

**Surveillance of CVD Risk Factors and Health Promotion Intervention
in a rural community in Trivandrum district**

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EXECUTIVE SUMMARY

Kerala state of India is reported to have the largest proportion of elderly population among the Indian states. Non Communicable diseases (NCDs) like cardiovascular diseases, diabetes, cancer and chronic lung diseases are also reported to be highest in this state. Access to health care in the state is extremely high evidenced by 97% of institutional delivery and a low infant mortality rate of 11 per 1000 live births. However, with regards to NCDs, limited information is available on the knowledge and behavior of people in this state related to preventive factors of NCDs and early symptoms of heart attacks. We wanted to study the knowledge, behavior and effect of health education intervention on preventive factors of NCDs and symptoms of heart attack in a selected population in the state.

The purpose of the present study was to evaluate the baseline prevalence, awareness, knowledge and practices of CVD risk factors in a rural population of Trivandrum district of Kerala. The second objective was to provide a health promotion intervention in the form of tailor made health education for a period of six months. We also wanted to assess the impact of a health promotion intervention on the awareness of risk factors of NCDs in that population and symptoms of heart attack.

One of the community development blocks in Trivandrum district of the state (Athiyannoor) was selected based on convenience. One of the six village Panchayats (Venganoor) was selected randomly for the study. The sample size of the baseline survey and post intervention survey was decided to be 2500 adults in the age group of 15-64 years. The subjects were identified from 10 out of 15 wards of the selected Panchayat. Baseline data was collected by trained investigators using a structure and pre-tested questionnaire. Information on risk factors, history of illnesses, behavior related to risk factors on NCDs and symptoms of heart attack was collected in base line and post intervention survey. Health promotion intervention was provide to the entire community by way of health education classes, medical camps including blood pressure check ups

and distribution of leaflets at various places for a period of six months. Post intervention survey was conducted six months after the intervention.

A total of 2635 adults (49.5% men) were surveyed in the baseline survey and 2509 (49.5% men) adults in the post intervention survey. Overall education level was significantly higher among men compared to women. No significant change was noted in the post intervention survey with regard to history of angina, stroke and hypertension. However, significantly low proportion of respondents reported history of peripheral vascular diseases, diabetes and high cholesterol. Physical inactivity during working hours was reported to be significantly ($p < 0.001$) lower in post intervention survey compared to baseline survey.

Over half of the respondents in both surveys checked blood pressure during the last 6 months, 41% in the baseline and 39% in the post intervention survey checked blood sugar and 31% in baseline and 29% in post intervention survey checked their cholesterol in the last one year. Among those who checked 22% and 28% reported to have HTN, 22% and 21.3% reported diabetes and 18.1% and 14.8% reported high cholesterol in the base line and post intervention survey respectively. Sixty nine per cent and 84.1% of hypertensives, 69.3% and 85.9% Diabetics and 51.4% and 63.9% of people with high cholesterol were under treatment in the baseline and post intervention survey respectively.

Among men 31% in the baseline survey and 27.7% in the post intervention survey used any form of tobacco while the respective proportion for smoking was 22.8% and 19.7% respectively. Among women any form of tobacco use was reported by 3.9% and 3.6% respectively in the two surveys. Smoking among women was 0.6% and 0.3%

respectively. Among men 32% and 30.1% reported alcohol use in the two surveys and while the respective figures for women were 2.6% and 0.9%. Fruits consumption (either daily or 3-4 times a week) was reported to be significantly higher in the post intervention survey. Over 85% of the subjects reported eating vegetables at least 3 times daily in both surveys.

The mean awareness level of nine preventive factors (lose weight, eat more fish, increase exercise, eat more vegetables, eat more fruits, quit smoking, less alcohol, less fat in diet, less salt in diet) was 6.4 (total score 9) in the baseline survey that increased to a mean value of 8 in the post intervention survey. Awareness of symptoms of heart attack significantly increased in the post intervention survey.

Baseline awareness level of the sample population was reasonably good. Awareness level increased significantly after the health education intervention. Since the post intervention survey was conducted immediately after the intervention it is difficult to say whether this increase in awareness will be retained. In certain risk factors like tobacco use there was significant reduction in the post intervention survey. Although the reduction in percentage terms was small the total impact in the population is likely to be very high. In a highly educated population like that we studied such health education efforts can be done without much cost and can be integrated with the existing health care system. Such integration is likely to have long lasting positive impacts on NCD risk reduction

INTRODUCTION

Evaluation of awareness and practices is an essential element of cardio vascular diseases (CVD) research. Little information is available from Kerala on awareness and practices related to CVD and its risk factors. Kerala is reported to have the largest proportion of elderly population among the Indian states and non-communicable disease like diabetes and cardiovascular diseases are reported to be highest in this state. The state has also reported the lowest infant and child mortality and highest literacy levels in the country. Therefore it is important to know the awareness level of cardiovascular diseases and risk factors among the population. This is likely to provide the highest level of awareness from any state in India. It is also important to know the impact of health promotion intervention in the population and its impact on the change in awareness levels in the population. In order to find the impact of health promotion intervention we decided to conduct a pre and post health promotion intervention study in one of the rural areas of Trivandrum district of Kerala.

OBJECTIVES:

- 1) The purpose of the present study was to evaluate the baseline prevalence, awareness, knowledge and practices of CVD risk factors in a rural population of Trivandrum district of Kerala.
- 2) The second objective was to provide a health promotion intervention in the form of tailor made health education for a period of six months.

3) We also wanted to assess the impact of a health promotion intervention on the awareness of risk factors of CVD in that population.

METHODS

Location of the study

We selected a rural block Panchayat namely Athiyannoor based on convenience. One of the six village Panchayats namely Venganoor Panchayat with a population of 28742 was selected randomly for our study. This Panchayat is located within 45 minutes drive from our institute. This Panchayat had 15 wards with approximately equal distribution of population in each of the ward.

Sample size and selection process

The sample size of the baseline and post-intervention survey was decided to be 2500 in the age group of 15-64 years based on the World Health Organization (WHO) STEPs approach for non-communicable diseases (NCD) risk factor surveillance. We also decided to follow the model to take 500 (250 men) from each of the five age deciles. The sample design adopted for the survey was stratified multistage random sampling. In the rural area, we first selected one community development block based on convenience and one village Panchayat was selected randomly. From the 15 wards of this village Panchayat 10 wards were selected randomly (ward numbers 4 to 13).

