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Original Article

Impact of a community based intervention program on awareness, treatment and control of hypertension in a rural Panchayat, Kerala, India



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ABSTRACT

Objective: Community based intervention to control hypertension is extremely limited in India. We conducted this study to find the effectiveness of a community based intervention program on the awareness, treatment and control of hypertension.

Methods: A baseline survey was conducted among 4627 adults aged ≥ 30 years (men 44%) selected by cluster sampling. Information was collected using a structured interview schedule by trained local volunteers. They measured weight, height, waist circumference and blood pressure using standard protocol. The volunteers monitored blood pressure at least once a month and educated the people in neighborhood groups on the need for regular medication and reducing risk factors of hypertension for a period of six years. A post intervention survey was conducted among 2263 adults aged ≥ 30 years (men 49%). Stepwise logistic regression analysis was done to find the odds of change in awareness, treatment and control of hypertension.

Results: The odds of awareness (OR 4.18, 95% CI 3.44–5.08), treatment (OR 3.44 CI 2.81–4.22) and control (OR 4.39 CI 3.36–5.73) of hypertension increased significantly in the post intervention survey compared to the baseline survey. Baseline hypertension prevalence of

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34.9% (CI 33.8–36.1) was reduced to 31.0% (CI 29.1–32.9) in the post intervention survey based on age adjusted analysis.

Conclusion: Our community based intervention using trained community based volunteers could increase awareness, treatment and control of hypertension among adult hypertensives.

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1. Introduction

Hypertension is an important public-health challenge worldwide affecting more than a quarter of the world's adult population.¹ High blood pressure was the leading risk factor for death in the world in 2004² which accounted for 12.8% of the total deaths. High blood pressure is associated with many risk factors like overweight, high salt intake, alcohol intake and physical inactivity.^{3–7} Hypertension is also directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease deaths in East Asian populations.⁸ Effective delivery of hypertension care in the country is likely to reduce cardiovascular mortality and morbidity.⁹

Hypertension is a greater population burden in developing countries compared to developed countries. Almost three quarters of the world's hypertensive population will be in developing countries by 2025. Hypertension prevalence in India was projected to rise from 20.6% in 2000 to 22.9% in 2025 among men and 20.9% to 23.6% among women.¹ Incidence of hypertension was 0.3 per 100¹⁰ in rural India in 1995 which increased to 3.4 in 2011.¹¹ Although the hypertension prevalence in the country is comparatively lower,¹ the huge population of the country results in a large number of people affected. Hypertension control can prevent 300,000 of the 1.5 million annual deaths from cardiovascular diseases in India.¹²

Kerala is the most advanced Indian state in epidemiological transition¹³ and the prevalence of most chronic diseases and their risk factors are the highest in the state.¹⁴ Various studies reported high prevalence of hypertension in the state among children,¹⁵ adults,¹⁶ middle aged¹⁷ and the elderly.^{18,19}

The role of appropriate, low cost and locally relevant health education interventions that enable self management of hypertension in the population including early detection of hypertension is very important in the context of developing countries.²⁰ Earlier findings evidenced the reduction of hypertension as a result of non-pharmacological intervention program.²¹ Health education intervention studies in different parts of the developed world indicated that appropriate and locally relevant strategies improved patient knowledge and compliance leading to small but potentially beneficial reductions in blood pressure.^{22–24} The beneficial impact of community based lifestyle intervention on hypertension was reported from developing countries like Pakistan,²⁵ Taiwan²⁶ and China.²⁷ Community based intervention on diabetes prevention was found to be effective in India.²⁸ Community based randomized controlled trials of non-pharmacological interventions such as physical exercise, salt reduction and yoga were found to be effective in prevention and control of hypertension among young Indians.^{29,30} However, these studies did not report awareness, treatment and control of

hypertension. Therefore we conducted this study to find out the effect of a community based intervention program on the awareness, treatment and control of hypertension.

2. Methods

This study was conducted in Kumarakom village Panchayat in Kottayam district of Kerala. It was a pre and post intervention study without a control. The baseline study was conducted in the year 2001 among 4955 adults selected using cluster sampling method. Each of the 12 wards of the Panchayat was considered as a cluster. Detailed methodology of the baseline study was published elsewhere.³¹ In brief, information on demographics, tobacco use, alcohol consumption, diet and self reported diabetes was collected using an interview schedule. Anthropometric measurements (height, weight, waist circumference) and blood pressure were measured using standard protocol. Two blood pressure measurements were obtained initially in a seated position, and if there was a difference of more than 10 mmHg either in systolic or diastolic blood pressure between the initial readings, a third measurement was obtained and the average of two or more readings was taken as the final value. Information on awareness and treatment of hypertension was also collected.

