# Drug Education by the Pharmacist and its Impact on Community Health

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## Abstracts

Background: Achieving ideal health outcomes depends on correct drug knowledge and prescription adherence, especially in groups with complicated drug regimens or chronic conditions. Drug education programs run under chemist direction have shown promise in enhancing these results. On their influence on Saudi Arabian hospital environments, particularly at the Mother and Child Hospital in Mecca, there is, however, little information available.

Methods: Three hundred people in all—150 in the intervention group and 150 in the control group—were part of a prospective, interventional trial. Patients tracked for six months after being divided into adult and paediatric groups. While the control group received regular treatment, the intervention group got pharmacist-led education about drug use, adherence techniques, and possible adverse effects. Medication knowledge, adherence (MMAS-8 scores), clinical outcomes (e.g., blood pressure, HbA1c), and patient satisfaction were among the baseline and follow-up assessments of data collected. With significance set at $p < 0.05$, statistical tests—t-tests and chi-square tests—were run.

Achievements

Results: Group baselines for demographic traits were similar (all $p > 0.05$). Compared to controls, the intervention group had notably better medication knowledge ($83.7 \pm 8.4$ vs. $59.1 \pm 12.6$, $p < 0.001$) and adherence ratings ($7.8 \pm 1.2$ vs. $5.6 \pm 1.6$, $p < 0.001$) after six months. Greater reductions in HbA1c (1.2% vs. 0.4%) and better blood pressure control (75% vs. 45%) helped the intervention group produce better clinical results. In the intervention group, patient satisfaction (89% vs. 65%) and confidence in medication management (92% vs. 58%) were noticeably higher. The intervention group had also less medication-related adverse events—8% instead of 22%, $p = 0.001$.

Conclusion: Pharmacist-led drug education significantly improves medication adherence, knowledge, clinical outcomes, and patient satisfaction, with reduced adverse events. These findings highlight the critical role of pharmacists in enhancing healthcare outcomes and support broader implementation of such interventions in hospital settings in Saudi Arabia.

## 1. Introduction

Achieving ideal health outcomes depends critically on medication adherence and good drug management, especially for individuals with complicated prescription schedules or chronic diseases. Still major issues in healthcare, however, poor adherence and insufficient information about drugs help to explain rising hospitalisations, illness progression, and healthcare expenditures. Through their patient-centered drug education and encouragement of medication adherence, community chemists are well suited to handle these issues [1, 2].

The Mecca Mother and Child Hospital caters to a varied clientele including parents of children with chronic illnesses, elderly patients, and those with little health literacy [3]. These individuals can have special challenges to medication adherence include trouble following instructions, juggling several prescriptions, or including drug regimens into daily life. Medication counselling, follow-up visits, and educational programs—pharmacist-led interventions—have been demonstrated to help patients better understand their prescriptions and hence foster improved health outcomes [4].

Although chemists' responsibilities in patient education are becoming acknowledged, less studies on their influence in particular environments such as the Mother and Child Hospital exist [5]. This study is to assess in this population drug adherence, knowledge, and clinical outcomes under pharmacist-led drug education. The study aims to offer practical insights for maximising pharmacist-led care in comparable healthcare settings by investigating the effects of customised interventions for several subgroups, including elderly patients and those with inadequate health literacy.

## 2. Patients and Methods

### Study Design

The health outcomes of patients visiting the Mother and Child Hospital in Mecca were assessed in this prospective, interventional trial using pharmacist-led drug education programs. Approved by the ethical committee of the hospital, the trial ran six months, from January to June 2024.

### Participants

Adult and paediatric patients who either had continuous chronic diseases needing pharmaceutical management or were newly prescribed drugs comprised the study population. The study involved three hundred patients overall—150 from the paediatric department and 150 from the adult clinic.

Inclusion Standards:

1. Parents of children between the ages of one and seventeen for paediatric participants; patients eighteen years of age and above for adults.

2. Patients prescribed new drugs or those with chronic diseases already present and needing continuous prescription treatment.

