

Systematic Review

Nutrition and Physical Activity Educational Intervention on CHD Risk Factors: A Systematic Review Study

Fatemeh Rahmati-Najarkolaei PhD¹, Eiman Ghaffaripasand MD^{•2}, Mohammad Gholami Fesharaki PhD³, Nematollah Jonaidi-Jafari MD¹

Abstract

Introduction: Fast-growing epidemic of chronic diseases causes many health challenges over the world. Regarding reported pros and cons, the aim of the current study is to review the effect of nutrition and physical educational intervention in decreasing cardiovascular risk factors.

Methods & Materials: In this review study, searching has done through the English and Persian databases. Articles with other languages, lack of important information, and score 3 or less in the JADAD standard checklist were excluded from the study.

Findings: In the primary search, 194 articles have been found, Through four stages of secondary search and further evaluation, 43 articles were selected. These articles were published between 1989 to 2013.

Conclusion: According to these findings, the majority of articles showed a positive effect of nutrition and physical activity educational interventions on cardiovascular risk factors- blood cholesterol, systolic and diastolic blood pressure, as well as smoking cigarette in high risk patients. These results, suggest the necessity of continuing nutrition and physical educational intervention for individuals with cardiovascular risk factors.

Keywords: Cardiovascular risk factors, education, nutrition, physical activity, systematic review

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Introduction

Regarding high prevalence of coronary artery disease (CAD) in Iran and worldwide, the recognition of its major risk factors can lead us to decrease the incidence and prevention of cardiac diseases account in high priority. Presence of any of the major risk factors, along or without family history, dietary regimen and lifestyle can induce multi-fold increase in risk of CAD or facilitate the course of other cardiac diseases.^{1,2}

It's a fact that the presence of one or more cardiac risk factors is not equal to definite CAD. Furthermore controlling only one risk factor is not enough to prevent CAD. Despite that, there are risk factors which their close lookup can lower the risk of CAD in most populations i.e. smoking, high cholesterol levels, hypertension, etc.³

On the other hand, Fast increase of chronic diseases is one of the most important pitfalls in countries' health care system, which consists of 60% of total mortality and 47% of diseases' burden. These patients need lifelong care, specific educations, rehabilitation and focused treatment to shift them into a more normal life.^{1,2}

Lifestyle, non-healthy dietary habits, and low physical activity are highly associated with cardiac related mortality and morbidity^{3,4} and moreover, it can induce a lot of costs and decreases productivity.⁵ More than 50% of all cancers and 40% of other cardiac problems are related to lifestyle.⁶ Accordingly, CAD is one of the

most prevalent chronic diseases responsible for high proportions of mortality and morbidity in Iran. However, researchers predicted an increase in its prevalence in the near future⁷ and also youth population is prone to CAD in the next decade.⁸

The goal of health educations is to improve the health knowledge and attitude, and ultimately, to change behavior of the individuals toward a better lifestyle in all aspects of life.⁹ According to *Green and Kreuter* definition, health promotion is "the process of enabling people to increase control over their health and its determinants, and thereby improve their health".^{10,11} All researches and systematic reviews have suggested and supported that education programs on healthy diet and physical activity are the most effective programs and able to improve knowledge and lifestyle.^{12,13} Researches on the effect of knowledge translation methods on cardiac diseases prevention should not be limited to knowledge, attitude and operation. It should aims on laboratory studies to evaluate the actual effect of known risk factors. On the other hand, there is vague information regarding the effect of educational programs on cardiac risk factors. The purpose of this review is to collect all recent information regarding how education programs affect metabolic syndrome indices from the literature. It also aimed to introduce a fully comprehensive survey on the actual effect of nutritional and physical activity changes in improving cardiac risk factors. This information can help us to improve our knowledge toward this issue and will provide data for researches all over the world as a complete discussion on risk factor modification.

Methods and search strategies

In this systematic review, all literature regarding risk factor modification by educational programs on physical activity and nutrition according to JADAD checklist and the results are presented

Authors' affiliations: ¹Health Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran, ²Hormozgan Institute of Health, Hormozgan University of Medical Sciences, Bandar Abbas, Iran, ³Department of Biostatistics, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran.

Corresponding author and reprints: Eiman Ghaffaripasand MD, Hormozgan Institute of Health, Hormozgan University of Medical Sciences, Bandar Abbas, Iran. Tel: +98-913-1088901. E-mail: Ghaffaripasand@yahoo.com.

