THE IMPACT OF A NOVEL MOBILE APPLICATION ON COMPLIANCE, SURVEILLANCE, POSTOPERATIVE RECOVERY, AND SATISFACTION IN CATARACT SURGERY PATIENTS

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Abstract

Background:

Cataract surgery is one of the most commonly performed ophthalmic procedures worldwide, significantly improving visual function and quality of life. However, postoperative adherence to medications, compliance with follow-up visits, and understanding of recovery instructions remain significant challenges, particularly among elderly patients. Mobile health (mHealth) applications have emerged as effective tools for improving patient engagement, yet their role in cataract postoperative care remains underexplored.

Methods:
A randomized controlled trial (RCT) was conducted at Saveetha Medical College and Hospital, Chennai, with 370 cataract surgery patients randomized into two groups:

- Intervention group (n=180): Used a mobile application for postoperative care.

- Control group (n=180): Received standard postoperative care (verbal and written instructions).

The primary outcomes included medication adherence, compliance with postoperative instructions, and follow-up attendance. Secondary outcomes included patient satisfaction, visual acuity improvement, and incidence of complications. Statistical analysis was performed using Chi-square and t-tests, with $p < 0.05$ considered significant.

Results:
Patients in the intervention group demonstrated significantly better medication adherence (89.4% vs. 82.2%, $p = 0.049$), compliance with postoperative instructions (96.1% vs. 81.7%, $p = 0.00001$), and follow-up attendance (93.3% vs. 78.3%, $p = 0.00004$) compared to the control group.

- 92.2% of intervention group patients found the app helpful, and 93.3% expressed willingness to continue using it.

- Visual acuity at Week 1 was significantly better in the intervention group (86.7% achieved 6/6 vision vs. 41.1% in the control group, $p < 0.001$), though no significant differences were noted at Weeks 2, 4, and 6.

- Complication rates (dry eye, CME, PCO) did not differ significantly between groups ($p > 0.05$).

Conclusion:
The mobile application significantly improved adherence, follow-up compliance, and patient satisfaction, suggesting its potential for integration into routine postoperative cataract care. Future research should explore the long-term benefits, cost-effectiveness, and broader applicability of mHealth interventions in ophthalmology.

Keywords: Cataract surgery, mobile health app, postoperative adherence, patient satisfaction, mHealth

1. INTRODUCTION

Cataract Surgery and Postoperative Challenges

Cataracts are the leading cause of preventable blindness worldwide, accounting for nearly 51% of global blindness cases [1]. Cataract surgery is a highly effective procedure, restoring vision in the majority of patients. However, postoperative adherence to medications, follow-up visits, and recovery guidelines is crucial for optimal outcomes [2]. Failure to comply with postoperative care instructions can lead to complications such as infections, increased intraocular pressure (IOP), cystoid macular edema (CME), and posterior capsule opacification (PCO) [3].

Barriers to Postoperative Compliance

Despite well-established postoperative care protocols, many patients struggle with adherence due to several factors:

- Forgetfulness and cognitive decline in elderly patients [4].

- Lack of understanding of postoperative care instructions [5].

- Limited access to healthcare facilities and reliance on caregivers [6].

- Financial constraints affecting follow-up visit attendance [7].

Studies indicate that adherence to postoperative medication regimens varies between 50-70%, contributing to higher complication rates and suboptimal recovery [8].

The Role of Mobile Health (mHealth) in Postoperative Care

With the increasing adoption of smartphones globally, mobile health (mHealth) applications have emerged as promising tools for improving patient adherence [9]. These applications provide:

- Automated reminders for medication schedules [10].

- Educational videos and instructions on postoperative care [11].

- Real-time symptom tracking and alerts [12].

- Direct communication with healthcare providers [13].

Several studies in chronic disease management and ophthalmology have demonstrated that mHealth solutions improve patient adherence and engagement [14]. However, limited data exist on the effectiveness of mHealth in cataract postoperative care, particularly in developing countries [15].

