

Alteration in unhealthy nutrition behaviors in adolescents through community intervention: Isfahan Healthy Heart Program

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Original Article

Abstract

BACKGROUND: Primary prevention of chronic diseases has been suggested to initiate health promotion activities from childhoods. The impact of Isfahan Healthy Heart Program (IHHP), a comprehensive community trial, on unhealthy snacks and fast food intake changes was evaluated in Iranian adolescents between 2001 and 2007.

METHODS: Healthy Heart Promotion from Childhood (HHPC) as one of the IHHP interventional projects was conducted in adolescents aged 11-18 years, selected randomly by multistage random sampling. Isfahan and Najafabad districts were intervention areas (IA) and Arak district was reference area (RA). The baseline and post-intervention surveys were conducted on 1941 and 1997 adolescents, respectively.

Healthy lifestyle interventions were performed during the 2nd phase of the study targeting about 410000 students in urban and rural areas of the IA via education, environmental and legislation activities. Dietary intake was assessed annually using a fifty-item food frequency questionnaire in both communities.

RESULTS: The interaction of year×area demonstrated that the consumption of unhealthy snacks decreased significantly in middle school boys of RA compared to IA (P for interaction=0.01). However, middle school girls (P for interaction = 0.002) and both sexes of high school students in IA showed a significant reduction in fast food consumption against RA (P for interaction < 0.001).

CONCLUSION: The HHPC interventions made some improvement in fast food consumption. It did not show significant decrease regarding unhealthy snacks in adolescents. Proper and higher dose of interventions may be effective in achieving this goal.

Keywords: Nutrition, Dietary Behaviour, Adolescent, Lifestyle, Community Trial

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Introduction

Increasing evidence over the past 4 decades indicates that the progression of atherosclerosis begin early in life is affected by some modifiable and non-modifiable risk factors of cardiovascular diseases (CVD).¹⁻³ Furthermore, the patterns of behavioral and biological risk factors originate in early childhood and influence CVD risk factors in adolescence and usually persist until adulthood.¹⁻²

Dietary behaviour modification has a main effect on the occurrence of chronic diseases and their risk

factors.³⁻⁵ Therefore, it has been suggested for primary prevention of chronic diseases, to initiate health promotion activities from childhood.⁴ Moreover, a healthy dietary pattern in childhood is an important public health issue.⁶ A previous study in Iran indicated that excess weight gain and its cardiometabolic outcomes were common in adolescents and it should be considered as a national health priority.⁷ Unhealthy snacks consists of sausage, sandwiches, crisps and cheese balls, creamy wafers, cakes, chocolate and toffee were the

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most common snacks consumed by Iranian children and adolescents.⁸ Among the reasons that led to the recent habit changes are the long time spent by women working outside homes, inexpensiveness of unhealthy food and their good taste.⁹⁻¹¹ Americans eat outside home four times per week and one third of American children and adolescents consume fast food one time per week,^{12,13} while Iranian adults consume fast foods on average one time per week.¹⁴ It seems Iranian adolescents consume fast foods more.

Since schools are the best place to work with children and adolescents, they are the best place for health promotion and lifestyle modification and for implementing favorable environmental changes through the availability of healthy foods and physical exercise.¹⁵

Several successful school-based health promotion programs were carried out in developed countries.¹⁵⁻¹⁸ Therefore, Heart Health Promotion from Childhood (HHPC) project was performed as one of interventional projects of a comprehensive community-based program entitled Isfahan Healthy Heart Program (IHHP) with school-based approach¹⁹ to improve lifestyle behaviour and cardiometabolic risk factors among children and adolescents. HHPC targeted students in middle and high schools. The current study focused on the impact of HHPC nutrition interventions on unhealthy dietary behaviour changes of Iranian adolescents.

Materials and Methods

IHHP was carried out by Isfahan Cardiovascular Research Center (ICRC) (a WHO Collaborating Center), and Isfahan Provincial Health Office, both affiliated to Isfahan University of Medical Sciences. Ethics committees of Isfahan University of Medical Sciences approved the study. IHHP was a quasi-experimental community trial with reference area and different types of evaluation.^{20,21} The study was launched in 1999-2000 and conducted 2001-2007, in three phases as pre-intervention (baseline), intervention and post-intervention phase.²¹ Written informed consent was obtained from the parents or legal guardians of students.

