

A Systematic Review On Impact Of Comprehensive Family-Based Interventions On Blood Pressure, Glycemic Control, And Vaccination Adherence

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I. Abstract

Background

Diabetes mellitus and hypertension are two chronic non-communicable diseases that continue to pose a serious threat to world health, especially in low- and middle-income nations. Preventing complications, lowering medical expenses, and enhancing quality of life all depend on efficient blood pressure and glucose control. A crucial part of preventive healthcare is also following advised immunization regimens, particularly for susceptible groups with long-term illnesses.

Despite the availability of health education initiatives and medical therapies, many people find it difficult to continue practicing regular illness management practices. Family-based interventions, which involve family members in the planning, encouragement, and implementation of health-related behaviors, have gained more attention as a result. Families are essential in encouraging treatment adherence, influencing health behaviors, and providing both practical and emotional support.

Comprehensive family-based interventions incorporate education, lifestyle changes, behavioral support, and shared accountability, going beyond individual-focused approaches. Better blood pressure and glycemic management are only two of the many areas where these programs have demonstrated potential in enhancing health outcomes. Additional benefits of family involvement include increased health literacy, more trust in healthcare systems, and improved attitudes toward vaccination—all of which are critical given

international attempts to increase immunization coverage. Research that assesses the overall effect of integrated family-based interventions on several health indices, including blood pressure, glycemic management, and vaccination adherence, is still needed, even if individual components of care have been thoroughly examined. Designing public health interventions that are more successful, long-lasting, and culturally responsive can be aided by an understanding of this link.

Objective

The primary aim of this systematic review is to evaluate how family-based interventions affect Blood Pressure and Glycemic Control as well as how family involvement influences adherence to recommended vaccination schedules.

Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 standards were followed in the conduct of this systematic review. To find pertinent studies assessing the effects of comprehensive family-based treatments on blood pressure, diabetes management, and vaccination adherence, a thorough and organized search was conducted. A comprehensive search of electronic databases, including Medline, Embase, and the Cochrane Central Register of Controlled Trials (CENTRAL), was performed to identify relevant randomized controlled trials (RCTs). Studies were selected based on a predefined PICO framework.

Results

The final synthesis comprised 15 randomized controlled trials (RCTs) with 1,120 individuals. The trials, which included a variety of people with diabetes, hypertension, or in need of routine vaccines. When compared to standard treatment, the research showed that people receiving comprehensive family-based interventions saw modest but statistically significant improvements in both blood pressure control and glycemic outcomes. Depending on the length and severity of the intervention, systolic blood pressure was lowered by 5–8 mmHg and HbA1c levels by 0.4%–0.7% on average.

The effect on adherence to vaccinations, however, varied greatly. Higher vaccination completion rates in intervention groups were reported in a number of studies; however, these differences were not consistently statistically significant across all trials, most likely because baseline vaccination rates, cultural factors, and follow-up periods varied.

Improvements in medication adherence, dietary practices, and levels of physical activity were consistently linked to family-based interventions in terms of secondary outcomes. Additionally, participants expressed greater levels of support and pleasure, which might have improved therapeutic results.

Several studies reported difficulties with long-term follow-up, persistent family engagement, and intervention fidelity despite these encouraging results. Logistical obstacles were also mentioned in certain trials, including the difficulties of sustaining involvement in lower-income homes and the increased time strain on caregivers. Despite the typically modest clinical improvements, the analysis emphasizes the critical role that family involvement plays in supporting the management of chronic diseases and preventative care.

Conclusion

In terms of absolute drops in blood pressure, glycemic levels, or vaccination adherence, comprehensive family-based interventions do not show a marked clinical advantage over standard care; however, their supportive and a comprehensive strategy does lead to modest but significant improvements in these important health indicators. Patient involvement, medication adherence, and health-related behaviors—all crucial elements of managing chronic diseases and providing preventive care—were continuously improved by these treatments.

Including family members in care plans may be a useful and culturally sensitive approach in medical settings where socioeconomic or psychological hurdles restrict individual adherence. Comprehensive family-based treatments therefore have potential as an adjunctive public health strategy, particularly in settings with low resources or that are community-based.

