Original Article

The Benefits of 4-Sided Behavioral Modification Strategy on Cardiovascular Risk Factors in the National Alliance for Tobacco Free Networks, Thailand

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Background: Non-communicable diseases (NCDs) are the critical cause of morbidity and mortality in Thailand. Medical treatment and lifestyle modifications are indicated to control the disease. However, the efficacy of lifestyle modification programs is still not clearly revealed. Objective: To estimate and report on the effectiveness of health-risk behavior modification programs, called the "Change 4 Health" Strategy, on health outcomes in the National Alliance for Tobacco Free, Thailand.

Methods and Materials: "Change 4 Health" programs use mnemonics to change four bad habits: A-Avoiding Alcohol, B-Body Movement, C-Cessation, and D-Diet. Results aimed to retrieve the summary and secondary data from the database. Thailand's National Alliance for Tobacco Free (THPAAT) offers basic, easy-to-follow behavior workshops. We reviewed 1,815 quality records and qualitative data from 20 Bangkok primary care units. Changes in health risk behaviors were tracked 1 and 3 months after "Change4Health" was implemented. Changes in cardiovascular risk factors, alcohol intake, smoking cessation, exercise, and eating behaviors and diets were statistically significant at p-value 0.05.

Results: THPAAT's "Change 4 Health" technique helped populations quit smoking, improve their dietary habits, exercise more, and reduce alcohol consumption by 45%, 47.8%, 11.8%, and 15.8%, respectively. One-third (31.3%) reported weight loss. Nearly one-fifth (16.3%) reduced their waist circumference. These effects were linked to eating and smoking (p-value <0.01). Smoking cessation and exercise reduced blood pressure monitoring by 15.3%. Dextrostix found that glucose levels improved by 55.2%, which was strongly linked to eating behavior. One-third of LDL values dropped after eating and smoking cessation (p-value <0.01). Reducing alcohol consumption improved health indicators (body weight, waist circumference, blood pressure, blood sugar, and LDL) by 15.85% (p-values >0.05).

Conclusion: A health-risk behavior modification program called Change 4 Health (Avoid Alcohol, B-Body movement, C-Cessation, D-Diet) improved health indexes among participants. However, smoking cessation and diet changes appeared to be the most effective way to change physical parameters, including body weight, Waist circumferences, and have some effect on blood sugar and lipid level.

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INTRODUCTION

According to the World Health Organization (WHO) [1], the most common cause of death in low- and middle-income countries (nearly 71%) is due to non-communicable diseases (NCDs). The leading cause is cardiovascular diseases (like heart attacks and stroke). Bundhamcharoen, K [2] confirmed that NCDs are increasing. These are an economic burden to all countries, including Thailand. Several studies were conducted. For instance, Thanarung P, et al [3] found that 18.8% of the population in Nong Hai Village had NCDs. The most common was high blood pressure, 7.9 %, followed by diabetes, chronic kidney failure, and ischemic heart disease, 5.5%, 2%, and 1%, respectively. The same results were shown in many studies [4-6]. The problematic situation of NCDs reflects that more specific and effective disease prevention and control are needed.

Health literacy and risk behaviors modification should be incorporated to control NCDs. Most patients [3-5] had high-risk behaviors, such as insufficient physical activity, smoking, improper diets, and excessive alcohol consumption. Waist circumference and BMI of the population were found to exceed standard 3. Exercising in various forms gives better health outcomes for NCDs [7-9]. Health literacy is essential in controlling NCDs [7, 9-10] moderate-high knowledge gives them good attitudes and health-seeking behaviors. Awareness of risk factors can help to prevent complications among these illnesses.

Ministry of Public Health, Thailand [11] and WHO [2] have set the objective to reduce the level of exposure of individuals and populations to the common risk factors for NCDs, namely tobacco consumption, unhealthy diet, and physical inactivity, and their determinants. Thai Physicians Alliance Against Tobacco (THPAAT), under the supervision of The Medical Association of Thailand. They recognize these problems and then let the team to organizes a campaign project, "Change before sickness" (CHANGE 4 HEALTH), to educate health professionals and the public to protect themselves from chronic non-communicable diseases (NCDs).

This study aimed to find out the quality of health-risk behavior modification programs, including A-Avoid Alcohol, B-Body movement, C-Cessation, and D-Diet on health outcomes of patients whom healthcare providers worked with in "Change before sickness" (CHANGE 4 HEALTH). The outcomes were measured based on secondary summative data, e.g., health parameters, body weight, waist circumference, self-monitoring blood pressure, and daily dextrostix in the CHANGE 4 HEALTH database.

