



Effectiveness of a Nurse-Led Health Education Program on Attitudes Toward Hypertension Management in the Kurdistan Region of Iraq: An Intervention Study

Shakhawan Azad Ahmed^{1*} and Kareem Fattah Aziz²

¹College of Nursing, University of Raparin, Ranya, Kurdistan Region, 46012, Iraq

²College of Nursing, Hawler Medical University, Erbil, Kurdistan Region, 44001, Iraq

*Corresponding author: Shakhawan Azad Ahmed (e-mail: shakhawanazad@uor.edu.krd).

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Abstract Background: Hypertension remains one of the most prevalent non-communicable diseases globally, contributing substantially to cardiovascular morbidity and mortality. Limited awareness and poor attitudes toward disease management exacerbate health outcomes, particularly in low- and middle-income settings. **Objective:** To evaluate the effectiveness of a structured health education program in improving the attitudes of patients with hypertension in Ranya City, Kurdistan Region, Iraq. **Methods:** A one-group quasi-experimental pre-post intervention study was conducted among 75 hypertensive patients attending a primary health care center in Ranya City, Kurdistan Region of Iraq. Participants completed a structured attitude questionnaire before and after a nurse-led education program. The intervention consisted of structured group-based educational sessions covering diet, physical activity, stress management, medication adherence and smoking cessation, delivered in small groups for 45-60 minutes per session. Participants attended a minimum of two sessions over a four-week period, with standardized educational materials and interactive discussions. Pre- and post-intervention attitude scores were compared using the Wilcoxon signed-rank test and effect size was calculated to estimate the magnitude of change. **Results:** Participants were predominantly female (64.0%), married (98.7%) and urban residents (98.7%), with most reporting a family history of hypertension (81.3%). Post-intervention, significant improvements were observed in participants' attitudes toward exercise, dietary modification, regular healthcare visits and blood pressure monitoring. The mean attitude score increased from 2.26 ± 0.50 pre-intervention to 3.82 ± 0.40 post-intervention ($p < 0.001$), indicating a shift from generally negative/neutral attitudes toward clearly positive attitudes on a five-point Likert scale where higher scores reflect more favorable attitudes toward hypertension self-management. Effect size analysis demonstrated a large improvement ($r = 0.868$). **Conclusion:** The structured nurse-led health education program was associated with substantial improvements in patients' attitudes toward hypertension management within a one-group pre-post design. Although the findings suggest strong short-term attitudinal gains, the absence of a control group limits causal inference. The results support the feasibility and potential value of integrating structured nurse-led education into primary care settings in resource-limited contexts.

Key Words Hypertension, Attitude, Health Education Program, Quasi-Experimental Etudy, Patient Empowerment

INTRODUCTION

Hypertension is one of the most important preventable causes of premature morbidity and mortality worldwide. According to the WHO Global Hypertension Report 2025, more than 1.4 billion adults are living with hypertension, yet fewer than one in five achieve adequate control [1]. Elevated systolic blood pressure is now the leading metabolic risk factor globally, responsible for over 10 million deaths annually and more than 200 million disability-adjusted life

years (DALYs) [2,3]. Despite progress in detection and treatment, control rates remain persistently low, particularly in low- and middle-income countries [4,5].

The reasons for poor control extend beyond clinical access and pharmacotherapy. Patient knowledge, attitudes and behaviors are recognized as critical determinants of successful hypertension management [6]. In the context of this study, "attitude" refers to patients' evaluative beliefs, perceived importance, motivation and readiness to engage in

recommended hypertension self-management behaviors, including adherence to medication, dietary modification, physical activity, routine blood pressure monitoring and follow-up care. Attitudes were conceptualized as modifiable cognitive-affective orientations that influence willingness to adopt and sustain lifestyle changes rather than as measures of knowledge or actual behavior [7,8]. The educational program was conceptually informed by behavior-change models commonly used in chronic disease management, particularly the Health Belief Model (HBM) [9]. This framework proposes that individuals are more likely to adopt recommended health behaviors when they perceive hypertension as a serious condition, recognize personal susceptibility to complications, believe in the benefits of lifestyle modification and treatment adherence and feel confident in their ability to implement changes. Nurse-led education can influence these cognitive and motivational dimensions by addressing perceived barriers, reinforcing benefits and strengthening self-efficacy for self-management. Incorporating such a theoretical orientation helps explain how structured education may influence patients' attitudes and readiness for behavioral change in hypertension management. Negative or ambivalent attitudes toward dietary modification, physical activity, medication adherence and blood pressure monitoring significantly undermine disease control [7,8]. In contrast, structured health education programs, particularly when delivered by nurses or primary care providers, have consistently demonstrated effectiveness in improving awareness, shaping positive attitudes and sustaining self-care behaviors [9-14].