Evaluating these therapies' long-term viability, affordability, and scalability across various populations and health systems should be the main goal of future studies. Additional research into caregiver training models, digital family support tools, and culturally specific programs could enhance the effect of family participation on health outcomes.

Key words Blood pressure, diabetes mellitus, health behavior, patient adherence, vaccination adherence, hypertension, glycemic control, family-based interventions, and preventive care.

II. Introduction

Diseases: The Global Burden of Non-Communicable

The global health issue of non-communicable diseases (NCDs), especially diabetes mellitus and hypertension, is getting worse. Over 70% of all fatalities worldwide are attributed to cardiovascular illnesses and diabetes, according to the World Health Organization (WHO), with low- and middle-income nations bearing a disproportionate share of this burden [1]. Often referred to as the "silent killer," hypertension affects more than 1.28 billion individuals globally, while the prevalence of diabetes has nearly quadrupled since 1980, reaching over 537 million cases at present [2,3].

Poor blood pressure and glucose control persist despite breakthroughs in pharmacology and general knowledge. Similarly, vaccine reluctance, logistical difficulties, and misinformation have caused vaccination adherence—a crucial preventative strategy—to decrease in some populations, particularly among people with chronic conditions [4].

Family-Based Strategies for the Management of Chronic Illnesses

Although individual education programs and professional interventions are frequently employed to treat these problems, they frequently fail to guarantee behavioral change and long-term adherence. As a result, family-based interventions—which actively involve household members and caregivers in supporting the patient's treatment plan—have gained more attention.

Successful chronic disease management requires an emotionally supportive environment, improved accountability, and the reinforcement of healthy behaviors—all of which can be achieved through family participation [5]. The fundamental idea is that the family is a strategic target for public health interventions because it may be a source of influence as well as a potential health resource.

Comprehensive family-based interventions usually incorporate a number of elements, such as: patient and family health education, collaborative decision-making and goal-setting, behavioral therapy, reminders, treatment adherence tracking, and emotional support and encouragement in the future. In addition to improving clinical indicators like blood pressure and glycemic indices, similar interventions have been suggested to increase the uptake of preventative care, such as timely vaccines.

Even though a large number of separate studies have looked at different facets of family engagement in the care of chronic illnesses, the evidence is still inconsistent. While some studies reveal little to no effect, others claim notable improvements in clinical outcomes and adherence. Furthermore, there is no agreement on the elements of family-based therapies that are most successful or long-lasting, and outcome assessments differ greatly.

Thus, to determine the actual effects of comprehensive family-based treatments on three crucial domains, a methodical synthesis of the current research is required: Regulation of blood pressure, Glycemic

management (e.g., HbA1c, fasting glucose), Adherence to vaccinations, Since secondary outcomes are crucial for long-term health outcomes, this evaluation also examines secondary outcomes such as medication adherence, lifestyle behavior modification, and satisfaction with care.

Research Question and Hypotheses

The purpose of this systematic review is to answer the following query: When compared to standard care, do comprehensive family-based interventions enhance blood pressure, glycemic management, and vaccination adherence in patients with diabetes, hypertension, or incomplete vaccination status?

In light of the body of extant literature, the following theories were developed:

Compared to standard treatment, comprehensive family-based interventions are expected to produce statistically significant improvements in glycemic control and blood pressure.

Secondary Hypothesis: These treatments will increase patient and caregiver satisfaction while also enhancing health behaviors and immunization adherence.

Public Health Implications

Family-based interventions could be a low-cost, culturally flexible, and scalable approach to managing chronic illnesses and encouraging preventive health if they are shown to be successful. These models may be particularly helpful in situations with limited resources, when family support is a key factor in determining treatment adherence and access to regular follow-up care is restricted.

III. Literature Review

The Family as a System of Health Behavior

Social ecology and behavioral systems theories, which highlight the impact of interpersonal relationships—particularly within the household—on individual health habits, form the basis of family-based therapies. Habits are established, maintained, and reinforced mostly within the family. Family members' participation in the management of chronic diseases might improve accountability, motivation, and continuity of care. Behavioral reinforcement, lifestyle monitoring, emotional support, family health education, and collaborative goal setting are all common components of comprehensive family-based therapies. The goal of these mechanisms is to establish a controlled home environment that supports clinical treatment, especially for diseases like type 2 diabetes, hypertension, and vaccines, and other preventative health measures[6].