Recruitment, Training and Field Work

Initially three field staff was recruited for the conduct of the survey. One senior research fellow was also appointed to monitor the field activities including the intervention programs. The field workers were well experienced and familiar with the

area, because of their previous field work experience in the same place for another project. This prior experience very much helped them to identify the wards. A short training for the field workers was organized at Achutha Menon Centre for Health Science Studies (AMCHSS) of the Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum. The principal investigator and some senior faculty members of the institute including senior project staff were involved in the training program. Question by question explanation and clarifications were made during the training program. In addition at least one questionnaire was filled by each participant in the training program. Doubts were cleared after going through the filled up questionnaire.

Baseline Survey

Baseline survey was conducted by trained investigators using pre-tested and structured questionnaire. Basic information on age and educational level were collected. The information on perceived quality of life as well as general health were collected by giving them choices like excellent, very good, good, fair and poor. Information on the history of diseases like heart attack, angina, stroke, peripheral vascular disease (disease of the arteries), diabetes, hypertension and high cholesterol were also collected. Physical activity details during working hours as well as after working hours were collected separately. Data on detection and treatment of hypertension, diabetes and high cholesterol were gathered. Information on the behavioral characteristics like tobacco use (smoking and chewing separately) and alcohol consumption were also included in the questionnaire. The information on the consumption of fruits and vegetables and extra salt use were also collected. Knowledge on the prevention strategies of heart attack and

awareness on the symptoms of heart attack were collected. Questions on the symptoms of stroke were included. The respondent's prevention practices for the improvement of their general health were also gathered with a reference period of one year.

Health Promotion Intervention

After completing the baseline survey, the field workers with the help of a senior research fellow arranged camps for conducting health education classes. Health professionals including the senior project staff handled several classes. All health education classes were made in the afternoons to ensure maximum participation of individuals. After the health education classes there were question answer sessions which provided sufficient time for the participants to clarify doubts.

In addition to health education classes there were medical camps for general medical check up including blood pressure examination, height and weight measurements. Some of the participants who required expert consultation were referred to the cardiology and neurology clinic of the nearby hospital. No medicines were supplied during these camps. However, prescriptions were given to those who wanted them.

Posters and leaflets containing information on prevention and control of cardiovascular diseases were distributed among the participants of the camps and health education classes. The elected Panchayat officials offered full support for all the activities. The Panchayat hall was given free of charge for conducting medical camps and health education classes. In addition they also helped us to arrange schools and sports

clubs for arranging health education classes. Some of the faculty members from Achutha Menon Centre for Health Science Studies also offered health education classes.

Post Intervention Survey

Post intervention survey was conducted in a separate cross sectional sample of around 2500 individuals in the same population. Age and sex groups were same (15-64 years) using the same questionnaire.

Data Processing and Statistical analysis

All the completed questionnaires were brought to AMCHSS, Trivandrum. The questionnaires were checked before data entry. The data process consisted of data entry, cleaning, merging and tabulation.

The data entry and analyses were done using SPSS version 11. Univariate and Bivariate analyses for the characteristics under consideration were done for different age and sex groups, wherever necessary. Difference in the awareness of prevention strategies and practices regarding CVD risk factors in both surveys were analyzed using Chi-square tests. A 'p' value of < 0.05 was considered for statistical significance.

RESULTS AND DISCUSSION

Demographic factors

The age and sex wise distribution of the sample population in the two surveys is presented in Table.1.

Table1. Age and sex distribution of the sample population

Age group	Baseline Survey			Post Intervention Survey		
	Males	Females	Total	Males	Females	Total
15-24	261(49.1)	271(50.9)	532(100.0)	248(49.8)	250(50.2)	498(100.0)
25-34	253(48.7)	266(51.3)	519(100.0)	246(48.5)	261(51.5)	507(100.0)
35-44	270(51.4)	255(48.6)	525(100.0)	254(50.3)	251(49.7)	505(100.0)
45-54	263(48.2)	283(51.8)	546(100.0)	254(50.4)	250(49.6)	504(100.0)
55-64	258(50.3)	255(49.7)	513(100.0)	240(48.5)	255(51.5)	495(100.0)
Total	1305(49.5)	1330(50.5)	2635(100.0)	1242(49.5)	1267(50.5)	2509(100.0)

(Figures in parenthesis are percentages)

The original plan was to take equal samples (250) from each age and sex groups. But in some age and sex groups we could not achieve the target. Contacting males was a problem during data collection because many males were out of their houses during data collection time. This is reflected in the sample size distribution where females are slightly more than that of males (see table 1).

Table 2. Educational level of the sample population in baseline and post intervention survey

Educational level	Baseline Survey			Post intervention Survey		
	Males	Females	Total	Males	Females	Total
No formal education	61(4.7)	113(8.5)	174(6.6)	57(4.6)	116(9.2)	173(6.9)
Primary education	226(17.3)	309(23.2)	535(20.3)	296(23.8)	347(27.4)	643(25.6)
Secondary education	680(52.1)	598(45.0)	1278(48.5)	590(47.5)	495 (39.1)	1085(43.2)
Higher education	338(25.9)	310(23.3)	648(24.6)	299(24.1)	309 (24.4)	608(24.2)
Total	1305(100.0)	1330 (100.0)	2635 (100.0)	1242(100.0)	1267(100.0)	2509 (100.0)

In the baseline and post intervention survey 6.9 per cent of the respondents had no formal education. Percentage of sample with no formal education was high among females than males in both the surveys. The highest percentage of respondents had

secondary education in both surveys. Proportion of males with secondary education was significantly higher compared to females in both surveys ($p < 0.001$).

Perceived Status of quality of life

Quality of life in the present study was captured by people's perception. A few people perceived their quality of life as *excellent*. In both surveys most of the males as well as females perceived their quality of life as 'fair'. The percentage of people who perceived their status of life as 'poor', was comparatively high in the post intervention survey ($p < 0.001$).

