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Research Article

COMPARE INFLAMMATORY MARKERS FOR CARDIOVASCULAR DISEASE AND LIPID PROFILE IN ACTIVE AND INACTIVE CHILDREN

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ABSTRACT
The purpose of this research is to compare the inflammatory markers for cardiovascular diseases and lipid profile in active and inactive children. Materials and methods: physical activity of 64 child candidates (26 boys and 38 girls) with the BMI of 15.53 ± 0.98 kg/m^2, aging 9 to 10 years old was assessed through PAQ-C questionnaire and they were divided into two categories of active (33 people) and inactive (31 people). After 12 hours of fasting without heavy activities, blood samples were taken to measure the following variables: serum CRP, TG, LDL, HDL, TC/LDL, and plasma FG. To analyze the data, independent T-test was used by $SPSS_{18}$ with the significance level of P≤0/05. Results: Statistical analysis showed that there is no significant difference in any of the variables of CRP, TG, LDL, HDL, TC /LDL between the two groups. Discussion and Conclusion: Although physical activity is an important factor in adults' cardiology general health, due to the intrinsic activity of children, the total amount of their activity was not effective in reducing cardiovascular risks.

Keywords*: Inflammatory Markers for Cardiovascular Diseases, Lipid Profile*

INTRODUCTION
Cardiovascular diseases (CVD) are the fifth leading cause of death and disability in the world (Anderson *et al.*, 1991). It is necessary to prevent CVD before adulthood because CVD risk factors start in adolescents and even children and this concept can be supported by the fact that CVD begins from birth (Barst, 2007). Atherosclerosis is the most lethal type of CVD in adulthood in which Pathological processes start during childhood, and environmental and internal factors are effective on it (Barst, 2007; Kwon, 2010). Environmental causes of atherosclerosis include Dish Lipid my, hypertension and obesity that to adjust them during the childhood, another factor must be considered instead of diet, which is the level of physical activity (Srinivasan *et al.*, 2006). Scientific data about the effect of physical activity on CVD risk factors showed that improved training in children can serve as a preventative average of CVD in adulthood (Steinberger *et al.*, 2009). Exercise and physical activity can improve blood lipid by increasing high density lipoprotein- cholesterol (HDL), which can prevent arteriosclerosis, and decreasing low density lipoprotein- cholesterol (LDL) and total cholesterol (TC), which cause arteriosclerosis (Berenson, 2001; Srinivasan *et al.*, 2006).
According to many researchers exercise can have anti-inflammatory effects, and due to positive effects on internal organs it reduces levels of inflammatory mediators (Gokhale *et al.*, 2007; Huang *et al.*, 2015; Kohut *et al.*, 2006).
Between the 1.5 million heart attacks and 600,000 strokes which occur annually in the United States, almost half of those are on healthy subjects with normal or even low cholesterol levels (Lloyd-Jones *et al.*, 2010). So, in an effort to better define CVD risk and prevention of clinical events, many doctors use protein measurements in the acute phase as Global Risk Assessment Program (Ridker, 2003). However, the acute phase proteins, will not replace lipid assessment but must be combined with other risk factors to be evaluated in determining CVD risk in individuals (Ridker, 2003).
Despite the fact that clinical symptoms of CVD are not particularly there from adulthood to fourth and fifth decades of life, some evidence have demonstrated that the disease occurs in childhood and Origins of adult cardiovascular disease are in childhood (Berenson, 2001; Fujii *et al.*, 2006; Steinberger *et al.*, 2009;

Wu *et al.*, 2003). Therefore, it seems that CVD has symptoms which appear to have originated in the first decade of life (Ruiz *et al.*, 2007).

Known cardiovascular risk factors are Overall and central fat tissue, lipids and lipoproteins, hypertension, acute phase proteins such as Gr- reactive protein C (CRP) and fibrinogen (FG), body mass index (BMI), homocysteine, lipoprotein a, and lack of physical activity (Dumith *et al.*, 2010; Fujii *et al.*, 2006; Ruiz *et al.*, 2007).