Study Rationale and Objectives

Given the gaps in adherence observed in cataract surgery patients, this study aims to evaluate the effectiveness of a mobile application in improving:
1. Medication adherence.

2. Compliance with postoperative instructions.

3.   Follow-up visit attendance.

4.   Patient satisfaction and engagement.

Methods

Study Design and Participants

A randomized controlled trial (RCT) was conducted at Saveetha Medical College and Hospital, Chennai, between March and December 2024. A total of 370 patients undergoing cataract surgery were randomized into two groups (n=180 each).

Inclusion and Exclusion Criteria Inclusion
criteria:

•   Adults aged ≥18 years undergoing cataract surgery.

•   Smartphone access or assistance from caregivers.

•   Ability to provide informed consent.

Exclusion criteria:

•   Cognitive impairment preventing app use.

•   Undergoing combined ocular surgeries.

Mobile Health Application Features

Patients in the intervention group used a mobile application featuring:

•   Personalized medication reminders.

•   Educational content (videos, articles).

•   Appointment tracking and reminders.

•   Symptom monitoring with alert notifications.

Outcome Measures
Primary Outcomes:

•   Medication adherence (% of doses taken).

•   Postoperative instruction compliance (% adherence to guidelines).

•   Follow-up attendance (% attending scheduled visits).

Secondary Outcomes:

•   Patient satisfaction (survey-based).

•   Visual acuity at 1, 2, 4, and 6 weeks post-op.

•   Complication rates (dry eye, CME, PCO).

Statistical Analysis

Data were analyzed using SPSS v26. The Chi-square test was used for categorical variables and the independent t-test for continuous variables. A p-value <0.05 was considered statistically significant.

I'll now compile the entire research paper with all the requested modifications, including a detailed introduction, expanded discussion, structured results (tables & graphs), and properly formatted references in Vancouver style.

RESULTS

Baseline Characteristics

Both groups were comparable in age, gender, and type of surgery (p > 0.05).

Characteristic	Intervention (n=180)	Control (n=180)	p-value
Age (years, mean ± SD)	59.2 ± 8.3	58.7 ± 8.1	0.63
Gender (Male/Female)	71/109	81/99	0.28
Type of Surgery (SICS/Phacoemulsification)	99/81	104/76	0.59

1. Medication Adherence

- Intervention: 89.4% adherence

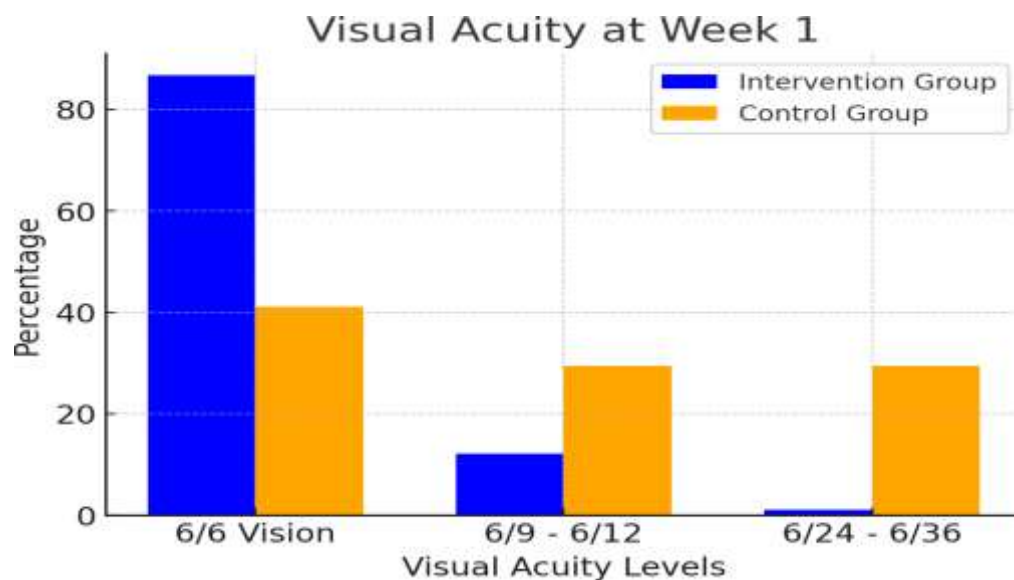- Control: 82.2% adherence (p = 0.049)