Table 3. Perceived status of quality of life

Quality of life	Baseline Survey			Post-Intervention Survey		
	Males	Females	Total	Males	Females	Total
Excellent	1(0.1)	0	1(0.0)	0	4(0.3)	4(0.2)
Very good	50(3.8)	49(3.7)	99(3.8)	26(2.1)	14(1.1)	40(1.6)
Good	480(36.8)	434(32.7)	914(34.7)	360(29.0)	359(28.4)	719(28.7)
Fair	570(43.7)	646(48.6)	1216(46.2)	569(45.8)	662(52.3)	1231(49.1)
Poor	204(15.6)	200(15.0)	404(15.3)	287(23.1)	226(17.9)	513(20.5)
Total	1305(100.0)	1329(100.0)	2634(100.0)	1242(100.0)	1265(100.0)	2507(100.0)

Perceived status of health

When respondents were asked to describe their overall health status, most of them answered their health status as *Good*. The percentage of people reported their health as excellent and good increased in the second survey ($p < 0.001$).

Table 4. Perceived status of overall health

Health status	Baseline survey			Post intervention survey		
	Males	Females	Total	Males	Females	Total
Excellent	0	1(0.1)	1(0.0)	3(0.2)	1(0.1)	4(0.2)
Very good	104(8.0)	51(3.8)	155(5.9)	88(7.1)	62(4.9)	150(6.0)
Good	737(56.6)	654(49.2)	1391(52.8)	656(52.9)	590(46.6)	1246(49.7)
Fair	320(24.6)	398(29.9)	718(27.3)	339(27.3)	425(33.6)	764(30.5)
Poor	141(10.8)	226(17.0)	367(13.9)	155(12.5)	188(14.8)	343(13.7)
Total	1302(100.0)	1330(100.0)	2632(100.0)	1241(100.0)	1266(100.0)	2507(100.0)

Personal history of disease

The participants were asked history of certain diseases like heart attack, angina, stroke, peripheral vascular disease, diabetes, hypertension and high cholesterol and the results of the reports are given in table 5.

Table 5. History of diseases as reported by the participants

Diseases	Baseline survey			Post intervention survey		
	Males	Females	Total	Males	Females	Total
Heart Attack	46(3.5)	42(3.2)	88(3.3)	14(1.1)	17(1.3)	31(1.2)
Angina	82(6.3)	117(8.8)	199(7.6)	82(6.6)	111(8.8)	193(7.7)
Stroke	8(0.6)	7(0.5)	15(0.6)	5(0.4)	17(1.3)	22(0.9)
Peripheral vascular disease	87(6.7)	105(7.9)	192(7.3)	57(4.6)	72(5.7)	129(5.1)
Diabetes	148(11.3)	141(10.6)	289(11.0)	105(8.5)	110(8.7)	215(8.6)
Hypertension	187(14.3)	240(18.0)	427(16.2)	154(12.4)	236(18.6)	390(15.5)
High cholesterol	96(7.4)	79(5.9)	175(6.6)	54(4.4)	65(5.1)	119(4.7)

No significant change was noted with regard to history of angina, stroke and hypertension. However, significantly low proportion of respondents reported history of peripheral vascular diseases, diabetes and high cholesterol. This could be due to better understanding of the diseases and risk factors as a result of intervention.

Age wise prevalence of the history of diseases under consideration in the baseline survey is presented in Table 6. As expected, prevalence of all the diseases and risk factors significantly increased with age ($p < 0.001$).

Table 6. History of various diseases/risk factors reported by respondents in different age groups: Results from the baseline survey

Age group	Heart attack	Angina	Stroke	Peripheral vascular disease	Diabetes	Hypertension	High cholesterol
15-24 (n=532)	2(0.4)	12(2.3)	0	11(2.1)	2(0.4)	6(1.1)	0
25-34 (n=519)	1(0.2)	20(3.9)	0	19(3.7)	9(1.7)	34(6.6)	8(1.5)
35-44 (n=525)	8(1.5)	38(7.2)	1(0.2)	5.9(5.9)	46(8.8)	66(12.6)	35(6.7)
45-54 (n=546)	28(5.1)	43(7.9)	6(1.1)	53(9.7)	91(16.7)	121(22.2)	58(10.6)
55-64 (n=513)	49(9.6)	86(16.8)	8(1.6)	78(15.2)	141(27.5)	200(39.0)	74(14.4)
Total (n=2635)	88(3.3)	199(7.6)	15(0.6)	192(7.3)	289(11.0)	427(16.2)	175(6.6)

The following table gives the age-wise prevalence of different diseases from the results of post intervention survey.

Table 7. History of various diseases/risk factors reported by respondents in different age groups: Results from the post intervention survey

Age group	Heart attack	Angina	Stroke	Peripheral vascular disease	Diabetes	Hypertension	High cholesterol
15-24 (n=498)	2(0.4)	11(2.2)	1(0.2)	6(1.2)	3(0.6)	6(1.2)	3(0.6)
25-34 (n=507)	4(0.8)	19(3.7)	3(0.6)	11(2.2)	12(2.4)	27(5.3)	9(1.8)
35-44 (n=505)	3(0.6)	31(6.1)	2(0.4)	12(2.4)	32(6.3)	63(12.5)	21(4.2)
45-54 (n=504)	3(0.6)	46(9.1)	2(0.4)	31(6.2)	60(11.9)	115(22.8)	38(7.5)
55-64 (n=495)	19(3.8)	86(17.4)	14(2.8)	69(13.9)	108(21.9)	179(36.2)	48(9.7)
Total (n=2509)	31(1.2)	193(7.7)	22(0.9)	129(5.1)	215(8.6)	390(15.5)	119 (4.7)

As expected, proportion of history of diseases increased with age in both baseline survey and post intervention survey.

Physical activity

In the present study, physical activity levels were assessed using questions separately for type of activity during working hours and after working hours. The results obtained from the two surveys are presented in Table.8 and Table 9.

