccination services within pharmacies and limits the potential reach of vaccination programs (Jarab et al., 2022).

Addressing the issue requires a two-pronged approach: first, by clarifying and standardising the legal frameworks that define the scope of pharmacists' involvement in vaccination across different regions, and second, by bolstering advocacy efforts. Professional pharmacy organisations must actively engage in advocacy, working in close collaboration with governmental health agencies to establish clear, supportive regulations. This collaboration ensures consistency in pharmacists' roles nationwide and empowers pharmacists to contribute more effectively to public health initiatives (Schmit and Penn, 2017).

1.12.4 Lack of Space and Infrastructure

The physical layout of many pharmacies is not conducive to providing vaccination services. In a study conducted by Merks et al. in Poland, pharmacists reported that the lack of dedicated space for vaccinations within pharmacies posed a significant challenge. This lack of space can affect patient privacy and comfort which limits the number of vaccinations that can be administered simultaneously, thereby reducing the overall efficiency and effectiveness of vaccination programs (Merks et al., 2021).

Pharmacies can overcome this challenge by redesigning the layout to include private consultation areas and dedicated vaccination rooms. This change can create a more comfortable and confidential environment for patients, which enhances trust and encourages more people to utilise pharmacy services. Investing in mobile vaccination units or collaborating with local health facilities to share space during peak vaccination periods can be effective solutions. Mobile units allow pharmacies to reach underserved communities, improving healthcare access and visibility. By adopting these strategies, pharmacies can

increase their service capacity and strengthen their role as vital healthcare providers within their communities (Hattingh et al., 2016).

1.12.5 Professional Skepticism

Skepticism from other healthcare professionals about pharmacists' ability to administer vaccines is another notable barrier. A study in the UK by Warner et al. found that other healthcare providers, such as doctors and nurses, often doubted pharmacists' competence in this area. Professional skepticism can lead to poor collaboration between healthcare providers, negatively impacting the integration of pharmacists into the broader vaccination efforts (Warner et al., 2013).

Addressing this challenge requires fostering interprofessional education and collaboration. Joint training sessions and workshops that include pharmacists, doctors, and nurses can enhance mutual understanding and respect for each profession's capabilities. Highlighting successful examples of pharmacists' contributions to vaccination efforts can help build trust and reduce skepticism (Khan et al., 2020).

1.12.6 Fear of Adverse Reactions

Pharmacists' fear of adverse reactions, such as anaphylaxis, may deter them from administering vaccines. A study in Canada by Isenor et al. indicated that this fear is a significant barrier, as pharmacists may not feel adequately prepared to handle severe adverse reactions. This concern can be alleviated through better training and the availability of emergency protocols and equipment (Isenor et al., 2016).

Providing pharmacists with advanced training on managing adverse reactions, including the use of epinephrine and emergency procedures, can increase their confidence in administering vaccines. This training equips pharmacists with the skills to handle unexpected situations calmly and effectively, ensuring patient safety and enhancing trust in pharmacy services. Ensuring that all pharmacies are equipped with the necessary emergency kits and protocols is crucial, as it allows for rapid response to any adverse reactions that may occur. Having these measures in place improves patient outcomes and reinforces the pharmacist's role as a reliable healthcare provider. Additionally, regular drills and updates to emergency protocols can keep staff prepared and ensure compliance with the latest healthcare standards (Karuppannan et al., 2022).

1.12.7 Insufficient Remuneration

Compensation for vaccination services is another crucial factor affecting pharmacists' willingness to participate in vaccination programs. A study conducted in Jordan by Jarab et al. revealed that pharmacists frequently felt that financial compensation for providing vaccination services was inadequate. This perception can discourage pharmacists from offering these services since it may not be perceived as a financially viable addition to their workload (Jarab et al., 2022).

To address this, policymakers and insurance companies need to establish fair reimbursement rates for vaccination services provided by pharmacists. Incentive programs and additional funding for pharmacies offering vaccination services can motivate pharmacists to participate more actively in immunisation efforts (Shahin et al., 2024).

1.12.8 Misconceptions Among Patients

Patients' misconceptions about pharmacists' qualifications to administer vaccines can affect their trust and willingness to receive vaccinations. The study carried out in Jordan found that these misconceptions often stem from a lack of awareness about pharmacists' training and capabilities. Educating the public about the role of pharmacists in vaccination can help address these misconceptions and increase vaccination uptake (Jarab et al., 2022).

Public awareness campaigns that emphasise the extensive training and qualifications pharmacists undergo, as well as their integral role in the healthcare system, can significantly contribute to building public trust in pharmacist-administered services. These campaigns should also focus on educating the public about the specific expertise pharmacists have in administering vaccinations, helping to reinforce their credibility as healthcare providers. Providing clear, accurate, and accessible information about the safety, efficacy, and benefits of pharmacist-administered vaccinations can further alleviate patient concerns and misconceptions (Di Castri et al., 2021).

1.12.9 Documentation and Record-Keeping Challenges

Maintaining accurate records of vaccinations is essential for monitoring public health and ensuring that patients receive appropriate follow-up care. In a study conducted by Thomas et al. in United Arab Emirates (UAE), pharmacists reported challenges with documentation and maintaining accurate records of vaccinations, which was a significant barrier. These challenges can be due to inadequate record-keeping systems or lack of training in documentation practices (Thomas et al., 2024).

Implementing electronic health record systems that are integrated with national immunisation registries can streamline documentation processes, allowing pharmacists to quickly access and update patient vaccination histories. This integration reduces the risk of errors and ensures that vaccination records are accurate and thoroughly updated. Training pharmacists in effective record-keeping practices and ensuring access to user-friendly documentation tools can improve accuracy and efficiency, making it easier to track patient progress and manage vaccine inventories. By adopting these technologies and practices, pharmacies can enhance operational efficiency and provide better-informed care, ultimately improving patient outcomes and satisfaction. Furthermore, seamless integration with national registries supports public health initiatives by contributing to a comprehensive view of immunisation coverage across communities (Au et al., 2010).

1.13 Continuous Professional Development and Strategies to Boost Pharmacist-Provided Vaccination Services

Continuous professional development is crucial for maintaining pharmacists' competence in vaccine administration. The following studies highlight various strategies which can help to boost vaccination services provided by the pharmacists.

1.13.1 Comprehensive Training Programs

Comprehensive training programs are fundamental to enhancing the capacity of pharmacists to provide vaccination services effectively. These programs typically encompass various modules designed to cover essential aspects of vaccination. Training programs that include information on vaccine-preventable diseases, appropriate storage and handling of vaccines, administration techniques, and management of adverse reactions have significantly boosted

pharmacists' knowledge and confidence. These programs often incorporate theoretical knowledge and practical skills, ensuring that pharmacists are well-prepared to handle real-world scenarios (Isenor et al., 2016).

For instance, in countries like Canada and Australia, national training programs have been established to ensure that pharmacists meet the competency standards required for immunisation practices. These programs are frequently updated to incorporate the latest guidelines and recommendations from public health authorities, thus ensuring that pharmacists remain current with their knowledge and skills. The continuous professional development fostered through these programs is crucial for maintaining high standards of patient care and safety in vaccination services.³

1.13.2 Hands-On Workshops and Simulation Training

Hands-on workshops and simulation training are invaluable for developing the practical skills necessary for vaccine administration. Pharmacists who participated in simulation training and hands-on workshops demonstrated higher proficiency in vaccination techniques and were more confident in administering vaccines. These training sessions often involve practicing on models or simulation devices, which help pharmacists familiarise themselves with the physical aspects of vaccine administration, such as needle insertion and proper injection techniques (Sayyed et al., 2024).

Simulation training can include scenarios that simulate emergency situations, such as managing anaphylactic reactions. This prepares pharmacists to respond promptly and effectively to adverse events, enhancing patient safety. By incorporating these practical

components into their training, pharmacists can gain the hands-on experience needed to feel confident and competent in providing vaccination services (Leleux et al., 2024).

