ORIGINAL RESEARCH ARTICLE

Comparison of Effects of Interactive Health Education and Self-Reading Learning on Blood Pressure Control in Hypertensive Patients: A Non-Randomised Controlled Trial

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ABSTRACT

Context/Background: Hypertension is a major contributor to cardiovascular mortality and morbidity worldwide and in India. Educational interventions can create opportunities for patients to better understand their conditions and the role of therapies, as well as heighten awareness about disease progression and complications. This study was conducted to evaluate the effectiveness of an interactive health education program in comparison with self-reading learning on blood pressure control.

Methodology: This study was a non-randomised controlled trial, involving 66 hypertensive patients from the eight villages in Kamjong district, Manipur. Participants were allocated to one of the two groups; intervention group (interactive health education) and control group (self-reading learning). Changes in blood pressure, Hypertension-related knowledge, attitude, lifestyle, adherence to medications and anthropometric parameters at three months post intervention from baseline were measured. Data was analysed using SPSS for Windows (Version 26.0).

Results: Three months post intervention, intervention group had more knowledge and adherence and better attitude as compared to the control. There was no significant change in the proportion of participants with controlled blood pressure in both the groups. Changes in lifestyle and anthropometric parameters were not significant.

Conclusions: Interactive health education is effective in terms of improvement in knowledge about hypertension, adherence to medication and attitude towards hypertension. A longer follow up might be needed to see changes in blood pressure control.

Key-words: Health education, Hypertension, Non-Randomised Controlled Trial, Knowledge

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INTRODUCTION

Hypertension is a major contributor to cardiovascular mortality and morbidity worldwide and in India.[1,2] It is one of the most important public health problems in the world and an important modifiable risk factor for the development of cardiovascular diseases, stroke and kidney disease, affecting more than one billion individuals worldwide and causing approximate 10 million deaths every year.[3,4] Uncontrolled hypertension is associated with high risk for development of heart disease, stroke, chronic kidney disease, retinopathy and peripheral vascular disease. It is estimated that 1.56 billion people will be affected worldwide by 2025.[5,6]

A systematic review conducted in 2014 showed an overall prevalence of hypertension in India to be 29.8% with higher prevalence in urban (33.8%) compared to rural (27.6%).[7] The prevalence is estimated to be 24% and 23% for man and woman, respectively.[8] Hypertension accounts for 57% of deaths due to stroke and 24% of deaths due to coronary heart disease in India.[9]

Only a quarter of rural and two-fifth of urban Indians are aware of their hypertensive status and only a third of those identified receive treatment. Those who are identified as hypertensive often receive inappropriate care or fail to adhere to therapy. The prevalence of controlled hypertension is only 10% and 20% in rural and urban patients respectively.[7]

Prevalence of hypertension is 37% in urban communities and 25% in rural communities of Manipur and 42.5% are aware about their hypertension status. Only 30.8% are under treatment but only 11.4% of those treated has their BP under control.[10,11]

Changes in lifestyle are fundamental to the prevention and control of hypertension, with diet figuring prominently. Health education may result in lifestyle modification and increase adherence to antihypertensive medications to improve effective blood pressure control in hypertensive patients.[12,13] It also improves patients' knowledge on a disease and its therapy leading to patients taking on a more positive role in the management of their health.[14,15]

A previous study demonstrated that educational interventions increased participants' levels of knowledge about hypertension and had a positive influence on their beliefs about medicines.[16] Educational interventions can also create opportunities for patients to better understand their conditions and the role of therapies, as well as heighten awareness about disease progression and complications. Through patient education, misconceptions that patients have about their therapy can be clarified. This can influence adherence to therapy, and may therefore potentially lead to improved blood pressure control.[17]

Implementing an effective community based educational intervention to increase the hypertension related knowledge and ultimately blood pressure control becomes important. However, it is unclear what educational strategy works best in improving patients' knowledge on hypertension and clinical outcomes in hypertensive patients. Hence this study was conducted with the aim to evaluate the effectiveness of an interactive health education program in comparison with self-reading learning on blood pressure control and to compare the effects of the two educational interventions on hypertension-related knowledge, attitude and practice, medication adherence, lifestyle & anthropometric parameters.

