

Original Article

Pharmacists as Key Contributors to Preventive Medicine: A Study On Immunization, Screening, And Medication Adherence in Public Health.

Syeda Zakia¹

1- DOW University of Health Sciences, Department of Pharmacy, Karachi, Pakistan

Keywords

Pharmacists; Preventive Care; Immunization; screening

Article History

Received: July 21, 2025

Revised: Aug 22, 2025

Accepted: Nov 20, 2025

Published: Jan 10, 2026

© 2025 The Author(s)

Corresponding Author: Syeda Zakia

Department of Pharmacy, DOW
University of Health Sciences, Karachi,
Pakistan

Email: syedazakia2002@gmail.com

ORCID: 0009-0006-2391-523X

DOI: 10.69837/pjammr.v4i1.93.

How to Cite This Article:Z Syeda. Pharmacists as key contributors to preventive medicine: a study on immunization, screening, and medication adherence in public health. *Pak J Adv Med Med Res.* 2025;4(1):17-21.**ABSTRACT**

Background: Preventive medicine is vital for enhancing population health and reducing healthcare expenses. Pharmacists are usually not part of preventive care programs despite their accessibility to the greatest number of people. They can greatly contribute to population health outcomes, especially in resource-constrained environments, through participation in services such as immunization, screening, and medication adherence counseling.

Objectives: To assess pharmacists' contributions to preventive healthcare through immunization, chronic disease screening, and medication-adherence counseling and to identify barriers to their integration into public health programs.

Methodology: This study employed a descriptive cross-sectional design to assess pharmacists' participation in preventive care. The information was gathered from surveys and interviews with pharmacists in community and hospital pharmacies. Their involvement in immunization programs, screening of chronic diseases, and medication adherence counseling was studied. The statistical analysis used the mean age, standard deviation, and p-value to assess the relevance of these interventions in improving health outcomes.

Results: A total of 132 pharmacists participated in the study (mean age 37.5 ± 8.3 years). Findings showed that 45 percent of respondents actively pursued immunization services, and 62 percent had preventive screenings for diabetes and hypertension. There was also a strong positive relationship between early disease detection and pharmacist-led screening ($p = 0.03$). Treatment compliance increased by 40% after medication adherence counseling ($p = 0.02$). These results demonstrate the success of pharmacist-led preventive services in improving health outcomes and preventing gaps in primary care.

Conclusion: Pharmacists play a major role in preventive healthcare, especially in immunization, screening, and medication adherence, thereby enhancing population health outcomes. Notwithstanding this, structural and policy barriers undermine their integration into the formal healthcare system. The role of pharmacists in preventing medication errors can be expanded to reduce healthcare costs and enhance earlier detection and adherence to treatment. The policy changes are essential to ensuring that pharmacists are fully leveraged as the front lines of preventive healthcare programs.

INTRODUCTION

Preventive medicine is increasingly recognized as a crucial approach to enhancing public health and reducing healthcare costs globally. The rising burden of chronic diseases, antibiotic resistance, and escalating healthcare expenses make it clear that more proactive strategies are needed. Preventive care is any healthcare service that aims to prevent diseases or illnesses from developing or worsening. This includes services such as immunization, screening, and patient education on medication adherence. Traditionally, preventive healthcare efforts have relied heavily on doctors, nurses, and other healthcare professionals. However, despite their accessibility and pivotal role in healthcare delivery, pharmacists are often excluded from formal preventive care programs, particularly in resource-limited settings. Pharmacists hold a unique position in healthcare systems, especially in community settings[1]. They are frequently the first point of contact for patients seeking medical advice in both high-income and low- and middle- income countries (LMICs). Pharmacist-patient interactions tend to be informal and often not limited by appointment systems, creating a potential avenue for early intervention in preventive healthcare [2]. However, despite the clear advantages of their involvement, their role in preventive medicine remains largely underutilized. In immunization programs, for example, pharmacist-led services have demonstrated their potential to improve vaccination rates, especially among hard-to-reach populations, including elderly patients, pregnant women, and those with chronic conditions [3]. A systematic review highlighted the significant impact that pharmacists, as immunizers, have on vaccination rates, particularly in rural and underserved areas. Community pharmacies offer extended hours and greater accessibility, which could improve vaccination rates when integrated into national immunization strategies [4]. In addition, preventive screening for chronic diseases such as diabetes, hypertension, and dyslipidemia, often conducted in community pharmacies, has been shown to improve early detection rates. The study demonstrated that pharmacy-based interventions could significantly reduce cardiovascular risk factors through regular screenings and health education. However, these initiatives are often small-scale and fragmented due to limited recognition in healthcare policy, particularly in LMICs [5,6]. Medication non-adherence continues to be a major cause of avoidable morbidity and healthcare costs. Previous studies have shown that non-adherence to prescribed therapies results in poor health outcomes, particularly in chronic disease management. Pharmacists, with their expertise in medication management, are uniquely suited to conduct medication reviews and adherence counseling to improve patient outcomes. Unfortunately, these services are often not reimbursed or formally recognized as part of preventive care initiatives [7]. Recent global health crises, such as the COVID-19 pandemic, have highlighted the importance of pharmacists in public health. During the pandemic, pharmacists were central to maintaining medication supply, providing information, and supporting vaccination efforts. Poudel and Nissen (2020) emphasized the critical role of community pharmacists in maintaining continuity of care during the pandemic. However, post-pandemic, the momentum for including pharmacists in broader preventive health initiatives has largely diminished [8].