MATERIALS AND METHODS

Recently, the Thai Physicians Alliance Against Tobacco (THPAAT) developed the program "Change 4 Health" to change four unhealthy habits, using the mnemonic, A-Avoid Alcohol, B-Body movement, C-Cessation, and D-Diet. The healthcare providers in 20 primary care units were trained to break and change unhealthy habits. The research objectives were to compare the successful outcomes (health indexes) after volunteers passed Change 4 Health program as 1) alcohol consumption should be decreased by aim, no more than two standard drinks per day with a maximum of 4 days a week. 2) The four types of exercises (endurance, strength, balance, and flexibility) were recommended, at least 30 mins/day and 600-1,200 METs per week. 3) Tobacco cessation was suggested, using 5 A-technics (Ask, Advise, Assess, Assist and Arrange for follow-up contact) to quit smoking. 4) Dietary controls included consuming the right number of calories, sugar, oil, and salt, less than 6:6:1 teaspoon(s). Reference from Krobthong A, et al. [2021] [12] and networks that conducted workshops from October 2018-August 2019 aimed to improve five health indexes after passing behavioral health modification in 20 primary care units in Bangkok. The workshop was implemented, plus gave educational materials to healthcare providers in primary healthcare units and collected health information to the "Change 4 Health Database". This study aimed to retrieve the summary and secondary data from the "Change 4 Health database" that this database was not tagged to confidential information of participants in records. The researcher extracted the database information in the domains of body weight, waist circumferences, blood pressure, and some of the self-monitoring laboratories (e.g., blood sugar and LDL level from the database. The analysis was divided into two parts. The first part was descriptive data in the count number and frequency. For the second analytic part, the researcher used multiple correlation analysis to look at the trend of Health indexes significantly correlated (p-value less than 0.05) with intervention data that consist of alcohol consumption, exercise, smoke cessation, and diet changes. A total of 1,815 data sets from 20 primary care units included five health indexes data, as previously mentioned reflecting health-risk related to NCDs. Health risk behaviors were initially input by themselves before entering the Change 4 Health program. Under the supervision of well-trained healthcare providers, they input health risk behaviors into the database at 1 and 3 months during the pilot phase. Then the data will retrieve and summarize. Some of the cardiovascular risk

factors were also measured in this study, such as body weight, waist circumference, and blood pressure monitoring. Dextrostix and LDL level in the database was recorded and summarized in some clinics and some patients as their routine check-ups (the researcher did not tag any of their confidential data).

Statistical analysis

The STATA software version 15, Educational licensed (Chicago, IL) was used for data analysis. The descriptive statistics were reported by Mean ± Standard Deviation (SD) and/or median (ranges) depending on data distribution. The count numbers were reported in numerical data and percentages. The p-value < 0.05 was assigned as statistical significance. The correlation between behavioral changing and health indexes use base core command inside the STATA software and correlation coefficient with p-values were reported and p-value less than 0.05 was considered as statistically significant.

RESULTS

A total of 1,975 summarized records of health data were retrieved. From database records, the author found that 34 patients (1.7%) were lost from the follow-up database, with only 1,815 database records remaining complete for analysis in this study. The overview of demographic data is shown in Table 1. The average age was 53 years, analyzed from the record database. Most patients in this database had NCDs, Hypertension, and other related diseases found in 70.3% of the population. 61.8% were found to be associated with Metabolic Syndrome.

Table 1. Demographic from the database records

	Number (n= 1,835)	%
Sex		
Male	1,281	70.6
Female	534	29.4
Age range (years)		
<30	185	10.2
31-50	540	29.8
51-70	879	48.5
>70	210	11.5

Table 2. Prevalence of NCDs in Database

	Number	%
NCDs		
None	474	29.7
Diseases	1,122	70.3
Underlying Diseases		
HT, DM, DLP	109	9.7
HT, DM, others	20	1.8
HT, DM	223	19.9
HT, DLP	55	4.9
DM, DLP	40	3.6
HT	356	31.7
DM	134	11.9
DLP	52	4.6
Others	133	11.9
Metabolic Syndrome		
BMI <23	693	38.2
BMI 23-25	322	17.7
BMI 25-30	553	30.5
BMI >30	247	13.6

Abbreviation: NCDs: Non-Communicating Diseases, BMI: Body Mass Index, HT: Hypertension, DM: Diabetes Mellitus, DLP: Dyslipidemia

Alcohol consumption was found in 36.8 %. Beer and Whiskey were the most popular, 44.4% and 39.2%, respectively. Most (42.5%) drank alcohol within the low level, 1-2 day(s) per week. 42.5 % of patients were not doing enough exercise. Only 44.2% did exercise more than three days per week. The most popular type of exercise was walking. Smoking was found in 68.7%. The cigarette was the most popular. The Smoking Index was estimated from the database records. The results showed around 38.3% or one-third of smokers will be categorized as having severe addiction based on their reports, and 24.8% with moderate addiction. The previous attempt at smoking cessation found only 3.8% (46 from 1,185 smokers). Various methods of smoking cessation were used, such as Thai herb tea (Vernonia cinerea Less) was the most used for smoking cessation. Unhealthy eating behavior was found; the summarized database showed more than 70% of all loved to eat fried foods, fermented bakery products, and instant food. 27.5%, 21.6%, and 26.7% of patients consumed sugar more than 6, oil more than 6, and salt more than 1 teaspoon(s) of, respectively.