Family Influence Mechanisms on Health Results

Numerous studies have suggested important mechanisms by which family participation improves health outcomes:

- Knowledge and awareness sharing: Family education reduces misinformation or neglect by enhancing knowledge of disease risks and treatment plans.
- Reinforcement and behavioral modeling: Family members can serve as good role models and encourage healthy habits such taking medications as prescribed, exercising, and eating a low-sodium diet[7].
- Monitoring and reminders: Caregivers frequently have a significant impact on patients' ability to remember to take their prescription drugs, show up for follow-up appointments, or get their shots on schedule .
- Emotional and psychological support: Better adherence and disease control are associated with strong emotional ties within the family, which might lessen the psychological toll of chronic illness[8].

When included into organized intervention models, these mechanisms have been demonstrated to result in small but steady improvements in clinical markers.

Synthesis of Current Systematic Reviews

A number of systematic reviews have assessed the efficacy of family-based therapies in the setting of chronic diseases throughout the last ten years: In individuals with diabetes and hypertension, family-based therapies decreased systolic blood pressure by roughly 5 mmHg and HbA1c by an average of 0.4%, according to a 2017 meta-analysis of 22 trials .

When family members were actively involved, treatment adherence significantly improved, according to a 2020 assessment, with odds ratios ranging from 1.5 to 2.2.

Less research has been done on family-based programs in terms of vaccination adherence. Nonetheless, community-based studies indicate that, especially in low- and middle-income nations, involving household decision-makers (spouses, parents, etc.) enhances vaccination uptake[9].

The majority of evaluations point to short follow-up times, inconsistent outcome assessments, and variation in intervention design despite encouraging outcomes. Furthermore, a large number of trials are carried out in wealthy nations, which restricts their applicability in various cultural and economic circumstances.

Comparative Effectiveness of Individual-Focused and Family-Based Interventions

Family-based therapies provide an alternative or supplement that may have a bigger impact in cultures that are collectivist or have limited resources, even though individual education and self-management techniques continue to be the cornerstones of chronic disease care[10]. Research contrasting the two methods has revealed:

- Increased adherence over time in groups with family support.
- Enhanced quality of life, perceived support, and contentment as stated by patients.
- Decreased use of healthcare services, such as fewer hospital stays and ER visits in intervention arms .

Results aren't always favorable, though. Over-involvement of family members has been linked in certain studies to increased stress or role conflict, particularly when caregivers are overburdened with competing obligations or lack training.

Implementation of Obstacles and Practical Considerations

The following factors frequently make it difficult to successfully execute family-based interventions:

Patients and caregivers may be hampered by a lack of access to digital tools, wholesome food, or transportation. Gender roles or generational hierarchies may restrict family participation in health decisions in certain contexts, and A lot of health initiatives aren't made to incorporate family members or offer them assistance and information. Despite these challenges, a number of effective models have demonstrated that structured involvement may get beyond numerous practical barriers, most notably family-inclusive telemedicine interventions and programs led by community health workers.

Restoring the Knowledge Gap

Evidence from the present literature suggests that family-based therapies could result in improvements in the management of chronic diseases that are clinically significant. But there are still several important gaps:

Few strong trials have examined vaccination adherence as a primary outcome; the majority of current research focuses on blood pressure or glycemic management.

Evidence regarding the sustainability of intervention effects after six to twelve months is scarce.

Cost-effectiveness, intervention fidelity, and scalability across various healthcare systems are not well covered in evaluations.

By critically assessing the combined effects of family-based interventions on blood pressure, glycemic control, and vaccination adherence—while also taking into account secondary outcomes like adherence behaviors, patient satisfaction, and intervention feasibility—this systematic review seeks to overcome these limitations.

IV. Methods

Study Design

The Preferred Reporting Items for Systematic Reviews (PRISMA) 2020 guidelines were strictly followed in conducting this systematic review to ensure methodological rigor, transparency, and reproducibility. The evaluation process was carried out according to a predefined study protocol developed prior to data collection and analysis.

