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Cardiovascular risk factors in young male adults: impact of physical activity and parental education

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Abstract

Background: This study was conducted to assess whether choices of physical activity, smoking status, and parental education and income were correlated with the health status of young adult males which are important for preventive health policy.

Methods: 491 18-29-year old males from lower socioeconomical districts in Turkey participated in this study. Information about demographic characteristics, parental education, household income, smoking status, and physical activity was obtained by means of a standardized questionnaire. BMI and metabolic parameters (serum lipid profile) were assessed.

Results: Mean total cholesterol, LDL, HDL and triglyceride levels were in the normal range. The physically active group displayed a better lipid profile. No relationship was found between parental education and serum lipids. Smoking was slightly correlated with household income (r=103, p=0.022).

Conclusion: Young adult males who participate in relatively high levels of physical activity are at lower CHD risk than less active ones. The present study also showed that lower socioecnomic status does not always correlate with higher levels of cardiovascular risk factors. In conclusion, data supports that while family history cannot be changed, HDL levels can be modulated by lifestyle factors as in other populations and that with the determined benefits of increasing physical activity and thus, HDL levels, policy reform in schools to promote physical activity are warranted.

Keywords: *educational status, lipoproteins, physical education and training, smoking, social class, Turkey.*

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Research

Introduction

Mortality rates from coronary heart disease (CHD), which rose during the twentieth century, started declining in most industrialized regions such as in United States and in Europe during the 1960s because of preventive studies.[1-4]

In Turkey,[5] the prevalence of CHD is higher than in the US and Europe. As a developing country, rapid lifestyle changes (fast food, obesity, physical inactivity), lower socieconomic status (SES), and high smoking prevalence are major factors in the development of CHD. Notably, Turks have low levels of HDL (10-15 mg/dl lower than in Europeans and

North Americans)[6] which appear to have genetic origin.[7,8] However, though genetically determined to a significant extent, these low HDL levels can be modulated by lifestyle factors, as in other populations.

Cardiovascular diseases typically occur in middle age or later, however lifestyle behaviors are learned in early life and maintained throughout adulthood.[9,10] Physical activity levels and dietary habits are important health related factors that, learned in early ages, are screening tools to identify young subjects at risk for later CHD development.[11]

Reports have shown that excess weight and sedentary lifestyle among young adults are associated with high prevalence of cardiovascular risk.[12] Low parental education has been shown to contribute to an individual's risk for CHD development.[13]

In the current study, analyses were conducted to assess whether choices of physical activity, smoking status, and parental education and income were correlated with the health status of young adult males, which are important for preventive health policy.

Materials and Methods

Study design

This study consisted of 491 healthy male volunteers between the ages of 18 and 29.

The study group was from different regions of Turkey whose families are mostly immigrants from lower SES parts of the country. The participants were recruits for the police academy and were attending our hospital for health reports. The blood samples collected during routine check up were used for this study- no additional sample was taken. The procedures were in accordance with the guidelines of the Helsinki Declaration of human experimentation. All participants provided written informed consent. The study was conducted between March and September 2011.

Blood samples were taken and information on smoking habits, physical activity, family income, and parental education were collected by trained staff using a self-administered questionnaire. Body mass index (BMI) was calculated as weight (kg)/height (m^2). Height was measured to within 0.5 cm and weight to within 0.1 kg.

Measurements

After an overnight fast, blood samples were obtained to measure levels of triglycerides (TG), total cholesterol (TC) and high-density lipoprotein cholesterol (HDL). Serum lipids were measured on the Abbott Architect analyzer (Abbott, Wiesbaden, Germany). Concentration of low-density lipoprotein cholesterol (LDL-C) was calculated using the Friedewald formula[14] ([LDL-chol]=[Total chol] - [HDL-chol] - ([TG]/2.2) where all concentrations are given in mmol/L. Coefficients of variation for the measured serum lipids were <3.3% (Bio-Rad laboratories, Milano, Italy).

Information on smoking habits, physical activity and parental education was collected from the questionnaire. Age was calculated based on date of birth from hospital data. The questionnaire contained the school-based and extracurricular physical activity questions used in the present analysis. Participants who perform moderate to vigorous physical activity 3 or more times per week for 60 min or above, minimum duration of 1 year, were classified as active. Remaining participants were classified as inactive.

