



Perspectives and Experiences of Community Pharmacists on Vaccine and Cold Chain: A Qualitative Study

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ABSTRACT

Objectives: Vaccination is a cornerstone of public health, and maintaining the vaccine cold chain within a temperature range of 2–8 °C is essential to preserve vaccine efficacy and prevent wastage. Community pharmacists are highly accessible healthcare professionals who play a crucial role in vaccine supply, storage, and public education. The aim of this study was to qualitatively assess vaccination and cold-chain practices in community pharmacies within Türkiye's primary healthcare system.

Materials and Methods: A qualitative study was conducted with 15 community pharmacists in Ankara, Türkiye, using semi-structured face-to-face interviews carried out between September 15 and 30, 2024. Participants were recruited through snowball sampling until thematic saturation was achieved. All interviews were audio-recorded, transcribed verbatim, and analyzed using Braun and Clarke's seven-phase thematic analysis. Data management was performed using ATLAS.ti version 24.0, and reporting adhered to the COREQ checklist.

Results: Three main themes emerged: vaccination practices, vaccine logistics and cold-chain management, and vaccine hesitancy. Pharmacists reported frequent patient inquiries, particularly regarding influenza, human papillomavirus, and childhood vaccines. Participants demonstrated a high level of awareness of cold-chain protocols, including the use of dedicated refrigerators and continuous temperature monitoring systems. Vaccine hesitancy, especially toward Coronavirus Disease 2019 vaccines, was primarily attributed to misinformation, with pharmacists emphasizing the importance of evidence-based and empathetic communication.

Conclusion: Community pharmacists possess substantial technical knowledge in vaccine logistics and play a critical role in patient counseling. Strengthening regulatory frameworks, professional training, and communication skills may further enhance pharmacists' contributions to immunization efforts and vaccine confidence.

Keywords: Vaccine, cold chain, hesitancy, pharmacy, pharmacist role

INTRODUCTION

Vaccination is a key public health intervention that prevents the spread of infectious diseases. Although global immunization efforts have led to major successes, such as the eradication of smallpox, maintaining vaccine efficacy continues to pose

challenges. In developing countries, issues such as unreliable electricity and limited refrigeration disrupt the vaccine cold chain. Surprisingly, similar problems have been observed in developed settings, where improper storage remains a concern.¹ The cold chain, which maintains vaccines at 2–8 °C, is essential

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to preserving potency and preventing waste.² Failures in the cold chain are a major cause of vaccine wastage.^{3,4}

Pharmacists serve as accessible healthcare professionals who play a central role in public education. In Türkiye, pharmacies are among the first points of contact for patients seeking vaccine information.⁵ However, they are not legally permitted to administer vaccines. Despite this, pharmacists contribute significantly to vaccine access and public awareness. This study aims to qualitatively assess vaccination practices and cold chain management in community pharmacies in Ankara, while exploring pharmacists' perspectives on vaccine hesitancy and professional responsibilities.

MATERIALS AND METHODS

This qualitative study was conducted among 15 community pharmacists in Ankara, Türkiye, using a snowball sampling method. The first participant was recruited through one of the researchers, who is also a pharmacist. The remaining participants were reached using snowball sampling. Data saturation was considered achieved by the 13th interview; two additional interviews were conducted to confirm it.

Face-to-face semi-structured interviews were held between September 15 and 30, 2024. Semi-structured interviews with the participants were conducted in the pharmacists' offices during their available hours, specifically at times when there were patients or clients or when their numbers were minimal. The semi-structured interview guide was developed by the researchers based on a review of the current literature. The questions were asked in a general-to-specific order, allowing flexibility according to the participants' responses. The semi-structured interviews were conducted by two researchers. During the interviews, one researcher posed questions while the other took notes. The semi-structured interview guide included questions designed to explore pharmacists' experiences and perspectives on vaccination practices, the logistical aspects of vaccine delivery and cold-chain management in pharmacies, and their approaches to addressing vaccine hesitancy among patients. Prior to the interviews, the participants were informed about the purpose of the study, and permission was obtained to record the sessions. All participants provided consent for audio recording. The audio files were stored on a password-protected digital storage device accessible only to the researchers. Each session lasted 10-15 minutes.

