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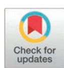

Effectiveness of a Home Visit Program Integrated With Primary Health Care in Improving Physical Activity of the Elderly With Hypertension: A Randomized Controlled Trial

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Abstract

Introduction: The prevalence of hypertension (HTN) increases with age. This study evaluated the effectiveness of a home visit program integrated with primary health care (PHC) in improving physical activities in the elderly with HTN.

Methods: This randomized controlled trial was conducted on 108 hypertensive elderly participants in Khorramabad from May to October 2023. They were selected using stratified, multi-stage cluster sampling, and the intervention was designed based on the Health Belief Model. The primary outcome was the change in physical activity, measured by the Physical Activity Scale for the Elderly. The data were analyzed by SPSS 19 using an independent t-test, the Mann-Whitney test, ANOVA, and the generalized estimating equations model.

Results: In the final analysis of 90 individuals, the integrated home visit program within the PHC structure could significantly increase the likelihood of engaging in overall physical activity (OR = 1.84; 95% CI: 1.27-2.66; *P* = 0.001) and leisure-time physical activity (OR = 1.81; 95% CI: 1.15-2.85; *P* = 0.01) compared to the control group. Based on the analysis of factors associated with the primary outcome, higher education (OR = 1.85, 95% CI: 1.3-3.4, *P* = 0.012), home ownership (OR = 6.9, 95% CI: 2.88.1-16.73, *P* = 0.001), and having health insurance (OR = 1.75, 95% CI: 1.26-2.42, *P* = 0.001) were independently associated with increased odds of achieving a clinically considerable improvement in leisure-time activity.

Conclusion: Overall, integrating a home visiting program into the PHC structure noticeably improved overall physical activity levels among older adults with HTN. Therefore, it is suggested that this model be used to improve physical activity in this population.

Trial Registration: Identifier: IRCT20180721040540N4; https://irct.behdasht.gov.ir/user/trial/45393/view (Registration date 2020-05-21).

Keywords: Elderly, Nurse, Home visit, Primary health care, Hypertension

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Introduction

The aging phenomenon is rapidly increasing worldwide (1). According to the United Nations, old age is defined as 60 years of age or older (2). Similarly, Iran is experiencing a growing trend of aging, so that people older than 60 years comprise 10% of the country's population (3). This demographic shift is associated with an increased prevalence of chronic diseases, particularly high blood pressure (BP) (4). Globally, high BP is a leading cause of premature death and disability, affecting more than one billion people and considerably contributing to cerebrovascular and cardiovascular diseases (5).

In Iran, the condition is highly prevalent among the elderly, with one study reporting a rate of 81.08% (6). Even a small reduction in BP can have noticeable health benefits. A 10-mm Hg decline in systolic pressure can reduce the risk of serious cardiovascular disease by approximately 20% and all-cause mortality by 13% (7).

Both non-modifiable (e.g., age, gender, and ethnicity) and modifiable (e.g., lifestyle) factors can influence BP.

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Physical inactivity is one of the vital modifiable risk factors of hypertension (HTN). Regular physical activity is crucial for controlling BP and preventing complications (8). Physical activity is defined as any body movement performed by the musculoskeletal system, including those conducted during leisure time or at the workplace (9). However, activity levels decrease with age due to various barriers, including lack of motivation, fear of injury, and limited access to appropriate facilities or programs (10).

The World Health Organization's "Global Action Plan on Physical Activity 2018-2030" emphasizes the urgent need to create active communities and environments in order to promote physical activity at all ages, especially in older populations (11).

Home visiting is a recognized method for providing follow-up care and health promotion at the community level (12). It should be noted that integrating such programs within a country's established primary health care (PHC) system offers a strategic approach to reach vulnerable populations efficiently (13).

Iran's health system has a well-defined PHC structure, with comprehensive health centers responsible for delivering services to specific geographic regions (14,15).

This infrastructure provides a viable platform for implementing and sustaining community-based interventions (16). While previous studies have explored various strategies (e.g., telemonitoring or standalone community programs), the direct integration of a structured home-visit program into the existing PHC framework for managing HTN remains underexplored (12,17).

