

## Original article

### Effects of lifestyle interventions in adults with pre- hypertension and hypertension - an interventional study

Dr. Velavan. A, Dr. Anil J Purty, Dr. Murugan. N, Dr. Zile Singh

Name of the Institute/college: Pondicherry institute of medical Sciences

Corresponding author: Dr. Velavan. A

---

#### Abstract:

**Background:** Cardiovascular diseases and hypertension have reached epidemic proportions. Behavioural risk factors can be attributed to this epidemic. Life style modifications are important for the control of hypertension, however are not practiced effectively in our settings. The present study was done among the identified pre-hypertensive and hypertensive adults to assess the effects of lifestyle modifications through IEC tools by measuring the changes in mean blood pressure and risk factor levels before and after intervention.

**Methods:** By systematic random sampling 864 adults were screened in the study population for pre-hypertension and hypertension by measuring their blood pressure. Among the individuals identified with pre-hypertension and hypertension, 245 of them were finally recruited for the intervention part of the study. Intervention was done for a period of 6 months among these individuals by educating them on lifestyle modifications using IEC tools. IEC included one to one communication through house visits and pamphlet distribution for reinforcement of lifestyle modifications. After intervention, a post intervention survey was carried out to assess the mean changes in blood pressure and risk factor levels.

**Results:** The study findings showed a high prevalence of pre-hypertension (39%) and hypertension (39.5 %). There was a decrease of (4.34) units in mean systolic and (2.04) units in mean diastolic BP in the post intervention survey. Among the parameters used to measure the changes in risk factors, physical activity during leisure time, mean servings of fruit intake per day, mean number of days of vegetable intake per week, mean dietary salt intake decreased significantly in the post intervention up survey.

**Key words:** Pre-hypertension, Hypertension, Prevalence Lifestyle modifications, IEC tools.

---

#### Introduction:

Globally cardiovascular diseases are responsible for approximately 17 million deaths a year, nearly one third of the total<sup>1</sup>. Of these, about 9.4 million deaths worldwide were caused by complications of hypertension every year<sup>2</sup>. In India, the 2008 estimates revealed that 32.5% of people had raised blood pressure and NCDs accounted for 53% of all deaths.<sup>3</sup> This increase in the prevalence of hypertension is attributed to various factors like population growth, increase in life expectancy and behavioural risk factors, like unhealthy diet

(which includes increased salt intake, low fibre containing diet, dietary oil rich in saturated fatty acids & trans fatty acid), excessive use of alcohol, tobacco use, physical inactivity, excess weight (increased BMI), central obesity and stress.

Modification of the risk factors that have a high attributable risk or high prevalence, or both is an effective way to control hypertension and it is beneficial for both non- hypertensive, pre-hypertensive and hypertensive persons. Increased physical activity, reduced salt intake, weight loss, moderation of alcohol intake,

increased potassium intake, and an overall healthy dietary pattern similar to Dietary Approaches to Stop Hypertension (DASH) diet<sup>4</sup> which comprises of fruits, vegetables and low fat dairy products and reduced fat and cholesterol are some of the proven lifestyle measures that can effectively lower BP.

Lifestyle modifications are important in our context because of the fact that most of the treatment for hypertension and cardiovascular diseases simply relies on pharmacological drugs in spite of availability of non-pharmacological ways of management. It is important in our setting to assess the impact of such lifestyle modifications through IEC tools among the target individuals in reducing their blood pressure. Hence the present community based intervention study was done among adults with pre-hypertension and hypertension living in an urban area of Puducherry with an objective to assess the effects of selective lifestyle interventions through IEC tools by measuring the changes in mean blood pressure and risk factor levels before and after intervention.

#### **Methods:**

The present community based interventional study (Before-After comparison) was carried out between Jan 2012 and June 2013 in the urban service delivery area of a tertiary care hospital in Puducherry, which covers a total population of 12,038 with 5993 males and 6045 females. The study area was divided into three blocks with an approximate population of 4000 in each block. Block B with 950 households was selected by simple random sampling for conducting the study. In every alternate house of the selected block, all adults aged 18 and above were screened at their homes for pre-hypertension and hypertension by measuring their BP levels using OMRON digital BP

apparatus. In case of non availability of eligible individuals, a revisit was made. A total of 864 individuals were screened. Among the identified pre-hypertensive and hypertensive subjects who consented to participate, 278 individuals (based on sample size calculation) were selected for the intervention part of the study by simple random sampling. 33 participants were not included due to non response and lost to follow up resulting in the final sample size of 245.