Design and participants: This study reports part of data of the HHPC project. The impact of all interventional projects in IHHP was reported before.²² In the 1st phase, the baseline status was assessed on 2000 students in middle and high schools (1000 girls and 1000 boys) aged 11-18 years, selected from Isfahan and Najafabad districts, as the intervention areas (IA) and Arak district as the

reference area (RA) in 2001.^{20,23} Both areas are industrial and located in the center of Iran with similar socio-economic and demographics. Recruitment was performed by multistage cluster random sampling method from 56 middle and high schools of different urban and rural areas. Sampling details were presented elsewhere.^{19,23} Based on the results of the baseline study, multidisciplinary interventions were conducted during the 2nd phase (2002-2006) of the study in IAs, but not in Arak. Lifestyle behaviors were evaluated annually by questionnaires in IA and RA. Post-intervention outcomes comprising behaviour, physical and biochemical measurements were done similar to the 1st phase but on independent random sample in 2007. Process evaluation was done in the IA only.²⁴ Overall, 1941 students in both communities were studied at baseline and 1997 students in post-intervention survey. Trained nurses carried out data collection.²³ The study design has been described elsewhere.^{20,21}

Interventions: HHPC interventions' design was based on findings of the baseline survey and needs assessment considering the existing health and human resources.²² Target groups were middle and high school students, their parents and teachers in urban and rural areas of IA. Healthy nutrition was one of the main fields of interventions in the program which was performed based on educational, environmental and legislative strategies. The details of IHHP interventions were presented elsewhere.^{21,22} In the beginning, HHPC activities were carried out in 1769 (45%) schools in IA; however, until 2004 it increased to 3654 (92.9%) schools with about 410000 students of Isfahan and Najaf-Abad.²⁵

Briefly, HHPC public education was done through mass media, pamphlets, booklets, face-to-face meetings, proposing role models among students, arranging different competitions with the subject of healthy heart, serving healthy snacks, establishing healthy heart buffets, reinforcing healthy eating habits in schools, and gathering parents at least yearly to train healthy nutrition.¹⁹

Dietary assessment: The common foods consumed in Iran were assessed by a validated 50-item-food frequency questionnaire (FFQ). The FFQ was adopted from the Non communicable Disease Intervention program questionnaire.²⁶ Four experts in nutrition and pediatrics assessed the content validity of the FFQ. Moreover, its criterion validity was evaluated by 24-hour recall questionnaires that were completed three times. The criterion validity

was acceptable for unhealthy snacks and fast food consumption. Unhealthy snacks included salty, sweeten and fatty snacks that were assessed by 4 questions and frequency consumption of fast foods included sausages, pizza and hamburgers were evaluated by 3 questions.

Evaluation: Evaluation consisted of impact, outcome and process types that were done as integrated elements of the program. The detail of evaluation was described previously.^{21,24,25} The impact of interventions on dietary behaviour was carried out by implementing annual dietary surveys during 2001-2006 and the outcome evaluation was done at baseline (2001) and post-intervention (2007) phases. Both impact and outcome evaluations were performed on independent samples in both communities, while process evaluation was done only in IA during the study.²⁴ Following the request of Isfahan University of Medical Sciences for undertaking an external evaluation of the whole IHHP, all component of the program including implementation of interventions as well as all evaluation studies was done by international experts.²⁵ This study reports the results of impact evaluation on unhealthy nutrition behaviors.

Statistical analysis: The mean frequency consumption of foods was compared between pre- and post-intervention in independent sample surveys using t-test and in terms of frequency of students by chi-square. The year × area interaction was determined by General Linear Model-univariate analysis to compare variable changes in intervention vs. reference community by adjustment for

residency (urban/ rural). Data were analyzed using the SPSS statistical package version 15.0 for windows (SPSS Inc., Chicago, USA). The significance level was set at P <0.05.

Results

The frequency of studied population in IA were 969, 1000, 629, 518, 389, and 972 subjects in 2001, 2002, 2003, 2004, 2005 and 2007, respectively. In RA, it was 977, 999, 798, 707 and 1020 subjects, in 2001, 2002, 2003, 2004, and 2007, respectively. Due to budget limitations, the repeated study was not done in RA in 2005. The basic characteristics of adolescences in 2001 and 2007 are presented in table 1. The mean age of students was not significantly different across the years. The differences were not significantly significant at baseline and final surveys in IA and RA based on sex, grade as well as place of residence.