2.1. Intervention program

Two volunteers from each of the 12 wards of the village Panchayat were selected for the baseline survey by the elected representative of the ward based on a criteria including minimum educational qualification of 12 years of schooling. Except two, all the volunteers selected were women. These volunteers were trained to collect the data using the interview schedule and take anthropometric measurements and blood pressure using sphygmomanometer and stethoscope. An Omron electronic blood pressure apparatus was also used during the training program to enhance the quality of blood pressure measurement using sphygmomanometer. If any of the trainees was not sure of the blood pressure reading, s/he used the electronic blood pressure apparatus to cross check the readings.

After the baseline survey, the volunteers were given training for interventions along with 12 health workers from the primary health centre (PHC) of the village Panchayat, 18 Anganwadi workers (grass root level workers of social welfare department for child care, adolescent care and care of the elderly) and 12 elected ward members of the Panchayat. The volunteers belonged to the neighborhood groups (NHG) and had the support of the Panchayat and organizations like self help groups (SHGs). A video film on heart health produced by

the initiative for cardiovascular health research in developing countries at New Delhi in Malayalam (local language) was also shown in the training camps. A 16 page printed booklet in local language adapted from the one that was published by the All India Institute of Medical Sciences, New Delhi was distributed to all of them. This booklet was used as a training material. This booklet included detailed information on the following main sections: need for weight reduction, quitting smoking, reducing/quitting alcohol, salt reduction, increasing fruits and vegetable consumption, regular physical activity, learn how to reduce stress and the importance of regular monitoring of blood pressure. They were also given training on the importance of regular monitoring of blood pressure and the risk factors. The BP apparatus and the weighing scale used for the baseline data collection were retained by the volunteers for regular monitoring of blood pressure and weight measurement. Blood pressure monitoring was done once in a month. This was done particularly for those with elevated blood pressure.

During monitoring visit, the hypertensives were requested to regularly take the medications and to modify their life styles as suggested in the booklet. The monitoring was done either in the NHG meetings or at volunteers' home since the volunteers were residents within the ward itself. We also trained the grass root health workers of the Panchayat such as the Junior Public Health Nurses (JPHN), health inspectors and Junior Health Inspectors (JHI) on the need for hypertension control. The doctors in the PHC of the Panchayat were also requested to support this program and procure antihypertensive medicines through the Panchayat funds. One of the investigators of the project was the Professor of Cardiology in the nearby Medical College (A K). The volunteers were instructed to refer uncontrolled hypertensive patients either to the PHC or to the nearest Medical College.

Other than the training expenditure no monetary incentive was given to the volunteers. However, the recognition given by the Panchayat and the local people was reported as a great incentive by the volunteers. The monitoring of blood pressure was done in the neighborhood group which used to meet once a month in one of the homes of the group members at a particular time. If anyone could not attend, either the volunteer visited the hypertensive individual or s/he visited the volunteer's house.

Based on the feedback from the participants during the training program, we focused on specific interventions such as reduction of salt intake and taking regular medication in controlling hypertension.

In our intervention program, we used a combination of population based strategies and individual high risk strategies for the control of hypertension. The population strategies used a series of health education classes focusing on the need for controlling hypertension and their risk factors by prominent professors of cardiology and public health of the neighboring Medical College and from the Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum. The individual high risk strategy used stressing the need for regular medication, regular blood pressure checks up and reducing risk factors. This was done during survey, during physical measurements and during monitoring of blood pressure. A copy of the education booklet was also

given to those who had elevated blood pressure. We did not provide any drugs for hypertension. However, we encouraged the hypertensives to take regular medication from the PHC or nearby hospitals.

There was a trained field level coordinator selected by the Panchayat who monitored the intervention activities regularly. The overall supervision of the project was done by a trained public health doctor coordinator from SCTIMST along with the field coordinator located in the Panchayat. The Principal Investigator (KRT) of the project and a trained public health doctor attended Panchayat level meeting of the ward members once in six months as special invitees. During these meetings progress of the hypertension detection, monitoring and the involvement of the volunteers, availability of antihypertensive drugs in the PHCs were discussed. On the same day, the principal investigator and the trained public health doctor used to meet the volunteers in their house or at the Panchayat.

