

Effectiveness of Virtual Pharmacist-Led Smoking Cessation Support in a Secondary Care Hospital in Islamabad

Ayesha Inam¹, Atifa Mushtaq², Amna Raza³ and Imran Akram⁴

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Abstract

Globally, smoking is a significant public health concern that requires innovative cessation interventions. Virtual pharmacist-led programs can provide accessible support, particularly in settings without dedicated services. This study evaluates a virtual pharmacist-led intervention's impact on smoking cessation, medication adherence, and patient engagement. A quasi-experimental pre-post study was conducted in a secondary care hospital in Islamabad, Pakistan, with 80 adult smokers (≥ 18 years, ≥ 5 cigarettes/day for a year) willing to quit. The three-month program included weekly teleconsultations, pharmacotherapy guidance, behavioral counselling, and automated text support. Post-intervention, 60% achieved 7-day abstinence ($p < 0.001$). Daily cigarette use decreased from 14.8 ± 5.7 to 6.3 ± 4.2 ($p < 0.001$); nicotine dependence dropped from 6.1 ± 1.9 to 3.2 ± 1.7 ($p < 0.001$). Motivation and medication adherence significantly improved. Logistic regression identified higher motivation, better adherence, and lower nicotine dependence as key predictors. Virtual pharmacist-led interventions show promise in resource-limited settings, warranting further large-scale studies.

Keywords: Smoking Cessation, Virtual Pharmacist, Telehealth, Nicotine Dependence, Behavioral Counselling, Digital Health, Tobacco Control, Public Health.

Introduction

Smoking remains one of the most significant public health challenges globally, contributing to millions of deaths each year. It is a well-established risk factor for several chronic diseases, including cardiovascular disease, chronic obstructive pulmonary disease (COPD), lung cancer, and stroke (Jha et al., 2013). According to the World Health Organization (WHO) (2021), tobacco use is responsible for over 8 million deaths annually, with more than 1.2 million of these deaths resulting from secondhand smoke exposure. In response, smoking cessation interventions have become a critical component of public health strategies worldwide. However, in many low- and

¹Pharmacist, Pharmacy Department, Federal General Hospital, Islamabad. Email: dr.aishh1990@gmail.com

²Pharmacist, Drugs Control and Traditional Medicine Division, National Institute of Health, Islamabad.

Email: Atifa_mushtaq@yahoo.com

³Pharmacist, School of Chemistry, Food & Pharmacy, University of Reading, United Kingdom.

Email: amnaraza.1199@gmail.com

⁴Pharmacist, Pharmacy Department, Federal General Hospital, Islamabad. Email: malikimranakram@gmail.com

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middle-income countries (LMICs), including Pakistan, the adoption of effective smoking cessation programs remains limited (Drope & Schluger, 2018).

Pakistan has one of the highest tobacco consumption rates in South Asia, with nearly 19.1% of adults using tobacco in some form, as reported by the Global Adult Tobacco Survey (GATS) Pakistan 2014 (Saqib et al., 2018). This prevalence translates into a significant burden on the healthcare system, with smoking-related illnesses causing thousands of premature deaths annually. Despite efforts to curb tobacco use, such as the implementation of tobacco taxation, warning labels, and public smoking bans, smoking cessation services remain underdeveloped and underutilized (Hameed et al., 2021; Martins et al., 2021). The lack of structured cessation programs, coupled with inadequate awareness and accessibility, continues to hinder progress in reducing smoking rates in Pakistan (Nadkarni et al., 2024).

Pharmacists are crucial in public health, particularly chronic disease management and preventive care. Their accessibility, expertise in medication therapy, and frequent interactions with patients position them as valuable providers of smoking cessation support (Aljahan, 2023). In high-income countries, pharmacist-led smoking cessation programs have demonstrated significant success in helping smokers quit by providing pharmacotherapy guidance, behavioral counselling, and follow-up support (Cahill et al., 2013). Various studies have highlighted that pharmacist interventions, particularly those delivered via telehealth platforms, improve smoking cessation rates by enhancing medication adherence, addressing withdrawal symptoms, and reinforcing behavioral change strategies (Saba et al., 2014).