Table 2 indicates the mean of unhealthy food consumption in IA vs. RA based on the school grade during the study. There was no significant difference between unhealthy snacks consumption in pre- and post- intervention phases in both sexes of middle and high school students in IA as well as high school students of RA. However, it showed a significant decrease in middle school boys (P =0.001) and girls (P <0.001) of RA. Furthermore, the interaction of year ×area demonstrated the consumption of these snacks decreased significantly in middle school boys of RA compared to IA (P for interaction=0.011).

Table 1. Basic characteristics of study population in intervention and reference area before and after intervention

	Baseline 2000-2001		Post-intervention 2007	
	Intervention	Reference	Intervention	Reference
Age (year)	Mean ± SD			
Middle school	12.92 ± 1.14	12.63 ± 1.11	13.17 ± 1.26	13.04 ± 1.15
High school	15.36 ± 1.02	15.36 ± 1.19	16.02 ± 1.00	15.85 ± 1.12
Sex	Frequency (%)			
Boy	501(51.7)	500(51.2)	467(48.0)	511(50.1)
Girl	468(48.3)	477(48.8)	505(52.0)	509(49.9)
Grade				
Middle school	500(51.6)	486(49.7)	524(53.9)	515(50.5)
High school	469(48.4)	491(50.3)	448(46.1)	505(49.5)
Residency				
Urban	613(63.3)	638(65.3)	857(88.2)	675(66.2)
Rural	356(36.7)	339(34.7)	115(11.8)	345(33.8)
Total	969	977	972	1020

In IA, mean of fast foods consumption had a significant reduction in middle school girls ($P < 0.001$), in high school boys ($P = 0.002$) and girls ($P = 0.008$), while it increased significantly in both sexes of high school students in RA (in boys: $P = 0.026$ and in girls: $P = 0.006$). Moreover, it showed

a significant reduction in middle school girls ($P = 0.001$) and both sexes of high school students in IA vs. RA across the years ($P < 0.001$). Figures 1 and 2 illustrate the trend of unhealthy snacks and fast food consumption (per week) based on sex and grade in IA vs. RA areas across years of study.

Table 2. The mean of unhealthy food consumption (per week) in intervention vs. reference area based on school grade between 2001 and 2007

	Intervention			Reference			Interaction P
	Baseline	Post-intervention	P	Baseline	Post-intervention	P	
	Mean±SD*	Mean±SD		Mean±SD	Mean±SD		
Unhealthy snacks (per week)							
Middle schools							
Boys	6.47 ± 0.29	6.46 ± 0.26	0.99	9.15 ± 0.31	7.700 ± 0.27	0.001	0.011
Girls	7.08 ± 0.28	6.61 ± 0.30	0.23	9.75 ± 0.29	8.26 ± 0.29	<0.001	0.079
High schools							
Boys	6.61 ± 0.32	6.27 ± 0.32	0.49	7.94 ± 0.30	7.98 ± 0.30	0.93	0.55
Girls	7.63 ± 0.32	7.10 ± 0.32	0.23	8.87 ± 0.31	9.10 ± 0.29	0.59	0.22
Fast foods(per week)							
Middle schools							
Boys	1.23 ± 0.09	1.11 ± 0.08	0.32	1.42 ± 0.09	1.44 ± 0.08	0.86	0.4
Girls	1.41 ± 0.08	0.92 ± 0.08	<0.001	1.17 ± 0.08	1.18 ± 0.08	0.98	0.002
High schools							
Boys	1.58 ± 0.09	1.13 ± 0.09	0.002	1.30 ± 0.09	1.54 ± 0.09	0.026	< 0.001
Girls	1.34 ± 0.08	1.04 ± 0.08	0.008	1.02 ± 0.08	1.33 ± 0.07	0.006	< 0.001