In addition to technical skills, these workshops emphasise communication strategies for discussing vaccines with patients, addressing vaccine hesitancy, and ensuring informed consent. This holistic approach ensures that pharmacists are equipped not only to administer vaccines and to educate and reassure patients, thereby improving vaccination uptake rates (Shen & Tan, 2022).

1.13.3 Online Continuing Education Courses

Online continuing education courses offer a flexible and accessible way for pharmacists to keep updated on vaccination practices. The FIP has emphasised the importance of these courses, which allow pharmacists to learn at their own pace and according to their own schedules. This flexibility is particularly beneficial for pharmacists who work in busy environments and may not have time to attend in-person training sessions.³

Online courses cover a wide range of topics, including the latest vaccine developments, updates on immunisation schedules, and best practices for vaccine administration. Online courses often feature interactive elements, such as quizzes and case studies, which help reinforce learning. Online platforms can provide pharmacists with access to a vast array of resources, including guidelines, research articles, and expert webinars. This continuous learning approach helps pharmacists maintain their competencies and adapt to new challenges in the field of vaccination.³

1.13.4 Certification and Credentialing Programs

Certification and credentialing programs are critical for ensuring that pharmacists meet the necessary standards to administer vaccines. The American Pharmacists Association (APhA) offers such programs, which typically include rigorous training and assessments to certify pharmacists as immunisation providers. These credentials validate the pharmacists' skills and knowledge and enhance public trust in their services.⁶

In many regions, certification is a legal requirement for pharmacists to administer vaccines. This ensures that all practicing pharmacists have met a standardised level of competency. Certification programs often include components on legal and regulatory aspects of vaccination, which is essential for ensuring that pharmacists operate within the bounds of the law and adhere to best practices. This formal recognition of their expertise encourages more pharmacists to engage in vaccination services, thereby expanding the reach of immunisation programs (Gerges et al., 2018).

1.13.5 Interprofessional Collaboration and Training

Interprofessional collaboration and training can significantly enhance the effectiveness of vaccination services provided by pharmacists. When pharmacists collaborate with other healthcare professionals, such as nurses and physicians, they can improve vaccination strategies and patient outcomes. Joint training sessions and collaborative practice agreements

⁶ American Pharmacists Association (APhA). Pharmacy-Based Immunization Delivery [Online]. Washington, DC: APhA 2024 [Cited 2024 July 14]. Available from: <https://www.pharmacist.com/Education/Certificate-Training-Programs/Immunization>

help establish clear roles and responsibilities, fostering a team-based approach to patient care (Warner et al, 2013).

Such collaborations can help in addressing common barriers to vaccination, such as vaccine hesitancy and logistical challenges. By working together, healthcare providers can share their expertise, develop more efficient workflows, and provide comprehensive care to patients. For example, joint training sessions may cover topics including coordinating vaccination schedules, managing inventory, and handling complex cases. This integrated approach ensures that all members of the healthcare team are aligned in their efforts to improve vaccination rates (Stewart-Lynch et al., 2023).

1.13.6 Regular Updates and Refresher Courses

The dynamic nature of the field of immunisation necessitates regular updates and refresher courses for pharmacists. A study by Aruru et al. emphasised the importance of keeping pharmacists informed about the latest guidelines, new vaccines, and emerging infectious diseases. Regular updates ensure that pharmacists' knowledge remains current and that pharmacists are prepared to handle new challenges as they arise (Aruru et al., 2021).

Refresher courses can be offered through various formats, including online modules, in-person workshops, and webinars. These courses typically cover updates on vaccine recommendations, changes in immunisation schedules, and new research findings. By participating in these updates, pharmacists can continue to provide safe and effective vaccination services, adhering to the latest evidence-based practices. Regular training also helps to reinforce previous learning, ensuring that pharmacists retain critical skills and knowledge over time (Uskun et al., 2008).

1.13.7 Public Health Campaigns and Community Engagement

Engaging pharmacists in public health campaigns and community outreach efforts can significantly enhance vaccination services. A study by DiPietro & Bright reported that involving pharmacists in public health campaigns, such as vaccination drives and health fairs, increases pharmacist visibility and educates the public about the availability of vaccination services in pharmacies. These initiatives boost vaccination rates and strengthen the role of pharmacists in public health (DiPietro & Bright, 2023).

Community engagement efforts can include providing educational materials, conducting informational sessions, and collaborating with local organisations to promote vaccination. By actively participating in these campaigns, pharmacists can help to address vaccine hesitancy and misinformation, encouraging more people to get vaccinated. These efforts highlight the accessibility and convenience of getting vaccinated at a pharmacy, making it easier for people to protect themselves and their communities from vaccine-preventable diseases (Guan et al., 2024).

1.13.8 Financial Incentives and Support

Financial incentives and support are crucial for encouraging pharmacists to offer vaccination services. A study by Jarab et al. in Jordan found that adequate remuneration and financial incentives play a significant role in motivating pharmacists to engage in vaccination programs. Support from health insurance providers and government programs can alleviate financial barriers and encourage more pharmacies to offer these services (Jarab et al., 2022).

Providing financial incentives can take various forms, such as reimbursement for vaccination services, grants for purchasing necessary equipment, and funding for training programs. These incentives compensate pharmacists for their time and efforts and help to cover the costs associated with setting up and maintaining vaccination services. By addressing the financial challenges, these incentives ensure that more pharmacists can participate in vaccination efforts, thereby increasing the overall vaccination coverage.⁷

1.13.9 Professional Networks and Peer Support

Professional networks and peer support groups play a vital role in enhancing the capabilities of pharmacists in providing vaccination services. A study by Jusufoska et al. highlighted the benefits of these networks in fostering a community of practice where pharmacists can share experiences, discuss challenges, and find solutions collaboratively. These networks provide a platform for continuous learning and professional growth (Jusufoska et al., 2021).

Peer support groups can facilitate the exchange of knowledge and best practices, helping pharmacists stay updated on the latest developments in immunisation. These groups can offer emotional and professional support, which is particularly important in managing the stress and challenges associated with vaccination services. By being part of a professional network, pharmacists can gain insights from their peers, learn from shared experiences, and improve their practice through collective wisdom (Richard et al., 2022).

⁷ The European Commission (EC). The organization and delivery of vaccination services in the European Union [Online]. EC; 2018 [Cited 2024 July 22]. Available from: https://health.ec.europa.eu/publications/organization-and-delivery-vaccination-services_en

1.14 Rationale of the Study

The rationale of this study was to assess the preparedness of pharmacists in delivering immunisation services. Pharmacists are increasingly recognised as crucial contributors to public health initiatives, particularly in vaccine administration due to their accessibility and frequent patient interactions. Despite their potential, pharmacists face significant challenges such as inadequate training, lack of confidence, and infrastructural limitations within pharmacies, which hinder their effectiveness in providing immunisation services. Addressing these gaps is crucial to enhancing pharmacists' preparedness and efficiency in vaccine delivery, thereby potentially boosting vaccination rates and improving public health outcomes. This is particularly pertinent in the context of global initiatives like the WHO's Immunisation Agenda 2030, aimed at achieving universal immunisation coverage.

The present study aimed to inform policymakers, educational institutions, and pharmacy organisations by identifying areas requiring additional support and training for pharmacists. Such insights are essential for developing comprehensive training programs and policies that can better equip pharmacists to handle immunisation responsibilities effectively. Furthermore, understanding pharmacists' preparedness levels, as highlighted during the COVID-19 pandemic, is critical for optimising their roles in future health crises and emergency response efforts. Ultimately, these efforts aim to integrate pharmacists more fully into immunisation efforts, thereby strengthening overall public health infrastructure.

1.15 Aim of the Study

This study aimed to evaluate the preparedness of pharmacists in delivering immunisation services. Specific objectives include:

- i. Assessing pharmacists' knowledge and confidence in vaccine administration.
- ii. Identifying perceived barriers and facilitators to providing immunisation services.
- iii. Evaluating the infrastructure and resources available to pharmacists for vaccine administration.
- iv. Understanding pharmacists' engagement in continuous professional development and their training needs.