Despite the proven effectiveness of pharmacist-led smoking cessation programs, their implementation in Pakistan remains limited. Most smoking cessation efforts in the country are physician-driven, with little integration of pharmacists into cessation services (Al-Worafi, 2023). Additionally, many smokers in Pakistan lack awareness about available pharmacological aids such as nicotine replacement therapy (NRT) and bupropion, which are commonly used in other countries to support quitting efforts (Siddiqi et al., 2016). The involvement of pharmacists in smoking cessation programs could help bridge this gap by improving patient education, medication adherence, and overall success rates in quitting smoking.

The rapid expansion of telehealth services has provided new opportunities for delivering healthcare, especially in resource-limited settings like Pakistan. Virtual pharmacist-led interventions, which leverage teleconsultations, mobile apps, and digital reminders, have been successfully implemented in various countries to support smoking cessation (Arain et al., 2022). These programs offer several advantages, including increased accessibility, personalized support, and the ability to reach individuals who may not have access to in-person healthcare services due to geographical or financial constraints (Khalil, 2024).

In Pakistan, however, the adoption of telehealth services, particularly in pharmacist-led interventions, remains in its early stages. Studies have shown that while telehealth services are gaining acceptance, challenges such as digital illiteracy, unreliable internet access, and a lack of regulatory frameworks hinder their widespread adoption (Mahdi et al., 2022). Additionally, there is limited research on the effectiveness of virtual pharmacist-led smoking cessation programs in the Pakistani healthcare system, creating a significant knowledge gap. Given the increasing burden of tobacco-related diseases and the urgent need for cost-effective cessation strategies, evaluating the role of virtual pharmacist-led smoking cessation support in Pakistan is both timely and necessary.

By introducing a structured, pharmacist-led telehealth intervention, this study aims to assess whether virtual pharmacist support can improve smoking cessation outcomes, medication adherence, and patient engagement.

Methodology

This pre-post interventional study evaluated the effectiveness of a virtual pharmacist-led smoking cessation support program at a secondary care hospital in Islamabad. A pre-and post-intervention design without a control group was used to measure changes in smoking cessation rates, medication adherence, and patient engagement. The study was conducted at Federal General Hospital, which provides outpatient and inpatient care but lacks a dedicated smoking cessation clinic. To address this, a virtual pharmacist-led intervention was introduced as an adjunct smoking cessation support service.

Participants included adult smokers (≥ 18 years) who had been smoking at least five cigarettes per day for the past year. Eligibility required willingness to quit smoking, participation in virtual counselling sessions, and access to a smart phone for teleconsultations and automated text reminders. Exclusion criteria included severe psychiatric illnesses or cognitive impairments, enrolment in another smoking cessation program, and chronic conditions requiring complex medication regimens, such as uncontrolled epilepsy.

A total of 80 participants were enrolled, with 40 assessed in the pre-intervention phase and the same 40 reassessed post-intervention, accounting for potential dropouts. This sample size was chosen based on previous smoking cessation studies to ensure statistical power while maintaining feasibility.

The three-month intervention included structured virtual pharmacist-led support. Baseline data collection involved demographic details, smoking history, nicotine dependence (assessed using the Fagerström Test for Nicotine Dependence), and previous quit attempts. Motivation to quit was measured using a 10-point Likert scale, and any existing pharmacotherapy use was recorded. Participants received weekly virtual pharmacist teleconsultations (20–30 minutes) covering behavioural change techniques, pharmacotherapy recommendations (nicotine replacement therapy, bupropion, or varenicline), and strategies for managing withdrawal symptoms. Automated text messages were sent daily, providing motivational support, medication adherence reminders, and personalized quit guidance. Weekly follow-up calls reinforced cessation strategies, monitored progress, and addressed concerns regarding medication side effects or behavioural challenges.

One month after completing the intervention, smoking cessation status was reassessed using self-reported 7-day point prevalence abstinence, with biochemical verification via exhaled carbon monoxide (CO) monitoring where feasible. Secondary outcomes included the reduction in cigarette consumption (percentage decrease in daily cigarette use), self-reported medication adherence, improvement in motivation to quit (pre- and post-intervention Likert scale), and patient engagement, assessed through attendance at teleconsultations and response to follow-up calls.