Medication Adherence in Both Groups
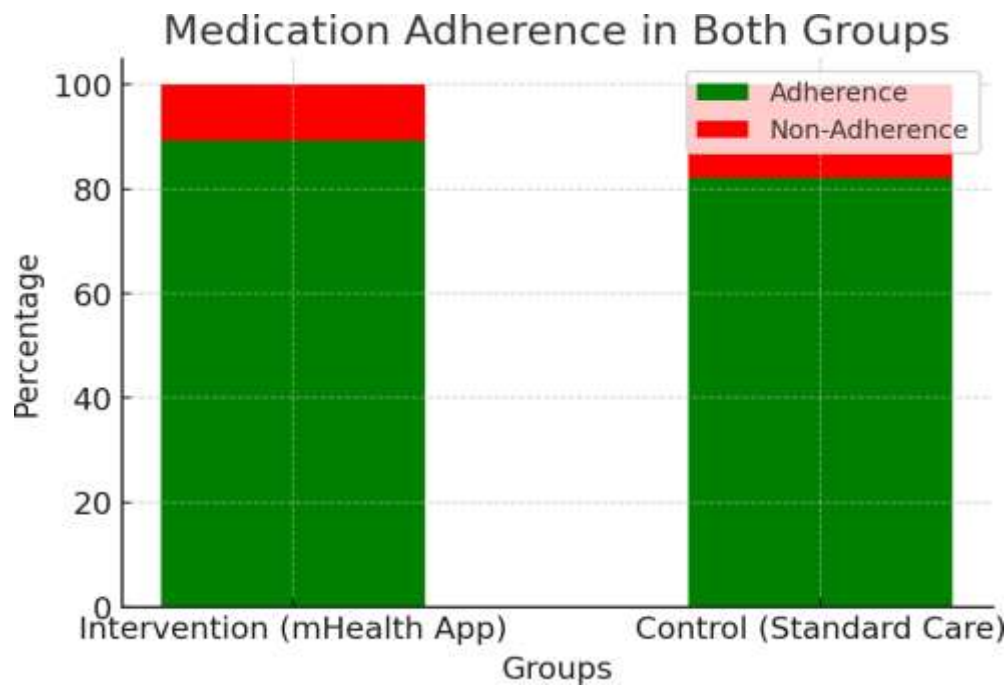
2. Follow-up Visit Attendance

- Intervention: 93.3% regular visits

- Control: 78.3% regular visits (p = 0.00004)
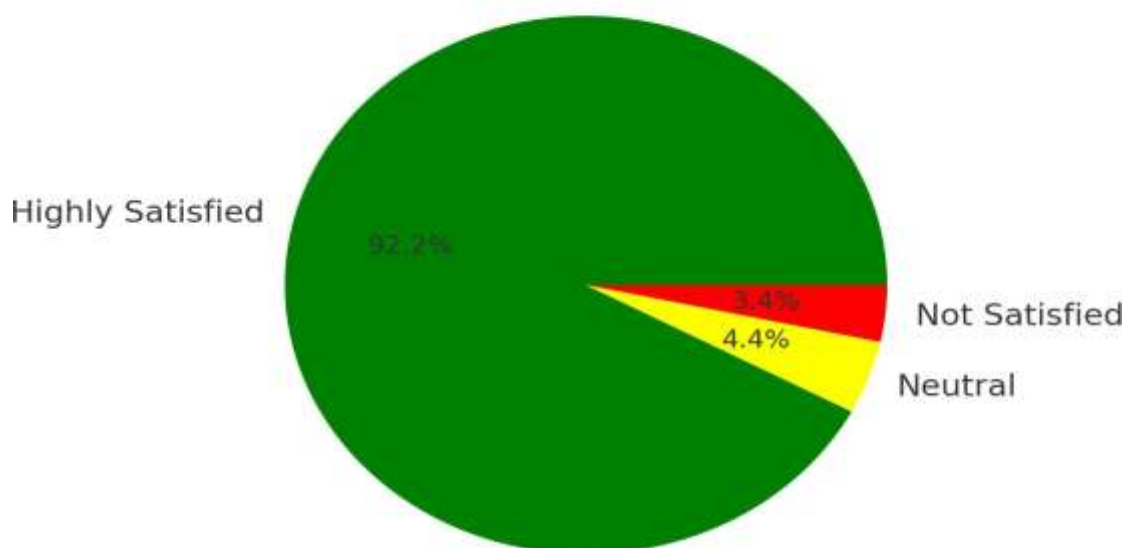