In the Middle East and specifically in Iraq, hypertension prevalence is rising rapidly due to demographic and lifestyle transitions [15-19]. A series of studies from Baghdad, Tel Afar and other Iraqi regions highlight that while many hypertensive patients report "good" knowledge or attitudes, this rarely translates into consistent practice [20,21]. A recent study from Zakho City in the Kurdistan Region reported a diagnosed hypertension prevalence was 9.5% among adults attending primary care services, reflecting a substantial and growing burden within northern Iraq [22]. Although district-level data from Ranya City are limited, clinical reports from local primary health care services suggest that hypertension represents one of the most common chronic conditions requiring long-term follow-up and lifestyle management. Moreover, misconceptions about treatment, underestimation of complications and poor follow-up behaviors remain widespread [23]. Recent regional evidence highlights the urgent need for interventions that bridge the gap between knowledge and practice by reshaping attitudes and empowering patients to adopt sustained lifestyle changes [23,24].

Despite this growing burden, structured educational interventions targeting hypertensive patients remain scarce in Iraq and the Kurdistan Region. Existing programs have focused mainly on epidemiological surveillance or pharmacological treatment, with little integration of nurse-led or community-based education into routine care.

Addressing this gap is essential for improving long-term control and reducing the complications of hypertension in resource-limited health systems. While improved attitudes toward hypertension self-management are widely considered a precursor to better adherence and potential clinical improvement, the present study was designed specifically to evaluate changes in patient attitudes rather than objective clinical outcomes such as blood pressure control or cardiovascular events. Assessing attitudinal change represents an important early step in understanding whether structured education can influence patients' readiness to adopt and sustain recommended self-management behaviors in routine primary care settings. Therefore, this study aimed to determine whether a structured nurse-led health education program improves attitude scores toward hypertension self-management among hypertensive patients attending a primary health care center in Ranya City, Kurdistan Region of Iraq.

METHODS

Study Design

The study employed a one-group pre-post design without a parallel control group. This approach was selected to evaluate the feasibility and short-term impact of a structured educational intervention within a real-world primary health care setting where randomization and control allocation were not operationally feasible during the study period. While this design allows for assessment of within-participant change over time, it does not permit definitive causal inference and improvements observed following the intervention may be influenced by factors such as repeated measurement, routine clinical exposure or increased attention to participants.

Study Setting and Period

The study was conducted at the primary health care center in Ranya City, located in the Kurdistan Region of Iraq. This center was selected because it provides services to a large population of hypertensive patients, making it an appropriate setting for implementing an educational program. Data collection was carried out over a 9-month period between July 2024 and April 2025, which included the recruitment of participants, delivery of the intervention and post-intervention follow-up assessments.

Participants and Sampling

Participants were recruited through purposive sampling from patients attending the primary health care center during the study period [25]. Eligibility criteria included adults aged 18 years and above who had been clinically diagnosed with hypertension, who were capable of providing informed consent and who were willing to participate in all phases of the study. Patients were excluded if they had severe comorbidities such as advanced heart failure or chronic kidney disease, if they had cognitive impairments that limited their ability to complete questionnaires or if they had previously participated in similar structured educational programs.

Additional clinical conditions that could substantially limit participation in lifestyle modification, such as severe mobility-limiting musculoskeletal disorders or advanced chronic respiratory disease, were also considered during screening when documented in patient records.

In total, 75 patients fulfilled the eligibility criteria and completed both the pre-intervention and post-intervention assessments. All eligible participants approached during the recruitment period agreed to participate and no enrolled participants were lost to follow-up between pre- and post-intervention assessments.

Sample Size Calculation

The required sample size was estimated for a one-group pre-post comparison (paired design). A priori power analysis was conducted with a two-sided significance level of $\alpha = 0.05$, desired power of 0.80 and a moderate standardized mean change (Cohen's $d = 0.50$) for the difference scores [25,26]. The calculation indicated that at least 32 paired observations were required. To account for potential deviations from normality (Wilcoxon signed-rank test) and possible participant attrition, the target sample size was conservatively increased by ~15%, yielding a minimum requirement of 37 participants. Ultimately, 75 patients completed both pre- and post-intervention assessments, which provided >80% power to detect even modest effects ($d \approx 0.33$) and >90% power for moderate or larger effects ($d \geq 0.40$) [25-27].