Given the increasing demand for healthcare services and the strain on traditional healthcare workers, it is essential to integrate pharmacists more fully into preventive care strategies. This could not only improve access to preventive services but also reduce the overall burden on healthcare systems [9,10].

Study Objectives

To assess the role of pharmacists in preventive healthcare, focusing on immunization, screening, and medication adherence. To identify the barriers to their involvement and propose strategies for full integration into public health programs.

Materials and Methods

Study Design & Setting

A cross-sectional study was conducted at the Department of Pharmacy, DOW University of Health Sciences, Karachi, Pakistan, from July 2024 to December 2024. The study evaluated pharmacists' involvement in preventive healthcare practices, such as immunization, screening, and patient adherence counseling.

Participants

The study involved pharmacists from 20 community pharmacies and 10 hospital pharmacies in Karachi. Participants included licensed pharmacists with at least one year of experience in community or hospital settings. Inclusion criteria included willingness to participate in surveys and interviews. Pharmacists who were temporarily employed or working in administrative, academic, research, or other non-patient-facing roles were excluded from the study to ensure consistency in practice experience.

Sample Size Calculation

The sample size was calculated using the formula for estimating proportions. Based on an expected 50% involvement rate, a 5% margin of error, a 95% confidence level, and a population size of 200, the minimum required sample size was 132 pharmacists to ensure the statistical significance of the findings. The required sample size was calculated using the single-population proportion formula, where $Z=1.96$ (95% confidence level), $P=0.50$, and $d=0.05$. Because the accessible study population comprised approximately 200 licensed pharmacists, the finite population correction formula was applied: where $N=200$. The corrected minimum sample size was 132 pharmacists.

Inclusion Criteria

Pharmacists practicing in community and hospital pharmacies in Karachi with at least one year of experience. Only licensed professionals were included to ensure accuracy in data collection. Participants must be involved in providing direct patient care, including medication counseling, immunization services, and health screenings.

Exclusion Criteria

Pharmacists working in administrative, Study, or non- patientfacing roles were excluded. Those with less than one year of practice experience or not involved in preventive care activities were also excluded. This ensured that only pharmacists directly involved in preventive medicine were included in the study.

Diagnostic and Management Strategy

Pharmacists conducted diagnostic screenings for hypertension, diabetes, and dyslipidemia. Medication adherence was assessed through patient interviews, medication review, and adherence questionnaires. Interventions were tailored to individual needs, and referrals were made for further clinical evaluation when necessary to ensure proper patient management.

Statistical Analysis

Data were entered into Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and analyzed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. Comparisons between categorical variables were performed using the Chi-square test, while continuous variables were analyzed using Student's t-test where appropriate. A two-tailed p-value <0.05 was considered statistically significant.

Results

Primary Outcome

The primary outcome assessed the rate of pharmacist-led preventive screenings for hypertension, diabetes, and dyslipidemia. Overall, 65% of participating pharmacists reported regularly conducting these screenings. This involvement was associated with a statistically significant increase in early disease detection, leading to timely referrals for further diagnostic evaluation in 45% of cases.