Chapter 2

Methodology

The methodology employed in this study was designed to comprehensively assess the preparedness of pharmacists in delivering immunisation services across various practice settings (Figure 2.1).

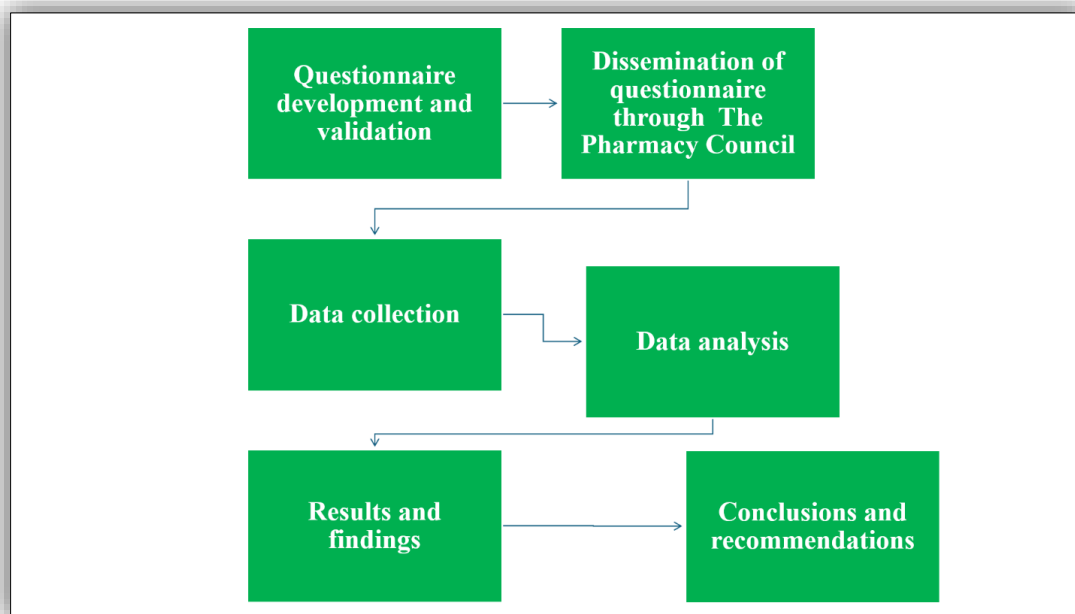


Figure 2.1 Research Design Overview

2.1 Study Setting

This study was conducted within the Department of Pharmacy at the University of Malta, situated in Msida, Malta.

2.2 Study Design

This study employed a cross-sectional survey design to evaluate the preparedness of pharmacists in providing immunisation services across various pharmacy practice settings. The cross-sectional approach is advantageous as it offers a snapshot of pharmacists' knowledge, confidence, and infrastructure related to vaccine administration at a specific point

in time. This method allows for the identification of strengths and weaknesses in their preparedness, which can inform future interventions and training programs. By capturing data at one point in time, this study can provide a clear picture of the current state of pharmacist preparedness, highlighting areas that require immediate attention and resources (Setia, 2016).

The survey encompassed multiple dimensions of preparedness, including vaccination knowledge, confidence in administering vaccines, and the availability of necessary infrastructure and resources. This comprehensive approach ensured that all relevant aspects of immunisation service delivery are assessed, providing a holistic view of the pharmacists' capabilities and identifying specific areas for improvement.

2.3 Ethical Considerations

Ethical approval for the study was obtained through the submission of a University Research Ethics Committee Approval (URECA) form, along with the dissertation proposal and a protocol, to the Faculty of Medicine and Surgery Research Ethics Committee. This process ensured that the study adhered to all ethical guidelines and was ready for implementation. Participants were thoroughly briefed about the study, including its purpose, procedures, and their rights as participants. They were informed about their right to confidentiality and voluntary participation, with assurances that their responses would be anonymised to protect their identities.

The study was conducted in accordance with ethical standards for research involving human subjects. All data collected were anonymised and securely stored to maintain participant confidentiality. Informed consent was obtained from all participants, ensuring that they were

aware of the study's aims and their role in it. By adhering to these ethical guidelines, the study aimed to respect the rights and privacy of participants while ensuring the integrity and reliability of the collected data (World Medical Association, 2013).

2.4 Study Population and Sample

The target population for this study included pharmacists from diverse practice settings, such as community pharmacies, hospital pharmacies, industry, academia, and regulatory bodies. This broad inclusion criterion ensured that the study captured a wide range of experiences and perspectives, providing a comprehensive assessment of pharmacists' preparedness for immunization services. By including pharmacists from various professional backgrounds, the study identified common challenges and unique barriers faced in different settings, allowing for more tailored and effective interventions. Recruitment strategies included reaching out to professional pharmacy organizations, utilizing pharmacy networks, and employing social media platforms to ensure broad participation. This diverse sample allowed for a thorough examination of factors influencing preparedness, such as differences in training, access to resources, and institutional support.

2.5 Data Collection Instrument

The data collection instrument was a structured questionnaire developed and validated by a panel of five experts in pharmacy practice, public health, and academia (Drozd et al, 2017). The questionnaire included six main sections.

2.5.1 Demographic Information

The study collected a comprehensive set of demographic data to better understand the profiles of participating pharmacists and identify potential patterns or trends related to their

vaccination practices. The demographic parameters included in the study were gender, years of experience as a pharmacist, type of pharmacy practice, and specific training or certification in vaccine administration. Pharmacists with specialised training were asked to specify the sources of their training, such as university programs, online courses and webinars, continuing education, pharmaceutical companies, or simulation courses.

2.5.2 Knowledge and Confidence

Pharmacists' knowledge and confidence in vaccine administration were evaluated through a combination of multiple-choice questions and Likert-scale items:

- i. Multiple-Choice Questions: These questions assessed pharmacists' knowledge and confidence in vaccinating patients.
- ii. Likert-Scale Items: Pharmacists rated their confidence and knowledge in vaccinating patients. This scale ranged from 1 (very low) to 5 (very high), providing a nuanced view of their self-assessed competency levels.

2.5.3 Barriers and Facilitators

The study aimed to identify both the challenges and supports that pharmacists encounter in providing immunisation services:

- i. Multiple-Choice Questions: Pharmacists selected from a list of common barriers such as lack of time, inadequate space, insufficient training, and regulatory restrictions. This helped to quantify the prevalence of each barrier.

- ii. Open-Ended Responses: These allowed pharmacists to describe in their own words any additional challenges they faced and suggest potential solutions or improvements that could support their vaccination efforts.
- iii. Facilitators: Identified key factors that enable successful vaccination practices, such as access to continuous education, supportive policies, and collaboration with other healthcare professionals.

2.5.4 Infrastructure and Resources

The availability and adequacy of resources necessary for providing vaccination services were assessed through a series of checklist items, open-ended responses, and multiple-choice questions:

- i. Vaccination Areas: Evaluated whether pharmacies had designated areas for administering vaccines.
- ii. Equipment: Checked for essential equipment like refrigerators, sharps disposal containers, and refrigeration space for storage of vaccines.
- iii. Record-Keeping Practices: The study assessed how pharmacists recorded vaccinations, including whether they used electronic systems, paper-based records, or relied on records maintained by other healthcare providers.
- iv. Open-Ended Responses: Pharmacists provided detailed descriptions of their infrastructure and suggested improvements, or additional resources needed to enhance their vaccination services.

2.5.5 Continuous Education

The participants were asked to thoroughly identify specific areas of vaccine administration where they felt a need for additional training, deeper knowledge, or ongoing professional development. This could include areas where they felt less confident, needed more comprehensive information, or desired enhanced skill development to ensure their ability to perform these tasks effectively and confidently in their practice.

2.5.6 Training Commitment

The dedication of pharmacists to training activities was evaluated to understand their commitment to professional development in immunisation services:

- i. Time Allocation: Pharmacists reported the amount of time they were willing to dedicate to training per week. This included options such as less than 1 hour, 1-3 hours, and more than 3 hours per week.
- ii. Types of Training: Assessed the specific types of training pharmacists were most interested in, such as online training programs, hybrid models, or physical hands-on training programs.
- iii. Barriers to Training: Identified obstacles that prevent pharmacists from participating in training, such as time constraints, financial barriers, and lack of accessible training opportunities.