Intervention

To ensure consistency of delivery, a structured session outline was developed in advance, specifying key content areas, learning objectives and discussion points for each session. All participant groups received the same core curriculum covering diet, physical activity, medication adherence, blood pressure monitoring, stress management and smoking cessation. Educational materials, including printed leaflets and visual aids, were standardized across sessions. A checklist was used by the educators to confirm that all planned topics were covered during each session, thereby promoting fidelity of intervention delivery across different participant groups. The intervention consisted of a structured health education program that was developed in alignment with international hypertension management guidelines and prior evidence from educational interventions [28-32]. The program was designed to address five key domains: lifestyle modification, dietary practices, physical activity, stress management and smoking cessation. Educational sessions were delivered in small groups by trained nursing staff using a combination of interactive lectures, group discussions, printed informational leaflets and practical demonstrations (Table 1). Each session lasted between 45 and 60 minutes and all participants were required to attend at least two sessions over a four-week period. Attendance was recorded for each session and all participants attended at least two sessions depending on scheduling availability within the program period.

Table 1: Content of the nurse-led health education intervention for hypertensive patients.

Domain	Key components	Practical strategies / examples
Lifestyle Modification	Gradual lifestyle changes; sleep hygiene; balanced routines; social/family support; community engagement.	Begin with small habits (e.g., 10 min daily walk); aim for 7-8 hours of sleep; use weekly schedules; share goals with family; join community groups.
Nutrition and Diet	Emphasis on fruits, vegetables, whole grains, lean proteins, low-fat dairy; sodium <1500-2300 mg/day; heart-healthy fats; hydration; reduced processed foods and sugars.	Use herbs/spices instead of salt; read food labels for low-sodium options; increase potassium-rich foods (bananas, spinach, beans); replace fried foods with baked/grilled options; avoid sugary drinks and excessive caffeine.
Physical Activity	Aerobic exercise (150 min/week), strength training, flexibility/stretching, mind-body exercises, daily movement; precautions for hypertensive patients.	Walking, cycling, swimming or dancing 30 min/day; 2-3 stretching/yoga sessions per week; warm-up/cool-down routines; monitor blood pressure before/after exercise; stay hydrated.
Stress Management	Mind-body techniques; mindfulness and meditation; deep breathing; progressive muscle relaxation (PMR); healthy sleep; social connection; supportive nutrition.	Practice meditation/breathing 10-20 min daily; use PMR during stress; establish bedtime routine (7-9 hours sleep); talk to family/friends; join support groups; include stress-reducing foods (fish, nuts, dark chocolate).
Medication Management	Adherence to prescriptions; awareness of rebound hypertension if doses missed; monitoring side effects; patient-provider communication.	Use phone apps or alarms for reminders; never stop medications suddenly; consult provider for dizziness/fatigue; regular medication reviews; lifestyle changes to support effectiveness.
Alcohol and Tobacco Use	Risks of smoking (heart disease, stroke, cancers, blood clotting) and alcohol (narrowing vessels, elevated BP, added risk >35 years).	Quit smoking with counseling/support; avoid secondhand smoke; limit or eliminate alcohol; replace with water/herbal tea; seek support groups for cessation.

To ensure consistency of delivery, a structured session outline was developed in advance specifying key content areas, learning objectives and discussion points for each session. All participant groups received the same core curriculum covering diet, physical activity, medication adherence, blood pressure monitoring, stress management and smoking cessation. Educational materials and visual aids were standardized across sessions and a delivery checklist was used to confirm that all planned topics were covered during each session, thereby promoting fidelity of intervention implementation.

The sessions were delivered by registered nursing staff who received preparatory training prior to program implementation. Training was conducted by the principal investigator and included orientation to intervention objectives, review of session content, use of educational materials and guidance on standardized delivery and participant engagement techniques. Training lasted approximately 6 hours and included mock teaching demonstrations and discussion of frequently asked patient questions. A written facilitator guide was provided to support consistent delivery across sessions and minimize variability between educators.

Participants continued to receive routine clinical care during the study period. To reduce potential contamination, the educational sessions were conducted as structured group sessions distinct from routine physician consultations and no additional structured education program was introduced during the study period outside the intervention sessions.