METHODOLOGY

Study design and setting: The study is a non-randomised non-blinded trial involving 66 participants divided into two groups. This study was carried out among hypertensive patients in Kamjong block in Kamjong district, Manipur, which is located about 120 km away from Imphal. According to 2011 census, Kamjong district has a total population of 45,616 out of which 23,473 are males and 22,143 are females. There are three blocks (Kamjong, Phungyar and Kasom) and 131 villages in Kamjong district out of which 56 are under Kamjong block with a total population of 16,717 of which 8729 are males and 7988 are females. The study was approved by the Research Ethics Board, Regional Institute of Medical Sciences, Imphal. Written Informed consent was obtained from all study participants. The trial was registered at Clinical Trial Registry of India (registration number CTRI/2022/08/044763).

Participants recruitment: Participants were recruited from among hypertensive patients residing in eight villages. The recruitment was conducted in September 2022. Patients were eligible if they met the following inclusion criteria: a clinically diagnosed hypertension receiving treatment for at least two months prior to study; capable of effective oral communication without help; age 18 years and above; availability to participate in assigned health education activities. They were not eligible if they met any of the following exclusion criteria: pregnancy; mental disorders, dementia or cognitive impairment; other serious diseases with the need for special care such as malignant tumour, heart failure, and kidney disease.

Taking proportion of patients with controlled hypertension as 43.1% and 86.3% in control group and intervention groups respectively,[18] power 90%, significance level 1% the estimated sample size was 60 (30 in each group). Expecting a drop-out rate of 10%, the final calculated sample size was 33 in each group.

Kamjong block was selected randomly out of the three blocks. The unit of allocation was a village. 26 villages with a population above 200 were identified and eight villages which are near to CHC, Kamjong were selected for the study. Then four villages were

conveniently allocated to intervention group and another four were allocated to the control group. The selection of villages was done in such a way that there was a minimum distance of around three km between the villages assigned to the two groups. 55 eligible hypertensive patients were identified from the intervention villages and 46 were identified from the control villages. 33 participants were then selected for the intervention and control groups by lottery method (Fig 1).