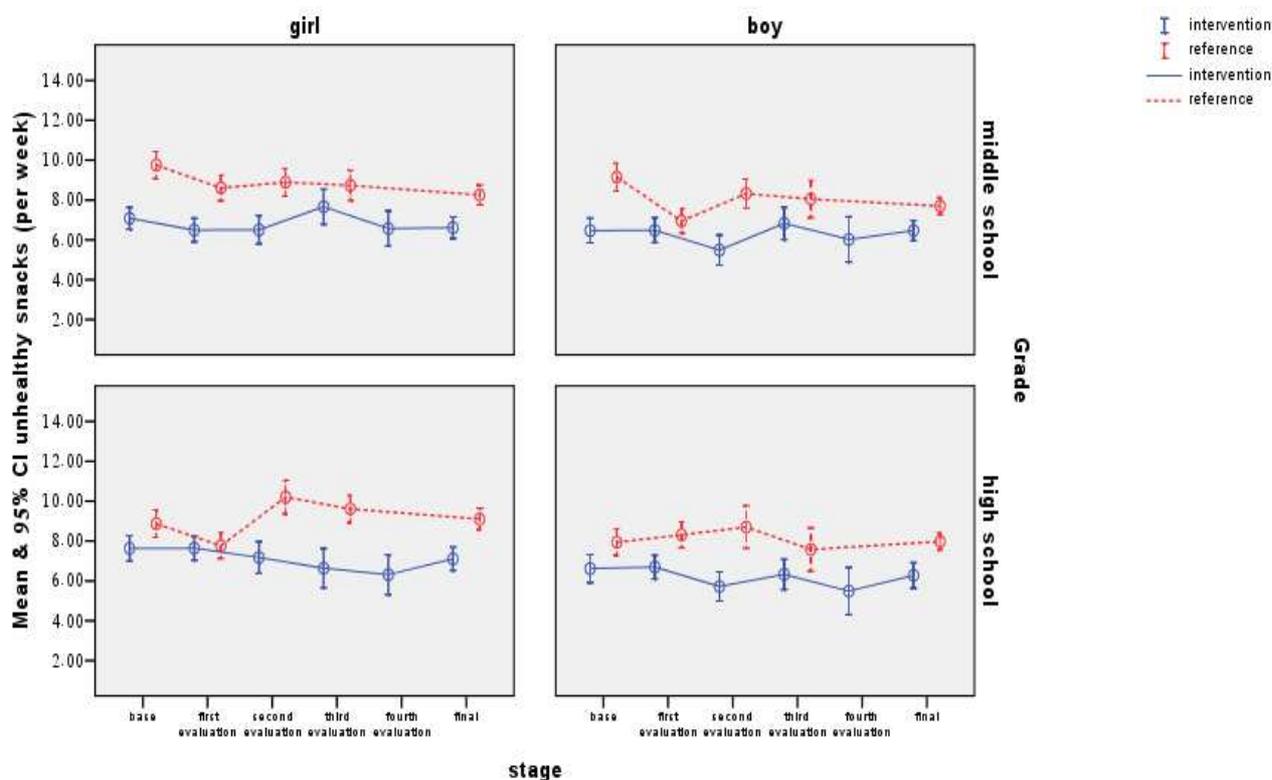


Figure 1. The trend of unhealthy snacks consumption (per week) based on sex and school grade in intervention vs. reference area between 2001 and 2007