Data Collection Tool

Data were collected using a structured questionnaire developed by the researchers and adapted from validated instruments widely used in previous hypertension attitude studies [33-35] and adapted to be culturally appropriate for the study population. The questionnaire was developed to ensure both theoretical relevance and practical applicability, integrating items that capture patients' attitudes regarding hypertension management. The questionnaires comprised two sections. The first section collected sociodemographic and clinical information, including age, sex, marital status, education level, place of residence (urban/rural), occupation and family history of hypertension. The second section assessed patients' attitudes toward hypertension management using a series of five-point Likert-scale items (1 = Strongly disagree to 5 = Strongly agree), evaluating dimensions such as treatment adherence, lifestyle modification, medication compliance and perceived barriers to disease control. Completion time was approximately 15-20 minutes for literate participants.

To ensure linguistic, semantic and conceptual equivalence, the questionnaire underwent forward translation into Kurdish (Sorani dialect) and back-translation into English by two independent bilingual translators. Discrepancies were reviewed and reconciled by the research

team to maintain clarity, accuracy and cultural relevance. Content validity was established through evaluation by a panel of three experts in nursing, public health and clinical medicine, who assessed each item for clarity, relevance, comprehensiveness and cultural appropriateness. Minor adjustments were made based on expert recommendations to enhance interpretability and contextual relevance. Prior to the main study, a pilot study with 10 hypertensive patients (excluded from the final sample) was conducted to assess clarity, readability and cultural relevance. Feedback from the pilot led to minor revisions in wording and item sequencing to enhance comprehension and minimize respondent burden. The Internal consistency of the attitude section was satisfactory, with a Cronbach's alpha of 0.82, indicating good coherence of items. The questionnaire was self-administered by literate participants, while illiterate participants were interviewed directly by the researcher using the same standardized items, ensuring consistent data collection and inclusivity.

Data Analysis

Data were coded and entered into the Statistical Package for the Social Sciences (SPSS), version 27.0, for analysis. Descriptive statistics were used to summarize participants' sociodemographic and clinical characteristics, with categorical variables presented as frequencies and percentages and continuous variables expressed as means and standard deviations. The Shapiro-Wilk test was applied to assess normality of distribution for the continuous variables. As the data were not normally distributed, non-parametric tests were selected for inferential analysis. The Wilcoxon signed-rank test was used to compare pre-intervention and post-intervention attitude scores, while the Mann-Whitney U test was employed to examine subgroup differences such as age group or sex. In addition, effect size (r) was calculated to quantify the magnitude of attitudinal change. All statistical tests were two-tailed, with a significance threshold set at $p < 0.05$.

Ethical Considerations

Ethical approval for this study was obtained from the Ethics Committee of the College of Nursing, University of Raparin (Reference No: 2866/28-5-2-23). All participants were informed of the purpose of the study and were assured of the confidentiality and anonymity of their responses. Written informed consent was obtained from each participant prior to enrollment and all study procedures adhered to the ethical principles outlined in the Declaration of Helsinki.

RESULTS

Sociodemographic and Clinical Characteristics

Seventy-five hypertensive patients participated in the study. The mean age of the participants was 58.9 ± 9.8 years (range 34-78), with the largest proportion belonging to the

Table 2: Demographic and Baseline Clinical Characteristics of Hypertensive Patients

Variables	Groups	Frequency	Percentage
Age groups	27-41	3	4.0%
	42-56	31	41.3%
	57-71	32	42.7%
	72-86	9	12.0%
	87+	0	0.0%
	Mean±SD (Min-Max) 58.88±9.76 (34-78)		
Gender	Male	27	36.0%
	Female	48	64.0%
Educational level	Illiterate	2	2.7%
	Able to read and write	56	74.7%
	primary graduate	9	12.0%
	Secondary graduate	4	5.3%
	institute graduate	3	4.0%
	University graduate and above	1	1.3%
Marital Status	Single	1	1.3%
	Married	74	98.7%
Occupation	Employed	0	0.0%
	Government employed	11	14.7%
	Self-employed	6	8.0%
	Jobless	0	0.0%
	Retired	16	21.3%
	Housewife	42	56.0%
	Un employed	0	0.0%
Monthly income as a participant	Sufficient	33	44.0%
	Barely insufficient	31	41.3%
	Insufficient	11	14.7%
Residential Area	Urban	74	98.7%
	Sub-urban	1	1.3%
	Rural	0	0.0%
Hypertension Rates (mmHg)	140/90	0	0.0%
	145/95	0	0.0%
	150/100	8	10.7%
	155/105	29	38.7%
	160/110 above	38	50.7%

57-71 year age group. The sample was predominantly female (64.0%) and nearly all participants were married (98.7%). In terms of education, the majority were able to read and write (74.7%), while only a small minority held higher educational qualifications. More than half of the participants were housewives (56.0%), followed by retirees (21.3%) and government employees (14.7%). Regarding economic status, 44.0% reported sufficient income, while 56.0% described their income as either barely sufficient or insufficient. Almost all participants resided in urban areas (98.7%). Importantly, more than half of the sample (50.7%) presented with severe hypertension ($\geq 160/110$ mmHg), underscoring the clinical vulnerability of this population. Detailed baseline demographic and clinical characteristics are provided in Table 2.