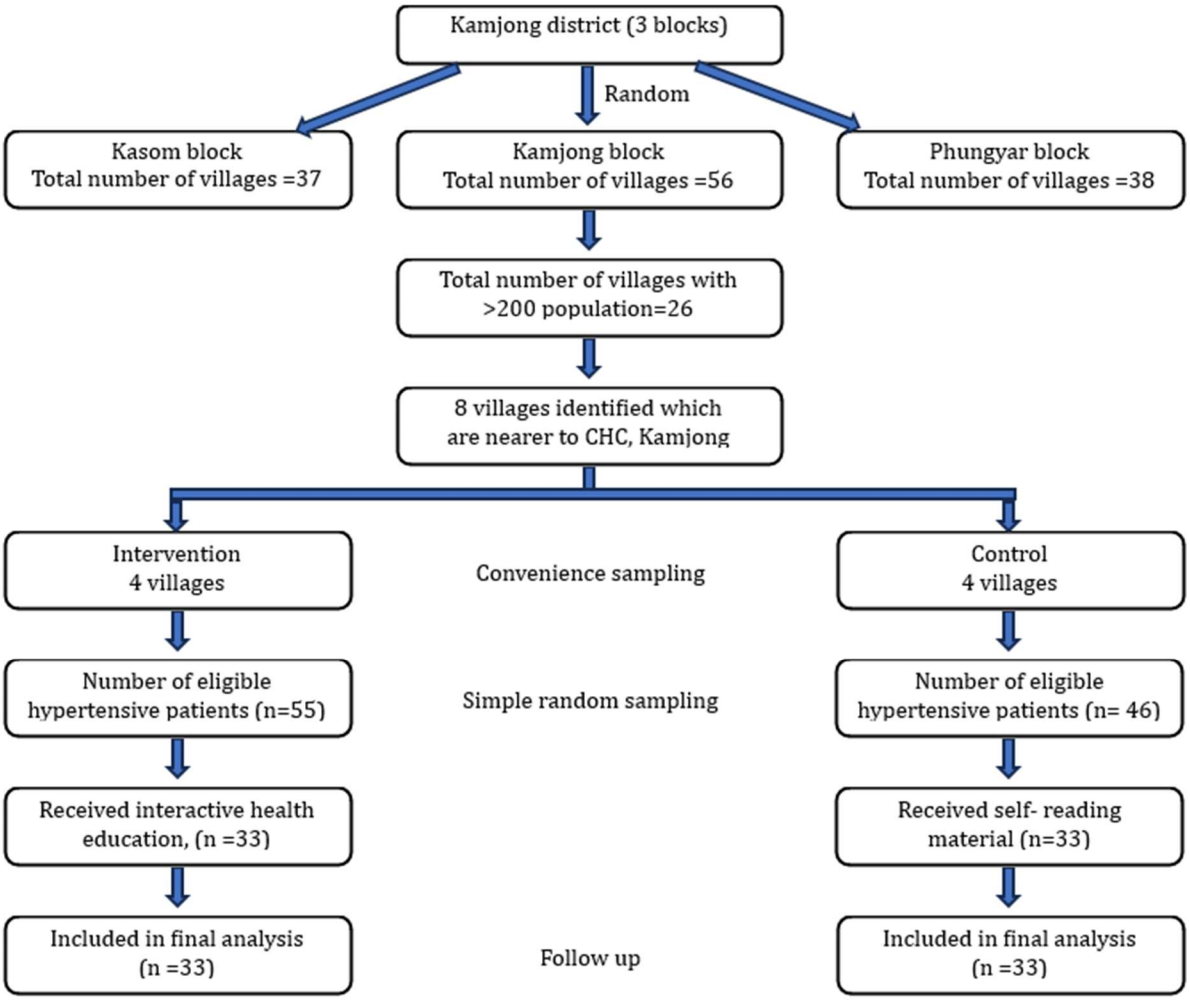

Fig 1. Flow diagram of study participants

Intervention: Interactive health education group sessions were held on hypertension and healthy lifestyles in different convenient locations of the study area in order to facilitate the access of the study participants. The sessions addressed topics on hypertension, non-communicable diseases (NCDs), lifestyle modification and behavioural change and importance of adherence to medications through dialogic, interactive lectures using posters, charts and videos. Two sessions were arranged for each village on two consecutive days. Each session was for 45 minutes followed by 30 minutes of interaction. The intervention for all the participants was completed within one month. All the sessions were delivered by the same investigator who was a post graduate trainee in Community Medicine. Control group participants were given patient information leaflet on hypertension and healthy lifestyles for self-reading and learning. The materials were translated into the local language.

Measurements of intervention effects: A pre-tested semi-structured questionnaire was used to collect data at baseline and follow up which was done three months after the intervention. The questionnaire consisted of the following domains: Background characteristics, knowledge on hypertension, attitude towards hypertension, practices related to hypertension, Morisky Medication-Taking Adherence Scale-MMAS (4-item).[19] Measurements of blood pressure (BP), weight, height, waist circumference was also done at baseline and follow up.

The primary outcome was the change in the proportion of subjects with normalized BP three months post health education intervention. Other outcomes included the changes in hypertension-related knowledge, adherence to anti-hypertensive medication, lifestyle changes, changes in anthropometric parameters.