Previous interventions for hypertensive elderly individuals frequently exist outside of or parallel to formal health systems. In this study, health services have been provided through the integration of home visits with PHC, with a direct focus on promoting physical activity in the elderly. This approach moves beyond isolated projects, testing a strategy that can be potentially institutionalized. Furthermore, although the benefits of physical activity are well established, there is a lack of strong evidence from randomized controlled trials in the Iranian context evaluating the effectiveness of combining home visits with PHC to improve lifestyle behaviors. Therefore, this study aims to determine the effectiveness of a home visit program integrated with PHC in improving physical activity among Iranian elderly with HTN.

Materials and Methods

This single-blind, randomized clinical trial was conducted on a population of elderly patients with HTN between May and October 2023. In this design, the participants were blinded to their group allocation, and the sample size was estimated using a power analysis for generalized estimating equations (GEE). A minimum of 90 participants was required, assuming a moderate effect size (Cohen's *d* = 0.5), four measurement timepoints, an intra-subject correlation of 0.6, an alpha of 0.05, and a power rate of 80%. To accommodate an anticipated 20% attrition rate, the final sample was increased to 108 participants (n = 54 per group).

Eligible participants were hypertensive older adults (60–84 years) registered in the Integrated Health System (SIB) who provided consent and were independent in daily activities. However, individuals (or their family members) with prior involvement in similar educational sessions were ineligible. In addition, participants were excluded post-enrollment if they missed two or more sessions, were lost to follow up, or developed serious physical or cognitive deficits.

Sampling

A stratified multi-stage cluster sampling method was employed for participant recruitment. First, the city of Khorramabad was stratified into northern, central, and southern regions. From these strata, 15 health service units were randomly selected from a total of 39. Eligible hypertensive older adults were identified from these units via the SIB electronic health registry, screened against the study criteria, and provided informed consent, yielding a final sample of 108 participants.

The participants were allocated to the intervention or control group via stratified block randomization. Stratification was based on gender and HTN stage, creating four strata. Within each stratum, a computer-generated sequence with fixed block sizes of four ensured balanced allocation. An independent researcher prepared sequentially numbered, concealed envelopes, which were opened only after enrollment to minimize selection bias.

Data Collection

The required data were collected using a two-part instrument comprising a demographic/health questionnaire and the Physical Activity Scale for the Elderly (PASE). The questionnaire gathered information on sociodemographic (e.g., age, education, and income) and clinical characteristics (e.g., duration of HTN and comorbidities).

The PASE was initially developed by Washburn et al (18). It is a standardized instrument whose English version was first translated into Farsi and psychometrically evaluated by Hatami et al (19), reporting a Cronbach's alpha coefficient of 94%, an intraclass correlation coefficient of 0.99, and a test-retest correlation coefficient of 0.94. Although the PASE has been previously validated in an Iranian elderly population, a pilot test was conducted to confirm the cultural relevance and clarity of the items for our specific context. Minor linguistic adjustments were made based on this pilot study in order to enhance participant comprehension.

The PASE is a composite scale evaluating leisure-time, household, and work-related activities over the past week. Leisure activities are scored on a Likert-type scale (0–3), while household and work-related activities are binary (yes/no). A total score (range: 0–400) is calculated by

summing weighted activity scores, with higher scores indicating greater physical activity. The PASE was administered at baseline and at 1 month, 2 months, and 3 months post-intervention.

Intervention

The home-visit intervention, developed in coordination with comprehensive health centers, was grounded in the Health Belief Model and focused on promoting physical activity in leisure, home, and workplace contexts. A community health nurse identified potential participants via the SIB registry, obtained informed consent from them, and was responsible for the planning, implementation, and evaluation of the program.

In addition, an introductory session was conducted by a multidisciplinary team, including a community health nurse, physician, psychologist, and nutritionist. Moreover, the team performed a comprehensive needs assessment and provided education on the health system, the patient's condition, and relevant self-care instructions.

Furthermore, a community health nurse conducted home visits at least twice weekly over the three-month intervention period, resulting in a minimum of 24 visits per participant (Table 1). It is noteworthy that visit frequency was tailored to individual patient needs and conditions. Participants in the intervention group received a researcher-developed educational booklet, which provided scientifically grounded, easy-to-understand guidance on using physical activity (during leisure, at home, and at work) to manage HTN and improve lifestyle. Intervention fidelity was ensured through the use of standardized protocols, structured checklists, and supervisory audits conducted by independent staff. Additionally, patients and caregivers had access to the community health nurse for ongoing support via phone or WhatsApp throughout the study period. The control group received usual care. Outcomes were assessed at baseline and 1 month, 2 months, and 3 months post-intervention.