Among these factors, overall and central fat, blood lipids, lipoprotein, hypertension, BMI, cardiorespiratory fitness, and low physical activity have been identified as traditional CVD risk factors (Dumith *et al.*, 2010). Being accustomed to maintaining an active lifestyle is vital to your health, this research concluded that improved training in children can serve as a preventative average of CVD and Developed physical readiness activities for children, can improve CVD prevention in adults (Srinivasan *et al.*, 2006).

The relationship between physical activity and heart disease is reverse (Wadden *et al.*, 2004). In response to the increased incidence of CVD in adults, America Heart Association and other organizations have emphasized on the importance of exercise in childhood as a deterrent to CVD in later life stresses (Stoedefalke, 2007). Since 1998 Academy of Pediatrics found that high levels of cholesterol in children increases the risk of CVD in later life (Stoedefalke, 2007).

C Reactive Protein and Fibrinogen FG have been identified as new CVD risk factors (Thomas *et al.*, 2008). New risk factors were stronger than traditional risk factors for future CVD diagnosis in children, but the combination of these two factors together, is the strongest predictor of CVD risk, especially in children (Agarwal, 2001).

The combination of these two categories, have results as well as research, including Levels of acute phase proteins CRP contributing factor to understanding CVD prevention in childhood with values such as BMI, TG, LDL HDL, TC ratio TC / HDL, blood pressure, physical activity readiness is related to cardiorespiratory and High levels of them can play an effective role in the future development of CVD (Clearfield, 2005; Ford, 2003; Srinivasan *et al.*, 2006; Wu *et al.*, 2003) and to combine them to predict adult CVD in childhood have higher credit (Clearfield, 2005; Lennon *et al.*, 2004). Unfortunately, in spite of extensive studies focused on adults, studies on children and adolescents in the context of regular exercise, fitness and physical activity on CVD risk factors is low and its effect remains unclear (Isasi *et al.*, 2000; Stoedefalke, 2007).

Because CVD has symptoms which begin in the first decade of life, efforts of prevention and physical activity should begin in childhood, especially the first decade of life (Ruiz *et al.*, 2007; Steinberger *et al.*, 2009). It seems comparing the risk factors of CVD (inflammatory markers CRP and FG new agents and old agents, including TG, LDL HDL, and the ratio of TC / HDL is necessary in healthy active and non-active children in Iran, to explore the influence of children's physical activity and sedentary lifestyle on development of CVD in early stages of life.

MATERIALS AND METHODS

Participants

Education in the city of Qom has 4 areas, those two elementary schools (one for boys and one for girls) with high social, economic and cultural status (according to the classification of education and parents' education level and occupation) were selected in each area. Children born in 2000 and 2001 in all eight elementary schools (about 1500 students) were invited to participate in the study.

Then weight and height of children who were healthy (no disease-specific as well as non-pharmacological treatment of diseases affecting factor measurements) and volunteered to participate in the study (800 patients) were measured. After calculating BMI, and Tanner stage in the study of sexual maturity, parents of the students with the BMI 17 -14 kg m were invited to attend the briefing (about 300) and while they got the information in this schedule, the company's consent and child health questionnaire for parents and

children to get exercise and physical activity, they were justified about completing the forms (Banz *et al.*, 2003).

A week later the forms were enrolled in schools and collected by the investigator. 110 healthy children and their parents completed questionnaires and were satisfied. According to the Physical Activity Questionnaire Score (validity and reliability of the International) similarly (Crocker *et al.*, 1997; Moore *et al.*, 2007), in Iranian children and review questions in the physical activity questionnaire (Faghihimani *et al.*, 2010), and in sedentary activities per week questionnaire, they were divided into two groups of 33 active children (14 boys and 19 girls) and 31 inactive children (12 boys and 19 girls). Specifications of subjects in Table 1 as mean ± standard deviation can be observed.

Table 1: General Characteristics of the Subjects

Group / Variable	Active Children (N=33)	Inactive Children (N=31)
Age (year)	9.47±0.45	9.57±0.51
Height (cm)	1.32±0.06	1.34±0.06
Weight (kg)	27.52±3.48	27.74±3.47
BMI	15.71±0.94	15.34±0.99

On the day, firstly blood samples were collected, and their weight and height were measured. After 30 minutes of rest sitting from the time of arrival at the laboratory (due to control of plasma volume changes) blood samples were taken from the subjects between 8:30 and 10 AM, after 12 hours of fasting and 24 hours of heavy inactivity. For this purpose, 5cc blood was taken from the subjects' left hand peripheral, and the samples were centrifuged for 5 minutes at 3500 rounds per minute.