Blood pressure (BP) was measured on the right arm

using the electronic BP monitor **(**OMRON HEM-7300**)**, and the average of three readings was taken. Control of hypertension was defined as systolic blood pressure (SBP) <140 mm Hg and diastolic blood pressure (DBP) <90 mmHg in people under 80 years of age, and SBP <150 mmHg and DBP <90 mmHg in people 80 years of age or older.[20] Knowledge on hypertension was measured by a set of 21 questions. A patient was said to have adequate knowledge if the participant scored ≥ 18 (75 % of the obtainable score). Adherence was assessed by using the Morisky Medication Adherence scale-4 which consists of four items with a scoring scheme of Yes=0 & No=1. The patient was considered having good adherence when his/her score obtained from the Morisky Medication Adherence Scale was at least three points. Attitude towards hypertension was measured by a set of four statements. Five-point Likert scale was used for attitude scoring. A score of 0 was given for strongly disagree, 1 for disagree, 2 for undecided, 3 for agree and 4 for strongly agree and higher the score, better the attitude. Regular physical activity was defined as moderate exercise for at least 150 minutes per week or vigorous exercise at least 75 minutes per week. Abdominal obesity was defined as waist circumference ≥90cm in males and ≥80cm in females. If BMI was ≥23, the participant was considered overweight.

Data analysis: SPSS for Windows (Version 26.0) was used for the statistical analysis. We compared the percentages and mean of outcome measurements between groups and within groups at baseline and follow up assessment. Paired t-test (for continuous variables like age, blood pressure, knowledge score, adherence score, attitude score etc) and McNemar test (for categorical variables like blood pressure control status, adherence to medication etc) was used for within group comparison. To test for difference between the groups, chi-square test or Fisher's exact test (for categorical variables) and independent t-test (for continuous variables) was employed and a p-value of <0.05 was taken as significant.

RESULTS

There were no statistically significant differences in sociodemographic characteristics in both the groups (Table 1) except employment status (p=0.016). The mean age was 67.36 ±12.97 years in the intervention group and 64.76 ±13.18 years in control group**.** Only three participants were unmarried. There were more females than males in both the groups.

At baseline, there were no significant difference in knowledge, attitude and adherence scores. In both the groups there was significant increase in knowledge and attitude scores from baseline to follow up while the adherence score significantly increased in only the intervention group.

Table 1: Socio-demographic characteristics of study participants at the baseline (N=66)

Characteristic	Intervention(%)	Control(%)	p-value
Age (years)*	67.36±12.97	64.76±13.18	0.421
Gender			
Male	14(42.4)	14(42.4)	1
Female	19(57.6)	19(57.6)	
Literacy			
10th std or below	26(78.8)	31(93.9)	0.149*
Above 10th std	7(21.2)	2(6.1)	
Employment			
Employed	11(33.33)	3(9.09)	0.016
Unemployed	22(66.67)	30(90.91)	
Family history of hypertension			
Yes	15(51.7)	14((48.3)	0.804
No	18(48.6)	19(51.4)	

*Mean± standard deviation; *Fisher's Exact test

Table 2: Knowledge, attitude and adherence of the participants at baseline and follow up(N=66)

Variable	Baseline	Follow up	p^a value	p^b value	p^c value
Knowledge score, mean ±SD					
Intervention	12.75±3.79	19.09±4.01	0	0.21	0
Control	11.54±3.98	12.57±3.64	0.046		
Attitude score, mean ±SD					
Intervention	13.48±1.30	14.72±1.20	0	0.131	0.025
Control	13.00±1.27	13.93±1.56	0.003		
Adherence score, mean ±SD					
Intervention	2.33±1.21	3.51±0.83	0	0.335	0.009
Control	2.60±1.05	2.78±1.29	0.311		
Adequate knowledge, n(%)					
Intervention	2(6.06)	22(66.66)	0	0.492	0
Control	0	3(9.09)	0.25		
Good adherence, n(%)					
Intervention	13(39.39)	28(84.84)	0.001	0.323	0.007
Control	17(51.51)	18(54.54)	1		

SD, standard deviation

p^a: within group analysis, paired t-test for continuous variables and McNemar test for categorical variables

p^b: between group analysis at baseline, independent t-test continuous variables and chi square test for categorical variables

p^c: between group analysis at follow up, independent t-test continuous variables and chi square test for categorical variables