Table 8. Physical Activity: During working hours

Level of physical activity	Baseline Survey			Post Intervention Survey		
	Males (N=1305)	Females (N=1330)	Total (N=2635)	Males (N=1242)	Females (N=1267)	Total (N=2509)
Lots	278(21.3)	25(1.9)	303(11.5)	176(14.2)	17(1.3)	193(7.7)
Medium	336(25.7)	109(8.2)	445(16.9)	446(35.9)	147(11.6)	593(23.6)
Light activity	464(35.6)	993(74.7)	1457(55.3)	516(41.5)	998(78.8)	1514(60.3)
Almost none	227(17.4)	203(15.3)	430(16.3)	104(8.4)	105(8.3)	209(8.3)

The category of '*lots*' of physical activity included lifting heavy weights, construction work, manual labor and running. The *medium* category included bike riding, rickshaw drivers, carrying buckets of water or loads of laundry to and from wells multiple times a day and walking long distances up and down hills. *Light activity*

included walking on the level, standing all day working at a shop, house work such as cooking and cleaning in the house. The category of *almost none* physical activity included seated at a desk, driving a car, watching television, reading and resting.

Physical inactivity during working hours was reported to be significantly ($p < 0.001$) lower in post intervention survey compared to baseline survey.

Table 9. Physical Activity: After working hours

Level of physical activity	Baseline Survey			Post Intervention Survey		
	Males (N=1304)	Females (N=1330)	Total (N=2634)	Males (N=1242)	Females (N=1262)	Total (N=2504)
Lots	4(0.3)	0	4(0.2)	2(0.2)	0	2(0.1)
Medium	1(0.1)	2(0.2)	3(0.1)	5(0.4)	2(0.2)	7(0.3)
Light activity	75(5.8)	109(8.2)	184(7.0)	39(3.1)	95(7.5)	134 (5.4)
Almost none	1224 (93.9)	1219 (91.7)	2443 (92.7)	1196 (96.3)	1165 (92.3)	2361(94.3)

Table 9 gives the physical activity level after working hours among the two survey respondents. This measures the leisure time activity level of people. Most of the respondents were inactive after their working hours. Among the physically active respondents majority were engaged in light activities. No significant change was observed in physical activity between baseline survey and post intervention survey. Physical inactivity was high among males than females in case of leisure time activity also.

Detection and treatment of hypertension, diabetes and high cholesterol.

Over half of the respondents in both the surveys checked their blood pressure within 6 months prior to the survey. The percentage of respondents who checked their blood pressure, diabetes and cholesterol increased with age.

Table 10. Checking of Blood Pressure, Blood Sugar and Cholesterol in different age groups: Results from two surveys

Age group	Baseline Survey				Post Intervention Survey			
	BP checked ¹	Sugar checked ²	Cholesterol checked ²	Total N	BP checked ¹	Sugar checked ²	Cholesterol checked ²	Total N
15-24	85(16.0)	59(11.1)	32(6.0)	532	74(14.9)	45(9.0)	36(7.2)	498
25-34	231(44.6)	165(31.9)	117(22.6)	518	225(44.4)	142(28.0)	105(20.7)	507
35-44	273(52.0)	220(41.9)	168(32.0)	525	281(55.6)	206(40.8)	152(30.1)	505
45-54	347(63.6)	288(52.7)	222(40.7)	546	339(67.3)	270(53.6)	201(39.9)	504
55-64	388(75.8)	352(68.6)	265(51.8)	512	360(72.7)	307(62.0)	235(47.5)	495
Total	1324(50.3)	1084(41.2)	804(30.5)	2633	1279(51.0)	970(38.7)	729(29.1)	2509

¹ within 6 months ² within 12 months

Table 11. Prevalence of self reported hypertension in Baseline and Post intervention Survey

Age Group	Baseline Survey		Post Intervention Survey	
	No checked for HTN	Prevalence of HTN	No checked for HTN	Prevalence of HTN
15-24	85	5.9	74	8.1
25-34	231	10.4	225	8.4
35-44	273	15.8	281	21.0
45-54	347	24.2	339	30.6
55-64	388	35.1	360	47.8
Total	1324	22.0	1279	28.1

Prevalence of Hypertension (HTN) increased with age as expected. Overall prevalence of HTN in the baseline survey was less than that reported in the post intervention survey. In the case of HTN there is likely to be large variation between self reports and actual prevalence as has been reported in several studies.

Table 12. Prevalence of self reported Diabetes in Baseline and Post intervention Survey

Age Group	Baseline Survey		Post Intervention Survey	
	No checked for Diabetes	Prevalence of Diabetes	No checked for Diabetes	Prevalence of Diabetes
15-24	59	6.7	45	8.8
25-34	135	5.4	142	5.6
35-44	220	16.8	206	15.0
45-54	288	26.4	270	21.9
55-64	352	31.8	307	34.2
Total	1084	22.0	970	21.3

Diabetes among those who checked for it increased with age in baseline and post intervention surveys. The proportion of respondents who checked for their diabetic status also increased with age in both surveys. In the age group of 55-64 years around 70% of the respondents checked their blood glucose in the previous one year. It has been reported that a substantial proportion of diabetes in Kerala already know that they are diabetic. This could be due to the higher level of access to health facilities in Kerala. The undetected diabetes in Kerala is not very high compared to other places.

Table 13. Prevalence of self reported high cholesterol in Baseline and Post intervention Survey

Age Group	Baseline Survey		Post Intervention Survey	
	No checked for cholesterol	Prevalence of High cholesterol	No checked for cholesterol	Prevalence of high cholesterol
15-24	32	3.1	36	11.1
25-34	117	7.7	105	6.6
35-44	168	16.0	152	13.8
45-54	222	22.0	201	15.9
55-64	265	23.0	235	18.7
Total	804	18.1	729	14.8

Around 30% of the subjects checked their cholesterol in the last one year. This is a high proportion compared to developing country standards. In the baseline survey 18% reported high cholesterol compared to 15% in the post intervention survey. However, we are not able to report which cholesterol was high. Most likely it would have been the total cholesterol that was reported to be high. Rather than the quality of these reports it is important to note that this much proportion of people is checking for their cholesterol levels at least once in a year.

Table 14. Treatment of Hypertension, Diabetes and High Cholesterol among those who reported to have Hypertension, Diabetes and high cholesterol.