Clinical History and Lifestyle Characteristics

A strong familial component of hypertension was observed, with 81.3% reporting a positive family history. The majority of patients (69.3%) had lived with hypertension for more than five years, reflecting a population with long-standing disease. All participants reported taking oral antihypertensive medications, while none were treated with injections or alternative therapies. Most participants (61.3%) had a normal body mass index, whereas 36.0% were overweight and very few fell into obesity categories.

Strikingly, a very high prevalence of cigarette smoking was noted, with 93.3% identified as current smokers. By contrast, alcohol use was rare, with 98.7% reporting abstinence. Physicians were overwhelmingly the main source of hypertension-related information (96.0%), while nurses and other sources contributed minimally. These findings are summarized in Table 3.

Changes in Attitudes Toward Hypertension Management

Marked improvements in patient attitudes toward hypertension management were observed following the structured health education program. Prior to the intervention, participants demonstrated neutral or negative orientations toward exercise, diet modification, regular monitoring and healthcare visits. After the intervention, significant positive shifts were documented across all domains. For example, agreement with the importance of regular exercise increased dramatically from 6.7% pre-intervention to 92.0% post-intervention, while recognition of the need for dietary control rose from 5.3-90.7%. Similarly, attitudes toward salt restriction, fat reduction and vegetable intake improved substantially. Despite these gains, barriers such as "lack of time for exercise" persisted among more than half of the participants. Full item-level comparisons of attitudes are presented in Table 4.

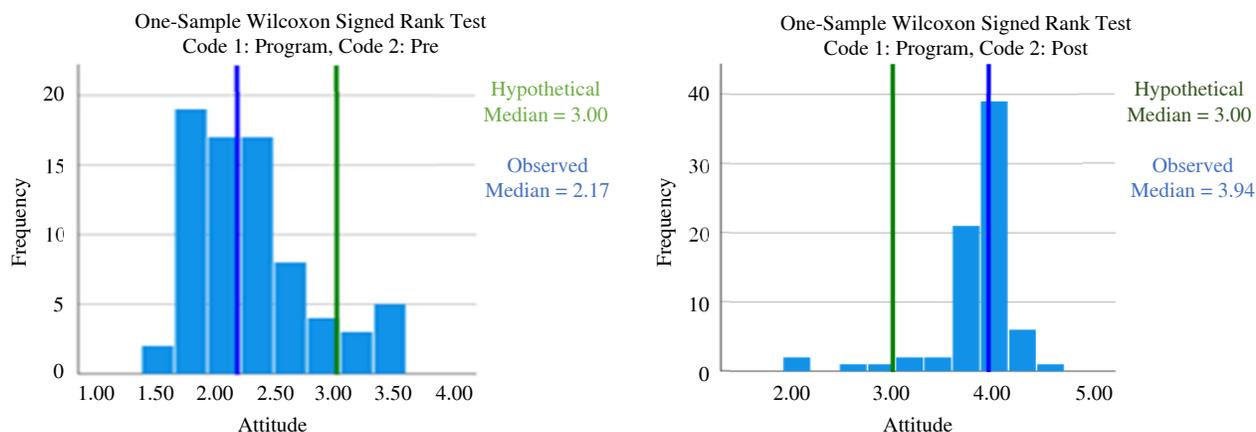


Figure 1: Pre- and Post-Test Attitude Scores of Hypertensive Patients: Wilcoxon Signed-Rank Test Results

