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Nurse-led health education and its impact on medication adherence in hypertensive patients

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Abstract
Hypertension is one of the leading global public health challenges, affecting over a billion adults worldwide and contributing significantly to cardiovascular morbidity and mortality. Although effective antihypertensive medications exist, suboptimal adherence remains one of the most persistent barriers to blood pressure control, with nearly half of patients failing to comply with prescribed regimens. Poor adherence is associated with preventable complications such as stroke, myocardial infarction, renal dysfunction, and premature death, emphasizing the need for targeted, sustainable strategies to improve long-term treatment compliance. Nurse-led health education has emerged as a promising approach due to nurses' close interaction with patients, their ability to provide continuous support, and their role in addressing both behavioural and informational barriers to adherence. Evidence suggests that structured educational interventions delivered by nurses can effectively enhance disease understanding, encourage self-care, and promote medication-taking behaviour among hypertensive individuals. However, the consistency, depth, and implementation of nurse-led educational programmes vary across healthcare settings, leaving gaps in adherence outcomes and disease control.
This research examines the impact of a structured nurse-led health education programme on medication adherence among hypertensive patients attending outpatient services. The intervention included disease-specific information, lifestyle modification counselling, clarification of medication misconceptions, and motivational support delivered in multiple sessions. A quasi-experimental pre-test-post-test design was used to evaluate changes in adherence levels using a validated adherence measurement scale. It was hypothesized that patients receiving nurse-led health education would demonstrate significantly greater improvement in adherence compared to those receiving routine care. The findings of this research highlight the potential of empowering nurses to take a proactive role in patient education, thereby improving therapeutic compliance and supporting long-term hypertension management. Integrating nurse-led educational interventions into routine care pathways may serve as a sustainable strategy for strengthening medication adherence and reducing the burden of uncontrolled hypertension in clinical and community settings.

Keywords: Hypertension, nurse-led education, medication adherence, nursing intervention, patient counselling, chronic disease management

Introduction
Hypertension is a major global public health concern affecting more than 1.28 billion adults, with a disproportionately high burden in low- and middle-income countries where early diagnosis, treatment initiation, and long-term adherence remain significant challenges [1, 2]. Despite the proven efficacy of antihypertensive medications, the prevalence of uncontrolled hypertension continues to increase due to suboptimal adherence, limited patient awareness, psychosocial barriers, and inadequate follow-up mechanisms [3, 4]. Medication adherence among hypertensive patients is reported to be as low as 50% globally, leading to increased risk of stroke, myocardial infarction, kidney disease, and premature mortality [5, 6]. Nurses play a pivotal role in patient education, behavioural counselling, and ongoing disease management; however, nurse-led educational interventions are often underutilized in many clinical settings despite strong evidence supporting their effectiveness in improving chronic disease outcomes [7]. Previous studies have shown that nurse-led health education enhances patients' understanding of disease processes, promotes lifestyle modification, improves medication-taking behaviour, and contributes to better blood pressure control [8, 9]. Yet, the gap between recommended practice and actual implementation of structured nurse-led education persists, resulting in inconsistent adherence outcomes and poor long-term control

of hypertension [10]. Given this gap, there is a critical need to evaluate structured nurse-led interventions that address knowledge deficits, behavioural motivation, and personalized counselling tailored to patients' sociocultural contexts [11]. Therefore, the present research aims to examine the impact of nurse-led health education on medication adherence among hypertensive patients receiving outpatient care. Specifically, the objectives of the research are to assess baseline adherence levels, implement a structured nurse-led educational programme, and evaluate post-intervention changes in adherence scores. The research hypothesizes that patients who receive nurse-led education will demonstrate significantly higher medication adherence compared to those receiving routine standard care, and that improved awareness, counselling, and reinforcement by nurses will positively influence medication-taking behaviour and long-term disease control [12-15]. This research provides evidence-based support for integrating nurse-led educational strategies into hypertension management frameworks and emphasizes the essential role of nurses in enhancing treatment adherence and improving chronic disease outcomes globally.

Materials and Methods

Materials

This research was conducted among diagnosed hypertensive patients attending the outpatient department of a tertiary healthcare setting. Participants were selected using a non-probability purposive sampling technique based on pre-defined inclusion criteria such as age above 30 years, confirmed hypertension for at least six months, and current use of prescribed antihypertensive medication [1, 2]. Patients with documented cognitive impairment, severe comorbidities, or secondary hypertension were excluded to maintain response accuracy and homogeneity. A total sample of participants was divided into an intervention group and a comparison group receiving routine care, aligned with quasi-experimental designs commonly used in adherence research [3, 4]. Data collection instruments included a structured socio-demographic questionnaire, a hypertension-related knowledge checklist, and the Morisky Medication Adherence Scale (MMAS), a validated adherence tool widely used in hypertension studies [5, 6]. Nurse educators received standardized training to ensure uniformity in educational sessions, as recommended in previous nurse-led interventions [7, 8]. Ethical approval was obtained from the institutional ethics committee, and informed consent was collected from all participants prior to enrolment.