The obtained data were analyzed using SPSS, version 19. Descriptive statistics were used to summarize baseline characteristics. In addition, the Kolmogorov-Smirnov test was applied to assess the normality of continuous variables. For baseline comparisons between the intervention and control groups, the chi-square test was utilized for categorical variables. Further, an independent t-test or Mann-Whitney U test was used for continuous variables depending on distribution.

To evaluate the effect of the intervention over time, the GEE model with a cumulative logit link function was employed as the primary analysis, accounting for repeated measures and within-subject correlations. Eventually, interaction terms between time and group were included to assess differential trends, and a P value of < 0.05 was considered statistically significant.

Results

Of the 108 initially enrolled participants, 90 (83.3%) completed the study. This final sample size met the a priori requirement of 90 participants, ensuring the study remained adequately powered.

Attrition occurred due to death, migration, and coronavirus disease 2019 infection; however, as the target sample size was fulfilled, these cases were not replaced, and their data were omitted from the final analysis (Figure 1).

At baseline, no significant differences were observed between the intervention and control groups in terms of demographic characteristics ($P > 0.05$). Participants had a mean HTN duration of 10.79 ± 6.02 years. The cohort aged 60–84 years was predominantly married (76.7%), and a majority (56.7%) had an educational level below a diploma (Table 2).

Following the intervention, the proportion of participants in the intervention group with low physical activity decreased from 72.9% to 25%, while the proportion with moderate activity increased to 60.4% (Table 3).

The intervention group had 84% higher odds of high versus low overall physical activity than the control group over the study period (odds ratio [OR] = 1.84, 95% confidence interval [CI]: 1.27–2.66, $P = 0.001$), based on the GEE model (Table 4).

Using a GEE model, the analysis of leisure-time physical activity over time indicated the odds for the intervention group were 1.81 times those of the control group (OR = 1.81, 95% CI: 1.15–2.85, $P = 0.01$, Table 4).

Table 1. Home Visit and Intervention Program

Session Number	Place	Duration (min)	Content
First	Comprehensive health service center	20-40	• Performing the session immediately after the selection of patients as the intervention sample • Comprehensively assessing patients and families in terms of demographic information, clinical assessment, and blood pressure (BP) status of the patient • Being examined by the physician, nurse, psychologist, and nutritionist
Second	Comprehensive health service center	20-40	• Identifying patients' needs • Explaining about BP and methods for its prevention and control • Identifying barriers for controlling BP • Addressing the complications of high BP • Explaining about the benefits of physical activities in patients with BP
Third	Comprehensive health service center	30-50	• Explaining about how to do physical activities at the time of leisure, in the home environment, and at workplace • Consulting with the physician, nurse, psychologist, and nutritionist on how to control BP and do physical activities
24 times	Home visit	15-30	• Follow-up for re-planning, education, counseling, and patient evaluation