For this study, ethics approval was obtained from the Marmara University Faculty of Medicine Clinical Research Ethics Committee (approval number: 09.2024.286, dated: 09.02.2024), and informed consent was obtained from all participants.

Statistical analysis

The data were analyzed using the seven-phase thematic analysis approach developed by Braun and Clarke:⁶ (1) familiarization with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, (6) writing the thematic map or story, (7) producing the report. After the interviews were transcribed in digital format, thematic content analysis was performed by the researchers to generate

initial codes. Following the coding process, a meeting was held to develop a set of common codes, which were then used by the researchers to construct subthemes and overarching themes. The analysis was carried out using ATLAS.ti 24.0 (Scientific Software Development GmbH), which is appropriate for analyzing qualitative research data. Codes and themes were derived inductively, and participant quotes were used to illustrate key points. The article has been written in accordance with the COREQ checklist.⁷

RESULTS

Fifteen pharmacists participated in the study; their ages ranged from 23 to 60 years (mean, 38.1 years). Their sociodemographic characteristics are presented in Table 1. Most participants were female and had more than 15 years of experience.

Key themes were (1) vaccination practices, (2) cold-chain management, and (3) vaccine hesitancy.

The main themes and subthemes are presented in Table 2.

Table 3 summarizes pharmacists' observations regarding vaccine-related inquiries, patient trust, and opinions on providing vaccination services in community pharmacies.

Pharmacists reported frequent patient inquiries regarding vaccine types, schedules, side effects, and payment. Influenza vaccines were most commonly requested, particularly during peak seasons. Pharmacies also stocked vaccines against human papillomavirus (HPV), rotavirus, meningitis, hepatitis, and tetanus.

Highlights of pharmacists' logistical handling of vaccines, including cold-chain adherence from supply to storage and common stock in pharmacies, are presented in Table 4.

With respect to logistics, participants demonstrated a high level of awareness of cold-chain protocols and actively maintained appropriate temperature controls. They expressed confidence in their ability to manage vaccines safely, although they acknowledged room for improvement in infrastructure.

Regarding vaccine hesitancy, pharmacists noted particular concerns about Coronavirus Disease 2019 (COVID-19) vaccines. While many patients trusted pharmacists' advice, hesitancy persisted due to misinformation. Pharmacists emphasized the importance of clear, evidence-based communication in addressing public doubts.

Table 5 details pharmacists' observations on public attitudes toward vaccination and outlines the communication strategies employed to address vaccine hesitancy.

DISCUSSION

The study illustrates the pivotal role pharmacists play in vaccine accessibility and public education. The seasonal availability of the influenza vaccine is crucial for protecting public health, and increasing access to these vaccines through pharmacies can improve vaccination coverage.⁸ Despite legal barriers, pharmacists in Türkiye serve as reliable sources of information and of vaccine supply. Their involvement, especially with influenza and HPV vaccines, supports greater public trust and immunization coverage.⁹

Table 1. Sociodemographic characteristics of pharmacists

Pharmacist number	Gender	Age	Years of experience	Owns pharmacy	Pharmacy location
1	Female	50	28	Yes	Near the hospital
2	Male	23	<1	No	Across FHC
3	Female	40	15	Yes	District pharmacy
4	Male	33	8	Yes	District pharmacy
5	Female	34	5	Yes	Across the FHC
6	Male	23	<1	No	Across the FHC
7	Female	60	38	Yes	Close to FHC
8	Female	54	28	Yes	District pharmacy
9	Male	46	16	Yes	Near the FHC
10	Female	54	30	Yes	Across the FHC
11	Female	24	1	No	Near the hospital
12	Female	24	<1	No	Near the hospital
13	Male	40	17	Yes	Across the training and research hospital
14	Male	32	4	Yes	Across the hospital emergency
15	Male	35	15	Yes	In the vicinity of hospital