In the questionnaire, current smoking status was considered to be smokers (current or past smoking), and non-smokers (never smoked).

Household income, paternal and maternal education were used as indicators of SES. Household income was assessed by total montly income for a family unit living together. Income was classified into three groups: low: ≤ $500/month, middle: $500-1,000, high: >$1,000.

Parental education level was classified into three groups: low(1): none+ elementary school, intermediate(2): middle +high school, and high(3): college+university.

The education levels of the study group were high school and college or university graduate, therefore, the education level of the participants was not considered useful for the purposes of this study.

Statistical analyses

Risk factors were analyzed as continuous variables including age, BMI, total cholesterol, LDL, HDL, triglycerides, and the ratio of TC to HDL. Household income, parental education, smoking, and physical activity were analyzed as categorical variables.

We used an independent samples *t*-test for comparison of quantitative variables. For qualitative variables, cross-tabulation and X^2 tests were used. A p value <0.05 (two-tailed) was considered significant. Normality of quantitative variables was verified by *Kolmogorov-Smirnov* test. Qualitative variables were expressed as a percentage with a confidence interval of 95%. Pearson and Spearman correlation coefficients were used as appropriate. Analysis of covariance (*MANCOVA*) analysis was used; age, BMI, smoking were included as covariates if needed. All statistical analyses were conducted with SPSS, version 15.0 (SPSS Inc., Chicago, IL, USA).

Results

Demographic and biochemical characteristics of the participants are presented in Table 1.

Table 1: Demographic and biochemical characteristics of study participants.

25.3% of the subjects (only 2 of them were obese) were overweight (BMI>25) according to the definition by World Health Organization.[15]

No associations were found between serum lipids, BMI and parental education.

The comparisons of physical activity and other risk factors are presented in Table 2.

Table 2. Analysis of covariance assessing the effects of physical activity using lipids as dependent variables, physically activation group as fixed factors, and age as a covariate (MANCOVA). TC/HDL-C between groups were determined by independent samples *t*-test.

In physically active adult group, a better lipid profile was determined (Table 2).

Subjects' smoking was not related to parental education, physical activity, BMI or age. A statistically significant but weak correlation was found only between with smoking and income (r=.103*, p=0.022*) (Spearman).

Lower HDL levels were found in subjects that cigarette smoking than non-smoking (Table 3).

Table 3: Analysis of covariance assessing the effects of smoking using lipids as dependent variables, smoking as fixed factors, and age, BMI as covariates. (MANCOVA).

Discussion

We observed a better lipid profile among Turkish young adults than the Turkish Heart Study[16] within the same age group, as we demonstrated a higher mean concentration of HDL Cholesterol (9.2 mg/dl higher). For these educated young adults, low parental education caused no impact on their health status.

Obesity and overweightness are important problems in industrialized countries. In Greece,[17] 40% of male young medical students are overweight (BMI>25.0 kg/m^2). According to a study,[18] a higher rate of obesity was established in a Turkish population relative to European countries. In the present study, the mean BMI was calculated as 23.3 kg/m^2.

BMI of the adults is thought to be influenced by environmental factors related to parental education as well as by genetic factors. In studies[19,20], BMI was found to be related to the parental education, however in the current study no relationship was found between.

It is recommended that school-age youth had to participate in physical activitiy approximately 60 min/day or more and had to reduce sedentary behaviours to < 2 hours per day for health promotion.[21] Previous studies[22-24] of the Turkish young population suggested rather high incidence of sedentary lifestyle and relatively low levels of occupational physical activity. Because the participants of this study were among the recruits for the police academy, the rate of the sports activity was very high (81.3%) which may have introduced some selection bias, resulting in participants being healthier.

Cigarette smoking influences cardiovascular system because of carbon monooxide and nicotine leading to a reduction in myocardial O_2 intake.[25] Although smoking is associated with low HDL, it did not account for the markedly low levels of HDL in Turks.[6,16] Regarding smoking status of participants, a lower rate of smoking rate was found compared to previous studies.[25-27] Paavola *et al.*[28] considered that, smoking status between the ages of 13-28 was not related to parental education, occupation, or income. In this study, smoking prevalence showed no relationship between parental education. However, others concluded that, parental education and participants' own education were the strongly related factors affecting their own smoking.[29]