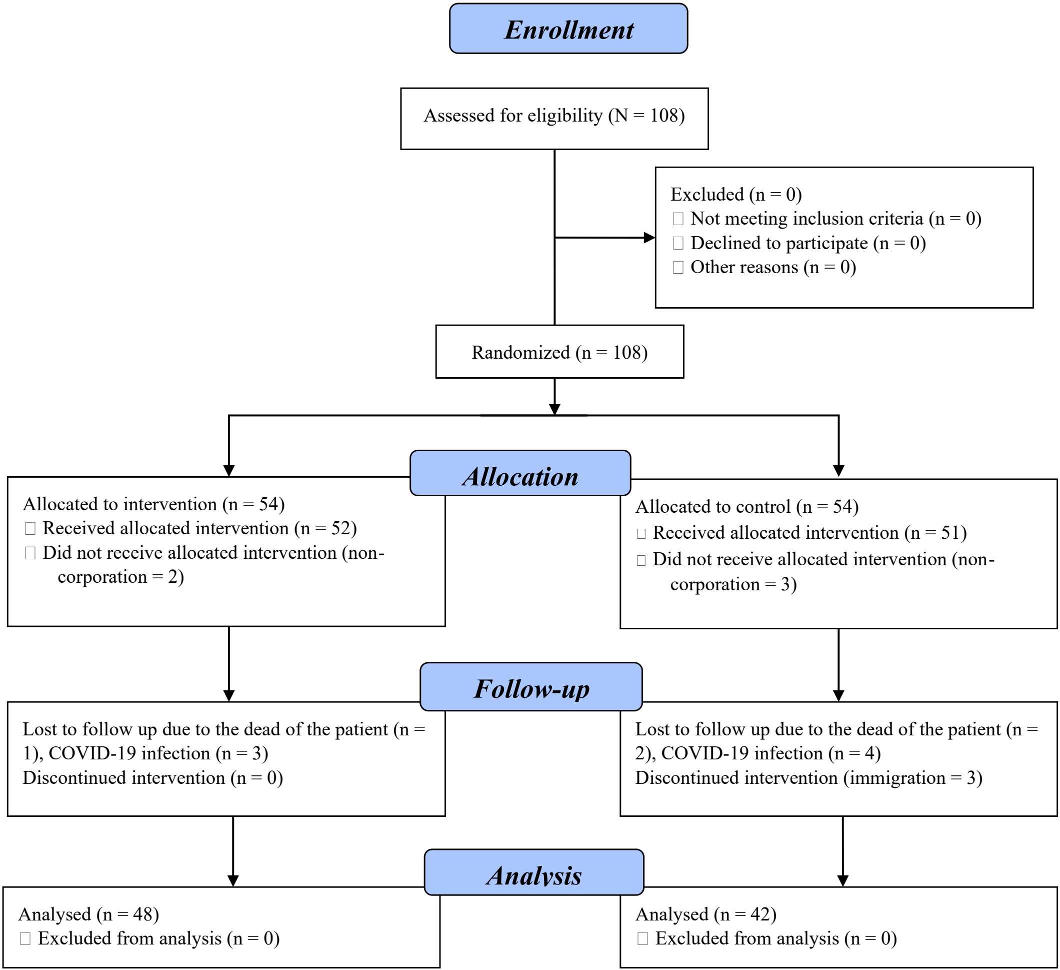

Figure 1. Flow Diagram of Subjects in the Trend of the Study According to CONSORT 2010. *Note*. CONSORT: Consolidated Standards of Reporting Trials

GEE analysis revealed several significant associations between demographic variables and physical activity subdomains over time (Table 5).

In the intervention group, higher leisure-time activity was significantly associated with a higher education level (OR = 1.85, P = 0.012), home ownership (OR = 6.9, P < 0.001), and health insurance (OR = 1.75, P < 0.001). However, marital status had different effects. More precisely, being single was a non-significant negative predictor in the intervention group (OR = 0.52, P = 0.051) but a significant positive predictor in the control group (OR = 2.47, P = 0.006).

For workplace activity within the intervention group, males had considerably higher odds than females (OR = 1.64, P < 0.001), while the younger age group (60–74 years) had lower odds (OR = 0.63, P = 0.026) than the older group (75–84 years). Regarding home activity, living alone was associated with significantly lower scores in the control group (OR = 0.65, P = 0.034).

A contrasting pattern was observed concerning health insurance and overall physical activity. Insurance was a negative predictor in the intervention group (OR = 0.2, P = 0.04) but a positive predictor in the control group (OR = 3.73, P = 0.011). Conversely, living alone was related to higher overall activity in the intervention group (OR = 1.81, P = 0.046).

Discussion

The findings of this randomized controlled trial demonstrated that integrating a home visiting program into the PHC structure could noticeably improve overall physical activity levels among older adults with HTN.

In this model, access to community-based services for patients with HTN was facilitated in a client-centered manner. However, these interventions improved leisure-time physical activity in older adults with HTN but made a slight change in physical activity at work or home. Thus, there is a need for more community-based interventions to encourage older adults with HTN to participate in physical activities in their own living environments.

The findings of the present study confirmed that a 3-month period of home visits encouraged the elderly suffering from HTN to have more physical activities during their leisure time, and education level and home ownership were positively related to leisure-time physical activities among the elderly. Leisure-time physical activity can be attributed to the intervention's focus on motivational training programs and participation in volunteer activities, which are consistent with the preferences of older adults (20).