Age group	Baseline survey						Post intervention survey					
	HTN	N	Diabetes	N	High Cholesterol	N	HTN	N	Diabetes	N	High Cholesterol	N
15-24	40.0	5	0	4	100.0	1	33.3	6	50.0	4	50.0	4
25-34	33.3	24	22.2	9	0	9	63.1	19	75.0	8	57.1	7
35-44	65.1	43	54.1	37	14.4	27	71.1	59	77.4	31	38.1	21
45-54	66.7	84	73.6	76	55.1	49	84.6	104	88.1	59	62.5	32
55-64	78.7	136	77.6	112	58.1	62	92.4	172	89.5	105	79.5	44
Total	69.1	291	69.3	238	51.4	148	84.1	360	85.9	207	63.9	108

Treatment of all diseases /risk factors increased in the post intervention survey.

Proportion of subjects that treated high cholesterol was the lowest in both surveys.

However it has to be noted that more than fifty per cent of those who were detected to have high cholesterol was receiving treatment with cholesterol lowering tablets.

Tobacco use

The information on tobacco use was collected separately for smoking and chewing form of tobacco. Earlier studies have attributed smoking form of tobacco to the development of cardiovascular diseases. Data on smokeless tobacco and its linkages to cardiovascular diseases are limited.

Table 15. Prevalence of tobacco use

Forms of use	Baseline Survey			Post Intervention Survey		
	Males	Females	Overall	Males	Females	Overall
Only smokers	297(22.8)	8(0.6)	305(11.6)	245(19.7)	4(0.3)	249(9.9)
Only chewers	42(3.2)	41(3.1)	83(3.1)	36(2.9)	37(2.9)	73(2.9)
Both forms	68(5.2)	3(0.2)	71(2.7)	63(5.1)	5(0.4)	68(2.7)
Any form	407(31.2)	52(3.9)	459(17.4)	344(27.7)	46(3.6)	390(15.6)
Non-users	897(68.8)	1278(96.1)	2175(82.6)	898(72.3)	1219(96.4)	2117(84.4)
Total	1304	1330	2634	1242	1265	2507

Prevalence of tobacco use was lower in post intervention survey compared to baseline survey. Tobacco use pattern in the two surveys is given in Table 15. There was a statistically significant reduction in tobacco use in the post intervention survey (p=0.051).

Alcohol consumption

Even though there are beneficial relationships between low drinking with coronary heart disease, WHO identified many health and social consequences of alcohol consumption. More than the use of alcohol, the frequency and quantity of drinking has been reported to be associated with harmful effects.

Table 16. Alcohol consumption: Baseline Survey

Sex	In a week		In a month		Not responding	Users	Non-users	Total
	5 or more days	1 to 4 days	1-3days	less than once				
Males	73(5.6)	90(6.9)	117(9.0)	137(10.5)	29(2.2)	417(32.0)	859(65.8)	1305(100.0)
Females	11(0.8)	3(0.2)	5(0.4)	16(1.2)	0	35(2.6)	1295(97.4)	1330(100.0)
Total	84(3.2)	93(3.5)	122(4.6)	153(5.8)	29(1.1)	452(17.2)	2154(81.7)	2635(100.0)

There was no difference in alcohol use between baseline survey and post intervention survey (p = 0.17).

Table 17. Alcohol consumption: Post intervention survey

Sex	In a week		In a month		Not responding	Users	Non-users	Total
	5 or more days	1 to 4 days	1-3days	less than once				
Males	65(5.2)	130(10.5)	93(7.5)	86(6.9)	1(0.1)	374(30.1)	867(69.9)	1242(100.0)
Females	8(0.6)	2(0.2)	0	1(0.1)	0	11(0.9)	1255(99.1)	1266(100.0)
Total	73(2.9)	132(5.3)	93(3.7)	87(3.5)	1(0.0)	385(15.4)	2122(84.6)	2509(100.0)

Fruits and Vegetables

WHO recommends consumption of five or more servings of fruits and vegetables per day to reduce the risk of CVDs and other non-communicable diseases like cancer and

diabetes. Results of fruits and vegetables consumption are given in table 18 and 19.

Fruit or fruit juice consumption was comparatively high among the respondents in the post intervention survey. In both the surveys, proportion of males who consumed fruits was more than that of females.

Table 18. Consumption of fruits/fruit juice

Frequency of use	Baseline survey			Post intervention survey		
	Males	Females	Total	Males	Females	Total
Daily	141(10.8)	126(9.5)	267(10.1)	166(13.4)	116(9.2)	282(11.2)
3-4 times a week	550(42.1)	554(41.7)	1104(41.9)	864(69.6)	794(62.7)	1658(66.1)
Occasionally	577(44.2)	588(44.2)	1165(44.2)	192(15.5)	326(25.7)	518(20.6)
Never	37(2.8)	62(4.7)	99(3.8)	20(1.6)	31(2.4)	51(2.01)
Total	1305(100.0)	1330(100.0)	2635(100.0)	1242(100.0)	1267(100.0)	2509(100.00)

Respondents, who reported to have never eaten fruits, are significantly higher among females. The fruits consumption increased in the post intervention survey. A significant ($p < 0.001$) increase in regular use (daily use or 3-4 times a week) of fruits/fruit juice from baseline survey to post intervention survey was seen both men and women.

Table 19. Consumption of vegetables (both cooked and raw)

Frequency of use	Baseline survey			Post intervention survey		
	Males	Females	Total	Males	Females	Total
4-5 times	13(1.0)	10(0.8)	23(0.9)	13(1.0)	26(2.1)	39(1.6)
2-3 times	1117(85.6)	1193(89.7)	2310(87.7)	1116(89.9)	1164(91.9)	2280(90.9)
Once a day	109(8.4)	83(6.2)	192(7.3)	84(6.8)	63(5.0)	147(5.9)
Less than daily	66(5.1)	44(3.3)	110(4.2)	29(2.3)	14(1.1)	43(1.7)
Total	1305(100.0)	1330(100.0)	2635(100.0)	1242(100.0)	1267(100.00)	2509(100.0)

Compared to fruits consumption, vegetable consumption was much better. Compared to higher proportion of males consuming fruits, vegetable consumption was

reported by more females. This could be attributed to the cultural food habits of Kerala population who usually eats vegetables with cooked rice. In vast majority of houses cooking is done by females. Also, the higher cost of fruits is one of the main reasons behind its low consumption particularly among women. By promoting seasonal and locally available fruit consumption, this can be improved. The increase in percentage of vegetable use with more than one time a day from baseline survey to post intervention survey is found to be highly significant ($p < 0.001$) both for males and females.