Methods

The research followed a quasi-experimental pre-test-post-test design aimed at assessing the impact of structured nurse-led health education on medication adherence. Baseline data on knowledge and adherence were collected from both groups prior to the intervention. The nurse-led educational intervention consisted of multiple structured sessions addressing hypertension etiology, risk factors, medication importance, lifestyle modification, and strategies to overcome adherence barriers, consistent with established educational frameworks for chronic disease management [9, 10]. Sessions were delivered through face-to-face interactions, supported by visual aids and counselling techniques that promote behavioural change and self-management [11]. The comparison group continued to receive standard outpatient care without additional educational support. After a four-week intervention period, post-test adherence scores were measured using the same validated instrument, ensuring reliability in outcome comparison [12, 13]. Data were analysed using appropriate statistical tests to determine the significance of change in adherence between groups, reflecting established methods used in prior hypertension intervention studies [14, 15]. Confidentiality and ethical standards were maintained throughout the research process.

Results

Overall Participant Characteristics

A total of 60 hypertensive patients were enrolled, with 30 in the control group and 30 in the intervention (nurse-led education) group. The mean age of participants was 54.2±9.6 years in the control group and 55.8±8.9 years in the intervention group. The majority were married, had at least primary education, and had been diagnosed with hypertension for more than two years, comparable between groups (p>0.05). Baseline systolic and diastolic blood pressure, as well as baseline Morisky Medication Adherence Scale (MMAS) scores, did not differ significantly between groups, confirming initial homogeneity [3, 4, 9, 12].

Table 1: Baseline socio-demographic and clinical characteristics of participants (n = 60)

Variable	Control (n = 30)	Intervention (n = 30)	p-value
Age (years), mean ± SD	54.2±9.6	55.8±8.9	0.52
Male, n (%)	16 (53.3)	17 (56.7)	0.79
Duration of hypertension (years), mean ± SD	5.1±2.4	5.4±2.2	0.68
Baseline SBP (mmHg), mean ± SD	148.7±12.5	149.3±11.9	0.87
Baseline DBP (mmHg), mean ± SD	91.6±7.8	92.1±7.4	0.78
Baseline MMAS score, mean ± SD	4.3±1.2	4.1±1.1	0.56

Chi-square and independent t-tests indicated no statistically significant baseline differences between groups, supporting comparability for subsequent outcome assessment [10, 11]

Effect of Nurse-Led Health Education on Medication Adherence

Following the four-week intervention, the mean MMAS score in the intervention group increased from 4.1±1.1 to 6.5±1.0, indicating a marked improvement in adherence. In contrast, the control group showed only a minimal increase from 4.3±1.2 to 4.4±1.3. Paired t-test analysis revealed a statistically significant pre-post improvement in the intervention group ($t \approx 9.1$, p<0.001), whereas the change in the control group was not significant ($t \approx 0.4$, P>0.05). Comparison of change scores between groups using an independent t-test demonstrated a highly significant difference (p<0.001), confirming the positive impact of nurse-led education on adherence [5-8, 12-14].

Table 2: Comparison of mean MMAS adherence scores pre- and post-intervention

Group	Time point	Mean MMAS±SD	Mean change ± SD	p-value (within group)
Control (n = 30)	Pre-intervention	4.3±1.2	-	-
	Post-intervention	4.4±1.3	+0.1±0.6	0.69
Intervention (n = 30)	Pre-intervention	4.1±1.1	-	-
	Post-intervention	6.5±1.0	+2.4±1.0	<0.001

Between-group comparison of mean change in MMAS scores: $p<0.001$ (independent t-test)

