

ARE COMMUNITY –BASED INTERVENTION PROGRAMS EFFECTIVE IN THE YOUTH POPULATION? RESULTS FROM ISFAHAN HEALTHY HEART PROGRAM

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Abstract

BACKGROUND: Although the relationship between unhealthy lifestyle and development of non-communicable diseases in the youth has been understood but intervention studies to improve lifestyle behaviors in this age group are low. Consequently, this study was performed to highlight important intervention activity of a NCD prevention and health promotion program for young people and to present its main results in Iran.

METHODS: The Youth Intervention Project (YIP) as a part of Isfahan Healthy Heart Program (IHHP) was carried out on all the youth aged 19-25 years in Isfahan and Najafabad counties as intervention areas and Arak as control area. The target groups could be reached in Red Crescent Society, universities, and garrisons. Multifactorial interventions included healthy nutrition, physical activity, coping with stress, and tobacco cessation by more emphasis on hookah smoking. Also, enforcing no-smoking regulations in teahouses and coffee shops was considered.

RESULTS: After performing multifactorial interventions, the change of fast food consumption frequency was statistically significant in comparison between intervention and control areas (P for trend<0.05). Percentage of individuals with high stress level were more significant in intervention area compared with control area (P for trend<0.05). Smoking was increased among men and women in both areas whereas the increase was higher in control area (P for trend<0.05). Although daily physical activity frequency was increased in intervention areas but it wasn't significant compared with control area. Also, decreased trend of carbonated drink consumption were not significant in intervention area compared with control area.

CONCLUSION: The lifestyle modification program in the youth was successfully implemented and was shown to have improved some of the youth's lifestyle behaviors related to healthy lifestyle.

Keywords: Intervention, The youth, Non-communicable disease, Lifestyle.

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Introduction

Lifestyle and habits are affected by multiple physiological and psychological changes in youth period. Based on this point, most diseases obtain their origin during childhood and adolescence,¹⁻³ but the complex relationship between the youth lifestyle and the development of non-communicable diseases is poorly understood³.

Today, Non-communicable diseases (NCD) are recognized as the major cause of morbidity and mortality. By reduction of non-communicable diseases risk factors in childhood and adolescence, morbidity and mortality in adulthood may be decreased.⁴ The rapidly growing epidemic of non-communicable diseases is obviously associated with changes in life styles. Poor nutrition, lack of physical inactivity, smoking, and high stress level are the main preventable risk factors for chronic conditions which result in more than 60% of the overall global burden of disease now, and an estimated 80% by the year 2020.⁵

Existing evidence described that screening of hypertension must be done in all people more than 18 years and screening of high cholesterol after 20 years old.⁶

Results of previous study in Iran illustrates that hypertension was seen in 5.4%, dislipidemia in 68%, smoking in 1.1% and obesity in 16% of women aged 19-35 years. Also, these findings were 6.6%, 50.9%, 27.5% and 6.1% respectively among men.⁷

Community-based approaches are accepted in primary prevention of NCD, through the promotion of a healthy lifestyle—healthy nutrition, physical activity, smoking cessation, and coping with stress.⁸ While the population is more educated, the public will become more alert and better informed on health subjects.

There is strong evidence that chronic disease can be prevented and controlled through comprehensive intervention and integrated actions.⁹ In spite of evidence for the efficacy of interventions to modify lifestyle behaviors in the primary health care (PHC) setting, intervention studies to improve these behaviors in youth remains low (¹⁰⁻¹²). A realistic intervention strategy will be proposed in order to test the feasibility and practicality of intervention strategies that enhance healthy lifestyle habits of adolescents in Iran. Our intent in this study was to highlight important intervention activity of a NCD prevention and health promotion program for young people and to present its main results in Iran.

Materials and Methods

The Youth Intervention Project (YIP) as a part of Isfahan Healthy Heart Program (IHHP) was carried out on all theyouth aged 19-25 years in Isfahan and Najafabad counties. IHHP, a comprehensive integrated community-based program, was designed and performed by Isfahan Cardiovascular Research Center with the cooperation of the Provincial Health Center to prevent NCD via improvement of healthy lifestyle.¹³ IHHP was conducted in two intervention counties (Isfahan and Najaf-Abad) and a control area (Arak), all located in the central part of Islamic Republic of Iran.

