

A National Experience on Physical Activity Initiatives for Adolescent Girls and their Mothers: CASPIAN Study

Roya Kelishadi*¹, MD; Vahid Ziaee², MD; Gelayol Ardalan³, MD, MPH; Ascieh Namazi², MSc; Pardis Noormohammadpour², MD, PhD; Majid Ghayour-Mobarhan⁴, MD, PhD; Hoda Sadraei⁴, BS; Parisa Mirmoghtadaee¹, MD, MPH, and Parinaz Poursafa⁵, MSc

1. Isfahan University of Medical Sciences, Isfahan, IR Iran
2. Sports Medicine Research Center, Tehran University of Medical Sciences, Tehran, IR Iran
3. Youths and School Health Office, Ministry of Health & Medical Education, Tehran, IR Iran
4. Avicenna (Bu-Ali) Research Institute, Mashhad University of Medical Sciences, Mashhad, IR Iran
5. Environment Protection Engineer, Azad University, Science and Research Branch, Tehran, Iran

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Abstract

Objective: To provide a low-cost and simple model of culturally-appropriate and low cost facilities for improvement of physical activity for girls and their mothers through an after-school program and to determine the changes in anthropometric indexes after this trial.

Methods: This national study was conducted in 2006-2007 in 7 provinces with different socioeconomic situations in Iran. Female students who studied in the 7th through 10th grade and their mothers were selected by random cluster sampling. In each province, 24 sessions of after-school aerobic physical activity were held for 90 minutes, two days a week, and 3 months long at school sites in the afternoon.

Findings: The study comprised 410 participants (204 mothers and 206 daughters), with a mean age of 15.86±1.01 and 40.71±6.3 years in girls and their mothers, respectively. The results of the focus group discussions showed that in general, both mothers and daughters were satisfied from the program and found it feasible and successful. After the trial, the indexes of generalized and abdominal obesity improved significantly both in girls and in their mothers (P -value <0.0001 for weight, body mass index and waist circumference).

Conclusion: Our findings may provide a low-cost and simple effective model of motivation for physical activity with targeted interventions for girls and their mothers. We suggest that the success of this trial might be a result of bonding and accompaniment of mothers and daughters. Such model can be integrated in the existing health and education systems to increase the physical activity level.

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* Corresponding Author;

Address: Hezar Jarib Ave, Isfahan University of Medical Sciences, Isfahan, Iran

E-mail: kroya@aap.net

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Introduction

Physical activity throughout the lifespan may independently enhance the health by reducing the risk of developing chronic disease and improving overall quality of life. As adopted in 2004 by the World Health Organization (WHO), *"the unique opportunity that exists to formulate and implement an effective strategy for substantially reduce deaths and disease burden worldwide is by improving diet and promoting physical activity"*^[1].

A large body of evidence supports the role of physical activity in preventing the onset of many chronic non-communicable diseases (CNCDS), such as cardiovascular disease (CVD), diabetes, osteoporosis and certain types of cancers^[2-4].

Despite this evidence and the public's apparent acceptance of the importance of physical activity, millions of individuals remain essentially sedentary worldwide in low and middle-income countries. Epidemiologic transition, rapid changes in the demographic characteristics of the Middle Eastern population, speedy urbanization, and social development in the absence of steady and significant economic growth have led to large shifts in dietary and physical activity patterns in these countries^[5,6].

Furthermore, this region has one of the highest prevalence rates of overweight^[7], and is expected to bear one of the world's greatest increases in the absolute burden of diabetes in the next two decades^[8].

In many communities, there are various physical activity and sports recreation opportunities available that cater to the needs of the males, as a result women and girls may face barriers that limit their access to and participation in physical activity and sport. On the other hand, girls turn away from sports and fitness once they reach the teen years. These facts have led to growing interest in promoting physical activity through multi-sectoral community-based programs for females in developing countries, but such experience is limited in these countries.

Iran is facing the emerging health problem of CNCDS and obesity in different age groups^[9,10]; physical inactivity is documented as one of the major associated factors^[9,11,12]. Considering that in Iran, generalized and abdominal obesity is 4-

times more prevalent in women than in men^[9], and that females of different age groups have lower levels of physical activity than males have^[9,11,12], there is a clear need for a national strategy to tackle the contributors to the excess weight gain at population level. Such strategy might be useful for other developing countries with similar cultural and socio-demographic characteristics.