In the "Change 4 Health" database, after participating in the programs, the participants' health risk behaviors changed. Alcohol consumption

decreased by 15.85%. 11.83% of patients did more exercise. The number of smokers decreased by 45.09% (514 patients). Smoking cessation for more than 3 months was found to be only 3.8%. Eating behavior was improved by 47.82%.

Table 3. Health risk behaviors

	Number	%
Alcohol consumption	638	36.8
Body movement, poor	770	42.5
Smoking	1185	68.7
Poor dietary behavior		
Sugar (>6 teaspoons)	277	27.5
Oil (>6 teaspoons)	218	21.6
Salt (>1 teaspoon)	269	26.7

Table 4. Behaviors changing

%	Alcohol	Exercise	Smoking	Diet
Improved	15.85	11.83	45.09	47.82
No change	55.69	83.12	31.75	49.53
Worse	28.46	5.05	23.16	2.65

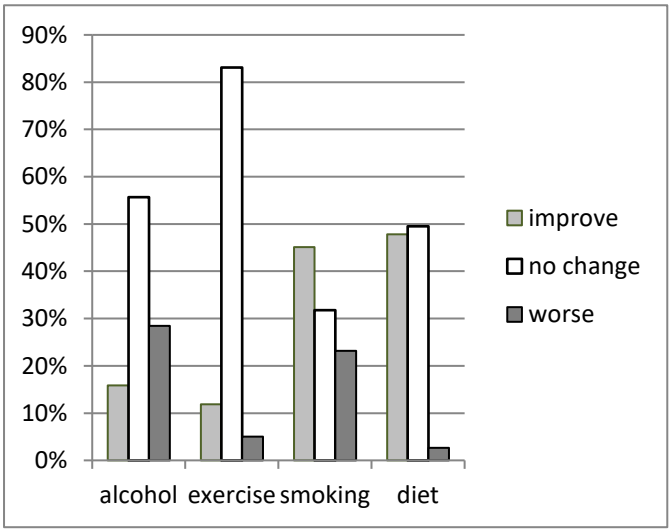

Figure 1. Behavior changing

Health indicators had improved, with a decrease in body weight and waist circumference. Of the 568 participants in the database demonstrated they lost weight, only 51 patients lost more than 5%, and 25 patients lost more than 7%. Waist circumference also decreased in 269 patients (16.4%). Blood pressure decreased in 278 patients; 41 patients were found that improve their blood pressure down two steps, and seven patients were found that HT level 3 became normal. Dextrostix was performed in 518 patients with diabetes; 286 patients (55.21%) had glucose levels (dextrostix) better than the last measurements. The record of LDL level was monitored in 165 patients with dyslipidemia and decreased by 31.5% (52 patients) after the completely engaged program.

Table 5. Health Index monitoring

	Weight	Waist	BP	DTX	LDL
Decreased	31.3%	16.4%	15.3%	55.2%	31.5%
No change	53.0%	74.9%	80.1%	16.8%	56.4%
Increased	15.7%	8.8%	4.6%	28.0%	12.1%

BP: Blood Pressure, DTX: Dextrostix, LDL: LDL Cholesterol

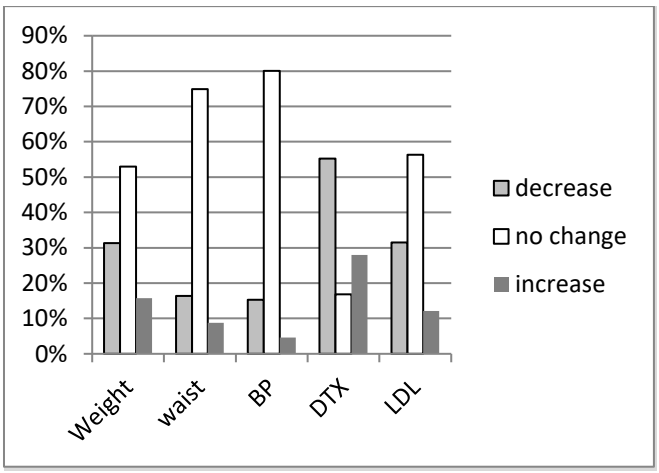

Figure 2: Health Index Monitoring

Table 6. Correlation between behaviors changing and health indexes

	BW	WC	BP	DTX	LDL
Alcohol	0.849	0.093	0.515	0.349	0.06
Smoking Cessation	0.000**	0.000**	0.012*	0.895	0.002**
Exercise	0.012*	0.000**	0.006**	0.490	-
Diet	0.000**	0.000**	0.928	0.000**	0.000**