The baseline survey of IHHP was conducted in 2000-2001 in intervention and reference counties. Then multi factorial intervention strategies were conducted only in intervention areas from 2002 to 2005 and post intervention survey was conducted in intervention and reference areas in 2007 using similar methodology of the baseline study. Five phases of annual evaluation were performed in both areas from 2002 to 2005. Multistage cluster random sampling method was used to categorize the population by their living area (urban vs. rural), age and sex according to the regional population distribution. CINDI protocol was the base of sampling method. Independent samples according to population distribution pattern of that year were considered for each phase of evaluation.

People aged over 19 years living for at least ten years in the selected regions were included in the program. Pregnancy, mental retardation and physical disability were exclusion criteria. Details of "Isfahan Healthy Heart Program" design have been described by Sarrafzadegan et al elsewhere.^{13,14} This paper presents the methodology and some main results of the YIP.

Intervention: Although total population based on target group and intervention sites were involved in intervention programs of IHHP, but annually surveys consisted small sample of intervention and control areas. Main strategies of IHHP are educational, environmental and legislative ones. The YIP was designed on the basis of above strategies. According to the situation analysis results, target groups could be reached in Red Crescent Society, universities, and garrisons.

The youth volunteers enrolled in Red Crescent Society to achieve some skills were enrolled in this project. For this purpose, Red Crescent Society agreed to link healthy lifestyle education to their common aid and rescue classes. Aid and rescue tutors of the Red Crescent society were trained to lecture healthy lifestyle to volunteers. Every year many of the

youth receive free aid and rescue educations in these classes. Educations included 45 hours which 4 hours were allocated for healthy lifestyle. In addition, there was a 9-CD educational package about aid and rescue in Red Crescent Society. Through YIP the 10th CD including lifestyle modifications that emphasized on healthy nutrition, tobacco cessation, physical activity and coping with stress were designed and all volunteers received this CD during their education sessions.

Another target group was military recruits in garrisons. Multifactorial interventions were performed in garrisons. Nutrition intervention was performed through improving healthy nutrition services in restaurants of garrisons. These programs aimed to decline hydrogenated oil and carbonated drink consumption, increase fruits and vegetables and teach chefs in restaurants. Existing rules that support daily physical activity and smoking ban policy were enforced and implemented in barracks. Health workers of garrisons were trained to educate lifestyle improvement skills to recruits.

There were 3 governmental universities in Isfahan and Najafabad. Similar interventions were carried out in university pupils to improve nutritional habits, increase physical activity, and stop or not to start smoking and cope with stress. Some active pupils as educated assembly represented all above educations via brochures, posters etc.

More emphasis on tobacco control, specifically antismoking activities against the increasing epidemic of using hookah among population was considered. Implementing the international antismoking campaign "Quit and Win" to promote the non-smoking culture among the youth and enforcing no-smoking regulations in teahouses and coffee shops, was another strategy.

Educational aids such as pamphlets, brochures, posters, educational leaflets and mass media programs were additional educational tools used in YIP like other IHHP projects.

Process evaluation to assess the implementation of intervention activities was conducted simultaneously.¹⁵

Measurements: Lifestyle variables that are presented in this report included fast food and carbonated drink consumption for nutritional habits, current smoking status, daily physical activity and psychological distress. Also, demographic characteristic including age, sex, area, marital status, educational level, and occupation were considered.

Dietary habits: To obtain information of dietary habits (such as fast food and carbonated drink consumption) each individual completed a Food Frequency Questionnaire (FFQ).¹⁶ This instrument was

designed according to the WHO Food Frequency Questionnaire; however some additions were made. Finally, this questionnaire consisted 50 items which included yes or no answers. If the answers were yes the frequency of consumption would be regarded to times per week. The validity of this questionnaire was confirmed by Medical Education Development Center affiliated to Isfahan University of Medical Sciences before being used.¹⁷

Smoking: People were considered to be "current smokers" if they reported smoking cigarette or hookah merely or mainly at the time of intervention and otherwise they were defined as "nonsmokers".¹⁸

Physical Activity: Daily physical activity was determined with regard to four types of physical activity, i.e. leisure time, worksite, transport and home activity. Physical activity was measured according to the duration of all four types of physical activity per day as metabolic equivalents (MET). One MET is equal to 3.5 ml/kg/min O₂ uptake.¹⁹

Psychological distress: Psychological distress was assessed by the 12-item General Health Questionnaire (GHQ12).²⁰ The GHQ-12 is a consistent and reliable instrument when used in samples of the general population of Iran.²¹ Each item in this questionnaire is rated on a four-point scale (less than usual, no more than usual, fairly more than usual, or much more than usual). The system used to score the GHQ12 questionnaires in this study was the GHQ score method (0-0-1-1 method). Using this method, a participant could score between 0 and 12. A GHQ score of 4 or above indicates a high level of psychological distress.