2.6 Data Collection Procedure

The questionnaire was distributed electronically through The Pharmacy Council via email to all pharmacists. The distribution process included:

- i. Initial Contact: An introductory email was sent to the pharmacists through The Pharmacy Council which invited them to participate in filling out the questionnaire.
- ii. Follow-up: The questionnaire was sent again through The Pharmacy Council and shared through various social media platforms to encourage participation and maximise response rates.
- iii. Response Monitoring: Responses were monitored to ensure data completeness and address any issues or questions from participants.

The data collection period lasted for 2 months to accommodate pharmacists' schedules and ensure adequate time for participation.

2.7 Data Analysis

The data collected through the questionnaire was analysed using Google Forms, which automatically generated visual representations such as bar charts and pie graphs to summarise the findings. The analysis primarily involved descriptive statistics to summarise pharmacists' demographics, knowledge levels, confidence in vaccine administration, perceived barriers and facilitators, infrastructure availability, continuous education participation, and training commitment.

2.8 Dissemination of Results

An abstract submission (Appendix 3) titled "Pharmacist Vaccination Preparedness" was successfully accepted as a poster presentation. This research was showcased at the 82nd International Pharmaceutical Federation (FIP) World Congress of Pharmacy and Pharmaceutical Sciences, held in Cape Town, South Africa, in September 2024. The presentation highlighted key findings and contributions of the study, emphasising the

importance of pharmacists' readiness in vaccine administration. The event provided an excellent platform to share insights and engage with professionals from around the world.

Chapter 3

Results

3.1 Demographics of Pharmacists

A total of 48 pharmacists responded to the questionnaire. Most pharmacists (n=26) worked in community settings, focusing on direct patient care (Table 3.1). Pharmacists' years of experience varied, with the largest group (n=22) having 1-10 years of experience, indicating newer practitioners. The gender distribution among the pharmacists in the study showed most female participants (n=30). Most pharmacists (n=38) were Maltese (Table 3.1).

Table 3.1 Demographics of pharmacists (N=48)

Principal area of practice	
Community	26
Regulatory	8
Industry	6
Administration	4
Hospital	3
Other	1
Years of experience as a pharmacist	
1-10	22
11-20	11
21-30	9
31-40	6
Gender	
Female	30
Male	18
Nationality	
Maltese	38
Filipino	7
Italian	2
Nigerian	1

Of the pharmacists surveyed, 22 had specific training or certification for vaccine administration, reflecting a proactive approach to enhancing their skills. However, 26 pharmacists lacked this specialised training, indicating variability in readiness or access to formal vaccine administration programs. Nine pharmacists received vaccination training as part of their university coursework. The training insights summarised in Table 3.2 offer an overview of the pharmacists' training experiences and their readiness for vaccine administration.

Table 3.2 Training received for vaccination (N=48)

Any specific training or certification for vaccine administration	
No	26
Yes	22
Training received at	
University	9
Continuing education	6
Online courses and webinars	3
Other	2
Pharmaceutical company	1
Simulation courses	1

3.2 Vaccine Administration Knowledge and Confidence

Pharmacists' knowledge and confidence in vaccine administration varied across the sample. When participants were asked to rate their knowledge on a scale from 1 to 5 (Figure 3.1), where 1 represented very low knowledge and 5 represented very high knowledge, the responses revealed a diverse range of self-assessed expertise. Notably, the highest number of responses was observed in the moderate category, with 18 pharmacists identifying their knowledge level as moderate.

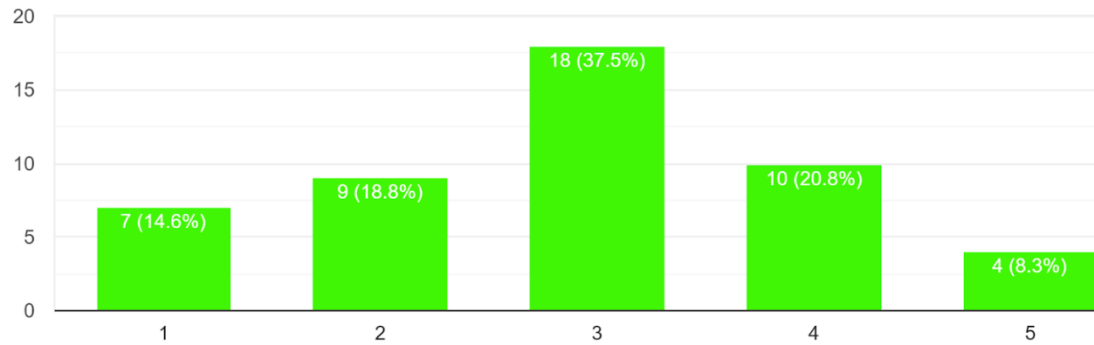


Figure 3.1 Assessment of knowledge of pharmacists regarding vaccination (N=48)

When participants were asked to rate their confidence on a scale from 1 to 5 (Figure 3.2), the highest number of responses was observed in the very low category, with 15 pharmacists identifying their knowledge level as very low.

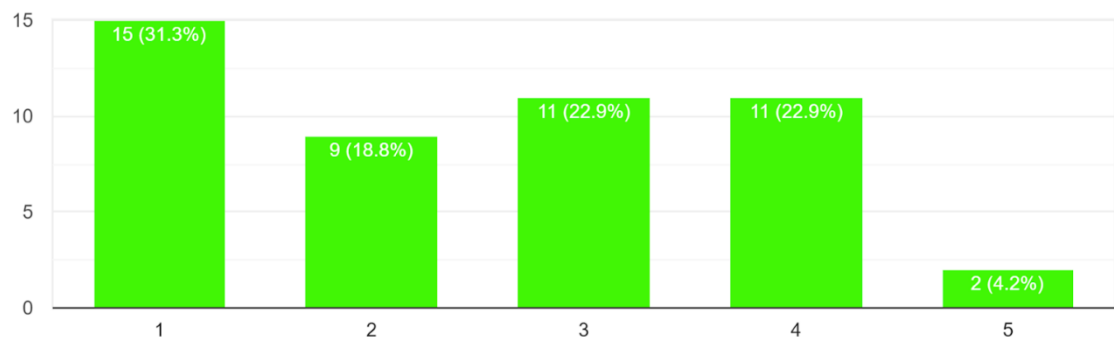


Figure 3.2 Assessment of confidence of pharmacists regarding vaccination (N=48)

3.2.1 Training and Attendance

The study revealed a gap in recent training and professional development related to vaccine administration among the surveyed pharmacists. Out of the 48 participants (Figure 3.3), 38 had not attended any recent workshops or training sessions on vaccine administration.

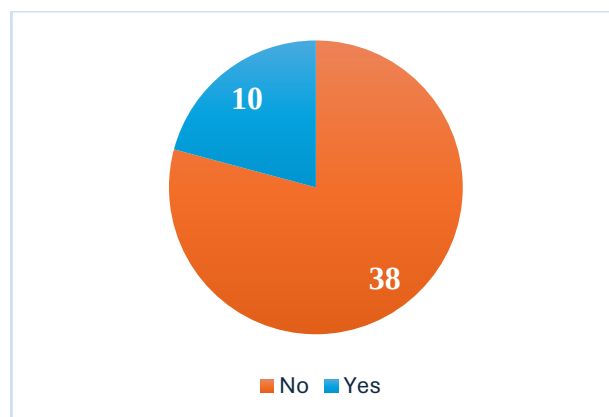


Figure 3.3 Attendance at a recent workshop or training session for vaccination (N=48)

Only 10 pharmacists reported having attended recent training sessions. Among these, the benefits of training were reflected in their higher confidence and knowledge ratings (score=4). When participants were asked to rate their comfort level on a scale from 1 to 5, the highest number of responses was observed in the very low and low category, with 14 pharmacists in each category identifying their knowledge level as very low. Thirty-six pharmacists had never administered a vaccine. However, even among those who had administered vaccines, challenges persisted.