2.2. Post intervention survey

A repeat survey was conducted in 2007 in the same Panchayat area selected by cluster sampling technique. Each ward was treated as a cluster similar to the baseline survey. From each of the 12 wards it was decided to survey 250 individuals (125 males and 125 females) in the age group of 25–74 years. Instructions were given to the volunteers to select approximately 500 individuals (males 250) from each 10 year age group of 25–74 years as per the WHO STEPS guidelines.³² We collected data from 2517 individuals above the age of 30 years. The interview schedule used for the post intervention survey was the same as that of the baseline survey. All the measurement tools were same for baseline and post intervention surveys.

2.3. Ethical clearance

Ethical clearance for this study was obtained from the Institutional Ethics Committee of Sree Chitra Tirunal Institute of Medical Science and Technology (SCTIMST), Trivandrum. Informed written consent was obtained from all the participants.

Data analysis was performed using SPSS (version 17.0; SPSS Inc., Chicago, IL, USA). Analysis was restricted to 4627 individuals from the baseline survey and 2263 individuals from the post intervention survey for comparative age group. Both bivariate and multivariate techniques were used for analysis of data. Age adjusted hypertension prevalence was estimated in the post intervention survey based on the baseline age distribution. Hypertension awareness (reported history of hypertension), treatment (on medication for hypertension) and control (systolic blood pressure <140 mmHg and diastolic blood pressure <90 mmHg) were also studied using the two survey results by analyzing the changes. Chi-square test for proportion and t-test for means were used to determine the difference between the groups in bivariate analysis. In order to determine the adjusted effect, stepwise logistic regression models were used, separately for awareness, treatment and control of hypertension. Baseline to post intervention changes were modelled with survey year as dummy variable with interaction terms added in the model.

3. Results

Study sample characteristics of the respondents in baseline and post intervention survey by sex are presented in Table 1.

The mean blood pressure (diastolic blood pressure plus 33% of pulse pressure) was reduced from 96 mmHg to 93 mmHg in the post intervention survey ($p < 0.001$). Baseline hypertension prevalence of 34.9% (95% CI 33.8–36.1) was reduced to 31.0% (95% CI 29.1–32.9) in the post intervention survey. The corresponding percentages for men were 34.6% and 31.6%, respectively and that for women were 35.3% and 30.4%, respectively. The prevalence of hypertension increased with age in both the surveys among men and women.

The results of stepwise logistic regression analysis on awareness, treatment and control of hypertension are presented in Table 2. The odds of awareness, treatment and control of hypertension were three to four times higher in the post intervention survey compared to the baseline survey. When interaction terms were added in the model, self reported diabetes was found to be significantly associated with increase in awareness (OR 3.26, 95% CI: 1.65–6.44), treatment (OR 2.38, CI: 1.31–4.32) and control of hypertension (OR 1.70, CI: 1.39–2.07). Control of hypertension was found to be significantly higher among women (OR 1.31 95% CI: 1.10–1.57) compared to men.

4. Discussion

This is one of the first studies in India that looked at the effectiveness of a community based intervention program on awareness, treatment and control of hypertension.

The odds of four times increase in awareness on hypertension in the post intervention survey indicated that community based volunteers can effectively increase the awareness on hypertension in the population. Frequent monitoring of blood pressure and the advice by the volunteers

Table 2 – Awareness, treatment and control of hypertension among hypertensives: results of stepwise logistic regression analysis.

Awareness, treatment and control of hypertension	Adjusted odds ratio	95% confidence interval
Awareness		
Baseline survey	Reference	
Post intervention survey	4.18 ^a	3.44–5.08
Treatment		
Baseline survey	Reference	
Post intervention survey	3.44 ^b	2.81–4.22
Control		
Baseline survey	Reference	
Post intervention survey	4.39 ^c	3.36–5.73

^a Adjusted for age, sex, self reported diabetes and overweight.
^b Adjusted for age, sex, alcohol use, self reported diabetes and overweight.
^c Adjusted for sex, alcohol use and self reported diabetes.

on the need for reducing the risk factors of hypertension were the probable factors that helped to increase in awareness. Fifty six percent of the hypertensives in the post intervention survey were aware of their hypertension status, which was much higher than the 36% awareness among adults (15–64 years) from rural Kerala,¹⁴ 39% among middle aged (40–60 years) urban population in Kerala,¹⁷ and 49% among adults in China.³³ However, it was slightly lower than the 61% among adults in the US.³⁴ The significantly higher level of awareness among women in the post intervention survey could be due to the services provided to them either in the neighborhood groups or at their homes that did not require much travel. Similar results were reported from urban population of Lithuania.³⁵

The odds of three times increase in the treatment of hypertension in the post intervention survey indicated the success of the monitoring services and the advice provided by the volunteers for regular medication for hypertension. The involvement of the primary health centers and the local self

Table 1 – Study sample characteristics.