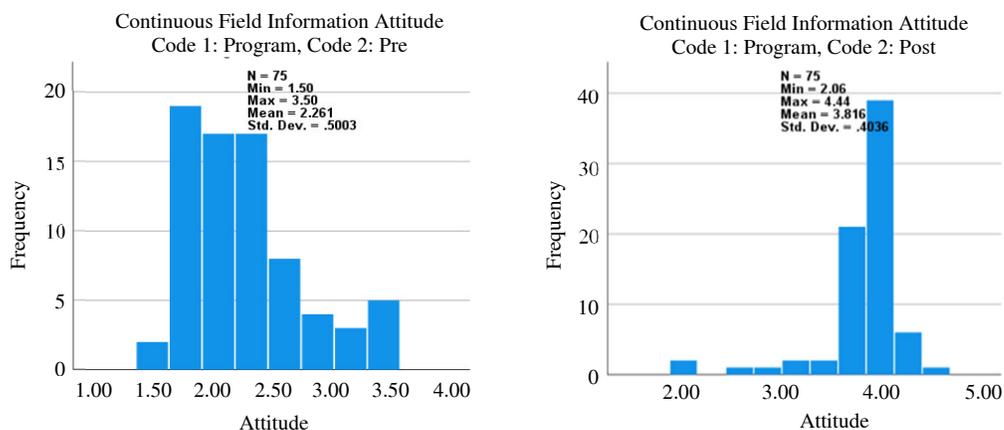


Figure 2: Distribution of Attitude Scores Among Patients Before and After the Health Education Program

Table 3: Clinical History, Treatment Modalities, Lifestyle Factors and Sources of Information Among Participants

Variables	Groups	Frequency	Percentage
Family history hypertension	No	14	18.7%
	Yes	61	81.3%
Diagnosed with hypertension in years	less than 1 year	1	1.3%
	1-5 years	22	29.3%
	More than 5 years	52	69.3%
Treatment method	Naturally	0	0.0%
	Tablet	75	100.0%
	Injection	0	0.0%
Body Mass Index	Under weight	0	0.0%
	Normal weight	46	61.3%
	Overweight	27	36.0%
	Obesity I	1	1.3%
	Obesity II	1	1.3%
Cigarette Smoking	Smoker	70	93.3%
	Non-smoker	5	6.7%
	Ex-smoker	0	0.0%
Drinking alcohol	No	74	98.7%
	Yes	1	1.3%
Source of your information about the Disease	Physicians	72	96.0%
	Nurse	2	2.7%
	Others	1	1.3%

Statistical Comparisons of Attitude Scores

Pre-intervention, the mean attitude score was 2.26±0.50, which significantly increased to 3.82±0.40 post-intervention. The Mann-Whitney U test confirmed the

highly significant difference (Z = -10.210, p<0.001), as shown in Table 5. The Wilcoxon signed-rank test further supported this finding, demonstrating a highly significant improvement (Z = -7.521,

Table 4: Changes in Participants' Attitudes Toward Hypertension Management Before and After the Health Education Program

N	Item	Pre										Post intervention									
		Disagree		Strongly Disagree		Neutral		Agree		Strongly Agree		Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
		F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
1	I think exercise is important to help to lower the blood pressure	40	53.3%	1	1.3%	34	45.3%	0	0.0%	0	0.0%	1	1.3%	3	4.0%	3	4.0%	65	86.7%	3	4.0%
2	I think I should increase fresh vegetable intake to control hypertension	47	62.7%	3	4.0%	20	26.7%	5	6.7%	0	0.0%	1	1.3%	0	0.0%	3	4.0%	68	90.7%	3	4.0%
3	I think I should exercise regularly for a healthy life	46	61.3%	2	2.7%	22	29.3%	5	6.7%	0	0.0%	3	4.0%	1	1.3%	2	2.7%	66	88.0%	3	4.0%
4	I need to control salt intake to reduce blood pressure	47	62.7%	4	5.3%	17	22.7%	7	9.3%	0	0.0%	1	1.3%	2	2.7%	2	2.7%	67	89.3%	3	4.0%
5	I think diet control will improve the condition of hypertension	48	64.0%	4	5.3%	19	25.3%	4	5.3%	0	0.0%	2	2.7%	2	2.7%	3	4.0%	65	86.7%	3	4.0%
6	I think it is important to monitor my blood pressure reading regularly	42	56.0%	4	5.3%	25	33.3%	4	5.3%	0	0.0%	3	4.0%	2	2.7%	2	2.7%	66	88.0%	2	2.7%
7	I think I should take less oily food for a healthy heart	40	53.3%	2	2.7%	29	38.7%	4	5.3%	0	0.0%	3	4.0%	2	2.7%	2	2.7%	66	88.0%	2	2.7%
8	I think I should increase fresh fruit intake to control hypertension	38	50.7%	5	6.7%	26	34.7%	6	8.0%	0	0.0%	2	2.7%	2	2.7%	2	2.7%	65	86.7%	4	5.3%
9	I think controlling high-fat food consumption is essential to control blood pressure	40	53.3%	4	5.3%	26	34.7%	4	5.3%	1	1.3%	1	1.3%	3	4.0%	2	2.7%	65	86.7%	4	5.3%
10	I think I should visit a doctor or other healthcare provider regularly	33	44.0%	5	6.7%	32	42.7%	4	5.3%	1	1.3%	3	4.0%	3	4.0%	3	4.0%	64	85.3%	2	2.7%
11	I think eating a low salt diet will keep my heart healthy	37	49.3%	3	4.0%	32	42.7%	3	4.0%	0	0.0%	6	8.0%	1	1.3%	33	44.0%	29	38.7%	6	8.0%
12	I think I should make healthy choices when eating outside	29	38.7%	11	14.7%	27	36.0%	8	10.7%	0	0.0%	3	4.0%	5	6.7%	17	22.7%	42	56.0%	8	10.7%
13	I think I should start making changes in my lifestyle	34	45.3%	5	6.7%	29	38.7%	7	9.3%	0	0.0%	3	4.0%	3	4.0%	4	5.3%	63	84.0%	2	2.7%
14	I prefer to see a clear warning label if foods are a low-salt selection on the package	36	48.0%	9	12.0%	22	29.3%	6	8.0%	2	2.7%	2	2.7%	3	4.0%	24	32.0%	45	60.0%	1	1.3%
15	I would rather rest at home than doing exercise	32	42.7%	6	8.0%	25	33.3%	12	16.0%	0	0.0%	14	18.7%	18	24.0%	37	49.3%	6	8.0%	0	0.0%
16	I think medications alone can control hypertension	34	45.3%	5	6.7%	26	34.7%	10	13.3%	0	0.0%	23	30.7%	41	54.7%	6	8.0%	5	6.7%	0	0.0%
17	I think I do not have time for exercising	32	42.7%	2	2.7%	30	40.0%	11	14.7%	0	0.0%	41	54.7%	21	28.0%	4	5.3%	9	12.0%	0	0.0%
18	should exercise at least 3 times a week 30 minutes each time	39	52.0%	2	2.7%	26	34.7%	8	10.7%	0	0.0%	3	4.0%	4	5.3%	4	5.3%	61	81.3%	3	4.0%

