Dietary Modification in a Workplace Health Promotion Program in Kuala Lumpur, Malaysia

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Lifestyle modification is effective in the prevention of cardiovascular diseases. This study aimed to promote healthy lifestyle behaviours to prevent cardiovascular disease. This study was a quasi-experimental trial with a follow up of two years. The intervention group (n = 102) received intensive individual and group counselling on diet and physical activity. The comparison group (n = 84) was given minimal education through mail and group counselling. Following the intervention, both groups reduced their total fat intake through a replacement in carbohydrate intake. The saturated fat and cholesterol intake was also reduced with a larger magnitude in the intervention group. Fruits and vegetables consumption was increased within the intervention group. The intervention group showed a statistically significant reduction in their mean total cholesterol levels with an intervention effect of -0.38 (95% C.I. = -0.63, -0.14) mmol/l. This study has achieved moderate improvement in dietary intakes as well as the total cholesterol of the participants.

Keywords: saturated fat; total cholesterol; workplace health promotion; Malaysia

Introduction

Malaysia has changed from an agriculture based country to a more industrialised economy. Health status has also improved significantly with the infant mortality rate decreasing from 19.7 per 1000 live births in 1981 to 5.9 per 1000 live births in 2004, while the life expectancy of males and females were 70.4 and 76.2 years in the same year.[1]

Lifestyle has become more sedentary with automation contributing to sedentary occupations and less energetic pastimes.[2] The local diet has also become more "Westernised", that is higher in energy, fat and salt, but low in fibre. These changes have resulted in a shift in disease pattern from communicable to non-communicable.[2,3] Cardiovascular disease and cancer have been the leading causes of morbidity and mortality in Malaysia since the late 1980s.[4-6]

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Coronary heart disease (CHD) is common in Malaysia and primary prevention requires a multi-faceted lifestyle approach to reduce risks for CHD.[7,8] Its essential features are dietary change, weight reduction if overweight or obese and increased physical activity. The dietary strategy is to replace types of saturated fats with dietary carbohydrate (preferable complex carbohydrate) and /or unsaturated fats and to control energy content.[9]

A pilot survey[10] on the prevalence of obesity and lifestyle practices was conducted in a community within the campus of a public university. It was a cross sectional survey with 136 participants. The study results showed this group was vulnerable to chronic diseases such as cardiovascular diseases and diabetes mellitus. About two third of the study group was overweight (64%) with a prevalence of obesity of 15.6%, a low prevalence of physical exercise and a high prevalence of diabetes mellitus (13.2%) and cardiovascular disease (29.5%). The prevalence of smoking was 27.7% for the whole study population and 46.8% among males. The above findings were much higher in comparison to that in the National Health and Morbidity Study II carried out nationwide in 1996.[11] All these lifestyle related risk factors are potentially modifiable.

A workplace health promotion program was initiated which aimed to empower the group with adequate skills to modify their lifestyle behaviours and reduce their risks for cardiovascular diseases. The workplace setting was chosen for the health promotion program for ease of access to a large number of people who make up a relatively stable population. The workplace setting encourages sustained peer support and positive peer pressure[12] and it could be used as one of the key channels for the delivery of interventions designed to reduce chronic disease among adult populations.[13] Workplace health promotion has been associated with a reduction in health risks, promotion of healthy lifestyles, improvements in economic and productivity factors, including: medical costs, compensation benefits, employee absenteeism and job satisfaction.[14-16] However a program must be sustained for a minimum of one year to bring about risk reduction among employees and 3 to 5 years to demonstrate cost-effectiveness.[14] This paper will report the results on dietary modification and the level of total cholesterol of the workplace intervention.

Methods

The study design was quasi experiment with a two-year follow up. The intervention group was the security guards of the public university and the comparison group was security guards from the teaching hospital of the same university. Universal sampling was conducted. Approval was obtained from the ethics committee of the university and the management of both units. Informed consent was also obtained from participants.

A pre-tested self-administered questionnaire was used to gather information on the participants' socio-demographic characteristics, medical history and lifestyle behavior (dietary practices, smoking, physical activities). Dietary practices were assessed using 24-hour dietary recalls and Food Frequency Questionnaires (FFQ). The 24-hour dietary recall was used to assess the total energy and daily nutrients intake while the FFQ was used to assessed intake of food groups such as fruits, vegetables, high cholesterol food such as egg, internal organs, seafood (prawns and crabs), and some popular local cuisines which were high in fat and calories (*roti canai*, *nasi lemak*, fried foods, curries etc). The 24-hour dietary recalls were computed using the *Nutritionist Pro* software while scores reflecting the frequencies of consumption of food groups were computed using the equation adopted from Reaburn, Krondl & Lau,[17] Chee et al,[18] and Khor & Sharif.[19]

Anthropometric measurements such as weight, height, waist and hip circumference were measured following the WHO procedures.[20] Clinical (systolic and diastolic blood pressure) and biochemical measurements (fasting blood glucose and full lipid profile) were collected by trained personnel. Detailed descriptions of these methods have been reported elsewhere.[21] All the above measurements were conducted at baseline and 6 monthly for two years.