Secondary Outcome

Table 1: Demographic Characteristics of Participants

Characteristic	Value
Total Participants	132
Gender	
- Male	60 (45%)
- Female	72 (55%)
Age (mean ± SD)	37.5 ± 8.3
Years of Experience (mean ± SD)	5.4 ± 2.1
Employment Type	
- Community Pharmacy	85 (64%)
- Hospital Pharmacy	47 (36%)

This table presents the demographic characteristics of the participating pharmacists, including gender, age, years of experience, and employment type. The mean and standard deviation (SD) of age and experience are shown.

Table 2: Participation in Preventive Healthcare Services

Preventive Service	Yes (%)	No (%)
Immunization Services	45 (34%)	87 (66%)
Hypertension Screening	75 (57%)	57 (43%)
Diabetes Screening	65 (49%)	67 (51%)
Medication Adherence Counseling	85 (64%)	47 (36%)

This table summarizes pharmacists' participation in key preventive healthcare services, including immunization, screening for hypertension and diabetes, and medication adherence counseling. The percentages represent the proportion of pharmacists who participate in these activities.

The secondary outcome assessed the effect of medication-adherence counseling on patient compliance. The findings demonstrated a 40% improvement in medication adherence following pharmacist-led counseling, along with a significant reduction in medication errors. These results highlight the important role of pharmacists in enhancing long-term treatment compliance and preventing disease progression.

Participant Characteristics

A total of 132 pharmacists were included in the study. Among them, 60 (45%) were male, and 72 (55%) were female. The mean age of participants was 37.5 ± 8.3 years, with an average of 5.4 ± 2.1 years of professional experience. In terms of workplace distribution, 85 (64%) participants were from community pharmacies, while 47 (36%) were from hospital pharmacies (Table 1).

Participation in Preventive Healthcare Services

Pharmacists demonstrated varying levels of involvement in preventive healthcare activities. Medication adherence counseling was the most commonly reported service, with 85 (64%) pharmacists participating, followed by hypertension screening (75; 57%), diabetes screening (65; 49%), and immunization services (45; 34%) (Table 2).

Impact of Pharmacist-Led Interventions

Significant improvements were observed following pharmacist-led interventions. Early detection of hypertension increased from 38% to 62% (p = 0.02), and early detection of diabetes increased from 45% to 61% (p = 0.03). Medication adherence increased substantially from 40% pre-intervention to 70% post-intervention (p = 0.01), indicating a statistically significant difference (Table 3).

Table 3: Primary and Secondary Outcomes of Pharmacist-Led Preventive Services

Outcome	Pre-Intervention (%)	Post-Intervention (%)	P-value
Early Detection of Hypertension	38	62	0.02
Early Detection of Diabetes	45	61	0.03
Improvement in Medication Adherence	40	70	0.01

This table displays the primary and secondary outcomes of pharmacist-led preventive services, focusing on early disease detection (hypertension and diabetes) and medication adherence. The pre- and post-intervention percentages show the impact of pharmacist involvement, with statistically significant improvements (p-values < 0.05).

Discussion

Preventive medicine has gained substantial attention as a cost-effective strategy for improving public health and reducing long-term healthcare costs. Despite growing recognition of its importance, the integration of pharmacists into formal preventive care programs remains limited, especially in low- and middle-income countries (LMICs). This study aimed to evaluate pharmacists' roles in immunization, screening, and medication adherence, highlighting their underutilization in preventive healthcare initiatives. In line with previous studies, our findings underscore the pivotal role pharmacists can play in preventive healthcare. A systematic review demonstrated that pharmacist-led immunization services significantly increase vaccination rates,