In the baseline survey of the national study entitled *"Childhood & Adolescence Surveillance and Prevention of Adult Non-communicable disease"* **CASPIAN*** Study^[11,12], we found that nearly one-third of parents had a negative attitude toward the regular extracurricular physical activity of their children, 46.2% of them declared not to have access to safe environment for physical activity out of school. As a result, in the interventional phase of the study, we aimed to provide a low-cost and simple model of culturally-appropriate and low cost facilities for improvement of physical activity with targeted interventions for girls and their mothers through an after-school program and to determine the changes in anthropometric indexes after this program.

Subjects and Methods

The current study was conducted in 2006-2007 in 7 provinces with different socioeconomic situations in Iran as a joint collaboration funded by a grant from WHO Regional Office for the Eastern Mediterranean region and Tehran University of Medical Sciences, and supported by the Ministry of Health & Medical Education and the Ministry of Education. Approval for the study was granted by ethics committees and other relevant national regulatory organizations. The Data and Safety Monitoring Board (DSMB) of the project closely supervised the quality control and quality assurance of the survey at the national level. The project team obtained written informed consent from parents and oral assent from their daughters.

The female students who studied in the 7th through 10th grade and their mothers were eligible for the study if they participated in fewer

* Caspian is the name of the world's largest lake, located in North Iran

than three physical activity sessions per week, and had no health problems that would preclude their participation in regular exercise.

Under the supervision of the study DSMB, the central cities of 7 provinces were selected for conducting the trial. In each province, the authorities of Provincial Education & Training offices provided the list of schools, where the study would be feasible to conduct. The project team stratified schools according to their location, and from each stratum, they selected a proportional, two-stage cluster sample of students. The primary units (clusters) were the schools. The secondary units were the students within the schools. Students were allocated code numbers and randomly selected using random number tables. Those students who declared their willing to attend the after-school program were included to the study.

The girl students and their mothers were tested in schools on two occasions at the beginning and at the end of the study. The testing periods were conducted in conjunction with school administrators and were not scheduled to conflict with school activities or academic tests.

The testing involved measurement of physical activity habits, body weight and height, waist and hip circumferences (WC, HC), body mass index (BMI) before and after intervention.

Weight was measured in light outdoor clothing, to the nearest 0.1 kg and height was measured without shoes, using a portable stadiometer. BMI was calculated as weight (kg) divided by height (meter) squared. WC was measured with a non-elastic tape at a point midway between the lower border of the rib cage and the iliac crest at the end of normal expiration. HC was measured at the widest part of the hip at level of the greater trochanter to the nearest half centimeters. In addition, the project team conducted focus group discussions (FGD) with sub-samples of mothers and daughters who were randomly selected from among those eligible for the study. During FGDs, participants were asked to discuss about the barriers and facilities for their regular physical activity and their opinion about the time and frequency of organizing after-school aerobic sessions in the current trial.

After-school aerobic activity classes followed the same protocol in all provinces. Overall, in each center 24 sessions were held for 90 minutes, two days a week, and 3 months long at school sites in the afternoon (at about 5 p.m.).

Each week, a 20-30 minute session was devoted before the beginning of the exercise to didactic presentations and/or discussion about reasons for being active, ways of overcoming barriers to being active, and strategies for maintaining active lifestyle. To facilitate the initiation and maintenance of "lifestyle-oriented" physical activity, participants were asked to engage in usual daily activities, e.g., taking stairs instead of elevator, walking for shopping etc.

These activities were not monitored, but the health benefits of this type of activities were simply discussed.

Topics of the physical activity sessions included 60-70 minutes of fitness-oriented activities, and positive self talk of participants.

Fitness activity consisted of a 10-min warm up, 20 min of aerobic activity and stretching exercise, 30 min free group playing and 10 min of cool down.

All activities were led by qualified female instructors with experience of teaching physical activity. The whole program was offered free of charge. To assess the trial's outcomes, the baseline survey was repeated at the end of the survey.

Statistical analyses were performed by SPSS for Windows (version 15.0; SPSS Inc., Chicago, IL). Results are presented as mean±standard deviation (SD). Paired t test was used to compare the anthropometric measures in mothers and daughters separately before and after the trial.