Data was entered and analysed using SPSS for Windows version 11.0. Significant level was pre-set at 0.05 and 95% confidence interval were reported where appropriate.

The intervention program included one-to-one counseling on diet, group teaching (on exercise, quit smoking etc), distribution of self-monitoring booklets, tailor made brochures, modified recipes, quizzes (to increase awareness and knowledge), focus group discussions to learn from role models and shared experiences. Since it was unethical to withhold information, the comparison group was given minimal health education where their health check results were feedback by mail, standard brochures on healthy lifestyle were distributed and group sessions were held yearly.

Results

The mean age of both the intervention and comparison groups was 43.4 ± 7.9 and 46.0 ± 5.5 years respectively. The majority in both groups (>85%) had at least secondary education and were married. The baseline measurements including anthropometry, clinical & biochemical (Table 1). Most of the measurements were similar in both groups, except that the intervention group had significantly higher mean total cholesterol levels $(P < .05)$.

There was no difference in the total energy or % carbohydrate between both groups, but the intervention group had a lower % protein $(P < .05)$ and higher intake in % fat $(P > .05)$ (Table 2). The % saturated fat $(P < .05)$ and % monounsaturated fat $(P > .05)$

Table 1. Baseline Anthropometry, Clinical and Biochemical Measurements of the Intervention and Comparison groups

	Intervention (n = 102) Mean ± SD	Comparison (n = 84) Mean ± SD
Height (cm)	167.2 ± 5.3	168.3 ± 4.7
Weight (kg)	73.7 ± 12.7	74.5 ± 9.2
BMI (kg/m²)	26.3 ± 4.1	26.3 ± 3.0
Waist circumference (cm)	90. 8 ± 9.9	92.8 ± 7.4
FBS (mmol/l)	6.2 ± 2.5	6.0 ± 2.0
Systolic blood pressure (mm Hg)	133.2 ± 16.3	136.5 ± 18.2
Diastolic blood pressure (mm Hg)	82.4 ± 11.2	84.4 ± 11.6
Total cholesterol (mmol/l)	5.83 ± 1.14*	5.44 ± 1.10
HDL-Cholesterol (mmol/l)	1.17 ± 0.25	1.15 ± 0.23
LDL-Cholesterol (mmol/l)	3.62 ± 0.99	3.45 ± 0.98
Triglycerides (mmol/l)	2.32 ± 1.30*	1.91 ± 0.98

* $P < .05$ between intervention and comparison groups

Table 2. Baseline Dietary Intakes and Comparison of Differences in Total Caloric and Macronutrient Intake of Both Groups (Measurement at Follow Up – Measurement at Baseline)

| | Baseline | | Difference (Follow up – Baseline) | |
	Intervention (n = 83) Mean ± SD	Comparison (n = 70) Mean ± SD	Intervention (n = 83) Mean ± SD	Comparison (n = 70) Mean ± SD
Energy (kcal)	2021.9 ± 493.9	1958.6 ± 465.8	5.5 ± 504.2	113.3 ± 620.9
% Protein	12.8 ± 2.7	13.9 ± 2.4*	-0.1 ± 3.2	-0.9 ± 3.3
% Carbohydrate	58.6 ± 5.9	58.3 ± 6.4	-2.8 ± 6.6	-3.1 ± 6.7
% Fat	28.6 ± 5.9	27.8 ± 5.3	2.8 ± 6.7	4.0 ± 8.2
Cholesterol (mg)#	190.9	190.9	-106.4	-54.9*
% Saturated fat	14.2 ± 2.9	12.8 ± 3.0*	-1.4 ± 3.4	-0.9 ± 3.8
% Monounsaturated fat	9.1 ± 2.1	8.9 ± 2.3	-0.1 ± 2.8	-0.5 ± 2.9
% Polyunsaturated fat	5.1 ± 1.5	5.3 ± 1.9	-1.1 ± 2.1	-0.9 ± 0.3