Statistical Analysis: Descriptive analysis of the study population was performed using mean \pm SEM for continuous variables and percentages for categorical variables. Differences between demographic data were detected with t-test and χ^2 tests of significance. The General linear models of ANOVA were used to compare the trend of quantitative variables (nutritional habits, daily physical activity) between intervention and control communities. In addition, trend of qualitative variables (smoking, psychological distress) in both groups were compared statistically using logistic regression analysis. Both models were adjusted on the basis of sex and age. The SPSS software version 15 was used for analysis. A p-value of 0.05 or less was considered statistically significant for all analyses.

Results

This study carried out on 4637 number of the youth in Isfahan and Najafabad as Intervention County and 4172 of the youth in Arak as Control County. This

sample included 49.9% male with a mean age of 21.98 ± 1.94 in intervention area and 50.7% with a mean age of 21.90 ± 1.99 in control area. Out of total population 81.5 % in intervention and 64.8% in control area were urban resident. In intervention area, 33.9% were manual and non manual worker and 32.4% were students whereas these were 33.5% and 30.8% respectively in control area. Nearly 39.6% of the participants were married in intervention area and 43.1% in control area.

Physical activity: The baseline means of daily physical activity frequency in intervention areas and control area was 856.81 MET/day and 835.63 MET/day respectively. Reevaluation in 2007 revealed mean daily physical activity frequency of 866.61 in intervention areas and 833.38 in control area. Although the increasing physical activity trend was seen in intervention areas but there is no significant trend in daily physical activity frequency in intervention areas compared with control area (P for trend > 0.05) (Figure 1).

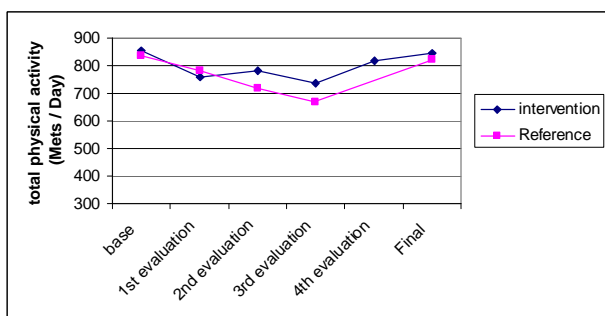


Figure 1. Mean frequency of total physical activity in Isfahan, Najaf-Abad (intervention areas) and Arak (control area) before and after lifestyle interventions in a study of the effects of the Isfahan Healthy Heart Program

Dietary habit: With regard to fast food consumption, the mean frequency was 1.53 times/week in control area and 1.24 times/week in intervention areas at baseline. After intervention, this frequency were 1.47 and 1.07 respectively in 2007 which was statistically significant (P for trend < 0.05) (Figure 2).

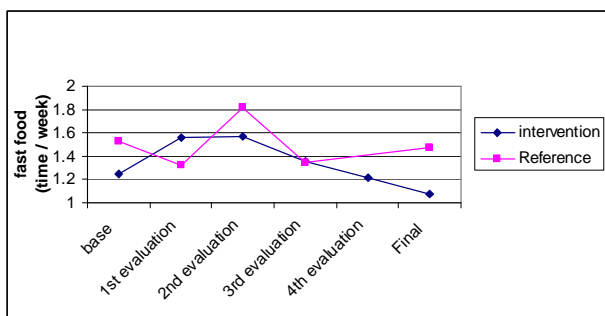


Figure 2. Mean frequency of fast food consumption in Isfahan, Najaf-Abad (intervention areas) and Arak (control area) before and after lifestyle interventions study of the effects of the Isfahan Healthy Heart Program.

Data on frequency of carbonated drink consumption showed a decreasing trend in Isfahan and Najafabad (from 2.03 times/week changed to 0.98 times/week), but the frequency of consumption was differed from 2.02 times/week to 0.92 times/week in Arak (P for trend > 0.05) (Figure 3).