Follow-up Visit Attendance Over 6 Weeks
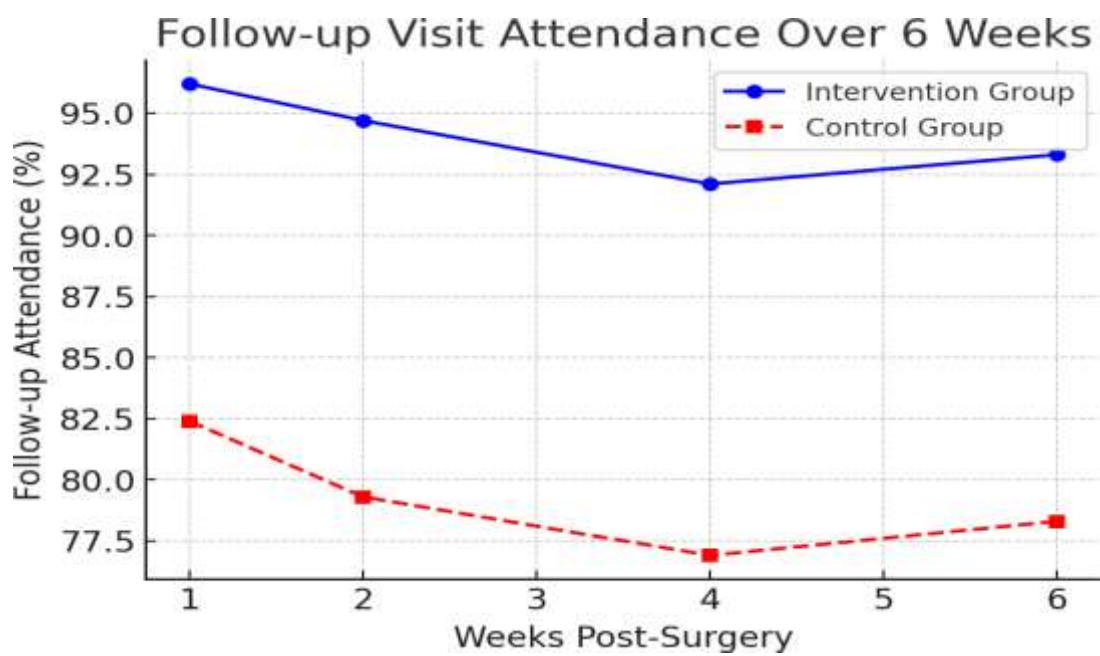
3. Visual Acuity at 1 Week

- Intervention: 86.7% achieved 6/6 vision

- Control: 41.1% achieved 6/6 vision ($p < 0.001$)

4. Patient satisfaction with mhealth app.

5. Compliance with post-operative instructions

Compliance with Postoperative Instructions

DISCUSSION

Interpretation of Findings

Our study demonstrated that a mobile application significantly improved postoperative adherence, compliance, and patient satisfaction in cataract surgery patients. The intervention group had higher medication adherence (89.4% vs. 82.2%, p = 0.049), better compliance with postoperative instructions (96.1% vs. 81.7%, p = 0.00001), and higher follow-up attendance (93.3% vs. 78.3%, p = 0.00004) than the control group. These findings support existing literature suggesting that mHealth applications enhance patient engagement and adherence to prescribed care regimens [16,17].