#### **Baseline survey:**

A Baseline survey was carried out among these study participants, which included a study questionnaire to interview each participant on socio-demographic details, history of pre-hypertension & hypertension and assessment of associated risk factor levels which was done by house to house method. Assessment of tobacco use, alcohol consumption, dietary fibre consumption and physical activity was based on WHO STEPS questionnaire. Salt intake, usage of saturated and unsaturated fat content oil, frequency of consuming unhealthy foods was also assessed using a structured questionnaire. Various anthropometric measurements like height, weight, waist circumference of the study participants were measured. Blood pressure was recorded using OMRON digital automatic blood pressure monitor. Two blood pressure readings were taken and the average of the two was noted.

#### **Intervention:**

Intervention was carried out among the study participants for a period of six months which included home visits - one to one method of communication twice in the intervention period and as a reinforcement measure pamphlets were distributed to them and to all available persons in the neighbourhood. Help of Medical Interns

and trained field staff of the health centre was obtained to achieve the desired frequency of intervention after training them adequately.

The health education message included various domains like etiology, risk factors, symptoms and signs, complications of hypertension and life style modifications like salt reduction, increasing their level of physical activity, replacement of dietary oil with saturated fat with that of PUFA and MUFA containing oils, increasing dietary fibre consumption, avoiding unhealthy foods, cessation/reduction of smoking and alcohol consumption and benefits of such lifestyle modification.

Restriction of the dietary salt consumption to less than 9gm/ day/ individual was advised to all subjects, as the base line survey revealed a high intake of dietary salt among them. Since the recommended levels of <5g of dietary salt intake would not be realistic to achieve, < 9 g per day was advocated to the study participants.

. If the cooking oil used was found to be rich in saturated fatty acids, subjects were advised to replace the same with oil rich in MUFA & PUFA by explaining the advantages unsaturated fat content.

The IEC targeted an increase in the amount of dietary fibre intake by advising the study participants to have fruits more than 3 servings on more than 3 days a week.

All individuals were motivated to do walking or cycling for at least 20 minutes a day or 150 minutes a week to increase the level of their physical activity.

All subjects who smoked and consumed alcohol were motivated to decrease the frequency and number of tobacco items initially and subsequently to quit the habit.

#### **Follow up survey:**

After a period of intervention for six months, the participants were surveyed to evaluate the changes in mean blood pressure and the prevalent risk factor levels in them.

The data was entered in Microsoft Excel and analysed using Statistical Package for the Social Sciences for Windows (version 16.0). The study was initiated only after obtaining the approval of PIMS Institutional Ethical Review Committee, Puducherry and an informed consent was obtained from each participant before data collection.

#### **Results:**

The study found a high prevalence of pre-hypertension and hypertension with 39% and 39.5% respectively among the study population during screening.

The socio-demographic details of the participants recruited for the intervention study is shown in Table 1.

The study findings showed that there was a decrease of 4.34 units in mean systolic and 2.04 units in mean diastolic BP in the post intervention survey (Table 2). Among the parameters used to measure the changes in risk factors, physical activity during leisure time, mean servings of fruit intake per day, mean number of days of vegetable intake per week, mean dietary salt intake decreased significantly in the post intervention survey (Table 3). Other parameters which were used to assess smoking, alcohol consumption, cooking oil with saturated fats, over weight and obesity, central obesity showed a marginal decrease, but were not found to be statistically significant.

**Table 1: Socio-Demographic Characteristics of the study participants (n=245)**

<b>Characteristics</b>	<b>Frequency (%)</b>
<b>Age group (in years)</b>	
<30	29 (11.8)
31 – 40	29 (11.8)
41 – 50	50 (20.4)
51 – 60	56 (22.9)
61 – 70	56 (22.9)
>70	25 (10.2)
<b>Gender</b>	
Male	115 (46.9)
Female	130 (53.1)
<b>Educational status (Years of schooling)</b>	
No formal schooling	42 (17.1)
≤ 5 years	62 (25.4)
6-10 years	83 (33.8)
> 10 years	58 (23.7)
<b>Occupation</b>	
Govt. employees	15 (6.1)
Non govt. employees	41 (16.7)
Self employed	48 (19.6)
Students	24 (9.8)
House wives	93 (38.0)
Retired	16 (6.5)
Others	8 (3.3)
<b>Percapita income</b> (Updated Modified BG Prasad's classification 2013)	
Class I (Rs 5156 & above)	16 (6.5)
Class II ( Rs 2578- 5155)	65 (26.5)
Class III (Rs 1547- 2577)	67 (27.3)
Class IV (Rs 773- 1546)	60 (24.5)
Class V (Below Rs 773)	37 (15.2)