Table 2. Demographic Information of Subjects

Variables	Categories	Groups		Total N (%)	Chi-square	*P* Value
		Intervention n (%)	Control n (%)			
Gender	Man	24 (50)	21 (50)	45 (50)	0	0.999
	Woman	24 (50)	21 (50)	45 (50)		
Age	60-74	24 (50)	22 (52.4)	46 (51.1)	0.051	0.836
	75–84	24 (50)	20 (47.6)	44 (48.9)		
Married	Single	0 (0)	1 (2.4)	1 (1.1)	1.31	0.725
	Married	38 (79.2)	31 (73.8)	69 (76.7)		
	Widow	9 (18.8)	9 (21.4)	18 (20)		
	Unknown	1 (2.1)	1 (2.4)	2 (2.2)		
Education statue	Illiterate	15 (31.3)	12 (28.6)	27 (30)	Z=0.3[a]	0.764[a]
	Under diploma	25 (52.1)	26 (61.9)	51 (56.7)		
	Diploma	5 (10.4)	4 (9.5)	9 (10)		
	University education	3 (6.3)	0 (0)	3 (3.3)		
Occupation	Employed	1 (2.1)	0 (0)	1 (1.1)	2.5	0.776
	Housekeeper	23 (47.9)	22 (52.4)	45 (50)		
	Retired	16 (33.3)	14 (33.3)	30 (33.3)		
	Self-employed	6 (12.5)	4 (9.5)	10 (11.1)		
	Unemployed	1 (2.2)	2 (4.8)	3 (3.3)		
	Other	1 (2.1)	0 (0)	1 (1.1)		
Income	Less than one million tomans	9 (18.8)	7 (16.7)	16 (17.8)	Z=0.07[a]	0.939[a]
	More than 2 million tomans	14 (29.2)	15 (35.7)	29 (32.2)		
	Between 2 and 3 million tomans	8 (16.7)	5 (11.9)	13 (14.4)		
	More than 3 million tomans	17 (35.4)	15 (35.7)	32 (35.6)		
Living situation	Alone	3 (6.3)	4 (9.5)	7 (7.8)	1.81	0.769
	Wife	12 (25)	10 (23.8)	22 (24.4)		
	Child	8 (16.7)	5 (11.9)	13 (14.4)		
	Wife and child	25 (52.1)	22 (52.4)	47 (52.5)		
	Other	0 (0)	1 (2.4)	1 (1.1)		
Housing	Personal	46 (95.8)	37 (88.1)	83 (92.2)	1.906	0.245
	Rental	2 (4.2)	5 (11.9)	7 (7.8)		
Insurance	Yes	44 (91.7)	37 (88.1)	81 (90)	0.317	0.729
	No	4 (8.3)	5 (11.9)	9 (10)		
Supplementary insurance	Yes	26 (54.2)	18 (42.9)	44 (48.9)	1.149	0.300
	No	22 (45.8)	24 (57.1)	46 (51.1)		
Family history	Yes	32 (66.7)	30 (71.4)	62 (68.9)	0.238	0.655
	No	16 (33.3)	12 (28.6)	28 (31.1)		
Underlying disease	Yes	39 (81.3)	32 (76.2)	7 (78.9)	0.344	0.611
	No	9 (18.8)	10 (23.8)	19 (21.1)		
Duration of the disease (year)		11.08±5.91	10.5±6.12	10.79±6.02	T=0.45[b]	0.647[b]

Note. [a] Mann-Whitney test; [b] Independent t-test.

The positive association between leisure-time physical activity and education level or home ownership indicates the fact that having resources and health literacy can be a desirable motivator for physical activity in older adults with HTN (21).

The findings of a study revealed that nearly half of the elderly never used sports equipment installed in parks, and some of them believed that such equipment was inapplicable for the use of the elderly (20). A number of organizations can be held responsible for establishing and expanding appropriate spaces and equipment for the physical activity of the elderly, demanding close inter-sectoral cooperation for achieving this goal and providing the elderly with the opportunity of safe participation in

Table 3. Rates of Physical Activity of Subjects in the Two Intervention and Control Groups in a Time Series