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in a table. The search key-words (Health education, Nutrition, Physical activity, Cardiovascular risk factor, Cholesterol, Triglyceride, CPK (Creatine Phosphate Kinase), Troponin, and High risk) and their Farsi synonyms were searched in medical and scientific databases (Scopus, Medline, Embase, Cochran central register of controlled trials, and Cochran database systematic review and also Farsi medical databases such as Iranmedex, SID and Magiran). All information in all kinds of research methodologies were included in our review (RCTs, Cohorts, Case-control and cross-sectional studies, and case reports). We also evaluated the references of articles found in our initial search. No time limitation was applied.

The research steps were as follows: 1) searching the terms: *Health education, Nutrition and Physical activity*, 2) adding *Cardiovascular risk factors* into our keywords search, 3) co-using the term "*Educational Intervention*" regarding the Mesh terms, and 4) limiting our search by using the words *cholesterol, Triglyceride, Blood pressure* and *Blood glucose*.

Exclusion criteria consist of other languages (rather than English and Farsi) for the full articles, conference presented abstracts due to lack of important information and also score 3 or less in

the JADAD standard checklist review. Inclusion criteria were relevancy to the main topic with no time or place limit; and also the articles should pass the 4 stages of searching protocol.

Results

Search results

In the first step of our search we found 194 articles, which was limited to 152 after adding the next keyword. MeSH term narrowing system left us with 108 useful articles. In the fourth step we reviewed the articles and omitted the unrelated and non-English/non-Farsi ones, 54 articles were selected for final evaluation by JADAD standard checklist; which at the end, 43 articles were enrolled into the review (Figure 1).

As seen in table 1, most of the articles were published between 1989 and 2013; three of them were from Iran (2 in Tehran, 1 in Boushehr). Regarding their methodology, eight review articles, three descriptive surveys, seven case control studies and 25 trials were included. Half of the research articles were population based studies.