Table 3: Blood pressure, lifestyle and anthropometric measurements of the participants at baseline and follow up (N=66)

Variable	Baseline	Follow up	p^a value	p^b value	p^c value
SBP, mean ±SD					
Intervention	156.64 ±21.19	147.63± 17.48	0.013	0.178	0.301
Control	150.13 ±17.45	143.06± 18.11	0.003		
DBP, mean ±SD					
Intervention	93.82 ±15.26	86.83± 11.48	0.001	0.452	0.563
Control	91.30± 11.50	85.35± 8.97	0		
Controlled BP, n(%)					
Intervention	7(21.21)	13(39.39)	0.07	0.757	0.8
Control	6(18.18)	12(36.36)	0.07		
No extra salt, n(%)					
Intervention	31(93.93)	33(100)	0.5	1	0.114
Control	30(90.90)	29(87.87)	1		
Regular physical exercise, n(%)					
Intervention	6(18.18)	7(21.21)	1	0.741	1
Control	5(15.15)	7(21.21)	0.625		
Current smokers, n(%)					
Intervention	1(3.03)	1(3.03)	1	0.355*	0.355*
Control	4(12.12)	4(12.12)	1		
Abdominal obesity, n(%)					
Intervention	17(51.51)	17(51.51)	1	0.459	1
Control	14(42.42)	17(51.51)	0.85		
Overweight, n(%)					
Intervention	14(42.42)	14(42.42)	1	0.084	0.048
Control	21(63.63)	22(66.66)	1		

SBP, systolic blood pressure; DBP, diastolic blood pressure; BP, blood pressure; SD, standard deviation
p^a: within group analysis, paired t-test for continuous variables and McNemar test for categorical variables
p^b: between group analysis at baseline, independent t-test continuous variables and chi square test for categorical variables
p^c: between group analysis at follow up, independent t-test continuous variables and chi square test for categorical variables
*Fisher's Exact test

Knowledge, attitude and adherence scores were significantly greater in the intervention group at follow up after three months of intervention as compared to control group. In intervention group, there was significant increase in proportion of participants with adequate knowledge (from 6.06% to 66.66%) and good adherence (from 39.39% to 84.84%). Intervention group had more knowledge (66.66%) as compared to the control group (9.09%) at follow up and it was statistically significant (p=0.000). Significantly (p=0.007) more patients in the intervention group (84.84%) had good adherence to hypertensive medications compared to the control group (54.54%) (Table 2).

The SBP and DBP between the two groups were not significantly different at baseline and follow up, but there was significant reduction in SBP as well as DBP in both the groups. The proportion of participants with regular physical exercise, extra salt intake, smoking, abdominal obesity, overweight and blood pressure control did not change significantly in both the groups (Table 3).

DISCUSSION

In this study it was found that at follow up, 39.39% had controlled blood pressure as compared to 21.21% at baseline in the intervention group. In the control group also, proportion of controlled blood pressure increased from 18.18% to 36.36% at follow up. However, these changes were not statistically significant. A study conducted in Argentina by He J et al.[21] showed that at six months follow up, the proportion of those with controlled blood pressure improved from 17% at baseline to 46.1% in the intervention group which received health coaching as part of a multicomponent intervention programme compared to change from 17.6% at baseline to 40.4% in the control group which received usual care. The multicomponent nature of the intervention which also included home BP monitoring and audit and the longer follow up could have led to greater improvement as compared to our study. There was significant reduction of mean SBP and DBP within group comparison in both the groups from baseline to follow up after three months in our study. The mean reduction in SBP was 9.01 mmHg and 7.07 mmHg in intervention and control group respectively. Whereas, the mean reduction in DBP was 6.98 mmHg and 5.94 mmHg in intervention and control group respectively. The reduction in SBP and DBP was also not statistically significant between the two groups. This reduction in SBP and DBP in the intervention group is consistent with a study in south Asia[22] where the mean reduction in SBP was 9 mmHg and the mean reduction in DBP was 6.1 mmHg in the intervention group which had health education as a component. In a study by Victor et al.[23] the mean systolic pressure fell by 27.0 mm Hg (152.8 mmHg to 125.8 mm Hg) in the intervention group versus 9.2 mm Hg (154.6 mmHg to 145.4 mm Hg) in the control