Table 5: Comparison of Pre- and Post-Intervention Attitude Scores using the Mann-Whitney U-Test

Variables	N	Mean	SD	Mean Rank	Mann-Whitney U	Z	p-value
Pre-intervention	75	2.262	0.500	73.35	2651.0	-0.608	0.543
Post-intervention	75	3.816	0.404	111.66	100.5	-10.210	<0.001

Table 6: Within-Group Changes in Attitude Scores Assessed by the Wilcoxon Signed-Rank Test

Variables	N	Mean	Mean Rank	SD	Z	p-value	Effect Size
Pre-intervention	75	2.262	1.00	0.500	-7.521	<0.001	0.868
Post-intervention	75	3.816	38.50	0.404			

Table 7: Pre- and Post-Program Distribution of Attitude Categories (Good vs. Poor)

Variables		Pre-intervention		Post-intervention		p-value
		frequency	%	frequency	%	
Attitude	Poor	45	60	23	30.67	0.0001
	Good	30	40	52	69.33	

Table 8: Comparison of Pre- and Post-Intervention Attitude Scores Among Hypertensive Patients

Variable	Pre-intervention				Post-intervention				Mean difference	p-value
Attitude	Mean	SD	Max	Min	Mean	SD	Max	Min	27.97	0.0001
	40.71	9.01	63	27	68.68	7.27	80	37		

$p < 0.001$), with a large effect size ($r = 0.868$), indicating a robust and clinically meaningful change (Table 6). The distribution of scores is illustrated in Figure 1, where the post-test median exceeded the reference value and Figure 2, which demonstrates the right-shifted distribution of attitudes, highlighting the broad-based impact of the intervention.

Overall Program Effectiveness

When analyzed categorically, the proportion of participants classified as having a “good” attitude increased from 40.0% at baseline to 69.3% post-intervention, while those categorized as “poor” declined from 60.0-30.7% ($p < 0.001$) (Table 7). The mean composite score for attitudes increased from 40.71 ± 9.01 to 68.68 ± 7.27 , representing a mean difference of 27.97 points ($p < 0.001$), confirming the strong and consistent effect of the intervention (Table 8).

DISCUSSION

This study provides compelling evidence that a structured health education program can produce substantial improvements in hypertensive patients’ attitudes toward disease management. Attitude scores rose significantly after the intervention, with a large effect size ($r = 0.868$), highlights the transformative potential of targeted, nurse-led education in reshaping patient beliefs and readiness for behavioral change. The findings are particularly important in the context of the Kurdistan Region of Iraq, where hypertension prevalence is rising and structured educational initiatives remain scarce.