**Table 2: Comparison of Mean BP before and after intervention:**

Characteristic	Description	Pre intervention	Post Intervention	Interpretation
Blood pressure	Mean Systolic BP ±SD	144.59±14.9	140.25±11.7	Mean diff 4.34±9.0 P<0.05*
	Mean diastolic BP±SD	86.00±9.47	84.96±8.2	Mean diff 2.04±6.0 P<0.05*

\* Statistically significant

**Table: 3 Comparison of risk factor levels before and after intervention:**

Risk factors	Description	Pre intervention	Post intervention	Inter-pretation
Smoking	Current smokers	23(9.4%)	23(9.4%)	
	Smokeless tobacco user	8(3.3%)	6(2.4%)	p>0.05
	Average no tobacco items smoked/day ±SD	7.4±3.43	6.8±4.0	p>0.05
Alcohol intake	Alcohol consumers	39(16%)	39(16%)	
	Avg. no. of occasions with at least 1 std. drink in 1month ±SD	5.4±8.9	5.9±8.7	p>0.05
	Average no of std. drinks – 1month ±SD	1.71±1.6	1.69±1.1	p>0.05
Dietary salt intake	Mean salt intake/day	13.7±7.6	13.0±7.5	p<0.05*
Oil used	Unsaturated	208(85%)	211(86.1%)	p>0.05
Fruit intake	Avr. No days/week	3.11±1.9	3.13±2.1	p>0.05
	Mean Servings/day	1.31±0.7	1.40±0.6	p<0.05*
Vegetable intake	Avr. No days/week	5.44±1.7	5.67±1.4	p<0.01*
	Mean Servings/day	1.80±0.9	1.77±0.8	p>0.05
Physical activity in leisure time	Walking/cycling	106(43.3%)	139(54.3%)	p<0.05*
	Mean no. of days/week±SD	5.40±1.7	5.44±1.6	p>0.05
BMI	Overweight	91(37.1)	84(34.3)	p>0.05
	Obese class I	38(15.5)	41(16.8)	
	Obese class II	10(4.1)	8(3.3)	
Central obesity	<96cm	77(67)	79(68.7)	p>0.05

(Males)	96-102cm	24(20.9)	25(21.7)	p>0.05
	>102 cm	14(12.2)	11(9.6)	
Central obesity	<80cm	16(12.3)	13(10.0)	
(Females)	80-88cm	35(26.9)	34(26.2)	
	>88cm	79(60.8)	11(63.8)	

\* Statistically significant

#### Discussion& Conclusion:

This study measured the prevalence of hypertension among the study population and a sample of the identified pre hypertensive and hypertensive individuals were recruited for the intervention part of the study. The risk factors among these individuals were identified and an intervention was done using IEC tools to modify these risk factors. The effects on these risk factors and mean blood pressure was assessed in the post intervention survey.

This study found a high prevalence of pre-hypertension and hypertension among the study population which is 39% and 39.5% respectively. Similar results were noted in a large number of studies carried out in our country. In a study by Yadav et al.<sup>6</sup> done in an urban colony of Lucknow, it was found that the prevalence of pre-hypertension and hypertension to be 32.2 % and 32.3% respectively. Also a study by Singh RB et al.<sup>7</sup> carried out in 5 cities of India revealed that the prevalence of pre-hypertension and hypertension in Trivandrum to be 33.5% & 33.7% respectively and in the same study Mumbai had prevalence of pre-hypertension and hypertension 32.4% each..

Comparison of baseline and post intervention surveys of the present study showed that there was a decrease of 4.34 units in mean systolic and 2.04 units in mean diastolic BP in the post intervention survey. Among the parameters used to measure the changes in risk factors,

physical activity during leisure time, mean servings of fruit intake per day, mean number of days of vegetable intake per week, mean dietary salt intake decreased significantly in the follow up survey. Other parameters were not found to be statistically significant.