3.3 Infrastructure and Resources

The availability of appropriate infrastructure and resources is crucial for effective vaccine administration. The survey results indicated that half of the pharmacies (n=24) had a designated area for vaccination. The lack of designated areas in the other half was primarily due to space constraints or the absence of such facilities in the pharmacy's initial design plan.

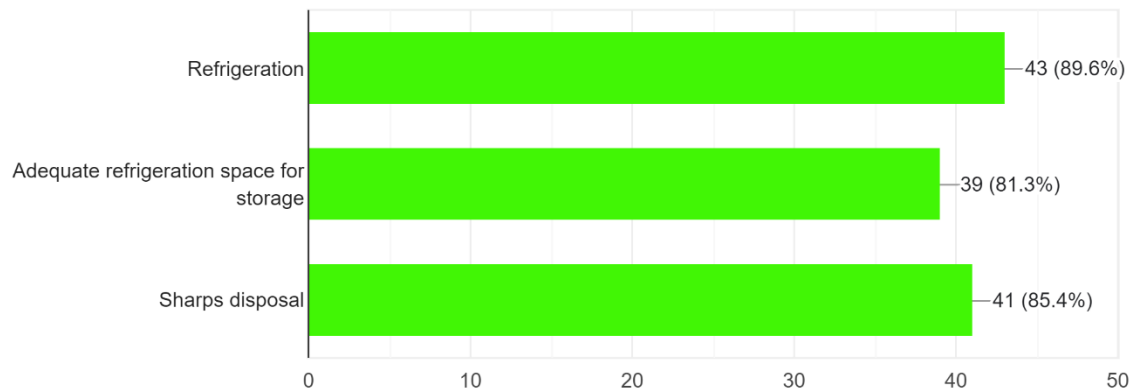


Figure 3.4 Presence of storage for vaccines and sharps disposal (N=48)

Despite these limitations, 39 pharmacies were well-equipped with essential resources for vaccine storage (Figure 3.4).

3.4 Documentation and Record-Keeping

Proper documentation and record-keeping are vital for tracking immunisation coverage and ensuring patient safety. The survey revealed that only 11 pharmacists maintained proper vaccination records. Thirty pharmacists did not keep any records of vaccinations conducted in their pharmacies (Figure 3.5).

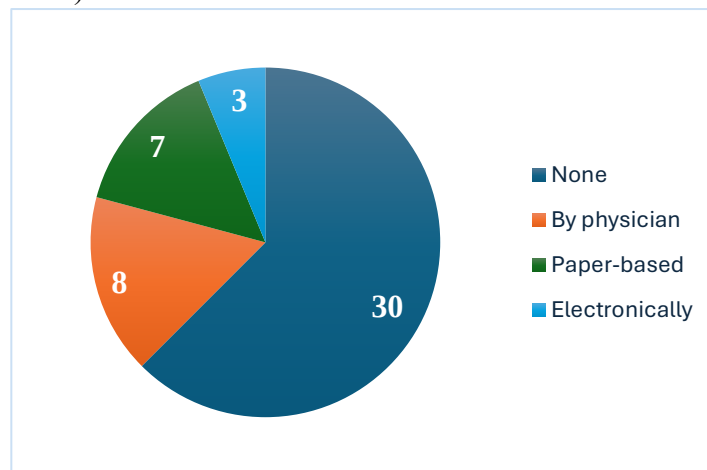


Figure 3.5 Documentation and record keeping practices (N=48)

3.5 Continuous Education

Continuous education and professional development are essential for ensuring that pharmacists remain competent and confident in vaccine administration. The current study found that 37 pharmacists expressed a need for additional training or information in various aspects of vaccine administration. The specific areas identified included managing anaphylactic reactions, understanding regulatory requirements, and improving overall administration skills.

3.6 Training Commitment

When asked about their commitment to training, most pharmacists (n=39) indicated that they could allocate less than 3 hours per week for training. Seven pharmacists were willing to commit 3 hours per week, and only 2 pharmacists could dedicate more than 3 hours weekly (Table 3.3).

Table 3.3 Attitude and commitment towards learning opportunities (N=48)

Continuous education	
If additional training or education needed	
Yes	37
No	9
Specific areas for training and education suggested by pharmacists	
Preparation and administration of vaccines	
Anaphylactic reactions	
Knowledge	
Regulatory affairs	
Continuing professional development	
Comprehensive training on entire process	

Training commitment	
Allocated hours for training per week	
Less than 3 hours	39
3 hours	7
7-10 hours	2

3.6.1 Training Preferences and Feasibility

The preference for training formats varied among pharmacists, with a strong inclination towards hybrid methods (Table 3.4). Twenty-five pharmacists preferred hybrid training due to its combination of convenience, interactivity, and flexible scheduling. Hybrid training offers the advantage of allowing pharmacists to benefit from online learning at their own pace while also providing the valuable networking opportunities available in in-person sessions. Sixteen pharmacists favored in-person training exclusively, highlighting the continued importance of face-to-face interactions in professional development. Seven pharmacists preferred fully online training, underscoring the need for a blended approach that effectively combines the benefits of both online and in-person training methods.

Regarding the feasibility of attending training sessions, preferences were as follows: 17 pharmacists preferred weekdays during business hours, 12 preferred weekends, and 19 had no specific preference and were flexible with their timings.

3.6.2 Willingness to Pay and Challenges Perceived

When asked about their willingness to pay for vaccination courses, 27 pharmacists indicated that they were willing to pay, while 21 were not. Among those willing to pay, the amount they were prepared to spend also varied, with 26 pharmacists willing to pay between 10€ and 20€, and 22 pharmacists willing to pay more than 20€.

Table 3.4 Training preferences and willingness to pay (N=48)

Factors influencing in-person or online training	
Interactivity	20
Convenience	15
Time flexibility	10
Networking opportunities	3
Feasibility to attend training session	
Flexible	19
Weekdays during business hours	17
Weekends	12
Hours preferred during business hours	
09.00-12.00	18
20.00-21.00	13
17.00-19.00	9
13.00-16.00	8
Preferences during weekends	
Saturday morning	20
Saturday afternoon	16
Sunday	12
Willingness to pay vaccination course	
Yes	27
No	21
Fee for the course	
€10-20	26
€21-30	11
€41-50	5
More than €50	4
€31-40	2

3.7 Overall Challenges and Suggestions

Pharmacists play a crucial role in the healthcare system, particularly in the administration and management of vaccines. However, the integration of pharmacists into immunisation services presents several challenges that need to be addressed to optimise their contribution to public health initiatives. Common challenges faced by pharmacists include limited training in vaccine administration, lack of designated spaces for immunisation services within pharmacies, and inconsistent documentation practices. Additionally, pharmacists often encounter barriers such as time constraints, inadequate staffing, and insufficient support from healthcare policies.

To overcome these obstacles, pharmacists have suggested targeted training programs that focus on vaccine administration techniques, regulatory compliance, and the management of adverse reactions. Furthermore, enhancing infrastructure to create designated vaccination areas, improving electronic health record systems for better documentation, and fostering interprofessional collaboration are key strategies to improve pharmacists' efficiency and confidence in delivering immunisation services. By addressing these challenges and implementing pharmacists' suggestions, the healthcare system can significantly enhance vaccination coverage and improve overall public health outcomes.