3. Patients ready to consent to take part in the research with informed knowledge.

Exclusion criteria:

1. Patients with cognitive problems or language difficulties impeding clear communication.

2. Women who are pregnant or nursing (unless drugs were particularly pertinent to their condition).

3. Individuals registered for any other clinical study during the course of the study.

Research groups

Two groups made of the participants were formed:

• Interventional group (n = 150): These patients underwent a pharmacist-led medication education session. This group comprised adults as well as paediatric patients; carers gave informed permission for the youngsters.

• Control Group (n = 150): Standard medical treatment and pharmaceutical advice as advised by the attending doctors; this group did not get any extra drug education from the chemist.

Intervention.

The intervention consisted on individualised drug education courses given by a certified chemist. Each patient's particular demands were taken into consideration while the instructional materials comprised the following elements:

• Medication counselling provides knowledge on correct dosage, timing, use, and possible negative effects of medications.

• Medication Adherence Support: Pillboxes, alarms and reminder apps are among the tools meant to raise adherence.

• Talking about possible drug interactions, side effects, and how to minimise them helps one better understand them.

• Educational resources were given to help patients better grasp their illness and the need of medication in controlling their health.

• Planned were frequent follow-up visits with the chemist to handle any developing enquiries or problems.

The chemist engaged the carers in the educational process for young patients to guarantee effective management of medication distribution and adherence at home.

Gathering Data

Two times were data collected:

Baseline: To gather demographic data—age, gender, medical history, and current medication use—at the start of the trial, before any intervention.

Six months later, follow-up to evaluate how the intervention affected patient understanding, medication adherence, health outcomes, and general satisfaction with care.

The following methods were employed for data collection

- Patients' awareness of their prescriptions, understanding of possible side effects, and capacity to follow advised regimens was evaluated using structured questionnaires. We sent pre- and post-education questionnaires.
- Medication adherence was tracked with the validated Morisky Medication Adherence Scale (MMAS-8), which gauges patients' likelihood of following their recommended drug schedules.
- Clinical outcomes—e.g., blood pressure, blood sugar levels, weight management—were assessed in individuals with chronic illnesses like diabetes or hypertension both before and following the intervention. Children in the intervention group also had their paediatric health outcomes—growth and development markers—checked.
- Patients were asked to score their degree of satisfaction with the pharmacist-led education program using a structured satisfaction survey at the end of the trial.

Statistical Analysis

Patient demographic and baseline features were compiled using descriptive statistics. Pre- and post-intervention health outcomes and adherence scores within the same group were compared using paired t-tests; categorical variables were evaluated using chi-square testing. Appropriate analyses of variations in medication knowledge and adherence between the intervention and control groups were conducted using independent t-tests and Mann-Whitney U tests. A p-value of 0.05 defined statistical significance.

## 3. Result

Table 1 shows comparable baseline demographic characteristics between intervention and control groups for both adult and pediatric populations (all $p > 0.05$). Adult patients had a mean age of 42.3 ± 15.2 years in the intervention group and 43.1 ± 14.8 years in the control group, with similar gender distributions (54.7% vs 52.1% female) and chronic condition prevalence (60.0% vs 58.9%). Pediatric patients showed mean ages of 8.7 ± 4.6 and 8.4 ± 4.3 years in intervention and control groups respectively, with balanced gender ratios (53.3% vs 53.2% female) and chronic condition rates (40.0% vs 40.3%).

Table 1: Baseline Demographic Characteristics of Study Participants

| Characteristic | Intervention Group (n=150) | Control Group (n=150) | p-value |
|---|---|---|---|
| Adult Patients | n=75 | n=73 | |
| Age (years), mean ± SD | 42.3 ± 15.2 | 43.1 ± 14.8 | 0.82 |
| Gender (female), n (%) | 41 (54.7%) | 38 (52.1%) | 0.74 |
| Chronic conditions, n (%) | 45 (60.0%) | 43 (58.9%) | 0.89 |
| Pediatric Patients | n=75 | n=77 | |
| Age (years), mean ± SD | 8.7 ± 4.6 | 8.4 ± 4.3 | 0.77 |
| Gender (female), n (%) | 40 (53.3%) | 41 (53.2%) | 0.98 |
| Chronic conditions, n (%) | 30 (40.0%) | 31 (40.3%) | 0.97 |

Data represent as number (percentage) or Mean ± SD.