In populations at high risk for CHD caused by low HDL, the TC/HDL ratio predicts CHD risk regardless of absolute LDL and HDL.[30] In the current study, with a population in low household income, the ratio was found as *3.5*, where it was found as *4* among Turks with similar income[6]. In contrast to a study,[16] we observed that higher salary was associated with lower HDL. This may be due to unhealthy dietary habits as it was showed in several studies among Turks.[12,23]

One limitation of this study is that the participants' duration and intensity of physical activity were evaluated according to their self reports in the questionnaire. However, in randomized or nonrandomized studies,[21] supervised programs are used for the evaluation of physical activities, generally. Another limitation is that the recruits for the police academy are usually more prone to physical activity compared with the same age group. Therefore this study group does not reflect their age-matched counterparts' lifestyle and lipid profile, however, we had a chance to compare the physically active young group with sedentary ones.

In conclusion, parental education has a lesser effect on the educated young adults' health statuses. Because HDL levels and physical activity rates were higher than in previous studies, we recommend a need to reform public health policies, especially in regards to physical activity programs because of the determined benefits..

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Table 1: Demographic and biochemical characteristics of study participants.

Variable	Males n=491
Mean Age (range)*	21(18-29)
Body mass index (SD, kg/m^2)†	23.3(2.24)
BMI >25	25.3%
Total cholesterol (SD, mmol/L)	3.94(0.75)
HDL-cholesterol (SD, mmol/L)	1.20(0.25)
LDL-cholesterol (SD, mmol/L)	2.28(0.65)
Triglycerides (range, mmol/L)*	0.87(0.23-4.09)
Total cholesterol/HDL (SD) cholesterol ratio	3.5(1.0)
Cigarette smoking (%)‡	25.1
Physically inactive (%)	18.7

Table 1 continued:

Paternal education (%)	
Lower	39.3
Medium	22.6
Higher	38.1
Maternal education (%)	
Lower	76.8
Medium	14.5
Higher	8.8
Household income (%)§	
Lower	47.5
Intermediate	40.3
Higher	12.2

Abbreviations: HDL, high density lipoprotein; LDL, low density lipoprotein.

Values are means±standard deviationor percentages. Means were compared by *t* -test, and percentages were analyzed by x^2- test.Statistically significant *p* values are marked in bold.

* median(min-max) values for non-Gaussian distributions

† Weight (kg)/height $(m)^2$

‡One or more cigarettes per day

§According to Turkish Statistical Institude during September 2011 the average Turkish net income was €790.

Table 2. Analysis of covariance assessing the effects of physical activity using lipids as dependent variables, physically activation group as fixed factors, and age as a covariate (MANCOVA). TC/HDL-C between groups were determined by independent samples *t*-test.

	Physically inactive (n=91)	**Physically active (n=399)**	**F**	***P***
Total Cholesterol (mmol/L)	4.07(3.92-4.22)	3.91(3.85-3.98)	3.57	0.059
Triglyceride (mmol/L)*	1.05(0.95-1.16)	0.89(0.84-1.08)	9.11	0.003**
HDL-Cholesterol (mmol/L)	1.10(1.05-1.15)	1.22(1.19-1.24)	16.13	0.000**
LDL-Cholesterol (mmol/L)	2.44(2.32-2.57)	2.24(2.18-2.30)	7.92	0.005**
Total Cholesterol/HDL-Cholesterol	4.20 (±1.32)	3.27(±0.86)	44.47	0.000**

Values of lipids are means with 95% confidence intervals in parenthesis and the ratio data are mean ± SD.
*Data on triglycerides $\log_{10}$ transformed before analysis and untransformed mean values were reported here.
**$p<0.05$

Table 3: Analysis of covariance assessing the effects of smoking using lipids as dependent variables, smoking as fixed factors, and age, BMI as covariates. (MANCOVA).

	Smoking (n=123)	**Non-smoking (n=367)**	**F**	***p***
Total Cholesterol (mmol/L)	3.91(3.79-4.03)	3.95(3.88-4.02)	0.29	0.591
Triglyceride (mmol/L)*	0.96(0.86-1.06)	0.90(0.86-0.96)	0.53	0.466
HDL-Cholesterol (mmol/L)	1.16(1.11-1.20)	1.21(1.18-1.23)	4.42	0.036**
LDL-Cholesterol (mmol/L)	2.28(2.17-2.38)	2.28(2.22-2.34)	0.00	0.982

** $p<0.05$