Extra Salt Use

In both the surveys, extra salt use was high among females than males. Overall extra salt use was significantly low in the post intervention survey ($p < 0.001$).

Table 20. Extra salt use

Extra salt use	Baseline survey			Post intervention survey		
	Males	Females	Total	Males	Females	Total
No	1180(90.8)	1162(87.6)	2342(89.2)	1181(95.2)	1194(94.3)	2375(94.8)
Yes	120(9.2)	165(12.4)	285(10.8)	59(4.8)	72(5.7)	131(5.2)
Total	1300(100.0)	1327(100.0)	2627(100.0)	1240(100.0)	1266(100.0)	2506(100.0)

Awareness on prevention strategies for heart attack or stroke

Awareness on the prevention strategies of heart attack was assessed in the two surveys. The variables that were included for this were lose weight, quit smoking, increase exercise, eat more fish, drink less alcohol, reduce fat in meals, reduce salt in meals, eat more fresh fruits and eat more green leafy vegetables. Awareness regarding these variables is given in table 21.

Table 21. Awareness on the prevention strategies for heart attack or stroke: Results from two surveys

Prevention strategies	Baseline survey				Post intervention survey			
	Yes	No	Unsure	N	Yes	No	Unsure	N
Lose weight	1501(57.0)	279(10.6)	853(32.4)	2633	2115(84.3)	60(2.4)	333(13.3)	2508
Quit smoking	2152(81.7)	168(6.4)	315(12.0)	2635	2343(93.5)	71(2.8)	93(3.7)	2507
Increase exercise	2028(77.0)	133(5.0)	474(18.0)	2635	2318(92.5)	22(0.9)	167(6.7)	2507
Eat more fish	1159(44.1)	313(11.9)	1158(44.0)	2631	1751(69.8)	179(7.1)	576(23.0)	2506
Drink less alcohol	2003(76.0)	218(8.3)	413(15.7)	2634	2217(88.5)	104(4.2)	184(7.3)	2506
Reduce fat in meals	2241(85.0)	97(3.7)	297(11.3)	2535	2414(96.2)	23(0.9)	70(2.8)	2507
Reduce salt in meals	2048(77.7)	133(5.0)	453(17.2)	2635	2364(94.3)	33(1.3)	110(4.4)	2507
Eat more fresh fruits	1719(65.3)	150(5.7)	765(29.0)	2634	2154(85.9)	42(1.7)	311(12.4)	2508
Eat more green leafy vegetables	1943(73.8)	132(5.0)	557(21.2)	2632	2286(91.1)	26(1.0)	196(7.8)	2508

In the baseline survey, more than half of the respondents identified all the above actions as prevention strategies for heart attack or stroke, except ‘*eat more fish*’ for which only 44% gave a positive response. Also, the highest reported prevention strategy was *reducing fat in meals* and *quit smoking*. Awareness on all the specified prevention strategies for heart attack or stroke has increased significantly from baseline survey to post intervention survey ($p < 0.001$). The highest significant increase was in *loss of weight* and *eats more fish*. The lowest increase in awareness from baseline survey to post intervention survey in case of *reduce fat in meals* and *quit smoking* which may be due to the higher awareness of these preventive actions in the baseline survey.

Responses to the above 9 questions were scored based on the correctness. Each respondent received a score of one point for each correct answer. In both surveys the score ranged from 0 to 9. The mean score was 6.4 (males=6.6 and females=6.2) in the baseline survey that increased to a mean value of 8 in the post intervention survey

(males=7.9 and females=8.0). Figure 1 and Figure 2 show the distribution of scores in the two study populations. In the baseline survey, 28.9 % of the respondents was aware of all the preventive factors under consideration.

Figure 1 Awareness score on the preventive factors for heart attack or stroke identified by the sample population: Baseline Survey

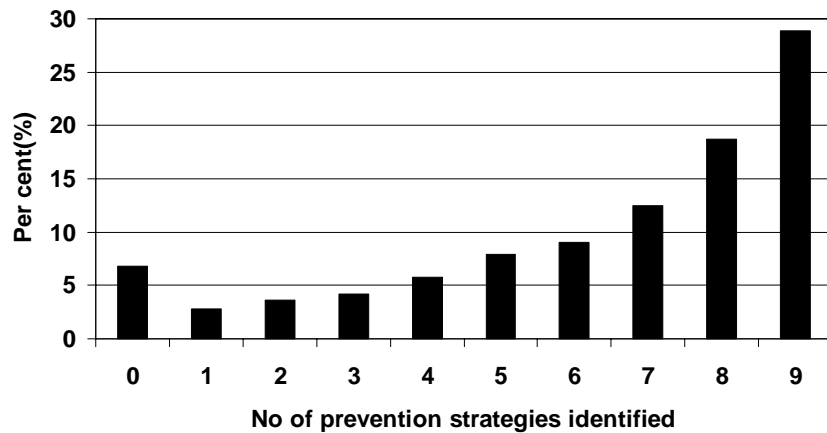
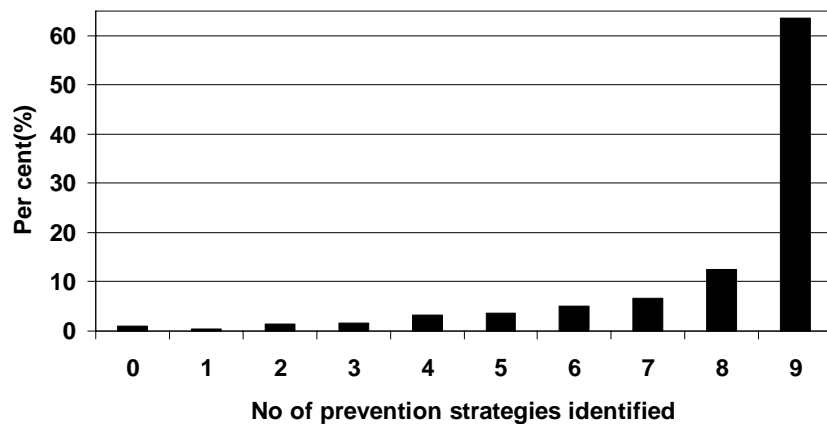