FHC: Family Health Center

Table 2. Main themes and subthemes

Main theme	Subtheme
1. Vaccination Processes and Practices	1.1. Patient Education 1.2. Trust of Patients in Pharmacists 1.3. Vaccination Services in Pharmacies
2. Vaccine Logistics and Cold Chain Management	2.1. Current Vaccines in Pharmacies 2.2. Pharmacists' Cold Chain Practices 2.3. Monitoring the Cold Chain in Pharmacies
3. Vaccine Hesitancy and Pharmacists' Approaches	3.1. Vaccine Hesitancy 3.2. Pharmacists' Approaches Against Vaccine Hesitancy

Table 3. Overview of vaccination practices in pharmacies

Subtheme	Key findings	Illustrative quotes
Patient education	Patients frequently inquire about vaccine types, administration, dosage, side effects, and cost. Flu, HPV, meningitis, and rotavirus vaccines are the most frequently mentioned.	"They ask questions like: is this the children's dose, the adult dose, or I have a certain disease, will the state cover it? Or if I get this, will it harm me or benefit me?...I'm going to the hospital, but can I get the vaccine here?" (Pharm 3, female, 40 years)
Trust in pharmacists	While many patients trust pharmacists, some express skepticism, particularly regarding product recommendations, such as vitamins.	"When we say it's necessary, they trust us and get vaccinated." (Pharm 5, female, 34 years) "In our profession, there has been growing distrust of our recommendations, even for vitamins." (Pharm 8, female, 54)
Vaccination services in pharmacies	Most pharmacists oppose in-pharmacy vaccinations due to legal and safety concerns (e.g., anaphylaxis), lack of medical staff, and insufficient training. Some administer subcutaneous vaccines, such as the influenza vaccine.	"We do not receive training in this. Professionals are available for this purpose." (Pharm 6, male, 23)

HPV: Human papillomavirus

Table 4. Cold chain management and vaccine availability

Subtheme	Key findings	Illustrative quotes
Available vaccines	Pharmacies commonly stock vaccines for influenza, tetanus, hepatitis, meningitis, HPV, and rotavirus. Influenza vaccines are produced seasonally, whereas other vaccines are stocked according to demand.	"We have flu vaccines available because it's the influenza season. Tetanus vaccines are widely available. Hepatitis B vaccines are regularly available." (Pharm 2, male, 23)
Cold chain practices	Vaccines are ordered from suppliers and stored immediately in dedicated refrigerators with ice packs. Cold chain protocols are carefully followed.	"Vaccines are transported in portable refrigerators. We place them on ice packs and store them immediately." (Pharm 5, female, 34)
Cold chain monitoring	Pharmacies employ automated temperature- and humidity-monitoring devices that send alerts via SMS or e-mail when readings fall outside predefined ranges. Cold-chain refrigerators are used exclusively for medical products.	"We have a 24/7 monitoring device. If the temperature exceeds the desired level, we receive a message." (Pharm 7, female, 60)

HPV: Human papillomavirus

Table 5. Pharmacists' perspectives on vaccine hesitancy

Subtheme	Key findings	Illustrative quotes
Vaccine hesitancy	Hesitancy has increased in the post-COVID period, driven by misinformation and concerns about adverse effects. Some pharmacists report no hesitancy.	"Most patients became more toward vaccines after receiving the COVID vaccine." (Pharm 6, male, 23) "I've encountered many individuals who wish to be vaccinated." (Pharm 12, female, 24)
Pharmacists' approach	Pharmacists attempt to mitigate hesitancy by providing education and emphasizing vaccine necessity, especially for high-risk groups.	"We explain what a vaccine is and why it's necessary. It is part of our professional responsibility." (Pharm 8, female, 54)

COVID: Coronavirus Disease

The literature emphasizes that vaccination training for pharmacists is critical to the safety and effectiveness of vaccination services.¹⁰ Mandatory training in emergency management, such as allergic reactions and anaphylaxis, is essential, especially since pharmacists may have limited capacity to intervene in these situations. Additionally, raising pharmacists' awareness of patient safety is crucial, as this will enhance both patient satisfaction and the effectiveness of the vaccine.¹¹

A study that explored community pharmacy service users' attitudes and opinions towards vaccination programs in pharmacies, found that more than half of respondents believe that providing vaccination services in pharmacies could increase vaccination rates for seasonal illnesses, but only if these services are free or covered by national health insurance.¹²