3.7.1 Challenges in Administering Vaccines

Pharmacists identified several challenges in administering vaccines (Figure 3.6), including lack of sufficient training, time constraints, infrastructure limitations (e.g., space for vaccination), fear of adverse reactions like anaphylaxis, and misconceptions among other healthcare professionals about pharmacists' roles. The most frequently reported barrier

among pharmacists was a lack of training, cited by 22 pharmacists. This was followed by 16 pharmacists who reported a lack of confidence, 9 who mentioned a lack of knowledge, 6 who identified a lack of time, and 3 who reported a lack of space. Additional challenges mentioned included:

- **Fear of Adverse Reactions:** Concerns about managing adverse reactions, particularly anaphylaxis, were prominent.
- **Professional Skepticism:** Some pharmacists faced skepticism from other healthcare professionals who traditionally view vaccination as outside the pharmacist's scope of practice.
- **Regulatory Uncertainty:** Unclear legal and regulatory frameworks regarding pharmacists' authority to administer vaccines.
- **Documentation Challenges:** Difficulties in maintaining accurate and comprehensive vaccination records.
- **Technical Know-How:** A need for more practical training and technical skills related to vaccine administration.
- **Perceptions by Other Healthcare Professionals:** Some healthcare professionals view pharmacists primarily as dispensers of medication rather than as active participants in patient care, including vaccination.
- **Infrastructure Limitations:** Inadequate facilities and resources for conducting vaccination services.



Figure 3.6 Qualitative depiction of quantitative data on challenges reported by pharmacists in administering vaccines

3.7.2 Suggestions for Enhancing Capabilities

When inquiring about methods to enhance the effectiveness and efficiency of vaccination services delivered by pharmacists, several strategies and recommendations emerged from the responses (Table 3.5). These strategies were crafted to address diverse facets such as training, practical application, and public perception. They aim to ensure that pharmacists are adequately prepared and supported in their expanding role as immunisers. The suggestions provided were informed by the personal experiences and insights of pharmacists, reflecting their firsthand understanding of the challenges and opportunities in this field.

Table 3.5 Suggestions for enhancing effectiveness and efficiency of vaccination services

Strategy	Description
Comprehensive Training	More extensive training during pharmacy education and ongoing professional development courses.
Hands-On Practice	Practical sessions and simulations to build confidence and skills in vaccine administration.
Continuous Updates	Regular updates from pharmaceutical companies and health authorities to keep pharmacists informed about new vaccines and best practices.
Online Education Modules	Accessible and flexible online training programs covering various aspects of vaccine administration.
Legal Authorisations	Clear and specific legal authorisations allowing pharmacists to administer vaccines, thereby reducing regulatory uncertainties.
Designated Areas for Vaccination	Allocating dedicated spaces within pharmacies for safe and efficient vaccination services.
Collaborative Training	Opportunities to collaborate with other healthcare providers, such as nurses, to gain practical experience.
Public Awareness Campaigns	Educating the public about pharmacists' roles and capabilities in vaccine administration to build trust and acceptance.

Chapter 4

Discussion

4.1 Reflection on Study Findings

The study carried out aimed to assess pharmacists' preparedness in delivering immunisation services, focusing on their knowledge, confidence, training, infrastructure, documentation practices, continuous education needs, and training commitment. The findings provide an overview of the current state of pharmacists' capabilities and challenges in vaccine administration.

4.1.1 Knowledge and Confidence

Pharmacists' knowledge and confidence in administering vaccines were found to vary widely. Only 4 pharmacists rated their knowledge as very high, while 7 rated it as very low. Similarly, confidence levels were generally low, with only 2 pharmacists feeling very confident in their ability to administer vaccines. These findings align with previous research indicating that pharmacists often feel underprepared for vaccine administration. A study by Kamuhabwa and Chavda found that healthcare providers in Tanzania, including pharmacists, lacked confidence in their vaccination capabilities due to insufficient training. This suggests a global issue where pharmacists are often not adequately trained or confident in their role as immunisers, highlighting the need for improved training programs (Kamuhabwa and Chavda, 2012).

4.1.2 Training and Attendance

Out of the sample of pharmacists surveyed, 38 had not attended any recent workshops or training sessions related to vaccine administration. This lack of continuous education likely contributes to the low levels of knowledge and confidence observed. The importance of

ongoing training is well-documented in the literature. For example, a systematic review by Isenor et al. was conducted which concluded that pharmacists who undergo regular training are more likely to be confident and effective in administering vaccines (Isenor et al., 2016). The present study reinforces the need for structured and accessible training programs to ensure pharmacists are well-equipped to participate in immunisation efforts.

4.1.3 Barriers to Vaccine Administration

The present study identified several challenges faced by pharmacists when administering vaccines. These challenges included lack of space, time, knowledge, practice and experience, as well as fear of adverse reactions and perceptions by other healthcare professionals. These findings are consistent with previous research. Agomo highlighted that community pharmacists face significant barriers, such as lack of time and space, when trying to expand their roles into public health services like vaccination (Agomo, 2012). A study by Jarab et al. pointed out that regulatory and legal uncertainties can also hinder pharmacists from fully participating in immunisation programs (Jarab et al., 2022).

Fear of adverse reactions, particularly anaphylaxis, was a notable concern among pharmacists in the present study. This fear is understandable, given the potential severity of such reactions. Pharmacists' anxiety about handling anaphylaxis can be mitigated through comprehensive training that includes the management of adverse reactions. A study by Thomas et al. emphasised the importance of training pharmacists in recognising and managing vaccine-related adverse events to boost their confidence and effectiveness in vaccination roles (Thomas et al., 2024).

4.1.4 Infrastructure and Resources

Twenty-four pharmacists reported having a designated area for vaccination in the pharmacy. However, space constraints were a significant barrier for the other half. The availability of essential equipment, such as refrigeration and sharps disposal facilities, was generally adequate. A study conducted by Merks et al., demonstrated that pharmacies with proper infrastructure and resources are more successful in implementing vaccination programs (Merks et al., 2021). These findings highlight the critical role of infrastructure in enabling pharmacists to provide vaccination services.

The lack of designated vaccination areas in 24 pharmacies suggests a need for infrastructural investment. Providing dedicated spaces for vaccination within pharmacies can improve the efficiency and safety of vaccine administration. Enhancing pharmacies by equipping them with the necessary tools, resources, and facilities can significantly contribute to overcoming the logistical challenges identified in this study. By providing pharmacies with the appropriate infrastructure and technology, we can streamline operations, improve efficiency, and ensure that they are better prepared to meet the demands of both routine services and unexpected situations (Grzegorzczak-Karolak et al., 2022).

4.1.5 Documentation and Record-Keeping

The present study revealed that proper documentation and record-keeping practices were lacking among the pharmacists surveyed. Only 11 pharmacists kept vaccination records, using a mix of electronic and paper-based systems, while 8 pharmacists depended on records maintained by physicians. This inconsistency in documentation can lead to gaps in patient care and hinder the ability to track vaccination coverage accurately. Robust record-keeping

systems in pharmacies ensure continuity of care and effective monitoring of vaccination programs (Mercer et al., 2022).

Improving documentation practices is essential for enhancing the overall effectiveness of pharmacy-based vaccination services. Implementing standardised record-keeping systems, whether electronic or paper-based, can help pharmacists maintain accurate and accessible vaccination records. This can also facilitate better communication and coordination with other healthcare providers (Honavar, 2020).

4.1.6 Continuous Education and Training Commitment

Thirty-seven pharmacists expressed a need for additional training in various aspects of vaccine administration. The areas of greatest need included managing anaphylactic reactions, understanding regulatory requirements, and improving overall administration skills. Continuous education plays a crucial role in ensuring that pharmacists remain updated on the latest best practices and emerging trends in vaccination. By engaging in ongoing training and professional development, pharmacists can enhance their knowledge and skills, enabling them to deliver higher-quality care and stay informed about new vaccines, advancements in immunization techniques, and changes in public health guidelines (Bach and Goad, 2015).

The present study revealed that while pharmacists are currently able to dedicate less than 3 hours per week to training, this presents an opportunity to enhance training accessibility. The preference for hybrid and online training methods among pharmacists demonstrates the potential for flexible and convenient training solutions. Online training can offer the interactivity and adaptability needed to fit seamlessly into pharmacists' busy schedules,

effectively addressing their educational needs and supporting their professional development (Violette et al, 2019).

4.1.7 Training Preferences and Feasibility

The present study revealed that preferences for training formats among pharmacists were diverse, with 25 pharmacists favoring hybrid methods. The reasons for these preferences included factors such as convenience, interactivity, and time flexibility. While online training methods were appreciated for their convenience and flexibility, the preference for hybrid and in-person sessions highlights the importance of interaction and hands-on experience. These findings align with trends in other healthcare professions, where a mix of online and in-person learning options is becoming more popular. Online training programs, therefore, have the potential to meet the training needs of healthcare providers, including pharmacists, by offering interactive and easily accessible content while also considering the value of in-person engagement (Ozdemir et al., 2022).