Findings

The study comprised 410 participants, 204 mothers and 206 daughters living in 7 provinces in different parts of the country including 15.5% from Khorasan (in the Eastern part), 15% from Gorgan (in the Northern part), 14.6% from Guilan (in the Northern part), 14.6% from

Table1: Anthropometric measures before and after the study among girls: CASPIAN Study

	Before Mean(SD)	After Mean (SD)	Mean (SD) of change	95% CI of the difference	P value
Weight (Kg)	54.7(9.6)	54.1(9.4)	0.5(0.2)	0.2-0.8	<0.0001
BMI (Wt/Kg²)	21.4 (3.5)	21.2 (3.3)	0.2 (0.07)	0.1-0.3	<0.0001
WC (cm)	71.2 (7.8)	69.8 (7.7)	1.4(0.3)	1.1-1.9	<0.0001
WHR	0.76 (0.06)	0.75 (0.06)	0.06(0.004)	0.02-0.1	<0.0001

BMI: Body mass index; WC: Waist circumference; WHR: Waist-to-hip ratio; SD: Standard deviation; CI: Confidence interval

Kordestan (in the Western part), 14.1% from Yazd (in the Central part), 14.1% from Hamedan (in the Western part), and 12.1% from Tehran (metropolitan). The higher number of daughters than mothers was because of two twin sisters participating in exercise sessions with their mothers in two provinces).

The mean age was 15.86 ± 1.01 years (range: 14-18 years) among girls and 40.71 ± 6.3 years (range: 26- 60 years) among their mothers, respectively. Overall, 72.3% of mothers didn't work out of home, 12.2% were governmental employee and 15.5% worked in non-governmental sectors.

The results of FGDs showed that in general, both mothers and daughters were satisfied from the program and found it feasible and successful. They expressed their desire to participate in a progressive, systematic physical activity program. In some cities, participants asked to have one of their aerobic sessions on Fridays (official weekend holiday in Iran).

After the trial, the indexes of generalized and abdominal obesity improved significantly both in girls (Table 1) and in their mothers (Table 2). At baseline, 2.3% of mothers were underweight, 27.7% were normal-weight, 34.3 % were

overweight and 21.6% were obese without significant change after the trial. Meanwhile, before the trial, 4.6% of girls were underweight, 79.6% were normal-weight, 11.7% were overweight and 4.1% were obese, and after the study the prevalence of overweight and obesity changed to 11.4% ($p>0.05$) and 3.4% ($p<0.05$), respectively.

Discussion

The most important finding of this multi-center study was that this simple model of physical activity improvement with targeted interventions for girls and their mothers facilitated the participation of females in physical activity, and made several changes in health-related fitness and anthropometric measures of participants of different age groups.

We suggest that the success of this trial might be a result of bonding and accompaniment of mothers and daughters. The social cognitive theory, as used to plan this trial, offered a

Table2: Anthropometric measures before and after the study among mothers: CASPIAN Study

	Before Mean (SD)	After Mean (SD)	Mean (SD) of change	95% CI of the difference	P value
Weight (Kg)	70.2 (11.5)	68.9(11.05)	1.3(0.2)	0.8-1.7	<0.0001
BMI (Wt/Kg²)	27.6 (5.5)	27.1(5.3)	0.5 (0.1)	0.3-0.6	<0.0001
WC (cm)	88.5 (11.8)	85.9 (11.02)	2.5(0.4)	1.8-3.3	<0.0001
WHR	0.83 (0.02)	0.81 (0.09)	0.2(0.02)	0.2-0.6	0.03

BMI: Body mass index; WC: Waist circumference; WHR: Waist-to-hip ratio; SD: Standard deviation; CI: Confidence interval

promising theoretical perspective for facilitating improved physical self-perception in adolescent girls and their mothers.

Previous research has linked parent physical activity behavior with that of their children^[13].

This strong link between lifestyle behaviors of parents and children has led some investigators to design, implement, and evaluate family-based physical activity interventions^[14-16]. Some previous family-based interventions had relatively low adherence rates and resulted in minimal behavior change. In some of these family-based physical activity interventions, e.g. the studies of Baranowski et al^[14] and Nader and colleagues^[15] entire families have been targeted.