Community pharmacists in Saudi Arabia generally hold positive attitudes toward vaccination services; however, reported barriers include a lack of support staff, adequate equipment, and certification. In their study, they also mentioned that the service will add extra workload and that there is a lack of formal certification in pharmacy-based immunization delivery. Pharmacists' clinical knowledge of vaccines should be improved.¹³

Pharmacists also reported barriers to vaccine service provision, including regulation, training, remuneration, and storage, which may consequently limit service expansion.¹⁴

Our findings align with global research showing increased vaccination rates where pharmacists are authorized to administer vaccines, such as in Canada and the U.S.¹⁵ However, Turkish law limits pharmacy involvement to distribution and counseling. Current legal regulations in Türkiye restrict pharmacies from offering vaccination services. Therefore, it is essential to revise the legal framework and improve the education levels of pharmacists.¹⁶ Regulatory change, paired with professional training, could enable pharmacists to administer vaccines safely and effectively. It is crucial to distinguish between the pharmacists' clinical aspirations and the current regulatory framework in Türkiye. Although this study explores the potential for expanded immunization services, vaccine administration by pharmacists is currently not legally permitted under existing health regulations. Consequently, the "vaccination practices" identified in our findings do not imply the physical act of injection, but rather encompass the pharmacists' rigorous oversight of cold chain integrity, inventory management, and evidence-based patient counseling. Operating beyond these defined legal boundaries

poses significant professional and legal risks, including potential malpractice liability and disciplinary actions by regulatory bodies. However, the high level of competence demonstrated by participants in cold-chain logistics suggests that the profession is technically prepared to assume broader responsibilities. As demonstrated by various global examples in which pharmacist-led vaccination has successfully increased immunization rates, a comparable transition in the local context would require a robust legal realignment and specialized clinical certification to mitigate professional risks and ensure patient safety. Thus, while our participants advocate for a larger role, these insights should be viewed as a professional perspective on the evolution of pharmacy practice rather than an endorsement of unauthorized clinical activities.

Furthermore, pharmacists should be provided with detailed information about post-vaccination side effects, allergy risks, and vaccination schedules. Participants in our study raised questions about vaccine dosages, available vaccines, and payment methods. This increases the importance of the pharmacists' role in patient education. Pharmacists should take a more active role in raising public awareness of and providing information about vaccination services.

The COVID-19 pandemic has contributed to an increase in concerns about vaccine hesitancy. In our study, participants expressed hesitancy and concerns about COVID-19 vaccines because of their rapid introduction to the market. International literature indicates that vaccine hesitancy increased during the COVID-19 pandemic and had negative effects on public health.¹⁷ To address vaccine hesitancy, pharmacists must engage in accurate communication and persuasive dialogue with patients.¹⁸

The active role of pharmacists in informing patients about the benefits of vaccines is crucial to increasing herd immunity. The growing demand for childhood and HPV vaccines underscores the need for pharmacists to provide more information about these vaccines. Vaccine hesitancy is often caused by insufficient information, and pharmacists' efforts to educate the public can help reduce vaccine hesitancy.¹⁹

Vaccine hesitancy, intensified during the COVID-19 pandemic, remains a challenge. Pharmacists report difficulties in countering misinformation. This highlights the need for communication skills training focused on persuasive, empathetic dialogue.

In a meta-analysis, the overall prevalence of adequate knowledge of vaccine cold chain management among health professionals was found to be significantly below the expected standard in Ethiopia.²⁰ They reported that years of experience, availability of guidelines at the health facility, being a nurse, and receiving on-the-job training in cold chain management were important predictors of health professionals' good knowledge of vaccine cold chain management. Given that family physicians, nurses, and pharmacists play a crucial role in delivering preventive health services, their professional attitudes and beliefs about vaccination can exert significant influence on the community. Cold chain practices performed carefully in pharmacies ensure that vaccines are stored within

the correct temperature ranges. The use of temperature monitoring systems during vaccine transportation and storage is vital for maintaining vaccine effectiveness.²¹ Proper management of these processes is critical to the safety of both pharmacists and patients. Devices such as ice packs and temperature monitoring systems used during transportation and storage contribute to the safe storage of vaccines and help maintain their efficacy.²²