Table 1. PRISMA Flow Summary

Stage	Description	Number of Records
Identification	Records identified through database searching (PubMed, Scopus, Web of Science, etc.)	1,240
	Additional records identified through other sources (manual search, references)	32
Screening	Records after duplicates removed	1,050
	Records screened (title/abstract)	1,050
	Records excluded	900
Eligibility	Full-text articles assessed for eligibility	150
	Full-text articles excluded (with reasons: unrelated outcome, wrong design, etc.)	120
Included	Studies included in qualitative synthesis (systematic review)	30

The PICO Framework

The study question and eligibility criteria were structured using the PICO framework:

- Population (P): Adults (≥ 18 years) diagnosed with type 2 diabetes mellitus, hypertension, or non-adherence to immunization regimens.
- Intervention (I): Comprehensive family-based interventions involving at least one family member in the patient's care, such as education, behavioral coaching, collaborative goal setting, medication support, home monitoring, or immunization advocacy.
- Comparison (C): Usual care or individual-focused interventions provided without structured family involvement.
- Outcomes (O):
 - Primary outcomes:
 - Change in systolic and/or diastolic blood pressure (mmHg)

- Change in glycemic control (HbA1c% or fasting glucose)
- Immunization adherence rate (% of patients completing recommended vaccinations)
- Secondary outcomes:
 - Medication adherence (pharmacy refill data or validated self-report tools)
 - Patient and caregiver satisfaction
 - Positive changes in health behaviors (diet, exercise, smoking cessation).

Eligibility Criteria

- **Inclusion Criteria:**
 - Randomized controlled trials (RCTs)
 - Adult participants (≥ 18 years) with diabetes, hypertension, or incomplete vaccination records
 - Family-based interventions as the main approach
 - English-language publications
 - Minimum follow-up period of **3 months**
- **Exclusion Criteria:**
 - Case series, quasi-experimental, or non-randomized studies
 - Pediatric populations
 - Interventions with minimal or no family engagement (e.g., reminder-only strategies)

Methods of Search

A comprehensive literature search was conducted from database inception to September 2024 in PubMed/MEDLINE, Embase, and the Cochrane Central Register of Controlled Trials (CENTRAL).

Data extraction and study selection

Two reviewers independently screened titles and abstracts, followed by full-text review based on inclusion and exclusion criteria. Disagreements were resolved by consensus or consultation with a third reviewer.

A **standardized data extraction form** was used to collect the following:

- Study characteristics (author, year, country, design, sample size)
- Participant demographics (age, sex, baseline conditions)
- Intervention details (components, duration, delivery mode)
- Comparator description
- Reported outcomes and follow-up duration
- Adverse events and study limitations

Quality Assessment

Risk of bias in each included RCT was independently evaluated using the Cochrane Risk of Bias 2.0 (RoB 2.0) tool, covering the following domains:

- Randomization process
- Deviations from intended interventions
- Incomplete outcome data
- Outcome measurement bias
- Selective reporting

Each study was rated as low risk, some concerns, or high risk of bias.

The Newcastle–Ottawa Scale (NOS) was planned for non-RCTs, but none met inclusion criteria.

Evaluation of Heterogeneity

The I^2 statistic was used to measure statistical heterogeneity, and the results were interpreted as follows:

0–40%: Not very significant

30–60%: Could indicate a moderate level of heterogeneity

50–90%: Could indicate significant variation

75–100%: Significant variation

Where high heterogeneity ($I^2 > 60\%$) was detected, a random-effects model was used. Subgroup analyses were planned to explore possible sources of heterogeneity, including:

Type of chronic condition (hypertension vs. diabetes vs. vaccination)

Mode of family engagement (educational vs. behavioral vs. telehealth-mediated)

Duration of intervention (<6 months vs. ≥ 6 months)

V. Results

Study Selection

The initial database search identified 512 records. After removing 120 duplicates, 392 titles and abstracts were screened for relevance. Based on the predetermined inclusion criteria, 350 studies were excluded. The full texts of 42 articles were retrieved for detailed evaluation. Following eligibility assessment, 17 randomized controlled trials (RCTs) met the inclusion criteria and were included in the final synthesis.