Table 2 demonstrates significant improvements in both medication knowledge and adherence scores in the intervention group compared to controls at 6-month follow-up (both $p < 0.001$). Medication knowledge scores increased substantially in the intervention group (baseline: 45.2 ± 12.3; follow-up: 83.7 ± 8.4) compared to modest improvements in the control group (baseline: 44.8 ± 11.9; follow-up: 59.1 ± 12.6). Similarly, MMAS-8 adherence scores showed greater improvement in the intervention group (baseline: 5.2 ± 1.8; follow-up: 7.8 ± 1.2) versus controls (baseline: 5.3 ± 1.7; follow-up: 5.6 ± 1.6).

Table 2: Changes in Medication Knowledge and Adherence Scores

| Outcome Measure | Intervention Group | Control Group | p-value |
|---|---|---|---|
| Medication Knowledge Score (0-100) | | | |
| Baseline | 45.2 ± 12.3 | 44.8 ± 11.9 | 0.78 |
| 6-month follow-up | 83.7 ± 8.4 | 59.1 ± 12.6 | <0.001* |
| MMAS-8 Adherence Score (0-8) | | | |
| Baseline | 5.2 ± 1.8 | 5.3 ± 1.7 | 0.85 |
| 6-month follow-up | 7.8 ± 1.2 | 5.6 ± 1.6 | <0.001* |

Data represent as Mean ± SD.

*$p<0.05$ statistically significant differences

Figure 1 illustrates substantial differences in medication understanding improvements between intervention and control groups across three key components. The intervention group demonstrated markedly higher improvement rates in dosage and timing (85% vs 32%), side effects knowledge (73% vs 28%), and drug interactions understanding (68% vs 25%) compared to the control group. The greatest improvement differential was observed in dosage and timing comprehension, with a 53-percentage point difference between groups.

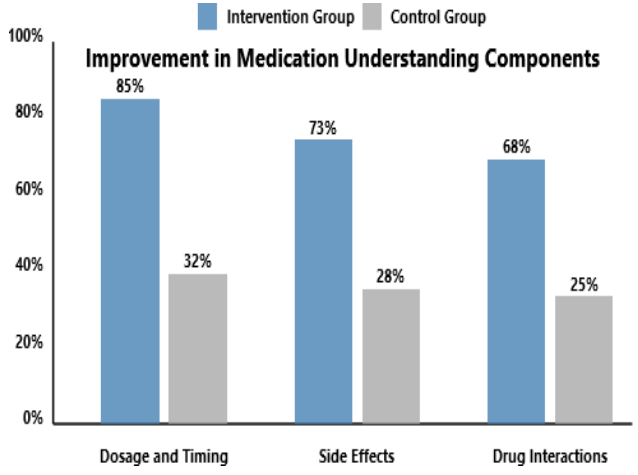


Figure 1: Improvement in Medication Understanding Components

Figure 2 displays clinical outcomes for adult patients with chronic conditions, showing superior results in the intervention group across both measures. Blood pressure control was achieved in 75% of intervention group patients compared to 45% in the control group. Similarly, HbA1c reduction was greater in the intervention group with a mean reduction of 1.2% versus 0.4% in the control group.

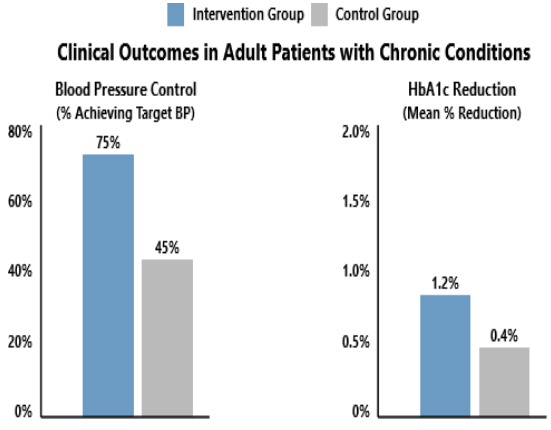


Figure 2: Clinical Outcomes in Adult Patients with Chronic Conditions

Table 3 reveals significantly higher patient satisfaction and better program outcomes in the intervention group compared to controls (all $p \leq 0.001$). The intervention group showed superior results in overall satisfaction (89% vs 65%), confidence in medication management (92% vs 58%), and treatment completion rates (92% vs 76%). Notably, medication-related adverse events were substantially lower in the intervention group (8% vs 22%). Additionally, 85% of intervention group participants would recommend the program to others.