group, mean DBP fell by 17.5 mmHg in intervention group compared to 4.3 mmHg in control group from baseline to six month follow up. Whereas in a similar study in China[18] there was no significant mean reduction in SBP and DBP among control group whereas, the intervention group had significant reduction in SBP by 9.1 mmHg and DBP by 5.4 mmHg. These findings suggest that educational intervention might be more effective in reduction of blood pressure (both SBP and DBP) compared to control group (usual care or self-reading learning), and sometimes clinically significant improvement in sign and symptoms can also be seen by slight reduction in BP. The greater reduction in BP in the study by Victor et al. may be due to regular review of every participant's treatment with specialists. Also in our study, the follow up was for three months which is a shorter duration compared to other studies.

There was significant increase in hypertension-related knowledge scores in both the groups. However, the increase was significantly greater in the intervention group (mean score increased from 12.75 to 19.09) than in control group (mean score increased from 11.54 to 12.57). This is consistent with the finding of a study conducted in China by Lu et al.[18] where the increase was significantly greater in the interactive education workshop group (mean score increased from 3.4 to 8.6) than in self-learning reading group (mean score increased from 3.6 to 5.8). Similarly, a study in Nigeria[4] showed that the mean hypertension knowledge score significantly increased in the health education intervention group from baseline to fourth month follow up compared to those in the control group ($p < 0.001$). The difference in mean score might be due to difference in number of questions asked, scoring style for multiple choice questions and overall total score.

The intervention was effective in improving adherence. This study found the adherence was 84.8% in the intervention group and 54.5% in the control group at follow-up. Regular use of medications for hypertension was significantly more in the intervention group in a study in China.[18] Similarly, medication adherence improved significantly in the intervention group compared to the control between baseline and four month after intervention as observed in a study conducted in Nigeria by Ozoemena et al.[4] A study conducted in Iran by Delavar et al.[24] also found that after health education intervention, medication adherence status in the intervention group was significantly better than the control group.

There was also significant increase in attitude score from baseline to follow up in both the groups and the score was significantly greater in the intervention group as compared to control group at follow up. This suggests that interactive health education is more effective than self-reading in improving the attitude towards hypertension. Health education has been shown to improve hypertension related attitude in other studies as well.[25,26]

The strength of this study was the use of a quasi-experimental design to determine the effectiveness of a health education intervention delivered in a community setting. The quasi-experimental (non-randomized) studies are increasingly adopted to evaluate population health interventions by health experts.

A study limitation is that the trial was not blinded to participants; blinding is impossible in such health educational interventions. Practice questions were self-reported and there is possibility of response bias/social desirability bias which can lead to over reporting of good behaviour and under reporting of bad or undesirable behaviours. Convenience sampling was done in this study which might limit the generalizability of the study findings. The study timeframe is another limitation. The follow-up period (i.e., three months after the intervention) might not be enough for certain changes to occur, especially for lifestyle modification which might require multiple sessions and longer duration (for example assessment of BMI after three months might not have much effect). Therefore, the long-term effects of the intervention could not be assessed.

Conclusion

This study showed that interactive health education is effective in terms of improvement in knowledge about hypertension, adherence to medication and attitude towards hypertension. The intervention has also led to greater mean reduction in both systolic blood pressure and diastolic blood pressure which might also lead to better control of hypertension. However, it needs to be seen if the educational intervention has a long-term effect.

In future, research with a larger sample size and longer follow up period is needed to assess the effect of educational intervention and whether this approach and the findings can be generalized for a larger population in Manipur.

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