Characteristics	Baseline n = 4627			Post intervention n = 2263			p value ^d
	Men	Women	Total	Men	Women	Total	
Mean age in years (±SD)	48.1 ± 12.2	47.6 ± 12.1	47.8 ± 12.2	51.8 ± 12.9	51.4 ± 13.0	51.5 ± 13.0	<0.001
Mean body mass index (±SD)	22.2 ± 3.5	22.5 ± 3.8	22.4 ± 3.7	21.6 ± 3.6	22.8 ± 4.1	22.2 ± 3.9	0.072
Mean waist circumference (±SD)	78.9 ± 14.5	79.0 ± 14.4	79.0 ± 14.4	83.0 ± 10.7	82.2 ± 12.1	82.6 ± 11.4	<0.001
Mean systolic blood pressure (mm Hg) (±SD)	127.1 ± 17.3	125.5 ± 18.6	126.2 ± 18.0	129.9 ± 19.5	127.3 ± 21.8	128.6 ± 20.7	<0.001
Mean diastolic blood pressure (mm Hg) (±SD)	81.7 ± 10.5	80.3 ± 11.1	80.9 ± 10.9	76.4 ± 11.8	74.4 ± 11.1	75.4 ± 11.5	<0.001
Awareness on hypertension ^a (%)	19.2	25.9	23.6	47.1	65.6	56.0	<0.001
Treatment for hypertension ^b (%)	15.0	21.9	18.9	35.3	53.9	44.5	<0.001
Controlled hypertension ^c (%)	4.5	8.1	6.5	16.1	27.6	21.7	<0.001
Tobacco use in the last one month (%)	43.2	3.9	21.0	48.0	3.8	25.5	0.011
Alcohol use in the last one month (%)	30.8	0.7	13.8	41.6	0.3	20.6	<0.001

SD – Standard Deviation.

^a Reported history of hypertension.

^b On medication for hypertension.

^c Systolic Blood Pressure <140 and Diastolic Blood Pressure <90 mm of Hg.

^d Significance between baseline total and post intervention total (t-test for comparing means and Chi-square test comparing proportions).

government in providing antihypertensive medication through the government health system also might have played a role in increasing the proportion of people on treatment for hypertension. Based on the recommendation of the ethics committee, we requested the elected Panchayat leaders to enhance the availability of antihypertensive drugs in the health centers under the control of the Panchayat. The health education classes offered by the prominent health professionals from the Medical College and SCTIMST could have also influenced the hypertensives to treat their condition. The proportion of hypertensives on treatment in our post intervention survey was 45% which was much higher than the 25% reported from another study from rural Kerala,¹⁴ 29% in urban Kerala among middle aged population¹⁷ and the 19% among urban sub Saharan African population. A multicentre study on hypertension in the elderly reported that 40% hypertensives were on treatment which was almost similar to our finding.¹⁹

The odds of more than four times control of hypertension in our post intervention survey were another positive finding of the intervention program. Twenty two percent of our hypertensives achieved adequate control of hypertension which was much higher than the 8% reported from another study in rural Kerala¹⁴ the 9% in an urban study¹⁷ and 7% among adult hypertensives in China.³³ However, our control rate was much lower than the 47% reported from the US.³⁴ The multicentre study among the elderly population mentioned above reported 10% of hypertension control.¹⁹

There was a significant increase in the mean systolic blood pressure and a significant decrease in the mean diastolic blood pressure in the post intervention survey. Almost all risk factors for hypertension such as alcohol consumption, tobacco use, overweight, abdominal obesity and self reported diabetes in the population increased in the post intervention survey in spite of our efforts to reduce the risk factors through health education program. A recent study from rural Kerala reported an annual incidence of 3.3% of hypertension which was one of the highest incidence rates in developing countries.¹¹ In spite of these increases in risk factors there was a significant reduction in the proportion of hypertensives and the mean blood pressure. Such dissociation between increase in risk factors such as body mass index and a fall in blood pressure has recently been reported by Anand and Yusuf.³⁶ There was a significant increase in awareness, treatment and control of hypertension which could be attributable to the intervention program.

To conclude our community based intervention using trained volunteers residing in the same community could significantly increase awareness, treatment and control of hypertension among adult hypertensives. This improvement was against all odds of increasing the risk factors of hypertension such as alcohol use, tobacco use, overweight and abdominal obesity; self reported diabetes and a high incidence of hypertension.

5. Limitation

We did not have a control population to compare the increase in awareness, treatment and control of hypertension.

However, similar pre–post intervention study was reported from India for diabetes control.³⁷

Conflicts of interest

All authors have none to declare.

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