Variable	Level	Before the Intervention		One Month After the Intervention		Two Months After the Intervention		Three Months After the Intervention	
		Intervention n (%)	Control n (%)	Intervention n (%)	Control n (%)	Intervention n (%)	Control n (%)	Intervention n (%)	Control n (%)
Leisure time	Weak	38 (79.2)	34 (81)	31 (64.6)	33 (78.6)	29 (60.4)	36 (85.7)	19 (39.6)	34 (81)
	Average	8 (16.7)	5 (11.9)	16 (33.3)	6 (14.3)	16 (33.3)	6 (14.3)	26 (54.2)	6 (14.3)
	Good	2 (4.2)	3 (7.1)	1 (2.1)	3 (7.1)	3 (6.3)	0	3 (6.2)	2 (4.8)
Home activity	Weak	22 (45.8)	22 (52.4)	22 (45.8)	26 (61.9)	17 (35.4)	22 (52.4)	20 (41.7)	27 (64.3)
	Average	17 (35.4)	19 (45.2)	16 (33.3)	14 (13.3)	21 (43.8)	17 (40.5)	17 (35.4)	11 (62.2)
	Good	9 (18.8)	1 (2.4)	10 (20.8)	2 (4.8)	10 (20.8)	3 (7.1)	11 (22.9)	4 (9.5)
Work activity	Weak	37 (77.1)	32 (76.2)	35 (72.9)	33 (78.6)	35 (72.9)	32 (76.2)	36 (75)	34 (81)
	Average	8 (16.7)	5 (11.9)	11 (22.9)	6 (14.3)	11 (22.9)	7 (16.7)	10 (20.8)	6 (14.3)
	Good	3 (6.3)	5 (11.9)	2 (4.2)	3 (7.1)	2 (4.2)	3 (7.1)	2 (4.2)	2 (4.8)
Overall physical activity	Weak	35 (72.9)	29 (69)	22 (45.8)	34 (81)	23 (47.9)	35 (83.3)	12 (25)	31 (73.8)
	Average	9 (18.8)	13 (31)	24 (50)	5 (11.9)	22 (45.8)	7 (16.7)	29 (60.4)	9 (21.4)
	Good	4 (8.3)	0	2 (4.2)	3 (7.1)	3 (6.2)	0	7 (14.6)	2 (4.8)

Table 4. Comparison of Changes in the Activity Levels of the Elderly in the Two Study Groups at Different Times Using the GEE Model

Dimensions of Physical Activity	Variable	Groups	Variable Coefficient	Standard Deviation	95% Confidence Interval for the Odds Ratio	95% Confidence Interval for the Odds Ratio	*P* Value
Leisure time	Group	Control	Reference	-	-		
		Intervention	– 0.52	0.66	0.59	(0.16, 2.2)	0.434
	Time		– 0.079	0.17	0.92	(0.65, 1.3)	0.65
	Group in the time	Control	Reference	-	-		
		Intervention	0.59	0.23	1.81	(1.15, 2.85)	0.01*
Home activity	Group	Control	Reference	-	-		
		Intervention	0.56	0.43	1.75	(0.16, 4.08)	0.194
	Time	-	– 0.079	0.08	1.04	(0.88, 1.24)	0.614
	Group in the time	Control	Reference	-	-		
		Intervention	0.046	0.11	1.04	(0.84, 1.31)	0.682
Work activity	Group	Control	Reference	-	-		
		Intervention	– 0.16	0.56	0.85	(0.28, 2.58)	0.77
	Time	-	– 0.079	0.09	0.91	(0.75, 1.1)	0.311
	Group in the time	Control	Reference	-	-		
		Intervention	0.046	– 0.13	1.13	(0.87, 1.45)	0.354
Overall physical activity	Group	Control	Reference	-	-		
		Intervention	- 0.31	0.57	0.73	(0.25, 2.12)	
	time	-	– 0.06	0.13	0.94	(0.72, 1.23)	0.569
	Group in the time	Control	Reference	-	-		0.67
		Intervention	0.61	0.18	1.84	(1.27, 2.66)	
							0.001*

Note. GEE: Generalized estimating equations. The table presents unstandardized regression coefficients (B), their standard errors (SE), and standardized coefficients (β) for each predictor variable across the dimensions of the physical activity. **P*<.05.

physical activities. Walking is the elderly's most popular type of physical activity (20), which requires appropriate shoes and clothing tailored to cultural and social norms (22), as well as the standardization of home spaces, sidewalks, streets, and parks. In addition, functional dependence, fear of injury, and medical limitations are barriers that may prevent physical activities in the elderly (23,24) and will not be resolved with limited educational interventions. Community health nurses can be responsible for teaching the principles of safe walking and pursuing the standardization of living spaces for the elderly through communication with responsible

Table 5. Relationship Between Demographic Variables and Changes in Physical Activity Over Time Using the GEE Model