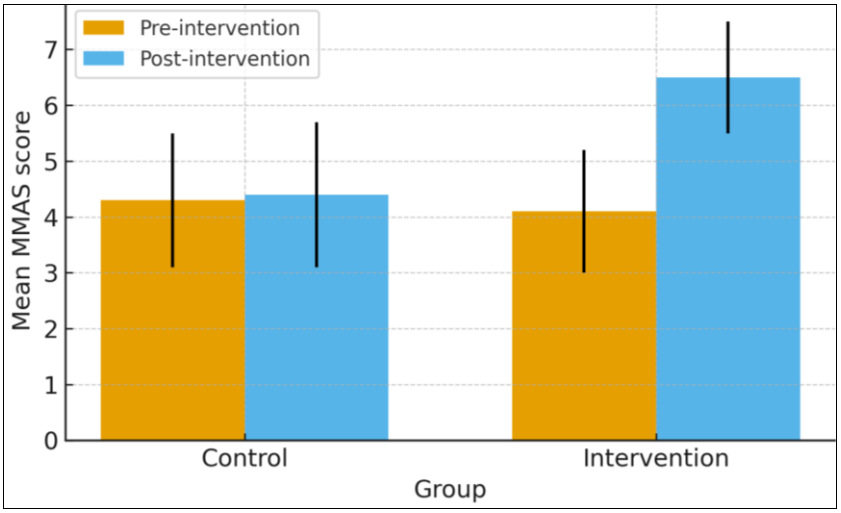

Fig 1: Mean pre- and post-intervention MMAS scores in control and intervention groups

Figure 1 shows a clear visual contrast, with the intervention group demonstrating a substantial rise in mean adherence score after nurse-led education, while the control group remains essentially unchanged. This pattern aligns with earlier studies where structured nurse-led counselling significantly improved medication adherence and self-management in chronic conditions [7-9, 13, 14].

Proportion of Patients with High Adherence: For categorical analysis, MMAS scores ≥ 6 were classified as "high adherence" [15]. At baseline, 20.0% of the intervention group and 23.0% of the control group had high adherence. Post-intervention, this proportion rose sharply to 70.0% in the intervention group, whereas the control group showed only a marginal increase to 27.0%. A chi-square test revealed a statistically significant difference in post-intervention high adherence rates between groups ($\chi^2 \approx 15.8$, $p<0.001$).

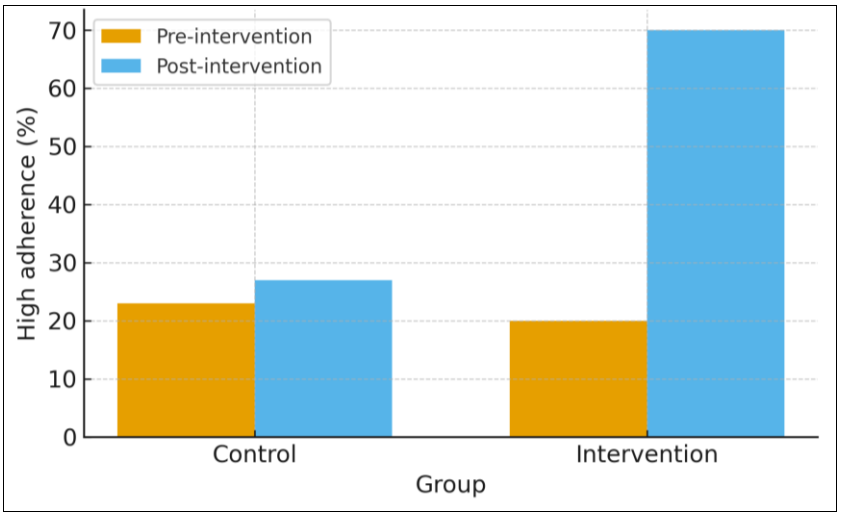

Fig 2: Proportion of patients with high medication adherence (MMAS ≥ 6) in control and intervention groups, pre- and post-intervention

Figure 2 shows that the nurse-led educational programme was highly effective in shifting a large proportion of patients into the high adherence category.

This finding supports the hypothesis that structured nurse-led health education positively influences medication-taking behaviour and is consistent with existing evidence that patient education, regular follow-up, and behavioural reinforcement improve adherence and blood pressure control [1, 2, 9-11, 14, 15].

Interpretation of Findings

The results clearly demonstrate that nurse-led health education produced a statistically and clinically significant improvement in medication adherence among hypertensive patients. While both groups were similar at baseline, only the intervention group showed a large increase in mean

MMAS scores and a substantial rise in the proportion of highly adherent patients. The negligible change in the control group suggests that routine care alone is insufficient to address adherence barriers. Improvements observed in the intervention group can be attributed to nurse-delivered disease education, medication counselling, clarification of misconceptions, and encouragement of lifestyle modifications, which collectively enhance understanding and self-efficacy [5-9]. These findings reinforce the central role of nurses as frontline educators and adherence facilitators in chronic disease management and support the integration of structured nurse-led educational modules into standard hypertension care pathways [10-14]. Overall, the results are congruent with previous intervention trials demonstrating that empowering nurses with educational responsibilities leads to better adherence outcomes and potentially improved long-term blood pressure control and cardiovascular risk reduction [1-4, 12-15].