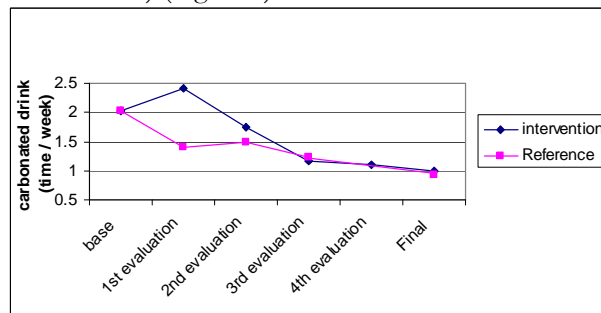


Figure 3. Mean frequency of carbonated drink consumption in Isfahan, Najaf-Abad (intervention areas) and Arak (control area) before and after lifestyle interventions in a study of the effects of the Isfahan Healthy Heart Program.

Psychological distress: A comparison of High Stress Level individuals between intervention and control areas indicates a significant decreasing trend in high stress level percent in intervention area compared with control area. (From 40% to 36% in intervention areas and from 47% to 40% in control areas) (Figure 4).

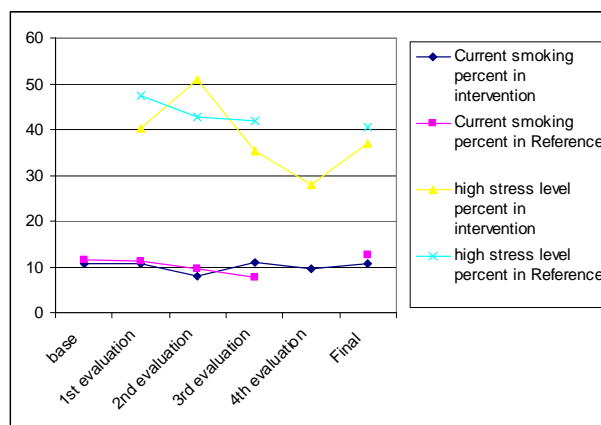


Figure 4. High stress level percent and current smoking percent in Isfahan, Najaf-Abad (intervention areas) and Arak (control area) before and after lifestyle interventions in a study of the effects of the Isfahan Healthy Heart Program.

Current smoking: Current smoking percent between 2001 and 2007 changed from 10.57% to 10.52% in intervention areas and from 11.49 to 12.64 in control area. Comparing the current smoking trend in intervention area with control area was statistically significant (P for trend < 0.05) (Figure 4).

Discussion

This study as a part of IHHP is an integrated community-based intervention to determine the feasibility and effects of lifestyle modification programs designed to prevent NCD risk factors in the youth. Findings of this study suggested that after performing multifactorial interventions, a significant increase was not seen in daily physical activity frequency in intervention areas compared with control area. In addition, the change of fast food consumption frequency was statistically significant in comparison between intervention and control areas. Decreased trend of carbonated drink consumption and percentage of individuals with high stress level were more significant in intervention area compared with control area. About smoking, results showed that smoking was increased among men and women in both areas whereas the increased was higher in control area.

Although assessing the effects of comprehensive lifestyle intervention on diet, physical activity, smoking and stress management is not new but the reports of such activities targeting the youth are few. On the other hand, considering that majority of NCD origins from youth period and the burden of NCD is increased rapidly, the implementation of intervention program in this age is necessary.

Since physical inactivity is one of the major underlying causes of mortality and is associated with increased levels of obesity, many studies have been carried out in this field. It has been shown that moderate amounts of physical activity (frequency, duration and intensity) are associated with health profits and can reduce various chronic disease related to lifestyle.²²⁻²⁵ However In the current study interventions targeting physical activity led to increased physical activity in intervention areas but it seems that during longtime it would be successful.

In addition the systemic review on the effectiveness of interventions to promote physical activity in 2007 presented that 54% of adolescent physical activity had reported positive effect. Interventions that were found to be effective achieved an increase of 83 minutes per week in moderate to vigorous physical activity.²⁶

Nutrition is a major modifiable determinant of chronic NCD with scientific evidence supporting that alterations in diet have effects on health throughout the life.