Figure 2 Awareness score on the preventive factors for heart attack or stroke identified by the sample population: Post intervention survey



Knowledge on the symptoms of heart attack

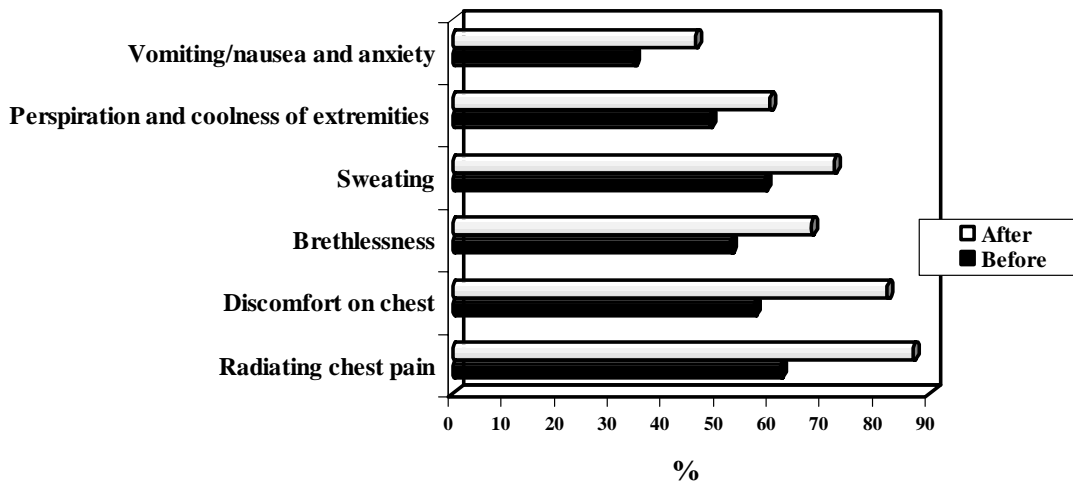
Knowledge on the symptoms of heart attack, like radiating chest pain, discomfort on chest, breathlessness, sweating, perspiration and coolness of extremities and vomiting of anxiety were collected. Radiating chest pain was the most commonly reported symptom of heart attack in both the surveys. This indicates the high perception of classical symptom of heart attack among the study groups. Positive effect of intervention was observed for all symptoms in post intervention survey with significantly ($p < 0.001$) better level of awareness. Even though an increase in the reported awareness of most symptoms of heart attack was observed in the post intervention survey, the respondents had relatively poor awareness about a few symptoms like, *perspiration and coolness of extremities* and *Vomiting/nausea and anxiety*.

Table 22. Awareness of the symptoms of heart attack

Symptoms	Baseline Survey			Post intervention Survey		
	Males N=1305	Females N=1330	Total N=2635	Males N=1242	Females N=1267	Total N=2509
Radiating chest pain	822(63.0)	804(60.5)	1626(61.7)	1115(89.8)	1061(83.9)	2176(86.8)
Discomfort on chest	753(57.7)	744(55.9)	1497(56.8)	1050(84.5)	1004(79.4)	2054(81.9)
Breathlessness	698(53.5)	681(51.2)	1379(52.4)	852(68.6)	842(66.6)	1694(67.6)
Sweating	794(60.9)	756(56.8)	1550(58.8)	896(72.1)	907(71.8)	1803(71.9)
Perspiration and coolness of extremities	647(49.7)	627(47.1)	1274(48.4)	728(58.6)	771(61.0)	1499(59.8)
Vomiting/nausea and anxiety	444(34.1)	455(34.2)	899(34.1)	546(44.0)	600(47.5)	1146(45.7)

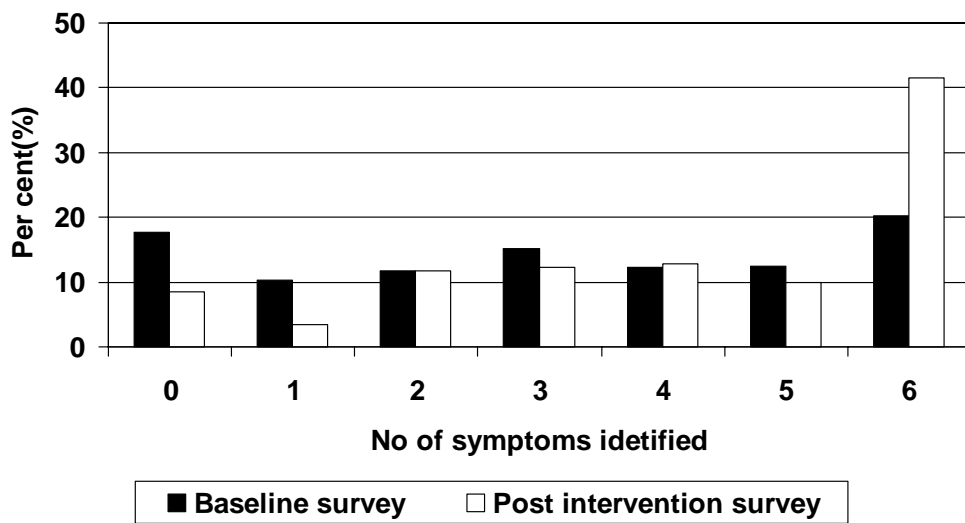
Figure 3 shows the awareness of each symptom of heart attack in the baseline and post intervention survey.

Figure 3 Awareness regarding the symptoms of heart attack: Before and after intervention



Respondent's knowledge on all the six symptoms of heart attack was given points to obtain the knowledge score. Those who were aware of each symptom received one point value. Thus the score of the study group varied from 0 to 6. In the baseline survey, about 18% of the respondents (males= 15.2%, and females= 20.2%) were not aware of even one of the above symptoms. This was significantly reduced to 8.4 (males=6.3%, females=10.4%) in post intervention survey. The change in knowledge score from baseline survey to post intervention survey is shown in Figure 4.