Data were collected using structured electronic forms and stored securely in a hospital database. Statistical analysis was performed using IBM SPSS version 23. A paired t-test compared pre- and post-intervention smoking cessation rates, nicotine dependence scores, and motivation to quit. The Wilcoxon signed-rank test was used for non-normally distributed variables such as medication adherence and engagement. Descriptive statistics summarized demographic and smoking behaviour data, while regression analysis identified factors associated with successful cessation. Ethical approval was obtained from the hospital's Institutional Review Board (IRB), and written informed consent was secured from all participants. Confidentiality was maintained by

anonymizing data and restricting access to authorized researchers. No financial incentives were provided to avoid bias. This methodology ensures a rigorous evaluation of virtual pharmacist-led smoking cessation support in a secondary care hospital in Islamabad.

Results

A total of 80 participants were enrolled in the study, with 40 assessed in the pre-intervention phase and the same individuals reassessed post-intervention. Table 1 presents the demographic and baseline characteristics of the participants.

Table 1: Baseline Characteristics of Study Participants (n=80)	
Characteristic	Mean $\pm$ SD / n (%)
Age (years)	38.5 $\pm$ 9.2
Gender	Male: 64 (80%) Female: 16 (20%)
Educational Level	Primary: 20 (25%) Secondary: 27 (33.8%) Higher Education: 33 (41.2%)
Employment Status	Employed: 47 (58.8%) Unemployed: 33 (41.2%)
Daily Cigarette Use	14.8 $\pm$ 5.7
Nicotine Dependence (FTND Score)	6.1 $\pm$ 1.9
Previous Quit Attempts	Yes: 27 (33.8%) No: 53 (66.2%)

The mean age of participants was 38.5 $\pm$ 9.2 years, with the majority being male (80%). Educational attainment varied, with 25% of participants having only primary education, 33.8% completing secondary education, and 41.2% attaining higher education. Employment status showed that 58.8% of participants were employed, while 41.2% were unemployed. Participants smoked an average of 14.8 $\pm$ 5.7 cigarettes per day, and the mean nicotine dependence score, as measured using the Fagerström Test for Nicotine Dependence (FTND), was 6.1 $\pm$ 1.9, indicating moderate to high dependence. A total of 33.8% of participants had made previous quit attempts, while 66.2% had never attempted to quit smoking before.

Following the intervention, significant improvements were observed in smoking cessation outcomes. As shown in Table 2, the 7-day abstinence rate increased from 0% at baseline to 65% post-intervention ($p < 0.001$). This indicates that a majority of participants were able to refrain from smoking for at least one week after completing the pharmacist-led smoking cessation program. Furthermore, daily cigarette consumption significantly declined from 14.8 to 5.9 cigarettes per day ($p < 0.001$), highlighting a substantial reduction in smoking intensity. Nicotine dependence, measured using the FTND score, showed a significant decrease from a pre-intervention mean of 6.1 $\pm$ 1.9 to a post-intervention mean of 3.0 $\pm$ 1.7 ($p < 0.001$), suggesting that participants experienced a notable reduction in their dependence on nicotine. These results emphasize the effectiveness of pharmacist-led virtual counselling in helping smokers lower their cigarette consumption and nicotine dependency.

Table 2: Smoking Cessation Outcomes Pre- and Post-Intervention (n=40)

Outcome Measure	Pre-Intervention (Mean $\pm$ SD / %)	Post-Intervention (Mean $\pm$ SD / %)	p-value (Test Used)
7-day Abstinence Rate	0 (0%)	26 (65%)	$p < 0.001$ (Chi-square test)
Daily Cigarette Use	14.8 ± 5.7	5.9 ± 4.1	$p < 0.001$ (Paired t-test)
Nicotine Dependence (FTND Score)	6.1 ± 1.9	3.0 ± 1.8	$p < 0.001$ (Wilcoxon signed-rank test)
Motivation to Quit (Likert Scale 1-10)	5.4 ± 2.3	8.3 ± 1.8	$p < 0.001$ (Paired t-test)
Medication Adherence	38 (47.5%) reporting consistent adherence	65 (81.2%) reporting consistent adherence	$p < 0.001$ (Wilcoxon signed-rank test)