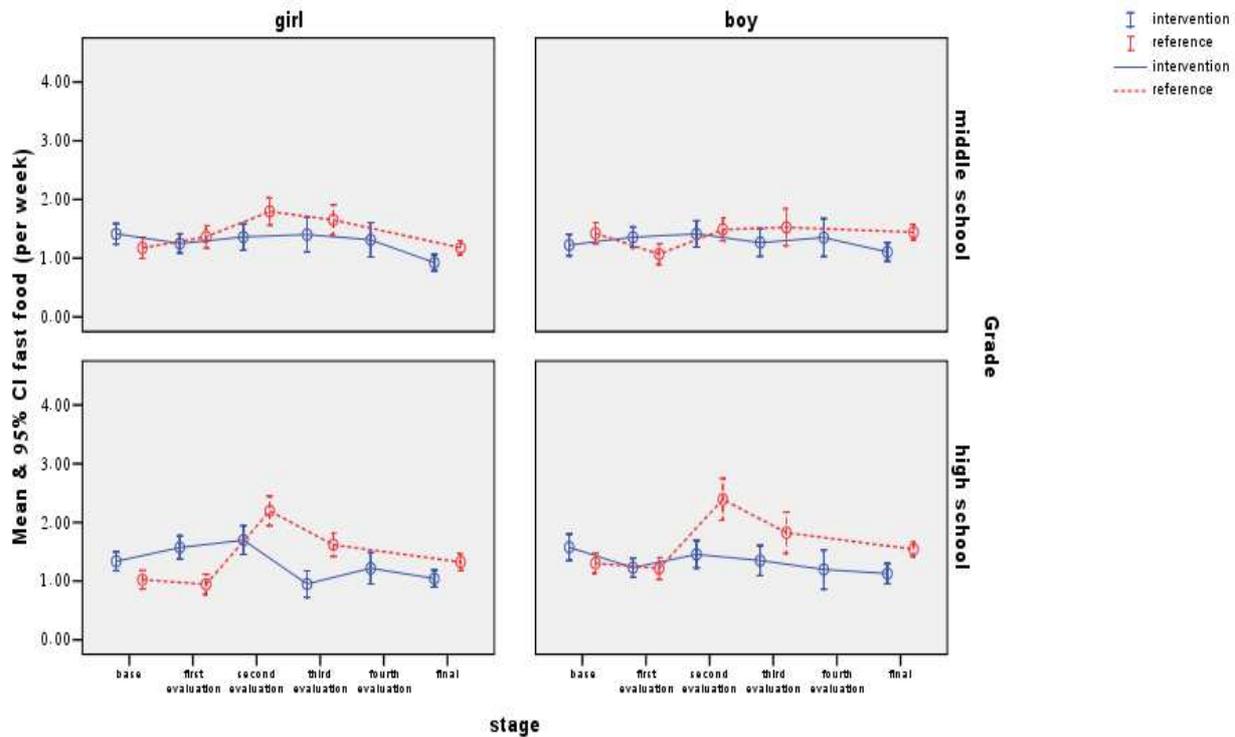


Figure 2. The trend of fast food consumption (per week) based on sex and school grade in intervention vs. reference areas between 2001 and 2007

Discussion

IHHP is the first community-based trial with quasi-experimental design and RA to assess the impact of comprehensive, multidisciplinary interventions on lifestyle improvement, and CVD and its risk factors prevention in a developing country setting. Our findings indicated that the HHPC, as one of IHHP intervention projects, made some positive changes in unhealthy dietary behaviors. There were no significant changes in unhealthy snacks consumption in middle and high school adolescents in IA vs. RA, except for unexpected reduction of unhealthy snacks in middle school girls of RA compared to IA, whereas fast food consumption showed a significant reduction in IA vs. RA in both sexes of high school students and middle school girls.

Lifestyle modification programs in other countries indicated contradictory findings.²⁷⁻³⁷ A cohort study of dietary intake tracking in Mexican-American and white children aged 4 to 12 years found that dietary intake was steady over 8 years and was better in younger ages compared with older children.²⁷ It may be the purpose of not improving unhealthy snacks consumption in middle schools students in our study. Another study was done in elementary school children to ease obesity and

improve lifestyle behaviors through nutrition education and serving lower fat and sodium lunch in intervention schools during 2 years. Although the lunch in these schools showed significantly less energy, fat, sodium, and more fiber, only sodium intake had significant difference in intervention vs. control schools.³⁴ This study concluded that dietary intake outside schools may be the cause of no differences between intervention and control schools.³⁴ Another study in adolescence from Tehran (Iran) indicated that there was no association between nutrition knowledge and behaviors,⁸ the same as other countries.^{38,39} Therefore, it seems that nutrition education and serving healthy food in schools could not improve nutrition behaviors of adolescents.