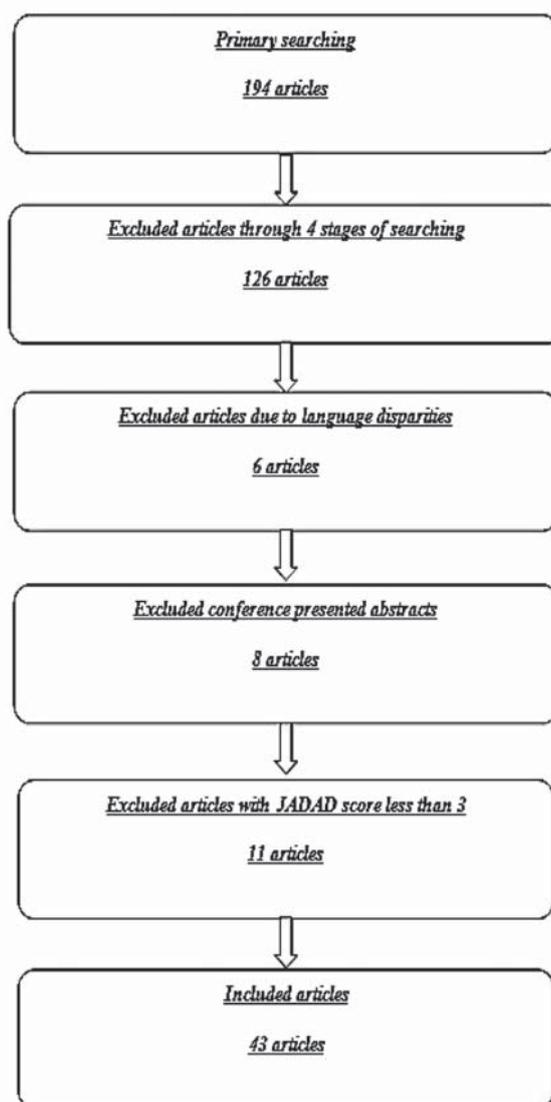


Figure 1. Schematic diagram of search protocol

Table 1. Summary of included articles

Reference number	Country	Year	Method	Sample size	Statistical population	Research place	Duration	Subjects	Risk factors modification
14	S. Korea	2013	Descriptive	15902	> 30 y	Society		CVRF	decrease in smoking, FBS, TG in men
15	USA	2012	Interventional	52	adolescence	School	4 m	D&PA	decrease in FBS, TG, Chol, LDL and increase HDL
16	USA	2012	Interventional	6.5 M	5 th , 7 th & 9 th grade	School	5 y	D&PA	decrease in weight and BMI
17	USA	2012	Interventional	508	menopause 52-62 y	Society	4 y	Nutritional health & PA	decrease in HDL, LDL, BP, TG and FBS
18	Norway	2011	Interventional	498	11-15 y	School	30 y	Nutritional health & PA	decrease in BMI, Chol, TG, BP by fathers' education (not mothers')
19	Netherlands	2011	RCT	80	School age	Society	2 y	D&PA & increase in self esteem	decrease in BMI and other risk factors
20	USA	2011	Case-control	279	Middle aged BMI > 25	Doctor Offices	2 m	D&PA	decrease in chol, BP, FBS and energy consumption, weight loss & LDL lowering
21	Japan	2009	Case-control	463	Middle aged	Society	15 m	D&PA	significant decrease in all risk factors
22	USA	2009	Interventional	1093	Hispanic middle aged women	Society	9 m	D&PA	significant decrease in all risk factors
23	USA	2008	Interventional	66	mean 11 y	Home family	2 y	D&PA	Significant decrease in BMI, chol, LDL, TG; Increase in HDL and Insulin
24	USA	2008	Interventional	200	5 th grade	School	2 y	D&PA	weight loss, lowering BMI, decreasing BP and CRP
25	Australia	2006	Case-control	133	Menopause 50-65 y	Society	12 w	D&PA	decrease in smoking, BMI, weight and Diastolic BP lowering systolic BP
26	USA	2006	Interventional	318	24-81 y	Society	6 m	D&PA	significant decrease in BMI, weight, lipid profile, BP and HDL
27	UK	2005	Interventional	11	7-11 y	Home family	3 m	D&PA	significant improvement of waist circumference, fitness, self-esteem and other cardiac risk factors
28	USA	2004	Interventional	1443	middle aged women	Society	12 m	D&PA	Significant decrease in BP and diet modification, No change in chol
29	Greece	2002	Interventional	831	1 st elementary grade	School	6 y	D&PA	modification of anthropometric measurements, significant decrease in LDL, HDL, Chol, TG
30	USA	2001	Interventional	506	Rural areas	Society	5 y	D&PA	significant improvement in HDL, TG, BP, smoking and in-significant decrease in FBS and chol
31	USA	1996	Interventional	1274	3 rd and 4 th grade	School	4 m	D&PA	decrease in chol, body fat, and diastolic BP increase in aerobic power,
32	USA	1996	Case-control	108	elementary school	School	2 y	D&PA	decrease in BMI, in-significant decrease in TG, chol, No BP change
33	Iran, Tehran	2012	Interventional	61	gestational diabetes cases	Society	1 m	D&PA	significant improvement in knowledge, and 1-2hpp BS
34	USA	2009	Interventional	785	Cardiovascular patients	Society	3 m	D&PA	decrease in BMI, TG, Chol, HgA1c, improvement in BP, LDL, HDL

35	Iran, Boushehr	2007	Interventional	335	middle aged women 25-64 y	Society	2 m	D&PA	no BMI, weight, lipid profile, diastolic BP change, significant decrease in systolic BP
36	Vietnam	2012	Interventional	4650	middle aged	Society	3 y	D&PA& smoking cessation	Increase in anthropometric measures in females and BMI in males decrease in BP and salty diet
37	Netherlands	2011	Case-control	276	office workers	Society	2 y	weight loss plus D&PA	no change except chol after 6m
38	USA	2010	Case-control	328	Cardiovascular patients	Society	2 m	D&PA	significant modification of BW, LDL, chol, HDL, BP, 10 year Framingham score
39	USA	1012	Analytic Cross-sectional	553	middle aged	Society	15 y	D&PA& life style	decrease 10 year risk factor in high educated patients
40	USA	2010	Analytic Cross-sectional	443	middle aged women	Society		D&PA & life style	decrease in waist circumference, HDL, TG, FBS, significant relation between Framingham risk score and education levels
41	Iran, Tehran	2013	Interventional	362	14-18 y adolescence	School	3 m	D&PA plus psychological health and communication skills	no change in diet, stress management or general hygiene; significant improvement in life style scores in both genders
42	USA	1994	Interventional	7097	25-74 y	Society	5-6 y	D&PA plus smoking cessation	smoking decrease in women, non-significant change in BP, mortality risk; no change in BMI or chol
43	Australia	1993	Case-control	431	Young people	Society	6 m	D&PA& life style	Significant decrease in BMI, smoking and BP, no change in Chol
44	Sweden	1995	Interventional	681	30-59 y	Society	18 m	D&PA& weight control	decrease in all risk factors; significant weight, BMI, BP other were non-significant, no change in smoking
45	UK	1994	Interventional	12472	40-59 y	Society	1 y	D&PA & life style	Significant decrease in coronary risk in both gender, lowering BP, weight and chol
46	USA	1993	Interventional	6814	25-74 y	Society	2 y	behavior and diet	decrease in chol only in men
47	Australia	1989	Interventional	1937	middle aged	workplace	6 m	D&PA	decrease in systolic BP and modification of others
48	Norway	1991	Interventional	1373	30-54y men	Home family	2 m	D&PA plus smoking cessation	significant decrease in all risk factors, lowering in children, no changes in smoking