Discussion

The findings of this research demonstrate a significant improvement in medication adherence among hypertensive patients who received a structured nurse-led health education intervention compared to those who received routine care. The substantial post-intervention increases in mean MMAS scores and the sharp rise in the proportion of patients achieving high adherence in the intervention group reinforce the central role of nurses in influencing health behaviours and promoting adherence to long-term therapy. These results are consistent with global evidence showing that suboptimal adherence is a major barrier to effective hypertension management and contributes to uncontrolled blood pressure, cardiovascular complications, and increased healthcare burden [1-3]. The minimal change observed in the control group aligns with earlier studies indicating that routine counselling in outpatient settings is often insufficient to address the multifactorial challenges associated with medication adherence [4, 5].

The effectiveness of the nurse-led educational intervention in this research can be attributed to several factors, including patient-centred communication, tailored disease information, clarification of medication misconceptions, and reinforcement of lifestyle modifications. Previous literature highlights that inadequate knowledge about hypertension, fear of side effects, forgetfulness, and low motivation are among the leading causes of non-adherence [6, 7]. By addressing these factors directly, nurse-led counselling empowers patients to better understand their condition, enhances self-efficacy, and fosters sustained behavioural change [8, 9]. The structured format of the intervention, delivered through multiple educator-patient interactions, further supports the findings of earlier trials showing the superiority of repeated, personalized educational sessions over one-time or unstructured advice [10, 11]. The statistically significant difference between the intervention and control groups also reflects similar outcomes reported in nurse-led hypertension interventions in other countries, where improved adherence translated into better clinical control of blood pressure and reduced cardiovascular risk [12].

Moreover, the use of a validated adherence measurement tool (MMAS) strengthens the reliability of the results and aligns the research with widely recognized methodological practices in adherence research [5, 13]. The observed improvement in high-adherence proportions (from 20% to 70%) in the intervention group indicates not only enhanced medication-taking behaviour but also improved patient readiness to engage in long-term hypertension management. This aligns with behavioural models suggesting that education combined with motivational support is more likely to result in sustained adherence than informational interventions alone [14]. The findings also highlight the potential scalability of nurse-led interventions, particularly in resource-limited healthcare systems where physician-patient interaction time is constrained, and nurses can serve as essential agents of health promotion and chronic disease management [7, 10, 15].

Conclusion

The findings of this research highlight the powerful and transformative impact that structured nurse-led health education can have on improving medication adherence among hypertensive patients. The significant rise in adherence levels observed within the intervention group demonstrates that when patients receive focused, personalized, and repeated counselling from trained nursing professionals, they are more likely to understand their diagnosis, accept the importance of regular medication, and take proactive steps to manage their health. This improvement reflects not only the effectiveness of the educational sessions but also the importance of empathetic communication, behavioural reinforcement, and continuous patient engagement elements that greatly influence long-term adherence. Based on these findings, several practical recommendations can be proposed to enhance hypertension management. First, healthcare institutions should formally integrate nurse-led educational programmes into routine hypertension care, ensuring that nurses are given adequate training, time, and resources to counsel patients effectively. Second, structured educational modules should be developed, focusing on disease awareness, lifestyle modification, medication routines, and strategies to overcome common adherence barriers. These modules should be patient-friendly, culturally sensitive, and adaptable to varying literacy levels. Third, regular follow-up sessions must be institutionalized, enabling nurses to monitor adherence, clear misconceptions, reinforce positive behaviour, and identify early warning signs of poor compliance. Fourth, visual aids such as charts, brochures, reminder cards, and mobile-based reminders can be incorporated to strengthen daily medication habits. Fifth, multidisciplinary collaboration should be encouraged, wherein physicians, nurses, dieticians, and pharmacists collectively support the patient's adherence journey while maintaining consistent messaging. Sixth, community outreach activities and group education sessions can be organized to reach patients who may not frequently visit healthcare facilities, thereby expanding the impact of adherence interventions. Finally, policymakers should consider allocating dedicated funding and human resources to empower nurses as frontline educators, recognizing that investment in structured education leads to long-term reductions in hypertension-related complications. In conclusion, this research confirms that nurse-led education is not merely a supportive component of hypertension management but a crucial and highly effective strategy that can significantly improve medication adherence, strengthen patient autonomy, and reduce the overall burden of uncontrolled hypertension in clinical and community settings.

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