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

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ABSTRACT

Background: Preventive medicine plays a key role in improving population health and reducing healthcare costs. Pharmacists, despite being highly accessible to the public, are often underutilized in preventive care programs. In resource-limited settings, they can support immunization, disease screening, and medication adherence, thereby strengthening health outcomes.

Objectives: This study aimed to explore the role of pharmacists in preventive healthcare—particularly in immunization, screening, and medication adherence—and to identify barriers to their inclusion in national health programs.

Methodology: This quasi-experimental pre–post interventional study collected data through surveys and interviews with pharmacists working in community and hospital settings. through surveys and interviews with pharmacists working in community and hospital settings. Their involvement in immunization services, chronic disease screening, and adherence counseling was assessed. Statistical analysis included mean age, standard deviation, and p-values to determine the significance of observed associations.

Results: A total of 132 pharmacists participated, with a mean age of 37.5 ± 8.3 years. About 45% were actively involved in immunization services, while 62% conducted screenings for conditions such as diabetes and hypertension. A significant association was found between pharmacist-led screening and early disease detection ($p = 0.03$). Medication adherence counseling improved treatment compliance by 40% ($p = 0.02$), highlighting the effectiveness of pharmacist-led interventions.

Conclusion: Pharmacists have a meaningful role in preventive healthcare through immunization, screening, and adherence support. However, structural and policy barriers limit their integration into formal healthcare systems. Expanding their role could enhance early disease detection, improve adherence, and reduce healthcare costs. Policy reforms are needed to better utilize pharmacists in preventive care programs.

Keywords: Pharmacists; Preventive Care; Immunization; Screening

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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 can be defined as 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 populations that are hard to reach, including elderly patients, pregnant women, and those with chronic conditions[3].A systematic review conducted 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, and this could improve vaccination rates if 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 lack of recognition within 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 drawn attention to the importance of pharmacists in public health. During the pandemic, pharmacists were central in maintaining the supply of medications, 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 the accessibility of 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 quasi-experimental pre–post interventional study was conducted at the Department of Pharmacy, DOW University of Health Sciences, Karachi, Pakistan, from July 2024 to December 2024. to evaluate 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 Study 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, with a margin of error of 5%, a confidence level of 95%, and a population size of 200, the minimum required sample size was calculated to be 132 pharmacists to ensure the statistical significance of the findings.

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- patient-facing 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 with direct involvement in preventive medicine were included in the study.

Ethical Approval Statement

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**) Confidentiality of participant data was ensured, and ethical guidelines were strictly adhered to throughout the Study process. No identifying information was disclosed in the results.

Data Collection Procedures

Data were collected using structured questionnaires and semi-structured interviews administered to participating pharmacists. Information regarding immunization services, screening practices, and medication adherence counseling was obtained and recorded for analysis of preventive healthcare involvement.

Statistical Analysis

Data were analyzed using SPSS version 25. Descriptive statistics, including means, standard deviations, and frequencies, were computed. The Chi-square test was used to compare categorical variables, while t-tests were used to compare continuous variables. A p-value of < 0.05 was considered statistically significant for all analyses.

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 notable increase in early disease detection, leading to timely referrals for further diagnostic evaluation in 45% of cases.

Secondary Outcome

The secondary outcome evaluated 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 professional experience of 5.4 ± 2.1 years. 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% ($p = 0.02$), while diabetes detection improved from 45% to 61% ($p = 0.03$). Medication adherence showed a substantial increase from 40% pre-intervention to 70% post-intervention ($p = 0.01$), indicating statistically significant outcomes (Table 3).

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

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 by 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, resonate with the results of a study that showed 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, similar to those identified in other studies, and lack formal integration into broader public health programs. Despite the evidence supporting pharmacist-led screenings, these services are still not widely reimbursed or included in national healthcare frameworks, which limits their scalability and impact in LMICs.Medication adherence continues to be a significant challenge in chronic disease management, as reported in Previous studies, which emphasized that no adherence results in 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, which demonstrated that pharmacist-led medication adherence counseling improves patient outcomes and reduces avoidable hospitalizations [14]. However, the lack of recognition and reimbursement for these services continues to be 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 that has been echoed in the literature. Previous studies emphasized the central role of community pharmacists in maintaining the 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 Study, 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 the findings of past studies, emphasizes the underutilization of pharmacists in preventive healthcare despite their unique position in the healthcare system. Pharmacists' involvement in immunization, screening, and medication adherence counseling has the potential to significantly improve public health outcomes and reduce healthcare costs. However, structural and policy barriers must be addressed to fully integrate pharmacists into preventive care initiatives. Future Study 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 quasi-experimental design without

randomization and by its restriction to selected pharmacies in Karachi, which may limit generalizability. 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 Contribution

Concept & Design of Study: Syeda Zakia

Drafting: Syeda Zakia

Data Collection & Critical Review: Syeda Zakia

Final Approval of Version: Syeda Zakia

CONFLICT OF INTEREST

The authors declare no conflict of interest.

FUNDING DISCLOSURE

No external funding was received for this study.

ETHICAL APPROVAL STATEMENT

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)**

INFORMED CONSENT

Written informed consent was obtained from all

AI USAGE STATEMENT

AI tools (**e.g., ChatGPT**) were used for language editing and structuring of the manuscript. The authors take full responsibility for the content and accuracy of the manuscript.

COPYRIGHT STATEMENT

DATA AVAILABILITY STATEMENT

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

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