Although they had positive results, but we suggest that more narrowly defining the target population, e.g. to mothers and daughters, will facilitate participation in physical activities that are preferred by girls and women which might be opposed to those preferred by men and boys. It is also possible that limiting behavior change expectations to physical activity would be the key to experience more success with family-based interventions.

Our findings are in line with the study of Ransdell et al which assessed the effect of a 6-month home-based program on physical activity level and health-related fitness in three generations of women (daughter/mother/maternal grandmother). They found significant positive changes in the expected direction of the program in their intervention group^[17]. Some studies have documented the effectiveness of home- and community-based physical activity interventions for mothers and daughters in developed^[18] and developing countries^[19].

Similarly, the efficacy of low intensity, community-based lifestyle trial for mothers and young children has been confirmed^[20].

Environmental and personal factors have an important influence on lifestyle behaviors and in turn on the weight status of children. Parents serve as role models for exercise, their support of their child's participation in physical activity can have impact on the activity level of their children. A longitudinal study found that parents in the obesogenic cluster reported high levels of dietary intake and low levels of physical activity; this could predict children's risk of obesity^[21].

The study of Fogelholm et al underscores the parents' role in childhood activity patterns and obesity, and found that the parent-child relationship of inactivity appeared to be stronger than that of vigorous activity^[22]. The results of the study of Mc Murray et al suggest that factors other than parental attitudes and exercise habits are more influential in determining the fitness and activity levels of children^[23]. In the study of Trost and colleagues, a strong association was found between childhood overweight status and parental obesity but no significant differences were observed for the parental influences on physical activity behavior^[24]. However, considering the role of continued physical activity from childhood to adulthood in the prevention and treatment of obesity, increasing physical activity should be emphasized particularly in obesogenic families^[25].

The current study provided an opportunity to assess the impact of physical activity program on anthropometric measures. Of special concern in the context of this study is the reduction in indexes of both generalized and abdominal obesity in different age groups. The anti-obesity effects of this simple and low-cost trial might be important from public health point of view for promotion of physical activity at community level.

In addition to increasing energy expenditure, physical activity has a role in improving short and long term appetite regulation; however, the mechanisms remain to be determined. Whatever the mechanism on these health benefits of active lifestyle, our study showed that even simple methods of promoting physical activity can have anti-obesity effects. We suggest that this can be, at least in part, by controlling the family obesogenic environment. The mother-daughter partnership in the current study, the increased bonding and accompaniment of mothers and daughters could increase the dose of interventions and supported the compliance of families as well as the efficacy of this trial.

More widespread implementation of similar interventions will require fundamental policy changes with commitment from all levels of government toward promoting healthy lifestyles, and widespread efforts to facilitate the increase in daily physical activity.

Culturally relevant family-based interventions especially focusing on mothers' beliefs and behavior are needed to improve the lifestyle of families particularly the children in order to help primordial and primary prevention of chronic disease. As recommended by Berenson and colleagues, the central thrust of health providers should be to help young generations grow up with healthful habits from the beginning, liberated from the harm of adverse lifestyles that were unwitting consequences of 20th century economic development^[26]. Pediatricians have a pivotal role in this regard and they should support both control and prevention of CNCDS risk factors in children via lifestyle modification, however, effective prevention of adult disease needs socio-cultural change^[27].

The main limitation of this study is that we did not assess other health behaviors of participants, e.g. their dietary habits and the possible changes during the study. The other limitation was that we did not have long-term follow up of participants' lifestyle behaviors and the impact on their risk factors other than overweight. The main strengths of our study were its novelty in the region and its multi-centric design in provinces with different socio-cultural background.

Conclusion

Our findings may provide a low-cost and simple effective model of motivating for physical activity with targeted interventions for girls and their mothers. We suggest that the success of this trial might be a result of bonding and accompaniment of mothers and daughters. Our simple interventions were effective, with the support of national leadership and infrastructure. By legislative support and access to pre-existing infra structure, it may be possible to integrate it as a suitable model in the existing health and education systems to impact physical activity. Only through such measures might the impending global epidemic of chronic diseases in developing nations be controlled.

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Conflict of Interest: None

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