Regarding the feasibility of attending training sessions, preferences varied, with 17 pharmacists favoring weekdays during business hours and others preferring weekends or flexible timings. This diversity in preferences highlights the importance of offering training sessions at various times to accommodate different schedules.

4.1.8 Willingness to Pay and Perceived Challenges

The present study found that 27 pharmacists were willing to pay a fee for vaccination courses, indicating a recognition of the value of such training. However, the remaining pharmacists were not inclined to pay, which may reflect concerns about the affordability of training or

skepticism about its benefits. Addressing these concerns through clear communication about the benefits and potential return on investment of training programs could enhance participation rates.

Pharmacists identified several challenges in administering vaccines, including lack of sufficient training, time constraints, infrastructure limitations (e.g., space for vaccination), fear of adverse reactions like anaphylaxis, and misconceptions among other healthcare professionals about pharmacists' roles. These challenges are consistent with findings from previous research. A study found that pharmacists' knowledge, attitudes, and practices regarding vaccination were influenced by similar factors, including time and resource constraints and professional skepticism (Jarab et al., 2022).

4.1.9 Suggestions for Enhancing Capabilities

Pharmacists suggested various resources and strategies to enhance their capabilities in vaccine administration. These included more comprehensive training during pharmacy education, hands-on practice sessions, continuous updates, online education modules, and specific legal authorisations for administering vaccines. These suggestions align with recommendations from previous studies, which proposed a framework for expanding pharmacists' roles in emergency preparedness and response, including vaccination (Aruru et al., 2021).

Providing pharmacists with access to regular, comprehensive training and hands-on practice opportunities can significantly improve their confidence and competence in vaccine administration. Addressing regulatory and legal barriers through advocacy and policy changes can empower pharmacists to take on more active roles in immunisation efforts.

4.2 Validity of Conclusions

The findings of the present study are consistent with previously published work, supporting the validity of the conclusions drawn (Kamuhabwa and Chavda, 2012; Agomo, 2012; Bach and Goad, 2015; Isenor et al., 2016; Violette et al., 2019; Jarab et al., 2022; Mercer et al., 2022; Ozdemir et al., 2022). The alignment with these studies strengthens the credibility of the results. The comprehensive nature of the survey, covering various aspects of vaccine administration adds to the robustness of the conclusions.

4.3 Limitations of the Study

- i. **Self-Reporting Bias:** Participants may overestimate or underestimate their knowledge, confidence and preparedness due to self-reporting bias. Self-reported data can be influenced by the desire to present oneself in a favorable light, or by imperfect recall, both of which can distort the accuracy of the findings.
- ii. **Small Sample Size:** The limited number of participants (48 pharmacists) may affect the generalisability of the findings. A small sample size restricts the ability to draw broad conclusions applicable to a larger population and may result in findings that are not statistically significant.
- iii. **Cross-Sectional Design:** The study captured data at a single point in time, which may not reflect changes in preparedness over time. This design limits the ability to observe trends or developments in pharmacists' knowledge, confidence, and infrastructure related to vaccine administration.

4.4 Recommendations for Further Study

To build on the findings of this study, future research should:

- i. **Expand the Sample Size:** Conduct studies with larger and more diverse samples to enhance the generalisability of the results. Increasing the sample size can provide a more accurate representation of the pharmacist population and improve the reliability of the findings.
- ii. **Longitudinal Studies:** Implement longitudinal studies to track changes in pharmacists' knowledge, confidence, and practices over time, particularly in response to targeted interventions. Longitudinal studies can help identify trends, causal relationships, and the long-term impact of interventions on pharmacists' preparedness.
- iii. **Intervention Studies:** Evaluate the effectiveness of specific training programs, infrastructural changes, and policy interventions in improving pharmacists' capabilities and participation in immunisation services. Experimental or quasi-experimental designs can provide robust evidence on what works best to enhance pharmacists' roles in vaccination.
- iv. **Qualitative Research:** Incorporate qualitative research methods, such as interviews and focus groups, to gain deeper insights into pharmacists' experiences, perceptions, and challenges related to vaccine administration. Qualitative data can complement quantitative findings and provide a richer, more nuanced understanding of the issues at hand.
- v. **Interdisciplinary Collaboration:** Explore the impact of interdisciplinary collaboration between pharmacists and other healthcare professionals on immunisation outcomes and identify best practices for effective teamwork. Collaborative efforts can leverage

the strengths of different healthcare providers to improve vaccination rates and public health.

- vi. Policy Analysis: Conduct policy analysis to identify and address regulatory and legal barriers that hinder pharmacists' involvement in vaccination programs and advocate for supportive policies. Policy changes can create a more enabling environment for pharmacists to contribute effectively to immunisation efforts.

4.5 Conclusion

The literature review highlighted the critical role that pharmacists can play in improving vaccination coverage and supporting public health initiatives. The present study highlights the need for targeted training programs, infrastructural improvements, and policy changes to address the barriers faced by pharmacists. By enhancing pharmacists' knowledge, confidence, and capabilities, the strategic position of pharmacists within the healthcare system can be leveraged to achieve broader immunisation goals and improve public health outcomes.

Pharmacists are uniquely positioned to contribute to immunisation efforts due to their accessibility and frequent interactions with the community. Strengthening their role through comprehensive training, supportive policies, and adequate resources is essential for maximising their impact on vaccination coverage. Future research should continue to explore and address the factors that influence pharmacists' preparedness and participation in immunisation services, ensuring that pharmacists are fully equipped to meet the demands of public health challenges. By doing so, the overall effectiveness of vaccination programs and safeguarding public health on a larger scale can be enhanced.

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Appendices

Appendix 1

Questionnaire for Evaluation of Pharmacist

Vaccination Preparedness

01/18/2024

I am Abdullah Tariq, a post-graduate student following the Master of Pharmacy program at the Department of Pharmacy, University of Malta. As part of my studies, I am undertaking a dissertation on 'Pharmacist Vaccination Preparedness' under the supervision of Professor Lilian M. Azzopardi and Dr Francesca Wirth. The aim of the study is to understand current landscape and identify needs to support pharmacist contribution towards vaccination strategies.

I would like to invite you to participate in this research and provide your insights by completing the questionnaire. All data is anonymous. Thank you for your time and commitment to advancing the field.

Should you have any questions, I can be contacted on **abdullah.tariq.22@um.edu.mt**.

Demographics:

1. Principal area of practice of pharmacy:

- Community
- Hospital
- Regulatory
- Industry
- Administration
- Academia
- Others

2. Years of experience as a pharmacist:

- 1-10 years

- ☐ 11-20 years
- ☐ 21-30 years
- ☐ 31-40 years
- ☐ 41-50 years
- ☐ More than 50 years

3. Gender:

- ☐ Male
- ☐ Female
- ☐ Other

4. Nationality:

5. Have you received any specific training or certification for vaccine administration?

- ☐ Yes
- ☐ No

If yes, where have you received such training or certification?

- ☐ University
- ☐ Online courses and webinars
- ☐ Continuing medical education
- ☐ Pharmaceutical company
- ☐ Simulation courses

Vaccine Administration Knowledge and Confidence:

1. On a scale of 1 to 5, rate your knowledge of vaccine administration procedures?

(1= Not knowledgeable at all, 5 = Very knowledgeable)

2. On a scale of 1 to 5, rate your confidence in vaccine administration procedures?

(1 = Not confident at all, 5 = Very confident)

3. Have you attended any recent workshops or training sessions related to vaccine administration?

- ☐ Yes
- ☐ No

4. How comfortable are you with vaccinating patients?

(1=Not comfortable at all, 5=Very comfortable)

5. Have you ever administered a vaccination to patients?

- ☐ Yes
- ☐ No

6. Have you faced any challenges in vaccinating patients?

- ☐ Yes
- ☐ No

If yes, what challenges have you faced.