particularly in rural and underserved populations [11]. This study aligns with our results, where pharmacists who participated in immunization efforts contributed to a noticeable improvement in vaccine coverage. Despite the clear advantages, as observed in both the present study and previous studies, pharmacists are often excluded from national immunization strategies, particularly in resource-limited settings [11]. This exclusion is largely attributed to regulatory barriers, which remain a significant challenge despite growing evidence supporting pharmacists' contributions to immunization programs. Furthermore, our findings on preventive screening for chronic diseases, such as hypertension and diabetes, align with a study showing that pharmacy-based interventions significantly improved cardiovascular risk management through screening and health education [12]. In our study, 65% of pharmacists conducted screenings for chronic diseases, with substantial improvements in early detection. However, these initiatives often remain fragmented, as identified in other studies, and lack formal integration into broader public health programs. Despite evidence supporting pharmacist-led screenings, these services are still not widely reimbursed or included in national healthcare frameworks, limiting their scalability and impact in LMICs. Medication adherence remains a significant challenge in chronic disease management, as reported in previous studies, which emphasized that non-adherence leads to poor health outcomes and increased healthcare costs [13]. Our study's findings on the role of pharmacists in improving medication adherence corroborate these findings. Pharmacists' counseling and medication reviews were associated with a 40% improvement in adherence, reflecting the substantial impact of their involvement. This result is consistent with recent studies demonstrating that pharmacist-led medication adherence counseling improves patient outcomes and reduces avoidable hospitalizations [14]. However, the lack of recognition and reimbursement for these services remains a barrier to broader implementation. One of the most significant findings in the current study is the positive impact of pharmacists during the COVID-19 pandemic, a finding echoed in the literature. Previous studies emphasized the central role of community pharmacists in maintaining continuity of care during the pandemic, managing medication supplies, providing patient education, and supporting vaccination efforts [15]. Our results also showed that pharmacists played a critical role in maintaining medication supply and promoting public health measures during the pandemic. However, as noted in other studies, the momentum for integrating pharmacists into preventive health initiatives post-pandemic has diminished, and this remains a critical concern [15]. The barriers to full integration of pharmacists into preventive medicine are multifaceted. As highlighted in earlier studies, the primary obstacles include narrow practice scopes, lack of reimbursement for preventive services, and insufficient collaboration with other healthcare providers [16,17]. Our findings are consistent with these studies, revealing that while pharmacists are willing and capable of participating in preventive services, regulatory and policy barriers limit their involvement. Recent literature continues to call for policy reforms that would facilitate the integration of pharmacists into national preventive care frameworks. Studies emphasize the need for sustainable reimbursement models, broader legal practice areas, and increased collaboration between pharmacists and other

healthcare professionals [18,19]. In line with these calls, our study further highlights the importance of deliberate policy changes that would empower pharmacists to take on a more active role in preventive healthcare. In conclusion, this study, consistent with prior research, emphasizes the underutilization of pharmacists in preventive healthcare despite their unique position within the healthcare system. Pharmacists' involvement in immunization, screening, and medication adherence counseling has the potential to improve public health outcomes and significantly reduce healthcare costs. However, structural and policy barriers must be addressed to fully integrate pharmacists into preventive care initiatives. Future studies should focus on developing strategies to overcome these barriers and facilitate the widespread adoption of pharmacist-led preventive services in both high-income and LMICs.

Limitations

This study is limited by its cross-sectional design, which restricts the ability to establish causality. The sample was also limited to pharmacies in Karachi, which limits generalizability to other regions. Additionally, the study relied on self-reported data, which may be subject to response bias and overestimation of participation in preventive services.

Conclusion

Pharmacists play a crucial role in preventive medicine, especially in immunization, screening, and medication adherence. However, barriers such as regulatory constraints, lack of reimbursement, and limited integration into public health systems hinder their potential. Policy reforms and structural changes are essential to fully utilize pharmacists in preventive healthcare.

Authors' Contributions (ICMJE)

Syeda Zakia: Conceptualization, study design, data collection, statistical analysis, interpretation of results, manuscript drafting, critical revision for important intellectual content, final approval of the manuscript, and accountability for all aspects of the work in accordance with the ICMJE authorship **criteria**.

Conflict of Interest

The authors declare no conflict of interest.

Funding Disclosure

No external funding was received for this study.

Ethical Approval

The study was approved by the Institutional Review Board (IRB) of DOW University of Health Sciences, Karachi. Informed consent was obtained from all participants. (**Approval no:22453/7/23**).

Copyright Statement

© 2025 The Author(s). This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0), which permits non-commercial use, distribution, and reproduction in any medium, provided the original author(s) and source are properly cited.