Type of Activity in the Groups	Leisure Time		Home Activity		Work Activity		Overall Physical Activity	
	Intervention	Control	Intervention	Control	Intervention	Control	Intervention	Control
Gender (male/female)	1.41 (0.081)	68.56 (0.002)	0.21 (0.023)	0.005 (<0.001*)	8.32 (0.065)	5.99 (0.093)	1.7 (0.565)	0.592 (0.003)
Gender * time (male/female)	1.42 (0.24)	0.48 (0.057)	0.77 (0.095)	1.65 (0.322)	1.64 (<0.001*)	2.16 (0.084)	0.527 (0.123)	1.1 (0.177)
Age(60-74/75-84)	1.16 (0.874)	0.33 (0.303)	1.22 (0.733)	1 (0.99)	9.9 (0.011)	4.53 (0.129)	1.69 (0.56)	0.88 (0.664)
Age*time (60-74/75-84)	1.19 (0.576)	0.83 (0.655)	1.09 (0.566)	1.21 (0.381)	0.63 (0.026*)	0.79 (0.385)	0.82 (0.614)	0.511 (0.11)
Married (single/married)	2.46 (0.39)	0.009 (0.025*)	1.12 (0.875)	11.7 (<0.001*)	0.68 (0.001*)	0.66 (0.689)	0.27 (0.253)	2.94 (0.276)
Married * time (single/married)	0.52 (0.051)	2.47 (0.006*)	0.99 (0.975)	0.61 (0.058)	1 (>0.99)	0.45 (0.101)	2.3 (0.126)	1.12 (0.803)
Occupation	0.57 (0.549)	15.59 (0.011*)	0.34 (0.176)	0.01 (0.036*)	3.76 (0.134)	134.1 (0.017*)	2.69 (0.29)	0.74 (0.097)
Occupation * time (employed/ unemployed and free and housekeeper)	1.43 (0.267)	0.6 (0.159)	0.98 (0.93)	1.59 (0.51)	1.24 (0.275)	0.53 (0.338)	0.62 (0.237)	1.05 0.383
Income (less than 2 million/more than 2 million)	1.84 (0.004*)	0.21 (0.092)	1.39 (0.612)	4.53 (0.053)	0.2 (0.075)	0.02 (0.011*)	1.04 (0.967)	3.59 (0.194)
Income * time (less than 2 million/more than 2 million)	0.82 (0.515)	1.35 (0.33)	1.18 (0.333)	1.24 (0.344)	0.98 (0.923)	1.75 (0.257)	1 (>0.99)	1.21 (0.727)
Education Statues	0.25 (0.043)	3.12 (0.108)	0.49 (0.754)	0.15 (0.007)	0.89 (0.594)	0.25 (0.023)	1.76 (0.446)	0.16 (0.017*)
Education statues * time (illiterate/ diploma and upper)	1.85 (0.012*)	1.09 (0.759)	0.96 (0.594)	1.38 (0.147)	0.7 (0.911)	0.55 (0.279)	0.68 (0.222)	1.53 (0.188)
Living situation (alone/wife or child (	0.75 (0.096)	0.72 (0.005*)	0.62 (0.72)	5.2 (<0.001*)	0.73 (0.001*)	0.65 (0.001*)	0.10 (0.004*)	12.75 (0.046*)
Coexistence * time (alone/wife or child)	0.97 (0.697)	1.03 (0.527)	1.21 (0.341)	0.65 (0.034*)	1 (>0.99)	1.04 (0.224)	1.81 (0.046*)	0.69 (0.486)
Housing (Personal/ Rental)	0.03 (0.001*)	0.7 (0.338)	3.1 (0.419)	0.8 (0.777)	1.37 (0.001*)	0.87 (0.92)	0.41 (0.753)	0.85 (0.597)
Housing * time (personal/ rental	6.9 (<0.001*)	1.2 (0.11)	0.61 (0.146)	1.27 (0.177)	1 (>0.99)	1.05 (0.658)	1.06 (0.949)	1.16 (0.207)
Insurance (Yes/No)	0.45 (0.343)	1.1 (0.646)	0.78 (0.663)	0.17 (0.03*)	1.39 (0.001*)	1.54 (0.001*)	16.26 (0.029*)	0.045 (0.021*)
Insurance * time (Yes/No)	1.75 (<0.001*)	1.04 (0.505)	0.88 (0.467)	1.48 (0.149)	1 (>0.99)	0.96 (0.224)	0.2 (0.04*)	3.73 (0.011*)
Supplementary insurance (Yes/No)	0.38 (0.284)	5.63 (0.064)	0.9 (0.865)	0.28 (0.07)	7.21 (0.059)	2.84 (0.174)	2.91 (0.25)	0.34 (0.21)
Supplementary insurance*time (Yes/ No)	1.58 (0.129)	0.7 (0.284)	1.01 (0.967)	1.34 (0.125)	1.04 (0.862)	0.73 (0.07)	0.72 (0.407)	1.47 (0.321)
Underlying disease (Yes/No)	2.06 (0.584)	0.27 (0.114)	0.18 (0.028*)	1.37 (0.683)	1.2 (0.871)	0.2 (0.128)	1.41 (0.1)	0.76 (0.038*)
Underlying disease *time (Yes/No)	0.93 (0.852)	1.35 (0.279)	1.27 (0.085)	1.17 (0.373)	0.92 (0.729)	1.18 (0.472)	0.88 (0.208)	1.11 (0.214)