*CVRf: cardiovascular risk factor, FBS: fasting blood sugar, TG: triglycerid, D: Diet, PA: physical activity, Chol: cholesterol, LDL: low density lipoprotein, HDL: high density lipoprotein, BMI: body mass index, BP: blood pressure, RCT: randomized clinical trial.

Putting aside Aryana, et al. study (USA, 2013) which reviewed 6.5 M secondary school individuals;¹⁶ other studies have reviewed 62364 subjects during 955 months (near 80 years) regarding nutritional and physical activity educational program effect on cardiovascular risk factors. All but two articles (6.9%) did show some differences in risk-factors after educational interventions.

The risk factor modifications suggested by the respective articles are listed below:

1. Fasting blood sugar (FBS): six with significant decrease,^{14,15,17,20,40} two with non-significant decrease^{30,33} and one without any changes.³⁵ Other studies did not evaluate FBS.
2. Triglyceride (TG): eight studies showed significant decrease^{14,15,17,18,23,30,34,40} two others with non-significant decrease^{29,32} and one without any changes.³⁵
3. Cholesterol (TC): significant modification was seen in eight publications,^{14,15,17,18,23,30,34,40} non-significant in three^{29,30,32} and no changes in four.^{28,35,42,43}
4. Low-density lipoprotein (LDL): six were significant,^{15,17,20,23,29,38} and one was non-significant.³⁴
5. Weight and BMI: With 12 reports regarding the significant lowering effect,^{16-19,23-26,34,38,43} one with non-significant reduction,²⁰ one with no changes,⁴² and two reports with an increase in BMI.^{35,36}
6. Blood pressure (which was the most evident risk-factor): we found 14 articles in favor of significant decrease,^{17,18,20,24-26,28,30,31,35,36,38,43,47} two non-significant decrease,^{34,42} and one constant blood pressure.³²
7. Cigarette smoking: five reported decrease,^{14,25,30,42,43} and two reported no decrease.^{44,48}
8. Others: there were two reports in lowering HgA1c³⁴ and CRP²⁴ following educational program.

Furthermore, one research demonstrated its results quantitatively (4% smoking cessation, 7mmHg reduction in systolic BP, 3mmHg in diastolic BP, 1 kg weight loss, and 0.1 mM per liter reduction in cholesterol)⁴⁵ and four other ones have demonstrated that all risk factors were decreased after nutritional and physical activity educational program.^{21,22,44,48}

Eight review articles have been also found as below:

1) Population based educational interventions in lifestyle based on smoking cessation, healthy diet and physical activity were the most effective strategies for risk factor modification. They demonstrated that these programs are much better than other interventions such as drugs and mandatory activities.⁴⁹

2) Believe that dietary educational sessions are the choice treatment of morbid obese children and children with normal to low BMI benefit the most from these programs. They stated integrating the parent with the program have a better outcome, indeed.⁵⁰

3) Based on a school oriented weight loss program in students, 51 included article had a educational program, 15 ones had only changes in physical activity, 17 ones had changes on physical activity in parallel with nutritional and behavioral changes, and the other 19 included all educational programs; thereafter, 40 articles reported positive effects.⁵¹

4) Demonstrated that there are several studies regarding changing dietary habits in the first line therapy in treatment and preventing cardiovascular events; and all of them have shown a positive relation between dietary programs and cardiovascular risk factor

modification. There were only four studies on the effect of nutritional educational interventions, all of them showed significant improvement in risk factors. Furthermore, dietary programming affects these risk factors as same as physical activity changes and along each other, they can benefit more in reducing risk factors.⁵²

5) Reviewed the effect of smoking, alcohol use, physical activity and weight educational program on modifying chronic disease risk factors as a review article. In their 52 included articles, group session (15 papers) was the most prevalent type of education; diet (34 papers) and physical activity (32 papers) were the most important issues. There were only two articles regarding alcohol use. At the end, 38 articles (73%) had a positive demonstration on modifying the risk factors.⁵³