Previous reports from IHHP suggested that the lifestyle interventions could encourage people to choose healthy diet and prompted governments to make them more available.²⁷⁻²⁸ Dietary changes targeting the population have been assessed for long as 20

years after the cessation of lifestyle modification program.²⁹ Also, a comprehensive lifestyle modification on diet as a part of PREMIER study from 2000-2002 represented the effectiveness of such interventions.³⁰ Another nutrition intervention in the youth indicated that lifestyle intervention were successful to ameliorate atherosclerosis risk factors.³¹

Tobacco use is one of the most modifiable risk factors and preventable causes of death in the world. Improvement of smoking behavior has been noted in several Community-based interventions in youth and adolescence. Karen and David (2002) assessed reduction in smoking prevalence and cigarette use associated with mass media in both adults and the youth.³²

One community-based intervention in²² communities, revealed that within the specific tobacco control intervention areas, results from youth smoking cessation is more significant.³³

As Early detection and treatment of mental disorders in youth can lead to better health outcomes, some paper focused on evaluation of mental health intervention. For example, Annemarie Wright et al evaluated a youth mental health community awareness campaign. Finally, the program achieved many of its aims despite the relatively short duration and moderate intensity of the campaign.³⁴ The association between high stress levels and other unhealthy lifestyle factors were described by Roohafza in Iranian population as a model for intervention programs aimed at modifying lifestyle and providing education on stress management techniques.²⁸

Conclusion

The lifestyle modification program in the youth was successfully implemented and was shown to have improved some of the youth's lifestyle behaviors related to healthy lifestyle. Indeed such effective interventions have the potential to be performed in other developing countries.

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References

1. Moreno LA, Sarria A, Fleta J, Rodriguez G, Bueno M. Trends in body mass index and overweight prevalence among children and adolescents in the region of Aragon (Spain) from 1985 to 1995. *Int J Obes Relat Metab Disord* 2000; 24(7): 925-31.

2. Weiss R, Dufour S, Taksali SE, Tamborlane WV, Petersen KF, Bonadonna RC, et al. Prediabetes in obese youth: a syndrome of impaired glucose tolerance, severe insulin resistance, and altered myocellular and abdominal fat partitioning. *Lancet* 2003; 362(9388): 951-7.
3. Cook S, Weitzman M, Auinger P, Nguyen M, Dietz WH. Prevalence of a metabolic syndrome phenotype in adolescents: findings from the third national health and nutrition examination survey, 1988-1994. *Arch Pediatr Adolesc Med* 2003; 157(8): 821-7.
4. Nishtar S, Bile KM, Ahmed A, Amjad S, Iqbal A. Integrated population-based surveillance of noncommunicable diseases: the Pakistan model. *Am J Prev Med* 2005; 29(5 Suppl 1): 102-6.
5. WHO. Innovative care for chronic conditions: building blocks for action. [Cited 2002]. Available from: URL:<http://www.who.int/diabetesactiononline/about/iccereport/en/index.html>
6. Summary of the second report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel II). *JAMA* 1993; 269(23): 3015-23.
7. Roohafza HR. Comparison of coronary artery disease risk factors in young adults ages central Iran (Healthy Heart Program). *Journal of Isfahan Medical School* 2003; 21(71): 9.
8. Mendis S, Fuster V. National policies and strategies for noncommunicable diseases. *Nat Rev Cardiol* 2009; 6(11): 723-7.
9. World Health Organization. Preventing chronic diseases: a vital investment. 1st ed. Geneva: World Health Organization; 2005.
10. Lancaster T, Stead L. Physician advice for smoking cessation. *Cochrane Database Syst Rev* 2004; (4): CD000165.
11. Kaner EF, Beyer F, Dickinson HO, Pienaar E, Campbell F, Schlesinger C, et al. Effectiveness of brief alcohol interventions in primary care populations. *Cochrane Database Syst Rev* 2007; (2): CD004148.
12. Goldstein MG, Whitlock EP, DePue J. Multiple behavioral risk factor interventions in primary care. Summary of research evidence. *Am J Prev Med* 2004; 27(2 Suppl): 61-79.
13. Sarrafzadegan N, Sadri G, Malek AH, Baghaei M, Mohammadi FN, Shahrokhi S, et al. Isfahan healthy heart programme: a comprehensive integrated community-based programme for cardiovascular disease prevention and control. Design, methods and initial experience. *Acta Cardiol* 2003; 58(4): 309-20.
14. Sarrafzadegan N, Baghaei A, Sadri GH, Kelishadi R, Malekafzali H, Boshtam M, et al. Isfahan healthy heart program: Evaluation of comprehensive, community-based interventions for non-communicable disease prevention. *Prev Control* 2006; 2(2): 73-84.
15. Rabiei K, Kelishadi R, Sarrafzadegan N, Abedi HA, Alavi M, Heidari K, et al. Process evaluation of a community-based program for prevention and control of non-communicable disease in a developing country: the Isfahan healthy heart program, Iran. *BMC Public Health* 2009; 9: 57.
16. Dwyer TT. Dietary assessment. In: Shils ME, Olson JA, Shike M, editors. *Modern nutrition in health and disease*. Philadelphia: lea & febiger; 1994.