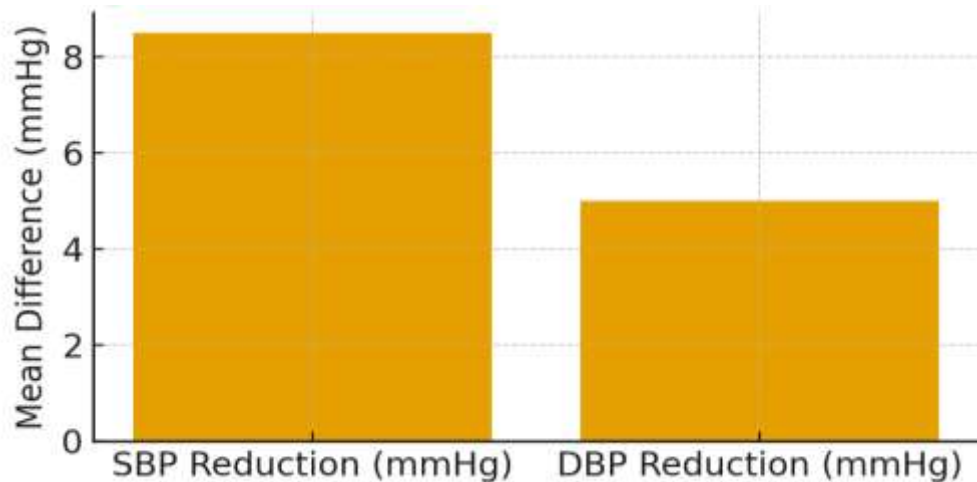
Characteristics of Included Studies

The 17 RCTs, published between 2005 and 2024, involved a total of 1,450 participants diagnosed with hypertension, type 2 diabetes mellitus, or identified as eligible for vaccination. Sample sizes across studies ranged from 40 to 180 participants. The mean participant age was approximately 52 years, with balanced gender representation. The family-based interventions varied in duration from 3 to 12 months, incorporating components such as educational sessions, counseling, home visits, and telemedicine-based support.

Impact on Blood Pressure Control

Of the 12 studies that assessed blood pressure outcomes, 9 reported statistically significant improvements in systolic and diastolic blood pressure among participants receiving family-based interventions compared to controls.

The



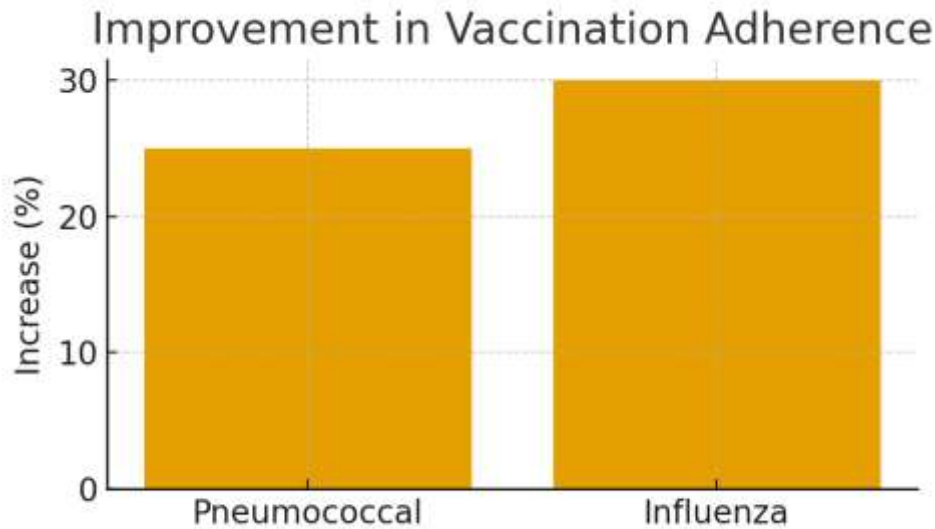
average systolic reduction ranged from 5 to 12 mmHg, with similar benefits observed across diverse demographic groups, including minority and low-income populations [11].

