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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 is vital in enhancing the health of the population and it saves 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 the health outcomes of the population, especially in resource-constrained environments, through participation in such services as immunization, screening, and medication adherence counseling.

Objectives

To investigate the role of pharmacists in preventive healthcare, namely, immunization, screening, and medication adherence, and emphasize the challenges to their inclusion in national health programs.

Methodology

This research applied the descriptive method to determine the participation of the pharmacists in preventive care. The information was gathered based on the surveys and interviews with the pharmacists in the community and hospital pharmacies. Their involvement in immunization programs, screening of chronic diseases, and medication adherence counseling was studied. The statistical analysis was conducted with the help of mean age, standard deviation, and p-value with the purpose to comprehend the relevance of these interventions in enhancing health outcomes.

Results

120 participants was used in the study with an average age of participants being 37.5 years (SD = 8.3). Findings showed that 45 percent of respondents pursued immunization services actively with 62 percent of the respondents having preventive screenings of diabetes and hypertension. There was also a strong positive relationship between early disease detection and pharmacist-led screening ($p = 0.03$). The treatment compliance was enhanced by 40 as a result of medication adherence counseling with p-value of 0.02. These results demonstrate the success of preventive services led by a pharmacist to improve health outcomes and prevent the primary care gaps.

Conclusion

The role of pharmacists in preventive healthcare especially in immunization, screening, and drug adherence plays a major role in enhancing the health outcomes of the population. This notwithstanding, structural and policy barriers undermine their formal healthcare system integration. The role of pharmacists in preventing medicine can be expanded, which will reduce the costs of healthcare, enhance the detection of the disease and adherence to it earlier. The policy changes are essential in ensuring that pharmacists are fully exploited as the frontiers in the preventive healthcare 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. 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. 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. A systematic review conducted by Isenor et al. (2016) 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 [1].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 RxEACH study by Tsuyuki et al. (2016) 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 [2].Medication non-adherence continues to be a leading cause of avoidable morbidity and health care costs. Sabaté (2003) reported that nonadherence to prescribed therapies results in poor health outcomes, especially 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 [3].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 [4].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 [5-10].

Research 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 conducted in community and hospital pharmacies in Karachi, Pakistan, 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 research 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, research, 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 research process. No identifying information was disclosed in the results.

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, ensuring proper patient management.

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 was the rate of pharmacist-led preventive screenings for hypertension, diabetes, and dyslipidemia. Results showed that 65% of participating pharmacists regularly conducted these screenings, with a significant increase in early detection rates. This intervention led to timely referrals for further diagnostic evaluation in 45% of cases.

Secondary Outcome

The secondary outcome measured the impact of medication adherence counseling on patient compliance. The study found a 40% improvement in medication adherence post-counseling, with a significant reduction in medication errors. This outcome highlights the critical role pharmacists play in improving long-term treatment compliance and preventing disease progression.

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 research, 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 research 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 research, 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 research 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 confined to pharmacies in Karachi, limiting 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.

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Availability of data and materials

The datasets analyzed during the current study are available from the corresponding author on reason

Authors Contribution

Concept & Design of Study: Syeda Zakia

Drafting: Syeda Zakia

Data Collection & Critical Review: Syeda Zakia

Final Approval of Version: Syeda Zakia

Author contributed significantly to the study's conception, data collection, analysis, Manuscript writing, and final approval of the manuscript as per **ICMJE Criteria.**

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