Globally, hypertension continues to be a leading preventable cause of morbidity and mortality, accounting for over 10 million deaths annually [1]. The challenge of inadequate awareness and poor adherence to lifestyle modification is well documented. Our findings align with large-scale studies such as those by Kebede *et al.* [36] and Ojangba *et al.* [37], which emphasized that effective non-

pharmacological management depends not only on clinical advice but also on patients’ attitudes and willingness to adhere to recommended changes. Similarly, Solhi *et al.* [38] highlighted that self-care behaviors-diet control, physical activity and stress reduction-are shaped primarily by patient attitudes, which can be influenced by structured education. The present study confirms these insights in a Middle Eastern context, demonstrating that attitudinal change is achievable even in resource-constrained health systems.

In the Middle East, patient attitudes toward hypertension remain a major barrier to effective control. Research in Iraq [20,21,39] and other countries consistently shows that although knowledge about hypertension may be present, it rarely translates into sustained behavioral practice [40]. Our findings add to this regional evidence by showing that attitudes can indeed be reshaped through structured, nurse-led education. By documenting significant gains in attitudes toward exercise, diet modification and routine monitoring, this study demonstrates that simple, low-cost interventions can overcome long-standing behavioral inertia.

Despite the strong improvements, some challenges persisted. A notable proportion of participants continued to agree that they lacked time for exercise and approximately one-third maintained the belief that medications alone are sufficient to control hypertension. These findings suggest that while educational programs can shift beliefs, structural, cultural and psychosocial barriers remain influential. For example, time constraints linked to occupation or household responsibilities, entrenched cultural norms around physical activity and the widespread reliance on pharmacological solutions may undermine behavior change. This highlights the need for multifaceted interventions that integrate education with community engagement, family support, workplace wellness policies and culturally tailored health promotion campaigns.

This study has several strengths. First, it employed a validated and reliable instrument to measure attitudes, with

strong internal consistency (Cronbach's $\alpha = 0.82$). Second, the program was designed and delivered in a culturally sensitive, nurse-led format, ensuring acceptability and feasibility within local health systems. Third, the use of effect size measures alongside non-parametric statistical tests provides robust evidence of the program's impact. Finally, the study adds to the limited body of evidence from Iraq and the Kurdistan Region, offering context-specific data that can inform national and regional strategies for hypertension control.

However, several limitations should be acknowledged. The quasi-experimental design without a control group limits the ability to establish causality, as external factors may have contributed to the observed improvements. The reliance on self-reported attitudes introduces the possibility of social desirability bias, especially post-intervention. The short follow-up period did not allow for evaluation of the sustainability of attitudinal changes or their translation into tangible health outcomes such as improved blood pressure control or reduced cardiovascular events. Additionally, the sample was drawn from a single city, with a high prevalence of smoking, which may limit the generalizability of the findings to other populations.

Despite these limitations, the findings carry important implications. Health education should be recognized as an integral component of hypertension management in Iraq and similar settings. Nurse-led interventions are both feasible and effective and can be scaled through primary healthcare systems [41]. Integrating structured education and mobile health applications into routine care could strengthen patients' self-management capacity, improve adherence and ultimately reduce the burden of uncontrolled hypertension [30,42,43]. Policymakers should prioritize capacity building for nurses and primary care providers, alongside public health campaigns that address structural barriers such as sedentary lifestyles, dietary practices and high smoking prevalence.

Future research should adopt randomized controlled designs with larger and more diverse samples and extend follow-up to assess the long-term sustainability of attitudinal changes and their impact on clinical outcomes. Studies should also explore innovative approaches such as digital health interventions, mobile health applications and family-centered programs, which may reinforce positive attitudes and translate them into sustained behavior change. Furthermore, qualitative research could provide deeper insights into the cultural and social determinants of patients' attitudes, guiding the design of tailored interventions.

CONCLUSIONS

This study shows that a structured nurse-led health education program significantly improved hypertensive patients' attitudes toward lifestyle modification and disease management in the Kurdistan Region of Iraq. These findings

highlight the value of integrating structured education into primary care as a low-cost strategy to strengthen self-management and support hypertension control. Future research with longer follow-up and broader populations is needed to confirm sustainability and translate attitudinal gains into measurable clinical outcomes.

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Ethical Approval and Consent to Participate

The study protocol was reviewed and approved by the Research Ethics Committee of the College of Nursing, University of Raparin, Kurdistan Region, Iraq (Reference No: 2866/28-5-2-23). Written informed consent was obtained from all participants prior to enrollment and confidentiality was assured throughout the study. The study was conducted in accordance with the Declaration of Helsinki.

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