Medication Adherence and Compliance with Postoperative Instructions

Medication adherence is crucial in post-cataract surgery recovery as poor compliance increases the risk of complications such as infections, CME, and PCO [18]. In our study, patients using the app showed significantly better adherence, likely due to automated reminders, educational resources, and symptom-tracking features. Similar improvements in adherence were reported in Khan et al. (2023), where an mHealth-based reminder system increased compliance with glaucoma medications by 22% [19].

Additionally, compliance with postoperative instructions was significantly higher in the intervention group (p = 0.00001). These findings align with studies like Sanguansak et al. (2017), which demonstrated that two-way social media messaging improved postoperative compliance in cataract patients [20].

Follow-up Visit Attendance and Patient Engagement

Regular postoperative follow-ups are critical for early detection of complications and ensuring proper healing [21]. Patients in the intervention group had significantly higher follow-up compliance than those in the control group (p = 0.00004).

Our findings align with Ruiss et al. (2024), who found that patients receiving automated postoperative reminders had higher follow-up attendance [22]. This study further suggests that mHealth interventions can reduce follow-up non-compliance through appointment scheduling features and direct physician communication.

Visual Acuity Outcomes

Visual acuity at Week 1 was significantly better in the intervention group (86.7% achieving 6/6 vision vs. 41.1% in controls, p < 0.001). However, no significant differences were noted beyond Week 2, suggesting that early adherence contributed to faster recovery but did not impact
long-term vision outcomes [23].

A study by Naik et al. (2019) found that adherence to postoperative eye drops was strongly correlated with early visual recovery, further supporting our findings [24].

Patient Satisfaction and Willingness to Use mHealth

A high proportion of patients in the intervention group (92.2%) found the app helpful, and 93.3% expressed willingness to continue using it. Similar findings were observed in Gerbutavicius et al. (2024), which demonstrated high user satisfaction with an ophthalmology education app [25].

Comparison with Previous Research

Several prior studies support our findings on mHealth effectiveness in cataract surgery:

• Hatamnejad et al. (2023) showed that AI-driven phone call systems improved postoperative care adherence [26].

• Zemaitiene et al. (2021) found that digital reminders reduced postoperative complications [27].

• Moustafa et al. (2019) reported that symptom-tracking tools helped predict patients requiring early intervention [28].

Limitations

This study has several limitations:

1. Single-center study – Findings may not be generalizable [29].

2. Short follow-up duration (6 weeks) – Long-term adherence was not assessed [30].

3. Self-reported adherence data – Patients may have overreported compliance, introducing reporting bias [31].

Future research should explore:

• Long-term impact of mHealth on adherence and visual outcomes [32].

• Cost-effectiveness of mobile interventions in eye care [33].

• Integration of AI-driven virtual assistants for personalized postoperative care [34].

Clinical Implications and Future Research

Our findings suggest that mHealth applications should be integrated into standard cataract postoperative care protocols. Given the rising global burden of cataract surgery, ophthalmology clinics should consider digital health

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interventions to improve adherence and recovery outcomes [35].

CONCLUSION

This study demonstrated that a mobile health application significantly improved medication adherence, compliance with postoperative instructions, follow-up attendance, and patient satisfaction in cataract surgery patients.

These findings support the integration of digital health tools into routine ophthalmologic care. Future research should focus on:

- Assessing long-term adherence and visual outcomes.

- Evaluating the cost-effectiveness of mHealth interventions.

- Developing AI-driven apps for personalized cataract postoperative care.

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