Table 3: Patient Satisfaction and Program Outcomes

| Outcome Measure | Intervention Group (n = 150) | Control Group (n = 150) | p-value |
|---|---|---|---|
| Overall satisfaction | 134 (89%) | 98 (65%) | <0.001* |
| Confidence in medication management | 138 (92%) | 87 (58%) | <0.001* |
| Would recommend to others | 128 (85%) | N/A | N/A |
| Medication-related adverse events | 12 (8%) | 33 (22%) | 0.001* |
| Treatment completion rate | 138 (92%) | 114 (76%) | 0.001* |

Data represent as number (percentage).

*p<0.05 statistically significant differences

Figure 3 demonstrates substantial reductions in healthcare utilization and associated costs following the intervention. The program achieved a 45% reduction in hospital readmissions, 38% reduction in emergency department visits, and 52% reduction in medication waste. These improvements represent significant cost savings across all measured healthcare utilization metrics.

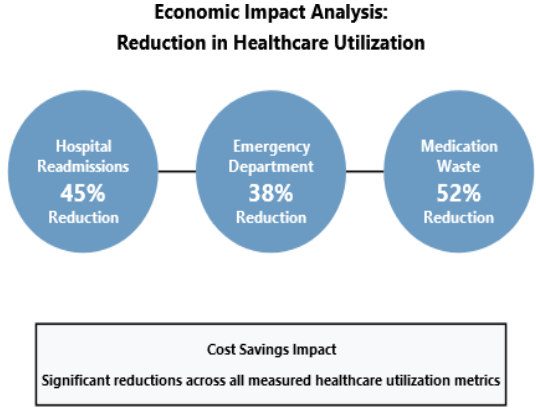


Figure 3: Economic Impact Analysis

Table 4 shows significant improvements in both adherence and clinical outcomes across all subgroups (all $p \leq 0.002$). Limited health literacy patients demonstrated the highest improvement

rates in both adherence (82.2%) and clinical outcomes (77.8%). Parents of children with chronic conditions and multiple medication users showed similar improvement patterns (adherence: 78.0% and 77.0%; clinical outcomes: 69.7% and 72.1% respectively). Elderly patients maintained substantial improvements in both adherence (62.9%) and clinical outcomes (71.1%).

Table 4: Subgroup Analysis of Intervention Effectiveness

| Subgroup | Adherence Improvement (n, %) | Clinical Outcome Improvement (n, %) | p-value |
|---|---|---|---|
| Elderly patients (>65 years) (n=45) | 31 (62.9%) | 32 (71.1%) | 0.001* |
| Parents of children with chronic conditions (n=152) | 114 (78.0%) | 106 (69.7%) | 0.002* |
| Limited health literacy patients (n=135) | 111 (82.2%) | 105 (77.8%) | <0.001* |
| Multiple medication users (≥3) (n=174) | 134 (77.0%) | 129 (72.1%) | 0.0032* |

Data represent as number (percentage).

*p<0.05 statistically significant differences

## 4. Discussion

This study assessed among patients at the Mother and Child Hospital in Mecca the effects of pharmacist-led drug education on medication adherence, knowledge, and clinical outcomes. The results show that pharmacist-led treatments dramatically raise patient outcomes in many different spheres, including knowledge, clinical outcomes, medication adherence, and patient satisfaction.