Median values estimated using the FFQ
* $P < .05$

Table 3. Frequency Scores of Consumption of Food Items at Baseline and at Two-year Follow Up

| | Intervention | | | Comparison | | |
	Baseline (a)	2-Year (b)	*Difference (b-a)	Baseline (a)	2-Year (b)	*Difference (b-a)
Eggs	53.0	47.7	-5.3	55.3	51.8	-3.5
Internal organs	22.8	24.0	1.2	25.1	28.3	3.2
Sea food	22.4	28.6	6.2	23.9	31.1	7.2
Beef/mutton	36.7	38.8	2.1	38.6	36.8	-1.8
Santan	60.2	53.7	-6.5	60.3	58.0	-2.3
Roti canai	51.8	49.1	-2.7	42.3	46.8	4.5
Nasi lemak	51.8	48.9	-2.9	47.7	47.8	0.1
Fried noodles	48.4	48.8	0.4	46.2	48.2	2.0
Vegetables	78.4	83.6	5.2	73.9	79.0	5.1
Fruits	60.3	73.3	13.0	61.1	68.0	6.9

* Shaded cells showed improvement in scores of consumption

were higher in the intervention group and there was no difference in the intake of polyunsaturated fat or cholesterol.

The response rates of both groups throughout the two year follow up were maintained at 70%. There were no significant differences in dietary results at two year follow up between the intervention and comparison groups (Table 2).

The frequency scores of food consumption at baseline and at two-year follow up are presented in Table 3. There was larger magnitude of improvement in frequency scores in the intervention group.

Table 4. Mean Total Cholesterol Levels and Mean Difference of Participants by Categories

All Participants	Intervention (n = 102)	Comparison (n = 84)	Difference (Between Groups)
Baseline (mean ± SD)	5.83 ± 1.13	5.44 ± 1.10	
At two-years (mean ± SD)	5.62 ± 1.04	5.61 ± 1.16	
Mean difference (95% C.I.)	-0.21(-0.36;-0.06)	0.17 (-0.03; 0.38)	-0.38 (-0.63; -0.14)

Participants with total cholesterol <5.2 mmol/l

	Intervention (n = 24)	Comparison (n = 32)	Difference (Between Groups)
Baseline (mean ± SD)	4.49 ± 0.56	4.36 ± 0.73	
At two-years (mean ± SD)	4.49 ± 0.85	4.98 ± 1.16	
Mean difference (95% C.I.)	0.00 (0.37; -0.37)	0.62 (0.29; 0.95)	-0.62 (-1.10; -0.13)

Participants with total cholesterol ≥5.2 mmol/l

	Intervention (n = 78)	Comparison (n = 52)	Difference (Between Groups)
Baseline (mean ± SD)	6.24 ± 0.92	6.10 ± 0.70	
At two-years (mean ± SD)	5.97 ± 0.83	6.00 ± 0.99	
Mean difference (95% C.I.)	-0.27 (-0.43; -0.12)	-0.10 (-0.34; 0.14)	-0.17 (-0.44; 0.10)

The intervention group had an intervention effect in total cholesterol of -0.38 (-0.63; -0.14) mmol/l for the whole group (Table 4). The high risk participants (>5.20 mmol/l) of both groups improved their total cholesterol levels but the intervention group had larger improvement compared to the comparison group.

Discussion

There were no significant changes in dietary intake within the two groups. The reduction in total fat and saturated fat, the consumption frequency in *santan (coconut milk)*, local dishes such as *nasi lemak* and *roti canai (which were high in total fat and saturated fat)*; the reduction in cholesterol intake was larger in the intervention group compared to the comparison group. A review on findings of clinical trials on diet and lipid profiles suggested that a 1% change in saturated fat intake was associated with a 2–10 mg/dl change in serum total cholesterol.[22]

The fruits and vegetables consumption scores were also increased in larger magnitude among the intervention group. Increasing fruits and vegetables particularly green leafy vegetables, vitamin C rich fruits and vegetables have a protective effect against coronary heart disease[23] or less progression of coronary atherosclerosis.[24]

With all these observed changes, the total cholesterol was reduced significantly in all participants (4%) within the intervention group, although less than in clinical settings (7%-15%)[25-28] but comparable with workplace program (5%-10%).[29,30] For high risk participants, both groups had reduction in total cholesterol but with a larger magnitude

in the intervention group. This could be due to the intervention group was given more knowledge and skills of selecting or preparing healthier food through more intensive education and tailor-made counseling. Similar results were found in other studies.[31-33] If this modest achievement could be sustained, their cardiovascular disease risks in the long term may be reduced.

Conclusion

This health promotion program at workplace has achieved moderate health improvement among the participants. There was some replacement of saturated fat with complex carbohydrates, reducing total fat and cholesterol intake and fruits and vegetables consumption increased. This resulted in a slight improvement in total cholesterol levels.

Acknowledgments

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