Note. GEE: Generalized estimating equations. The results are expressed as odds ratios (OR) with their 95% confidence intervals. An OR of>1 indicates a higher likelihood of being in a higher category of physical activity. Statistically significant at *$P<.05$.

organizations. Furthermore, officials should consider constructing appropriate watery spaces suitable for the elderly (e.g., swimming pools, hydrotherapy pools, and shallow play areas) so that they can enrich their leisure time with joyful physical activities. Gyms and fitness clubs can be interesting to the elderly, encouraging them to engage in leisure-time physical activities (25). A study asserted that some factors discouraging engagement in physical activity among the elderly included the lack of spaces for sports or the distance from such spaces, as well as medical restrictions and fear of falling and injuries (23). Another study suggested that an individual's perception of his/ her own health and body mass index could substantially affect the time spent on physical activities during leisure time, at home, or in the workplace (26). Likewise, mental norms should be considered among the factors that can persuade people to engage in physical activities during their free time (27), an issue that should stick in the mind of community health nurses paying home visits.

Our findings indicated that most participants did not take part in household affairs, and single seniors at home were more active than married people, which seems to be rooted in the prevailing social culture. It was suggested that favorable socio-cultural environments and social norms, as well as the availability of recreational facilities and suitable equipment, can encourage the elderly to become more involved in physical activities (28).

The obtained data demonstrated that despite a positive change in the mean score of workplace physical activity in the intervention group, this change was not statistically

significant, but older adults were more active at work than younger adults. According to a study, self-efficacy and perceived barriers were the most essential predictors of physical activity, so that increased self-efficacy and perceived barriers predicted increased and decreased levels of physical activity, respectively (29). By proper planning, it is possible to persuade the elderly with HTN to participate in light physical activities in line with their skills and abilities.

One of the strengths of this study was that the interventions were delivered by someone who was a graduate in geriatric nursing, experienced in caring for patients with high BP, and active in the field of health promotion. Nonetheless, this study had some limitations. The primary outcome of physical activity was self-reported, which is susceptible to recall and social desirability biases; participants in the intervention group may have over-reported their activity levels. In addition, the follow-up period was limited to three months, preventing conclusions about the long-term maintenance of behavioral changes. Finally, the single-center design in Khorramabad may have limited the generalizability of the findings. Accordingly, future multi-center trials across diverse Iranian regions are needed to confirm broader applicability.

Conclusion

This study presented a valuable model for using Iran's PHC network in order to address non-communicable diseases. The success in promoting leisure-time physical activities through a structured, home-visit model is a significant step. To use this model, health policymakers and planners should consider integrating less resource-intensive versions of the intervention (1) and developing complementary community-based programs to address environmental and social barriers to physical activities in all domains (2). Moreover, they should empower community health nurses to act as coordinators with municipal organizations to advocate for age-friendly public spaces, safe walking paths, and accessible recreational facilities. This comprehensive approach is essential to establish a sustainable program that supports active aging for older populations with HTN within the PHC framework.

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Authors' Contribution

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Competing Interests

The authors have no financial or non-financial competing interests.

Ethical Approval

All methods were performed according to the relevant guidelines and regulations of the Declaration of Helsinki (ethical approval and consent to participate). The aims and methods of the project were explained to all subjects, and necessary assurance was given to them about the anonymity and confidentiality of their information. Moreover, informed consent was obtained from all participants, and they had the right to withdraw from the study at any time. In addition, the study approval was obtained from the Ethics Committee of Lorestan University of Medical Sciences (ethical code IR.LUMS.REC.1399.039).

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