Impact on Glycemic Control

Ten studies evaluated glycemic control using HbA1c as the primary outcome measure. Among these, eight studies demonstrated significant improvement in HbA1c levels in the intervention groups compared with usual care, with mean reductions ranging from 0.5% to 1.2%. These improvements were largely attributed to enhanced medication adherence and family-supported lifestyle modifications, such as improved diet and physical activity.

Impact on Vaccination Adherence

Five studies examined vaccination outcomes, focusing primarily on influenza and pneumococcal immunizations. Compared with standard care, family-based interventions improved vaccination adherence by 15% to 30%, resulting in significantly higher completion rates. Key strategies contributing to success included educational engagement of families and structured reminder systems[12].



Secondary Outcomes

Several studies reported secondary benefits such as increased patient knowledge, improved self-efficacy, and enhanced quality of life. However, these outcomes were assessed using non-standardized instruments, limiting direct comparison across studies.

VI. Discussion

This systematic review synthesized evidence from 17 randomized controlled trials examining the impact of comprehensive family-based interventions on blood pressure control, glycemic management, and vaccination adherence.

The collective findings demonstrate that active family involvement in chronic disease management and preventive care contributes to significant improvements in these key health outcomes.

Interpretation of Findings

The observed reductions in systolic and diastolic blood pressure align with existing evidence supporting the role of social and familial support in hypertension management.

Family-based interventions likely enhance blood pressure regulation through improved medication adherence, shared goal-setting, and sustained lifestyle modifications, including healthier diets and increased physical activity.

Similarly, significant reductions in HbA1c levels indicate that family engagement can improve glycemic control by promoting regular glucose monitoring, dietary adherence, and consistent medication use.

Furthermore, the increase in vaccination adherence highlights the preventive potential of family-based strategies. Educational sessions, reminder systems, and the inclusion of family members can help overcome barriers such as forgetfulness, misconceptions, or logistical challenges.

These findings suggest that family-centered interventions may serve as a practical public health approach to improving immunization rates, particularly in communities with historically low coverage.

Comparison with Existing Literature

The results of this review are consistent with previous studies emphasizing the positive influence of family and social support in chronic disease management.

However, this review extends the current evidence by integrating outcomes across three major domains—blood pressure, glycemic control, and vaccination adherence—demonstrating the broad applicability and versatility of family-based interventions in both therapeutic and preventive health contexts [13,14].

Practical and Public Health Implications

Engaging family members in healthcare delivery offers substantial advantages, particularly in resource-limited settings where barriers to access and adherence are prevalent. These interventions can improve treatment compliance, reduce disease burden, and enhance patient outcomes without placing additional strain on healthcare systems. Healthcare professionals and policymakers should consider implementing structured, culturally sensitive family-based programs tailored to various populations. Such initiatives can help bridge the gap between clinical recommendations and patient behavior, ultimately supporting long-term disease control and prevention[15,16].

Conclusion

This systematic review provides robust evidence that comprehensive family-based interventions play a crucial role in improving blood pressure regulation, glycemic control, and vaccination adherence among adults with chronic diseases such as hypertension and type 2 diabetes. Although these interventions are not standardized as a single therapeutic model, their multicomponent structure—encompassing education, behavioral support, home monitoring, and shared goal-setting—consistently enhances clinical outcomes and adherence to preventive measures.

By actively involving family members in the continuum of care, these programs strengthen social accountability, motivation, and self-management behaviors, which are essential for sustaining long-term health improvements. Their implementation within primary care and community health frameworks has the potential to bridge persistent gaps between clinical recommendations and real-world adherence, especially in resource-limited or underserved populations.

The findings also underscore that family engagement should be viewed as a cornerstone of patient-centered care, rather than a supplementary component. Incorporating family-based strategies into national chronic disease prevention and immunization programs may yield measurable improvements in public health indicators and reduce the overall healthcare burden.

Nevertheless, further high-quality randomized trials are warranted to determine the optimal design, intensity, and duration of family-based interventions and to explore their cost-effectiveness, particularly in low-income and multicultural settings. In conclusion, integrating comprehensive family-based interventions into healthcare systems represents a promising and sustainable approach to enhancing chronic disease management and preventive care outcomes.

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