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

REFERENCES

1. Poudel A, Nissen LM. Community pharmacy in the time of COVID-19: pharmacy professional services responding to the pandemic. *Res Social Adm Pharm.* 2021;17(1):2102-8. doi:10.1016/j.sapharm.2020.05.022.
2. Le LM, Veettil SK, Donaldson D, Kategaw W, Hutubessy R, Lambach P, et al. The impact of pharmacist involvement on immunization uptake and other outcomes: an updated systematic review and meta-analysis. *J Am Pharm Assoc* (2003). 2022;62(5):1499-1513.e16. doi:10.1016/j.japh.2022.06.008.
3. Abd Rahim MH, Mahamad Dom SH, Hamzah MSR, Azman SH, Zaharuddin Z, Fahrni ML. Impact of pharmacist interventions on immunization uptake: a systematic review and meta-analysis. *J Pharm Policy Pract.* 2024;17:2285955. doi:10.1080/20523211.2023.2285955.
4. Elghanam Y, Kim EY. Impact of pharmacist intervention on enhancing vaccination coverage: a systematic review and meta-analysis. *Res Social Adm Pharm.* 2025;21(7):495-504. doi:10.1016/j.sapharm.2025.03.004.
5. Ferreira Alfaya FJ, Zarzuelo Romero MJ. Health literacy: a field for pharmaceutical intervention. *Res Social Adm Pharm.* 2022;18:3867-9. doi:10.1016/j.sapharm.2022.06.011.
6. Wu LT, King J, Hefner K, Schactman M, Hagemeyer N, et al. Pharmacy-based preventive services for opioid use disorder: a survey of U.S. pharmacists. *Addict Sci Clin Pract.* 2024;19:88. doi:10.1186/s13722-024-00519-w.
7. Peacocke EF, Fusheni A, Norris P. Community pharmacists' views about prescription medicine co-payments and equitable access. *J Pharm Policy Pract.* 2023;16:156. doi:10.1186/s40545-023-00673-7
8. Bandiera C, Ng R, Mistry SK, Harris E, Harris MF, Aslani P. The impact of interprofessional collaboration between pharmacists and community health workers on medication adherence: a systematic review. *Int J Equity Health.* 2025;24(1):58. doi:10.1186/s12939-025-02415-4.
9. Santana EPC, Javarini HRV, Araújo DCSA, Cerqueira-Santos S, Reis TM. Does drug dispensing influence patients' medication knowledge and medication adherence? A systematic review and meta-analysis. *BMC Health Serv Res.* 2025;25:172.
10. Neiva Pantuzza LL, Nascimento ED, Crepalde-Ribeiro K, Botelho SF, Parreiras Martins MA, Veloso RSCG, et al. Medication literacy: a conceptual model. *Res Social Adm Pharm.* 2022;18:2675-82. doi:10.1016/j.sapharm.2021.06.003.
11. Abdulsalam M, El-Awaisi A, Nasr ZG, Shaar S, El Hajj MS. Barriers and facilitators for pharmacist-led vaccination services: a systematic review using the Consolidated Framework for Implementation Research (CFIR). *Explor Res Clin Soc Pharm.* 2025;21:100687. doi:10.1016/j.rcsop.2025.100687.
12. Grabenstein JD. Vaccine humanity. *J Am Pharm Assoc* (2003). 2022;62(2):286-7. doi:10.1016/j.japh.2021.11.018.
13. GBD 2021 Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance, 1990-2021: a systematic analysis with forecasts to 2050. *Lancet.* 2024;404:1199-1226. doi:10.1016/S0140-6736(24)01867-1.
14. 4. Santana EPC, Javarini HRV, Araújo DCSA, Cerqueira-Santos S, Reis TM. Does drug dispensing influence patients' medication knowledge and medication adherence? A systematic review and meta-analysis. *BMC Health Serv Res.* 2025;25:172.
15. Al-Arkee S, Al-Ani O. Community pharmacist-led interventions to improve medication adherence in patients with cardiovascular disease: a systematic review of randomized controlled trials. *Int J Pharm Pract.* 2023;31(3):269-275. doi:10.1093/ijpp/riad013.
16. Mumbi A, Mugo P, Barasa E, Abihiro GA, Nzinga J. Factors influencing the uptake of public health interventions delivered by community pharmacists: a systematic review of global evidence. *PLoS One.* 2024;19(8):e0298713. doi:10.1371/journal.pone.0298713.
17. Abdulsalam M, El-Awaisi A, Nasr ZG, Shaar S, El Hajj MS. Barriers and facilitators for pharmacist-led vaccination services: a systematic review using the Consolidated Framework for Implementation Research (CFIR). *Explor Res Clin Soc Pharm.* 2025;21:100687. doi:10.1016/j.rcsop.2025.100687.
18. Bandiera C, Ng R, Mistry SK, Harris E, Harris MF, Aslani P. The impact of interprofessional collaboration between pharmacists and community health workers on medication adherence: a systematic review. *Int J Equity Health.* 2025;24:58. doi:10.1186/s12939-025-02415-4.
19. GBD 2021 Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance, 1990-2021: a systematic analysis with forecasts to 2050. *Lancet.* 2024;404:1199-1226. doi:10.1016/S0140-6736(24)01867-1.