6) On RCTs regarding the effect of 6 main risk modifiers (smoking cessation, physical activity, dietary control, anti-hypertensive and lipid lowering drugs, and weight control) on the risk factors in health system workers, with a minimum of 6 months follow-up; demonstrated a 4.2 and 2.7 mmHg lowering in systolic and diastolic BP, respectively, a 4.2% quitting cigarettes and 0.14 mM per liter decrease in TC.⁵⁴

7) Reviewed five different interventions consisted of school oriented education, social marketing, occupational health, adult direct education and physical environmental change to reduce cardiovascular risk factors. At the end, they demonstrated that these interventions had a positive effect on the risk factors.⁵⁵

8) On population-based interventions regarding cardiovascular risk factors which were concluded into WHO RCT for protecting cardiovascular events showed that social management, social networks, group campaigns and other advanced direct teaching methods can improve the knowledge on reducing cardiovascular risk factors.⁵⁶

Discussion

This review presents various studies on different age groups all over the world with different cultures and mostly all of them demonstrated that nutrition and physical activity, as well as educational programs can modify cardiovascular risk factors regarding different ages and different courses.

In our review, we found only two studies demonstrating no positive effect. One of them was done in Iran. It was based on the Persian Gulf Research Center (PGRC); showing no significant changes in BMI, weight, FBS, lipid profile and diastolic BP. However, the knowledge and systolic BP have changed significantly.³⁵ The effect of educational intervention on systolic BP is a matter of issue. Meanwhile, short follow-up period in this study (2 months) can be the reason of its paradoxical findings compared to ours.

The second study with non-significant results were conducted by Dekkers, et al. (2011) in the Netherlands; which demonstrated higher proportion of men and voluntarily enrollment as the cause of controversial results (selection bias). However, some patients had taken BP and lipid lowering drugs.³⁷

Studies have stated that women are more educable than men and the risk factors will reduce more when the educators are female.²¹ This means that the effort of education should be doubled in male subjects because men have a higher risk of CAD and a lower education efficacy. However, scientists have demonstrated women as "the heart of the family" and indicated that higher knowledge in women is essential for reducing cardiovascular risk factors within the family.²² Although, another study have demonstrated other-

wise. They have demonstrated that the knowledge of the fathers (despite the mothers') was significantly related to children's risk factors improvement.¹⁸ But we conclude that for having a better modified children regarding cardiovascular risk factors, both mother and father should be educated about diet and physical activity. The controversy between these results originates from the different methodology. In the first two studies, the mothers were educated only a few months before analyzing the children's risk factors;^{21,22} while, mother's education in the last article have improved long time ago in their high school course through a 30 years study.¹⁸ This indicates that education in long terms is less effective in women than men; however, the short term session can be more effective and this originates from different types of memorizing between two genders.

It is stated that the presence of parents is essential and inevitable for children learning.⁵⁰ We should note that bilateral learning (both mother and father) is more effective and furthermore, learner (the child) can learn more with less stress. Parents can also help their son/daughter to understand and apply the knowledge to gain from these educational programs.

Not having enough intention and also genetic backgrounds were the most important issues have made weight loss interventions not so effective. Researchers have stated that actual programs on physical activity and personal behaviors alongside other nutritional educational program are more useful, if the duration is between 6 to 12 months.⁵⁰ According to this fact, we can interpret the results in Bousher, Iran; because of the genetic pool and low interval of follow up.

Most of the studies regarding this issue demonstrate that only programs with "life style and habitual changes" are effective in reducing the risk factors.^{26,42,51,52} Therefore, we have to use at least a brief look on how to change bad habits and wrong attitudes toward lifestyle in any educational program. Using "life style change" theory, and "health habit changing" models can improve the success rate.

A holistic view of the studies indicates that interactive educational interventions were evaluated more than intellectual learning methods (such as internet based or CDs); therefore, comparing the impact of individual vs. group or direct vs. indirect learning interventions on CHD risk factors would remain a good field of study for future researches.

Along the articles, researchers have surveyed the effect of different educational interventions on 10-year CHD risk factors estimation in society (Framingham risk score). Finally, they suggested improvise educational interventions based on stop smoking, healthy diet and increasing physical activity as the most important and effective strategy. They indicated that all programs consisting knowledge of nutrition and physical activity can reduce cardiac risk factors.^{38,39,49} Therefore, paying attention to both diet and physical activity for decreasing risk factor in the population is essential.

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