Motivation to quit also improved considerably, with Likert scale scores rising from 5.4 ± 2.3 to 8.3 ± 1.8 ($p < 0.001$), as shown in Table 2. This suggests that the intervention successfully enhanced participants' willingness and determination to quit smoking. In addition, medication adherence showed a significant improvement, with 81.2% of participants reporting consistent adherence to smoking cessation pharmacotherapy post-intervention, compared to only 47.5% at baseline ($p < 0.001$). This increase in adherence was likely facilitated by the structured counselling sessions and automated text message reminders sent to participants, reinforcing the importance of medication compliance in smoking cessation efforts.

To better understand the factors influencing smoking cessation success, binary logistic regression analysis was performed, and the results are presented in table 3. Participants with higher motivation to quit, defined as a Likert scale score of 7 or above, were nearly three times more likely to achieve abstinence (AOR = 2.9, $p = 0.001$). Similarly, higher medication adherence, defined as an MMAS-8 score of 6 or above, was strongly associated with smoking cessation success, with an adjusted odds ratio of 3.7 ($p < 0.001$). Lower nicotine dependence (FTND Score ≤ 4) was also significantly linked to successful smoking cessation (AOR = 2.4, $p = 0.021$), indicating that individuals with lower initial nicotine dependence were more likely to quit smoking after the intervention. Additionally, frequent engagement with follow-up calls (≥ 4 calls attended) was found to be a significant predictor of quitting success, with an adjusted odds ratio of 2.8 ($p = 0.003$), highlighting the importance of consistent support and reinforcement in smoking cessation efforts.

Table 3: Logistic Regression Analysis for Factors Associated with Smoking Cessation (n=40)

Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Higher Motivation to Quit (Likert Scale ≥ 7)	2.9	(1.5 – 5.4)	0.001
Higher Medication Adherence	3.7	(1.9 – 6.8)	<0.001
Lower Nicotine Dependence (FTND Score ≤ 4)	2.4	(1.2 – 4.7)	0.021
Frequent Engagement with Follow-up Calls (≥ 4 calls attended)	2.8	(1.4 – 5.5)	

The findings of this study highlight the effectiveness of virtual pharmacist-led smoking cessation interventions in improving smoking abstinence rates, reducing daily cigarette consumption, decreasing nicotine dependence, and enhancing both motivation and medication adherence. The statistical analysis suggests that key factors associated with successful smoking cessation include higher motivation, better adherence to pharmacotherapy, lower nicotine dependence, and frequent

engagement with follow-up support. These results emphasize the importance of structured, pharmacist-led interventions combined with continuous reinforcement and support in promoting long-term smoking cessation. The study provides valuable insights into how virtual smoking cessation programs can be effectively integrated within healthcare settings to support individuals in quitting smoking.

Discussion

The findings of this study highlight the effectiveness of virtual smoking cessation support provided by pharmacists, demonstrating a significant reduction in cigarette consumption and nicotine dependence among participants. These results align with existing literature on pharmacist-led smoking cessation interventions and reinforce the critical role of pharmacists in tobacco control efforts.

A systematic review by Sinclair et al. (2016) confirmed that community pharmacy-based smoking cessation programs incorporating behavioural counselling and pharmacotherapy are effective in improving quit rates. The pooled odds ratio for successful cessation was 2.56 (95% CI 1.45–4.53), indicating a strong impact of pharmacist interventions compared to usual care. Our study supports this conclusion by showing that virtual pharmacist consultations significantly aid in smoking reduction, even in the absence of in-person visits. The virtual nature of our intervention overcomes accessibility barriers that often limit the reach of traditional pharmacy-based programs (Brown et al., 2016).

Similarly, Bauld et al. (2011) examined the effectiveness of smoking cessation services delivered in community pharmacies and found that personalized pharmacist counselling increased quit rates. Their study highlighted that patient adherence to nicotine replacement therapy (NRT) and the frequency of pharmacist follow-ups were key predictors of success. Our study mirrors these findings, demonstrating that more frequent virtual follow-ups contributed to better smoking reduction outcomes, even when conducted remotely (Shen, 2015).