*BW: Body Weight, WC: Waist Circumference, BP: Blood Pressure, DTX: Dextrostix, LDL: LDL Cholesterol, *p-value<0 .05 **p-value<0 .01*

DISCUSSION

In the present study, 1,815 summarized data from "Change 4 Health" database is retrieved and studied the benefit of health-risk behavior modification programs on Health Index outcomes (Body weight, Waist

Circumferences, Blood pressure, Dextrostix, and LDL Cholesterol). The parameters of changing the risk behavior of the records who participate in the programs were extracted and analyzed. The study found more than 40% had modified their behavior and success in reducing health risks after joining the program and supervising by healthcare providers in the primary care unit. Most of the basic physical parameters, Body weight and Waist Circumference (WC) and blood pressure, have significant correlations of improvement with changes in habits of eating, exercise, and smoking cessation, except the correlation between diet and blood pressure (p-value >0.05). It's relevant with studied of Wadden TA *et al.* [13]. They studied components of comprehensive lifestyle modification, including diet, physical activity, and behavior therapy to reduce participants' weight. Wadden TA *et al.* found a loss of up to 8 kg. (8 % of weight) in six months and still showed improvements in cardiovascular disease risk factors and quality of life. They demonstrated that if the participant had maintained high levels of physical activity, frequent monitoring of body weight combined to reduce calorie diet was significantly associated with long-term weight loss. Jansen et al. [2014] showed that a lifestyle modification program was needed to achieve clinically meaningful weight loss, typically defined as a reduction of ≥5% of initial weight after an intervention. [14] Dalle Grave R *et al.* [2013] also reported that Lifestyle modification therapy for overweight and obese patients combines specific recommendations on diet and exercise with behavioral and cognitive procedures and strategies, successfully to a mean weight loss of 8-10 % after 30 weeks of treatment.[15]

The alcohol consumption did not significantly change after participating in the Change 4 Health program (p-value >0.05). From the simplified laboratory monitor in the Change 4 Health database (DTX and LDL). The author found only changes in the habit of diet consumption correlated with changes in DTX and LDL. The joining in smoking cessation showed a significant correlation with the decline of LDL levels.

Kushima K, et al. [1998] conducted cross-sectional data measured in 1989 and longitudinal data (1985 to 1989). Kushima K et al. showed the effect of smoking cessation on BMI, blood pressure, and serum lipids; ex-smokers BMI remained at almost the same level as non-smokers. The Blood blood pressure was increased over the short period by both the effect of smoking cessation and the initially increasing in BMI from abstention from smoking. The triglycerides (TG) and atherogenic index (AI) levels tended to decrease. The HDL-cholesterol (HDLC) level tended to increase over the short period of smoking cessation. Finally, they summarized that smoking cessation has beneficial effects for health promotion in middle-aged men. [16]. Suwazono Y, et al. [2010] showed the participants who stopped smoking had more significant increases in body weight, BMI, systolic and diastolic blood pressure, total cholesterol, high-density lipoprotein cholesterol (HDL), and uric acid. And reported a greater decrease in hemoglobin in the 3 years following smoking cessation than continuing smokers. [17]. However, It is also relevant to the study of Allen SS, et al. [1994]. Allen SS and the working group studied abstinent patients and found that systolic blood pressure and heart rate decreased from baseline (while still smoking, before the start of the study) while weight increased. Similarly, HDL increased while LDL decreased, and triglycerides increased.[18].

CONCLUSION

Implementing a health-risk behavior modification program called "Change 4 Health" (Avoid Alcohol, B-Body movement, C-Cessation, D-Diet) in primary care settings effectively promoted health and improved the health indexes among participants. However, smoking cessation and diet changes appeared to be the most effective way to change cardiovascular risk (CVD) parameters. The present study shows significant differences in physical parameters, including body weight, waist circumference, and some effect on the surrogate parameters (blood sugar and lipid level) after implementing of health-risk behavior modification program. These demonstrate that these CVDs risk factors can be modified and prevented, leading to decreasing metabolic syndrome and cardiovascular disease developments in the future.

Author Contributions: All authors confirmed for equally distribution to the manuscript in the following areas: study conceptualization, methodology, data validation and data analysis, results interpretation, original draft preparation, review, and editing. All authors reviewed and approved the manuscript. **KA** responded in PI role, **SAV** worked and responded as Co-author and Corresponding author. **SR, SR, RT** and **KP** worked as Co-authors. This proceeding material and some part of these research study was presented in the poster section in the 13th ASIA PACIFIC conference on Tobacco or health APACT 2021, September 3-4, Bangkok, Thailand.

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