Statistical Method

Data was determined using the Kolmogorov-Smirnov normality test. To compare data (active and disabled children) the independent T-Test was used. Data analysis was done, using SPSS18 with the significance level of $P \leq 0.05$.

RESULTS AND DISCUSSION

Results

Results of statistical analysis showed that there is no significant difference between male and female, active and inactive children comparing the levels of CRP, TG, FG, LDL, HDL, TC / HDL.

Table 2: Descriptive Characteristics of the Subjects

Group / Variable	Inactive Girls	Active Girls	Inactive Boys	Active Boys
CRP	0.88±0.18	1.08±0.23	1.65±0.72	1.58±0.64
FG	280.23±34.4	267.88±34.73	271.25±28.59	268.86±44.25
TG	114.59±38.91	101.63±34.87	97.17±22.44	94±26.79
LDL	96.36±32.15	95.40±15.50	85.17±13.42	82.69±17.09
HDL	46.18±8.14	46.19±9.34	45.17±7.47	43.69±8.06
TC/HDL	3.58±0.88	3.49±0.63	3.24±0.40	3.19±0.52

Table 3: T Test Variables CRP, TG, FG, LDL, HDL, TC / HDL in Active and Inactive Children

Group / Variable	Active Children	Inactive Children	T	P
CRP (µg/ml)	1.24±0.43	1.20±0.45	-0.121	0.904
FG (mg/dl)	268±37.71	278.26±32.69	1.16	0.251
TG (mg/dl)	97.58±29.76	109.97±35.88	1.508	0.251
LDL (mg/dl)	91.61±20.34	93.29±27.89	0.277	0.783
HDL (mg/dl)	45.15±8.23	45.77±8.13	0.304	0.762
TC/HDL (mg/dl)	3.35±0.59	3.49±0.77	0.773	0.443

Discussion

CRP levels reflect inflammation associated with atherosclerotic process, the amount of myocardial ischemia, myocardial necrosis, and the amount and activity of circulating pro-inflammatory cytokines and have role in the pathogenesis of chronic inflammatory diseases such as cardiovascular disease, diabetes and cancer (Bassuk *et al.*, 2004; Heijden *et al.*, 2010; Kwon, 2010). Most studies have shown CRP levels in children may be involved in the future development of coronary heart disease (Yoshida *et al.*, 2006). Childhood physical activity is one of the things which there are conflicting results about their effects on CRP.

In this study it was shown that in the same BMI, physical activities of children have no significant effect on CRP indicating no effect of childhood physical activity on cardiovascular events. This study is consistent with research of Nassis *et al.*, (2005) in which they found that exercise independent of weight loss, does not improve inflammatory markers in childhood (Nassis *et al.*, 2005). Also, Royce & Associates (2007) studied 142 Swedish children (74 boys and 68 girls) aged 9 to 10 in the first and second stages of maturity of Tanner. The total intensity of physical activity and cardiorespiratory fitness was measured by bicycle ergometer.

CRP levels were negatively associated with readiness, but after controlling for age, sex and stage of maturity, the relationship was not significant (Ruiz *et al.*, 2007). Thomas *et al.*, (2008) relationship between CRP and physical fitness activity (assessed by questionnaire final stage of testing 20 m) and weight 164 kg. School 13 -12 year old boys and girls to study and to found that there is a significant association between CRP and fitness activities which is also seen in the present study (Thomas *et al.*, 2008). However, CRP was significantly associated with obesity which was controlled in this study (Thomas *et al.*, 2008).

According to available information, it appears CRP-lowering agent is in reducing childhood obesity and weight control, not increasing in activity or physical fitness.

Practice seems to decrease athero-genic monocyte activities including the synthesis of pre-inflammatory interleukins and TNF-α which in this study long-term activity levels were not measured (Knox et al., 2009). Also, Royce & Associates (2009) and Knocks *et al.*, (2009) in their review of the observational method of assessment activities concluded that high levels of activity, especially strenuous activity associated with overall and central fat is lower in children and adolescents and that moderate and vigorous activity to low intensity appears to be independently associated with an inflammatory protein in children and adolescents (Knox *et al.*, 2009; Ruiz *et al.*, 2007).