Figure 4 Knowledge score on symptoms of heart attack: Results from two surveys



Knowledge on symptoms of brain attack

Knowledge on symptoms of brain attack such as sudden loss of consciousness, weakness on any part of the body and paralysis were collected in both surveys.

Table 23. Awareness on the symptoms of brain attack

Symptoms	Baseline Survey			Post intervention Survey		
	Males N=1305	Females N=1330	Total N=2635	Males N=1242	Females N=1264	Total N=2506
Sudden loss of consciousness	973(74.6)	910(68.4)	1883(71.5)	1140(91.8)	1140(90.2)	2280(91.0)
Weakness on any part of the body	981(75.2)	947(71.2)	1928(73.2)	1016(81.8)	1062(84.0)	2078(82.9)
Paralysis	956(73.4)	916(68.9)	1872(71.1)	1026(82.6)	1069(84.6)	2095(83.6)

In the baseline survey and post intervention survey, the awareness on all the three symptoms of brain attack was high for males than females. A highly significant ($p < 0.001$) increase in awareness of all the symptoms from baseline survey to post intervention survey was observed.

AWARENESS AND PRACTICES

Knowledge about the prevention strategies of CVDs is an important step in the actual practice of these strategies. In the earlier sections, we have discussed the awareness on prevention strategies and some of the behavioral characteristics. The following sections correlate awareness and actual practices of prevention strategies related to CVD.

Smoking

Male respondents' awareness on "quit smoking" as a prevention strategy for heart attack or stroke and their actual smoking behavior is given in Table.24 and 25. In both the surveys, smokers were significantly more among those who were not aware of the harmful effects of smoking on CVDs compared to those who recognized the harmful

effects of smoking on CVDs. In the post intervention survey, prevalence of smoking was almost double among men who are unaware of health effects of smoking compared to their counterparts.

Table 24. Awareness and practice of smoking: Results of Baseline Survey

Smoking	Awareness on <i>quit smoking</i> as a prevention strategy for heart attack or stroke		
	Yes	No	Unsure
Yes	291(26.6)	35(33.3)	39(36.8)
No	803(73.4)	70(66.7)	67(63.2)
Total	1094(100.0)	105(100.0)	106(100.0)

P=0.001

Table 25. Awareness and practice of smoking: Results of Post intervention Survey

Smoking	Awareness on <i>quit smoking</i> as a prevention strategy for heart attack or stroke		
	Yes	No	Unsure
Yes	271(23.4)	24(42.1)	13(52.0)
No	889(76.6)	33(57.9)	12(48.0)
Total	1160(100.0)	57(100.0)	25(100.0)

P<0.001

Fruits and vegetables

The association between low fruits and vegetables intake and heart diseases has been reported in many earlier studies. We have already discussed the consumption of fruits and vegetables as well as the awareness on eating more fresh fruits and vegetables as a prevention strategy for heart disease among respondents in both surveys. Now let us see whether their awareness correlates with their actual practice of consumption of fruits and vegetables.

Table 26 Awareness and practice of fruit consumption: Baseline Survey

Frequency of fruit consumption	Awareness on the beneficial effects of fruits		
	Yes	No	Unsure
Daily	221(12.9)	10(6.7)	36(4.7)
3-4 times a week	710(41.3)	51(34.0)	343(44.8)
Occasionally	743(43.2)	84(56.0)	337(44.1)
Never	45(2.6)	5(3.3)	49(6.4)
Total	1719(100.0)	150(100.0)	765(100.0)

p<0.001

Daily consumption of fruits was higher among those who were aware of the benefits. Also those who never consumed fruits were significantly higher among the respondents who were not aware or not sure about the health benefits of fruit consumption.

Table 27 Awareness and practice of fruit consumption: Post intervention Survey

Frequency of fruit consumption	Awareness on the beneficial effects of fruits		
	Yes	No	Unsure
Daily	266(12.3)	3(7.1)	13(4.2)
3-4 times a week	1448(67.2)	25(59.5)	185(59.5)
Occasionally	408(18.9)	14(33.3)	95(30.2)
Never	32(1.5)	0	19(6.1)
Total	2154(100.0)	42(100.0)	312(100.0)

p<=0.001

Association between awareness and actual practice of vegetable consumption in baseline survey is given in table 28. It is clear from the table that there is not much difference in consumption of vegetables between the awareness groups. Also the relationship is not significant.

Table 28. Awareness and practice of vegetable consumption: Baseline Survey

Frequency of vegetable consumption	Awareness on the beneficial effects of vegetables		
	Yes	No	Unsure
4-5 times	18(0.9)	1(0.8)	4(0.7)
2-3 times	1692(87.1)	110(83.3)	505(90.7)
Once a day	147(7.6)	13(9.8)	32(5.7)
Less than daily	86(4.4)	8(6.1)	16(2.9)
Total	1943(100.0)	132(100.0)	557(100.0)

But in the post intervention survey, contradictory to our general expectation, a higher percentage of respondents, who were unaware of the benefits of vegetable use, were most frequent users of vegetables.

Table 29. Awareness and practice of vegetable consumption: Post intervention survey

Frequency of vegetable consumption	Awareness on the beneficial effects of vegetables		
	Yes	No	Unsure
4-5 times	36(1.6)	1(3.8)	2(1.0)
2-3 times	2092(91.5)	22(84.6)	165(84.2)
Once a day	116(5.1)	3(11.5)	28(14.3)
Less than daily	42(1.8)	0	1(0.5)
Total	2286(100.0)	26(100.0)	196(100.0)

$p \leq 0.001$

CONCLUSION

Baseline awareness level of the sample population was reasonably good. Awareness level increased significantly after the health education intervention. Since the post intervention survey was conducted immediately after the intervention it is difficult to say whether this increase in awareness will be retained. In certain risk factors like tobacco use there was significant reduction in the post intervention survey. Although the reduction in percentage terms was small the total impact in the population is likely to be very high. In

a highly educated population like that we studied such health education efforts can be done without much cost and can be integrated with the existing health care system. Such integration is likely to have long lasting positive impacts on NCD risk reduction.