Obesity epidemic and nutrition transition is increasing in developing countries. Thus the non-significant improvement of unhealthy snacks consumption might be considered as favorable impact of interventions in IA. Conversely, the trend of fast food consumption was increased in all students' categories of RA. Although it was insignificant in some groups, it might be significant if our sample size was larger. Planet Health study in middle schools of Massachusetts communities which was focused on decreasing high-fat foods

consumption and increasing fruit and vegetable intake, illustrated only increase in fruit and vegetable consumption without any change in high-fat foods intake and smaller increment in total energy intake among girls.³³

Conversely, the Child and Adolescent Trial for Cardiovascular Health (CATCH) in USA during 3 school years,²⁹ a short-term school-based interventional study in rural communities in USA,³² and a small scale multi-component intervention study in India managed to improve knowledge and healthy dietary behaviors by nutrition and lifestyle education model in children and adolescences.²⁸ Another school based health behaviour intervention program in England led to significant decrease in carbonated drink consumption.³¹ Implementing a multi component obesity prevention program in elementary schools of American Indian communities made significant improvement in dietary fat intake.³⁶ Moreover, there was some differences in nutrition behaviour changes among boys and girls in a controlled trial in Perth, Western Australia, which was conducted on children aged 10-12 years old, as change was larger in sugar intake in boys compared to girls, while fat intake showed contradictory changes.³⁷

Although comprehensive community-based lifestyle interventions of IHHP were successful in improving some dietary behaviour, fast food consumption had no reduction in adults of IA. Since it increased in the adults of RA, the trend of fast food consumption indicated a significant improvement in IA vs. RA.^{14,22} However, we found a significant reduction in fast food consumption of adolescents in IA, as well as significant reduction in IA compared to RA. Attained healthy information from other IHHP projects could increase the dose of interventions to improve the parents' life style and consequently had some beneficial effect on their children.^{20,21}

Unhealthy snack consumption showed no improvement, especially in middle school students. Moreover, unhealthy snack was consumed more than healthy snack in adolescents from Tehran.⁸ Non-communicable diseases prevention from childhood needs an intersectoral collaboration of governmental, non-governmental, national and international organizations, media, general population, and food producers. Although school-based programs that focused on improving knowledge could improve knowledge and attitude; however, it has less beneficial impact on lifestyle behaviors of students; because it has been affected

by socioeconomic status, culture, and environment.¹⁹ Therefore, there may be need for supportive policies and change in environment besides improving knowledge and behaviors.¹⁹

Furthermore, urban-rural residency, parents education (especially mothers), and family income may predict dietary changes during lifestyle modification program in developing countries with social and economic transitions. Wang et al. suggested children in higher income family, urban residency and with higher educated mothers are more likely to track unhealthy nutrition habits related to chronic disease. Although these mothers had better access to the media and to healthy nutrition awareness, their behaviors illustrated that they had no consideration about higher fat foods.⁴⁰ Unfortunately, these data were not gathered in our study. Therefore, it might have diluted the impact of our interventions. Considering the main role of parents in the dietary behaviors of their children, more emphasis on parents and their diet may improve adolescents' nutrition habits.^{41,42} In addition, advertisements in television have great effect on adolescences' nutrition behaviors.¹⁸ Although there are limited unhealthy food advertisements in Iran, especially after the enforcement by IHHP and the close collaboration with the Iranian Ministry of Health officials,²² these advertisements have been increased in computer digital games or movies on compact disks (CD). Therefore, as adolescents are getting used to watching video and computer CDs even more than TV, they are influenced by unhealthy food advertisement. Since the companies that produced these CD's were private, forbidding the advertisements was impossible. The attractive package of unhealthy snacks is another influential choosing factor⁸ that if had been considered in our interventions, we might have had better results in terms of unhealthy snacks.

Strength and limitation: The novelty of the data, assessing the impact of the comprehensive community-based interventions with quasi-experimental design and having reference area in several annual surveys in a developing country setting were the main strength of the present study.

The implemented FFQ was qualitative; therefore, the estimation of food intake was not precise. Furthermore, according to the limited food list, the frequency of categories choice and the difficulty in remembering foods were sources for bias.⁴³ Another limitation of the study was the small sample size in some annual surveys, which might be

the reason of non-significant results in some group. Mother education and family income might influence adolescences' dietary behaviour, but the data was unavailable.

Conclusion

The HHPC interventions had some improvement in fast food consumption. It did not show significant decrease regarding unhealthy snacks in adolescents; however, the insignificant change might be considered as favorable impact of interventions in IA in which a fast epidemic toward more consumption of these foods has been recently seen. Proper and higher dose of interventions may be effective in achieving this goal.

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Conflict of Interests

Authors have no conflict of interests.

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