- ☐ Lack of confidence
- ☐ Lack of knowledge
- ☐ Lack of space
- ☐ Lack of time

- Lack of practice
- Others (Mention):

Infrastructure and Equipment:

1. Does your pharmacy have a designated area for vaccine administration?

- Yes
- No

If not, what challenges do you face in creating one?

2. Do you have the necessary equipment for vaccine storage and administration?

Refrigeration

- Yes
- No

Adequate space for vaccine storage

- Yes
- No

Sharps Disposal

- Yes
- No

Documentation and Record-Keeping:

1. How do you currently manage the documentation and record-keeping for vaccine administration?

- Paper based

- ☐ Electronic
- ☐ Both
- ☐ Physician
- ☐ None

Continuous Education:

1. Are there specific areas of vaccine administration where you feel the need for additional training or information?

- ☐ Yes

If yes, please list

- ☐ No

Training Commitment:

1. On average, how many hours per week can you allocate for training on vaccine administration?

- ☐ Less than 3 hours
- ☐ 3 hours
- ☐ 7-10 hours
- ☐ More than 10 hours

2. Do you prefer in-person or online training for vaccine administration?

- ☐ In-person
- ☐ Online
- ☐ Hybrid

3. What factors influence your preference for in-person or online training? (Select all that apply)

- ☐ Convenience
- ☐ Interactivity
- ☐ Networking opportunities
- ☐ Time flexibility
- ☐ Other (please specify)

4. When do you find it most feasible to attend training sessions?

- ☐ Weekdays during business hours
 - i. 09.00-12.00
 - ii. 13.00-16.00
 - iii. 17.00-19.00
 - iv. 20.00-21.00
- ☐ Weekends
 - i. Saturday Morning
 - ii. Saturday Afternoon
 - iii. Sunday
- ☐ Flexible, no specific preference

5. Are you willing to pay fee for a vaccination course?

- ☐ Yes
- ☐ No

If yes, how much?

- 10-20€
- 20-30€
- 30-40€
- 40-50€
- Over 50€

Overall Challenges and Suggestions:

1. What do you perceive as the biggest challenges in administering vaccines as a pharmacist?

2. Are there any specific suggestions or resources you believe would enhance your capabilities in vaccine administration

Thank you for taking the time to validation of this questionnaire. Your feedback is valuable in identifying and addressing the needs of pharmacists in vaccine administration.

Appendix 2

Faculty Research Ethics

Committee Acknowledgement

The status of your REDP form (MED-2024-00109) has been updated to Acknowledged Inbox x

form.urec@um.edu.mt

Wed, 10 Apr, 15:53



to me ▼

Dear Abdullah Tariq,

Please note that the status of your REDP form (MED-2024-00109) has been set to *Acknowledged*.

Appendix 3

Abstract Submission to FIP and Poster Presentation

Pharmacist Vaccination Preparedness

Abdullah Tariq

Abstract

Background

“In 2020, the World Health Organization launched the Immunization Agenda 2030 to reduce mortality and morbidity from vaccine-preventable diseases, improve equity of access to vaccination, and increase immunisation coverage rates across all ages and special-risk groups, leaving no one behind.” As the global community strives to achieve these ambitious goals, the role of pharmacists in vaccine administration becomes increasingly pivotal. Pharmacists, with their accessibility and expertise in medication management, are well-positioned to contribute significantly to immunisation efforts. However, the extent of their preparedness in this domain remains a subject of inquiry, particularly in regions such as Malta.⁸

Purpose

The purpose of this study is to assess the readiness of pharmacists in Malta to provide immunisation services. Malta, like many other countries, faces unique challenges and opportunities in its healthcare landscape, influencing the role and readiness of pharmacists in vaccine administration. By understanding the current state of preparedness among

⁸ World Health Organization (WHO). Immunization Agenda 2030: a global strategy to leave no one behind [Online]. Geneva: WHO; 2023 [Cited 2023 Dec 20]. Available from: <https://www.who.int/teams/immunization-vaccines-and-biologicals/strategies/ia2030>

pharmacists, policymakers and stakeholders can tailor interventions to optimise their involvement in immunisation initiatives, ultimately bolstering public health outcomes.

Method

A rigorous methodology is employed to ensure the validity and reliability of the findings. A self-administered questionnaire, meticulously crafted and validated by a diverse panel of experts encompassing community, hospital, regulatory sciences, and academia, serves as the primary data collection tool. This questionnaire designed enables efficient data collection from a wide pool of pharmacists across various practice settings in Malta. Through comprehensive analysis, the questionnaire elucidates key aspects of pharmacist preparedness, including education and training, perceived barriers and facilitators, and engagement in continuous professional development activities.

Results

The findings of this study promise to yield valuable insights into the readiness of pharmacists to assume a more prominent role in immunisation services. By capturing data on education and training experiences related to vaccine administration, the questionnaire sheds light on existing competencies and identifies areas for improvement. Furthermore, the analysis explores variations in preparedness across different practice settings, offering nuanced perspectives on the challenges and opportunities encountered by pharmacists in diverse healthcare environments. Moreover, the questionnaire delves into pharmacists' perceptions of barriers and facilitators, providing crucial contextual information for devising targeted

interventions. Additionally, the study evaluates pharmacists' engagement in continuous professional development activities, highlighting avenues for ongoing skill enhancement.

Conclusions

The conclusions drawn from this study are poised to shape the trajectory of pharmacist involvement in public health initiatives in Malta. By identifying gaps in knowledge, competence, and confidence among pharmacists, this research informs strategies to fortify their role in immunisation services. Moreover, the insights garnered from pharmacists' preferences regarding training content pave the way for tailored professional development initiatives. Ultimately, this study serves as a cornerstone for guiding future interventions aimed at maximising the contributions of pharmacists to the advancement of public health goals in Malta and beyond.

Topic area

Pharmaceutical practice

PHARMACIST VACCINATION PREPAREDNESS

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INTRODUCTION

- The WHO's **Immunization Agenda 2030** seeks to improve equitable vaccine access and coverage for all. The **International Pharmaceutical Federation** highlights pharmacists' vital role in vaccine administration and professional development.¹
- This study evaluates pharmacists' readiness to enhance their impact on public health through vaccination efforts.²

AIM

- To evaluate pharmacists' **vaccination preparedness** for providing vaccination services.

METHOD

- A **self-administered questionnaire** was developed and validated by a **five-member expert panel**. The questionnaire covered key areas including pharmacists' educational background, training, perceived barriers, facilitators to providing immunization services, and engagement in continuous professional development activities.
- It was disseminated through the **Pharmacy Council** to all pharmacists registered in Malta.
- **Descriptive statistics** were used to analyze the data, providing insights into trends in knowledge, confidence, infrastructure, and training needs.

RESULTS

- A total of **48 pharmacists** participated in the study, 38 of whom were Maltese.

Knowledge and Confidence

Knowledge levels ranged from very low (7 pharmacists) to very high (4), while confidence levels ranged from very low (15) to very high (2).

Education Needs and Training Preferences

37 Pharmacists expressed a strong need for additional training, preferring online formats for convenience, despite some favoring in-person sessions.

Training and Experience

38 pharmacists had not attended recent training sessions and lacked experience in vaccinating patients, facing various challenges.

Overall Challenges

Pharmacists faced challenges such as inadequate space, insufficient training opportunities, and inconsistent documentation practices.

Infrastructure and Equipment

24 pharmacies lacked designated vaccination areas, though 39 had adequate storage equipment; record-keeping was often inconsistent.

Suggestions

Enhancing training programs and improving infrastructure are essential to boost pharmacists' readiness for vaccine administration and public health contributions.

CONCLUSION

- The survey revealed variability in **pharmacists' vaccine knowledge and confidence**, with many lacking recent training and experience.
- Addressing issues like **inadequate training and remuneration** is essential for improving preparedness.
- **Targeted training, better infrastructure, and regulatory support** can empower pharmacists to contribute more actively to public health.

REFERENCES

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