17. Sarrafzadegan N, Sadri G, Malek AH, Baghaei M, Mohammadi FN, Shahrokhi S, et al. Isfahan healthy heart programme: a comprehensive integrated community-based programme for cardiovascular disease prevention and control. design, methods and initial experience. *Acta Cardiol* 2003; 58(4): 309-20.
18. Abolfotouh MA, Abdel AM, Alakija W, Al Safy A, Khattab MS, Mirdad S, et al. Smoking habits of King Saud University students in Abha, Saudi Arabia. *Ann Saudi Med* 1998; 18(3): 212-16.
19. Ainsworth BE, Haskell WL, Leon AS, Jacobs DR, Jr., Montoye HJ, Sallis JF, et al. Compendium of physical activities: classification of energy costs of human physical activities. *Med Sci Sports Exerc* 1993; 25(1): 71-80.
20. Goldberg D. General health questionnaire (GHQ-12). Windsor, UK: NFER-Nelson; 1992.
21. Montazeri A, Harirchi AM, Shariati M, Garmaroudi G, Ebadi M, Fateh A. The 12-item general health questionnaire (GHQ-12): translation and validation study of the Iranian version. *Health Qual Life Outcomes* 1: 66.
22. Warburton DE, Glendhill N, Quinney A. The effects of changes in musculoskeletal fitness on health. *Can J Appl Physiol* 2001; 26(2): 161-216.
23. Blair SN, Cheng Y, Holder JS. Is physical activity or physical fitness more important in defining health benefits? *Med Sci Sports Exerc* 2001; 33(6 Suppl): S379-S399.
24. Bouchard C. Physical activity and health: introduction to the dose-response symposium. *Med Sci Sports Exerc* 2001; 33(6 Suppl): S347-S50.
25. Kolbe-Alexander TL, Lambert EV, Charlton KE. Effectiveness of a community based low intensity exercise program for older adults. *J Nutr Health Aging* 2006; 10(1): 21-9.
26. van Sluijs EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. *Br J Sports Med* 2008; 42(8): 653-7.
27. Sarrafzadegan N, Kelishadi R, Esmailzadeh A, Mohammadifard N, Rabiei K, Roohafza H, et al. Do lifestyle interventions work in developing countries? Findings from the Isfahan healthy heart program in the Islamic republic of Iran. *Bull World Health Organ* 2009; 87(1): 39-50.
28. Roohafza H, Sadeghi M, Sarrafzadegan N, Baghaie A, Kelishadi R, Mahvash M, et al. Relation between stress and other life style factors. *Stress and Health* 2007; 23(1): 23-9.
29. Ellingsen I, Hjerkin EM, Arnesen H, Seljeflot I, Hjerkmann I, Tonstad S. Follow-up of diet and cardiovascular risk factors 20 years after cessation of intervention in the Oslo Diet and antismoking study. *Eur J Clin Nutr* 2006; 60(3): 378-85.
30. Elmer PJ, Obarzanek E, Vollmer WM, Simons-Morton D, Stevens VJ, Young DR, et al. Effects of comprehensive lifestyle modification on diet, weight, physical fitness, and blood pressure control: 18-month results of a randomized trial. *Ann Intern Med* 2006; 144(7): 485-95.
31. Roberts CK, Chen AK, Barnard RJ. Effect of a short-term diet and exercise intervention in youth on atherosclerotic risk factors. *Atherosclerosis* 2007; 191(1): 98-106.
32. Friend K, Levy DT. Reductions in smoking prevalence and cigarette consumption associated with mass-media campaigns. *Health Educ Res* 2002;

- 17(1): 85-98.
33. Thompson B, Lichtenstein E, Corbett K, Nettekoven L, Feng Z. Durability of tobacco control efforts in the 22 community intervention trial for smoking cessation (COMMIT) communities 2 years after the end of intervention. *Health Educ Res* 2000; 15(3): 353-66.
- 34.. Wright A, McGorry PD, Harris MG, Jorm AF, Pennell K. Development and evaluation of a youth mental health community awareness campaign the compass strategy. *BMC Public Health* 2006; 6: 215.