Fibrinogen levels (FG) in atherosclerotic disease rises and they are predictors of these diseases (Berenson, 2001; Srinivasan *et al.*, 2006), and some children studies have shown an inverse correlation with FG levels of physical activity (Clarke *et al.*, 2005; GFR, 2010) and physical readiness (Steinberger *et al.*, 2009), but in this case, some studies have found conflicting results**.** In this study it was shown in the same BMI, physical activity does not impact significantly on the Kids FG. Reid *et al.*, (2008) and Ruiz *et al.*, (2009) also stated that the effect of physical activity on inflammatory proteins in children and adolescents

is low (Reed *et al.,* 2008; Ruiz and Ortega, 2009)**.** One can assume that low levels of physical activity may be important interactions between inflammation by reducing body fat and increasing cardiovascular fitness that will reduce this work to control obesity**.** In contrast to the present study Knocks *et al.,* (2009) also increased activity by 3,200-meter fast walk twice a week (every 60 minutes) in children aging 11 -14 years old with low socioeconomic divide into two groups and control exercises carried out for 18 weeks and in the exercise group they achieved favorable changes in FG (Knox *et al.,* 2009). The study was conducted on children with low socioeconomic status, which is a major factor, contributing to the increased CVD risk another reason which may be helpful in the field of higher CVD risk in this group (Ford, 2003; Kivimäki *et al.,* 2005)**.** With this interpretation the causes of the impact of child work on this research on FG are probably controlling obesity, age, race, stage, smoking, socio-economic status and lack of activity duration control.

Regular exercise is also inversely associated with cardiovascular events and will help to improve the lipid profile and reductions in TG, LDL, TC / HDL have been reported in the period after physical training (Clarke *et al.,* 2005; Lennon *et al.,* 2004; Pérez, 2008). In this study it was shown in the same BMI, children physical activity, have no significant effect on TG**.** Rizzo and colleagues (2007) studied 273 children aged 9 years old and 256 teenagers aged 15 to test their cardiorespiratory fitness and physical activity was measured with bicycle ergometer**.** Results showed a significant negative correlation with TG intense in the physical activity of adolescent girls that was not seen in male and female adolescents and children (Rizzo *et al.,* 2007)**.**

Kwon (2010) in a study of 123 children found out that cardiorespiratory fitness with the following TG controls obesity, pubertal age (before puberty) were not related in boys and girls but it may be effective in children after puberty so that the puberty influence of on the relationship (Kwon, 2010)**.** Dumith (2010) studied students with a mean age of 13 years old and concluded that fitness is associated with reduced TG (Dumith *et al.,* 2010).

Ruiz *et al.,* (2009) in their review of the observed spatial assessment activity reached to a conclusion that moderate and vigorous activity according to low intensity appears to be independently associated with serum lipids (Ruiz and Ortega, 2009).

Rizzo and colleagues (2007) studied 273 9-year-old children. Bicycle ergometer test of cardiorespiratory fitness and physical activity have intense correlation with HDL in male and female children and adolescents (Rizzo *et al.,* 2007).

Kwon (2010) and Ruiz *et al.,* (2009) in their review of the observational method of assessment activities concluded that moderate and vigorous activity compared to the low intensity appears to be independently associated with blood lipid (Kwon, 2010; Ruiz and Ortega, 2009). Diet and regular exercise, probably effects on the circulatory system and improve the oxidative enzymes in fat metabolism (Baker *et al.,* 2007).

Conclusion

The results reveal that there is not a significant difference between the levels of CRP, FG, TG, LDL, HDL, TC / HDL-active and non-active children, which indicates the level of activity in this age group may not be effective for cardiovascular risk factors but other factors may be involved in the activity level of an event at a later age that needs to be investigated.

Although physical activity is an important factor in public health and adult cardiovascular, due to the intrinsic activity of children, it seems that factors such as intensity, duration and type of physical activity and cardiorespiratory fitness can be effective.

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