Condinho et al. (2021) conducted a real-world study in Portugal and reported that 43.7% of participants remained abstinent after one month, with success rates decreasing to 32.6%, 28.1%, and 20.7% at the 3rd, 6th, and 12th months, respectively. Notably, smokers who engaged in more frequent pharmacist consultations and telephone follow-ups exhibited higher success rates. Our findings align with these results, as increased engagement in virtual consultations led to greater adherence to quit plans, underscoring the importance of continuous support in the cessation process.

A study conducted in Thailand by Lertsinudom et al. (2021) reported a 28.8% self-reported abstinence rate among smokers receiving community pharmacy-based smoking cessation services. Additionally, significant reductions were observed in cigarette consumption and exhaled carbon monoxide (CO) levels. While this study focused on in-person support, our virtual intervention achieved comparable outcomes, suggesting that remote pharmacist-led programs could be a viable alternative in settings where access to in-person counselling is limited.

Furthermore, the study by Todd et al. (2019) investigated barriers to the implementation of smoking cessation services in community pharmacies and found that organizational constraints, such as pharmacist workload and time limitations, affected service delivery. Our study addressed these limitations by shifting consultations to a virtual format, thereby increasing accessibility for smokers while reducing workflow disruptions in pharmacies. The ability to provide flexible support without interfering with routine pharmacy operations represents a significant advantage of virtual interventions (Brown et al., 2016).

Our study findings further reinforce the effectiveness of pharmacist-led smoking cessation interventions, consistent with previous research, including the randomized controlled trial conducted in Qatar. Both studies emphasize the role of pharmacists in helping individuals quit smoking through structured programs (El Hajj et al., 2017).

The current study demonstrates significant short-term reductions in cigarette consumption and nicotine dependence through virtual support, while a study by Condinho show long-term success rates influenced by pharmacological therapy and frequent pharmacist consultations. Both emphasize the importance of continuous pharmacist engagement in improving cessation outcomes (Condinho et al., 2021).

Overall, the findings from this study contribute to the growing body of evidence supporting pharmacist-led smoking cessation services. Virtual interventions appear to be an effective and accessible alternative to traditional in-person models, addressing barriers related to time, cost, and accessibility while maintaining high levels of engagement and success. The results demonstrate that frequent virtual follow-ups significantly improve smoking reduction outcomes, reinforcing the importance of sustained support in smoking cessation programs. Future research should explore the long-term sustainability of virtual smoking cessation programs and their integration into national public health strategies. Additionally, incorporating digital tools such as mobile health applications and AI-driven personalized counselling may further enhance the impact of pharmacist-led smoking cessation interventions.

Limitations

This study had several limitations. First, the absence of a control group limits the ability to attribute smoking cessation success solely to the intervention. Second, self-reported smoking abstinence may be subject to recall and social desirability bias, though biochemical verification was attempted where feasible. Third, the sample size was relatively small, and the study was conducted in a single hospital, limiting the generalizability of the findings. Lastly, follow-up duration was short, and long-term cessation outcomes beyond three months were not assessed.

Conclusion

The virtual pharmacist-led smoking cessation intervention significantly improved smoking abstinence rates, reduced daily cigarette consumption, and enhanced motivation and medication adherence, demonstrating its feasibility in healthcare settings without dedicated cessation services. By providing structured teleconsultations, pharmacotherapy guidance, behavioural counselling, and automated text support, this approach effectively supported smokers in their quit attempts. To maximize its impact, future efforts should focus on integrating virtual pharmacist support into national healthcare programs, expanding its reach to high-risk populations, and leveraging digital health innovations such as mobile apps, AI-driven chatbots, and wearable technology for real-time support. Additionally, incorporating behavioural and psychological support can further enhance long-term cessation success. Policymakers and healthcare providers should consider adopting this scalable and cost-effective solution as part of comprehensive tobacco control strategies to reduce smoking prevalence and improve public health outcomes.

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