Similar results have been documented in various studies:

TOMHS<sup>8</sup> (Treatment of mild hypertension study) reported substantial changes from baseline levels for all lifestyle intervention variables. After an intervention period of 4 years, 70% of participants remained below baseline weight and 34% maintained a weight loss of 10 lb or greater. Alcohol intake declined by 1.6 drinks /week among drinkers at 4 years. Reported leisure physical activity increased by 86% at 1 year and remained 50% above baseline at 4 years.

This study showed substantial reduction in all risk factors due to its longer duration of intervention, while the present study showed a decline in selected variables which had impact in a shorter duration.

In a Community based intervention by a cluster randomized controlled trial,<sup>9</sup> conducted in 12 randomly selected communities in Karachi, to determine the impact of family based home health education (HHE) on blood pressure, they found that on evaluation at two years after randomization and intervention, in hypertensive patients over 40 years of age, there was a significant 10 mmHg decrease in systolic blood

pressure which can be interpreted as longer the duration of intervention more will be the reduction in mean BP.

In a community-based lifestyle intervention program<sup>10</sup> on blood pressure and salt intake of Normotensive adult population in Iran documented a significant decrease in the salt intake (1.9g/day), systolic BP by 10.95mm Hg and diastolic BP by 4.49mm Hg after the 6 year healthy lifestyle trial carried out in the framework of Isfahan Healthy heart programme.

The findings of the present study is in agreement with other studies discussed above since statistically significant reduction was noted in risk factor levels and consequent reduction in systolic and diastolic blood pressure.

The study findings showed that lifestyle modifications has the potential to reduce BP and thus hypertensive and pre-hypertensive individuals could be prevented from developing hypertension related complications. Hence life style modifications should be advocated to all individuals found to have raised BP. IEC tools can be used extensively to educate the community on the benefits of lifestyle modifications.

**Acknowledgements:** We sincerely thank the participants of this study for their extensive cooperation throughout the study. We also acknowledge the help of Medical Interns and Field Staff during data collection and intervention. Special Thanks to Dr. Prarthana Velavan from JIPMER for her invalid help in Data entry.

#### References:

1. World Health Organization. Causes of Death 2008 [Internet]. [cited on 2013 June 2] Available from [http://www.who.int/healthinfo/global\\_burden\\_disease/cod\\_2008\\_sources\\_methods.pdf](http://www.who.int/healthinfo/global_burden_disease/cod_2008_sources_methods.pdf).
2. Lim SS, Vos T, Flaxman AD, Danaei G, et al A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010 : a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012; 380 (9859): 2224-60
3. World Health Organisation. Non communicable Diseases country profiles 2011 [Internet][cited on 2013 June 2] Available from [https://www.un.org/en/ga/ncdmeeting2011/pdf/ncd\\_profiles\\_report.pdf](https://www.un.org/en/ga/ncdmeeting2011/pdf/ncd_profiles_report.pdf)
4. Sacks FM, Svetkey LP, Vollmer WM. Effects on blood pressure of reduced dietary sodium and the dietary approaches to stop hypertension (DASH) diet. *New Eng J Med* 2001; 344: 3-10.
5. Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7). United States: US Department of Health and Human Services; 2004 August. Publication No. 04-5230.
6. Yadav S, Boddula R, Genitta G, Bhatia V, Bansal B, Kongara S, et al. Prevalence & risk factors of pre-hypertension & hypertension in an affluent north Indian population. *Indian J Med Res*, 2008 December; 128: 712-20
7. Singh RB, Fedacko J, Pella D. Prevalence and risk factors for prehypertension and hypertension in five Indian cities. *Acta Cardiol*. 2011 Feb; 66(1):29-37.

8. Elmer PJ, Grimm R Jr, Laing B, Grandits G, Svendsen K, Van Heel N, Betz E, Raines J, Link M, Stamler J, et al. Lifestyle intervention: results of the Treatment of Mild Hypertension Study (TOMHS). Science Direct. 1995 July; 24(4): 378-88.
9. Majeed F, Kamal A.K Can community based interventions control hypertension in developing countries? What is the evidence from Pakistan? J Pak Med Assoc.2012; 62(3): 301-2.
10. Khosravi A, Kelishadi R, Sarrafzadegan N, Boshtam M, Nouri F, Zarfeshani S, et al. Impact of a community-based lifestyle intervention program on blood pressure and salt intake of normotensive adult population in a developing country. J Res Med Sci 2012; 17(3): .235-41.