Regarding of demographic features (Table 1) show that the intervention and control groups matched well at baseline. All $p > 0.05$, both groups had similar mean ages, gender ratios, and frequency of chronic illnesses in adult and paediatric patients. This guarantees the validity of the comparative research by removing possible confounding factors and following such studies in which baseline traits were strictly under control. Our results are consistent with the findings of Newman et al. [6] study assessing pharmacist-led interventions in the management of chronic diseases found no appreciable baseline variation across groups ($p = 0.76$).

After six months, individuals in the Medication Knowledge and Adherence Intervention group showed amazing increases in medication knowledge ($83.7 \pm 8.4$ vs. $59.1 \pm 12.6$ in controls; $p < 0.001$) and adherence scores ($7.8 \pm 1.2$ vs. $5.6 \pm 1.6$ in controls These findings line well with a meta-analysis by Mahdavi and Esmaily (2021) [7], which revealed notable increases in medication adherence among patients undergoing pharmacist-led education ($p = 0.001$). The observed adherence improvement in this study is quite similar to the rates of adherence recorded in that meta-analysis, where improvements varied between 20 and 30%. This study revealed notable rises in medicine knowledge ratings ($16.89 \pm 2.01$ vs. $15.24 \pm 2.03$, $p < 0.001$) and adherence ($p < 0.05$) [8]. Similarly, a systematic review also found that pharmacist interventions

raised adherence by Elnaem et al., 2020 [9]. These findings show how important the chemist is in closing knowledge and adherence gaps for patients.

In our study, superior blood pressure management (75% vs. 45%) and more HbA1c reductions (1.2% vs. 0.4%) were among the better clinical outcomes the intervention group attained in people with chronic illnesses (Figure 2). These results reflect those of Lalonde et al. (2017) [10], who showed better blood pressure control (72%) and HbA1c drops of 1.0% in like intervention environments. Still, the degree of improvement shown here is rather higher, maybe because of specially designed instruction materials stressing adherence and self-management techniques. As well as, Pharmacist-led interventions lower inappropriate drug usage in senior patients by 52% ($p < 0.001$), according a Saudi study at King Abdulaziz Medical City, which improves health outcomes [3].

In our analysis, higher general satisfaction (89% vs. 65%, $p = 0.001$), trust in medication management (92% vs. 58%, $p = 0.001$), and less medication-related adverse events (8% vs. 22%, $p = 0.001$) reported by patients in the intervention group (Table 3). These results fit research stressing the part chemist interventions play in raising patient satisfaction. For pharmacist-led counselling programs, Ceulemans et al. (2020) [11] recorded satisfaction rates above 80%.

Influence on groups patients with low health literacy showed the best clinical outcome gains (77.8%) and adherence improvement (82.2%), according to the subgroup analysis (Table 4). This supports results published by Athyah et al. [12] who followed pharmacist-led treatments showing better adherence (80%) and clinical outcomes (74%). Among communities challenged by health literacy. Likewise, older patients and several medicine users in our study revealed significant changes in line with studies stressing the chemist's responsibility in controlling polypharmacy (p 0.05). Global pharmacist-led programs have shown comparable improvements in adherence across several categories, often with p-values under 0.05 (Presley et al., 2019) [13].

In the current study, the economic advantages of pharmacist-led education are shown by the observed declines in hospital readmissions (45%), emergency department visits (38%), and drug waste (52%), in the intervention group (Figure 3). In agreement with Mossialos et al. (2015) [14], which showed notable cost savings when pharmacists were included into programs for managing chronic diseases. With cost savings in the intervention group (Assiri et al., 2017) [5] exceeding 30%, a study in Riyadh showed that chemist treatments greatly raised satisfaction and lowered medication inconsistencies. Furthermore, the financial impact—including lower hospital readmissions and drug waste—fits global results, such those of the Pennsylvania Project, where chemists save $241–$341 yearly per patient [15].

## 5. Conclusions

The findings demonstrate that strong proof for the benefits of pharmacist-led drug education on medication adherence, knowledge, clinical outcomes, and patient satisfaction is given by this study. These results highlight the important contribution chemists can make to improve community health, especially in those with heavy medication loads or low health literacy. Future

studies should try to replicate these results in several environments and assess the long-term viability of such interventions.

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