Cold chain management was well understood among participants. Most used appropriate monitoring tools and storage practices. These practices are essential to prevent spoilage and ensure vaccine efficacy. However, global studies suggest that cold chain knowledge varies by profession and region, reinforcing the need for continuous training.²⁰

It was reported that vaccination administered by pharmacists would relieve the burden on medical staff and the healthcare system.²³ Multiple systematic reviews and meta-analyses show that pharmacist involvement (as immunizers or advocates) significantly increases vaccination rates (risk ratios approximately 1.1-1.6), resulting in fewer infections, hospitalizations, and downstream healthcare utilization.^{24,25}

Improving pharmacists' roles in vaccination requires integrated policies, certification programs, and emergency response readiness. Community pharmacies, if supported by adequate resources and appropriate regulation, can significantly enhance vaccination coverage and reduce the burden on healthcare systems.

Study limitations

The findings of this study should be interpreted within the context of several limitations. First, the use of snowball sampling may have introduced selection bias, as participants might have referred colleagues with similar professional backgrounds or viewpoints, potentially limiting the diversity of perspectives. Consequently, the results may not fully represent the entire spectrum of community pharmacists' attitudes. Second, the localized setting and relatively small sample size ($n=15$) restrict the generalizability of the findings to a national or international level. While the sample size was determined based on reaching thematic saturation, further quantitative research with a larger and more geographically diverse population is required to validate these results and explore regional differences. Third, the data relied on self-reports, which are susceptible to social desirability bias or recall inaccuracies. Although the interviews were conducted in a focused, semi-structured format, their duration (10-15 minutes) may have limited the depth of exploration into complex socio-legal issues compared to longer ethnographic studies. Finally, pharmacist-led vaccination is currently not legally permitted in the study's jurisdiction. Therefore, the participants' responses regarding "practices" primarily reflect their roles in cold-chain management, supply management, and patient counseling rather than clinical administration. The suggestions for legislative changes provided in this study are intended as preliminary insights to inform future policy discussions rather than definitive calls for regulatory reform.

CONCLUSION

Pharmacists are highly accessible and trusted healthcare professionals who hold significant potential to enhance public vaccine access and awareness. Currently, Turkish regulations define their role primarily through supply chain management and patient counseling. This study highlights that, while pharmacists are well-equipped with technical knowledge, particularly in cold chain management and temperature logistics, there is a clear opportunity to further integrate them into the national immunization framework.

Our findings suggest that the community pharmacist's role in combating vaccine hesitancy has become increasingly vital in the post-COVID-19 era. To fully leverage this potential, there is a need for structured support systems and continuous professional development programs focused on advanced communication strategies. Such support would enable pharmacists to more effectively address public concerns and provide evidence-based education.

Regarding the expansion of their clinical roles, the insights gained from this participant group suggest that future policy discussions could explore the feasibility of pharmacist-led immunization services. However, such a transition would necessitate comprehensive legal frameworks, standardized clinical training, and necessary emergency equipment to ensure patient safety and professional accountability.

While this study is limited by its sample size and qualitative nature, it serves as a preliminary rationale for further large-scale research. Empowering pharmacists, through legal, educational, and systemic advancements, could eventually help reduce the burden on the healthcare system, improve immunization coverage, and strengthen public health resilience.

Ethics

Ethics Committee Approval: For this study, ethics approval was obtained from the Marmara University Faculty of Medicine Clinical Research Ethics Committee (approval number: 09.2024.286, dated: 09.02.2024).

Informed Consent: Informed consent was obtained from all participants.

Footnotes

Authorship Contributions

Concept: H.İ., B.T.B., S.H., F.B.D., Design: H.İ., B.T.B., F.B.D., Data Collection or Processing: H.İ., F.B.D., Y.T., D.K.Ç., H.S., Analysis or Interpretation: H.İ., B.T.B., S.H., F.B.D., Literature Search: H.İ., B.T.B., S.H., F.B.D., Writing: H.İ., B.T.B., S.H., F.B.D.

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