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Effect of Cycling on Physical Fitness & Association with CVD- A Retrospective Study

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Abstract

Background: *Cycling is an easy and low-impact activity which can significantly improve individual fitness and which has the potential to have a major impact on public health. The present study was conducted to assess the CVD risk factor profile in children and adolescents who cycled to school compared with noncyclists.*

Materials & Methods: *It included 560 students who were divided into 2 groups. Group I comprised of cyclists and group II consisted of non- cyclists.*

General information such as name, age, gender, class etc was recorded. Height & weight was measured. BMI was calculated as weight (kg) / height.^{2} The sum of the thickness of 4 skin folds was measured. All blood samples were analyzed for blood lipids, glucose, and insulin at clinical pathology accredited laboratories.

Results: *Out of 560 subjects, cyclists were 350 (boys- 140, girls- 210) and non- cyclists were 210 (boys- 120, girls- 90). The difference was significant (P-0.01). BMI (Kg/m^2) in cyclist was 18 while in non- cyclist was 18.2. Skin fold sum (mm) was 36.2 in cyclist and 35.7 in non- cyclist. Waist circumference (cm) was 57.2 in cyclist and 58.6 in non- cyclist. Physical activity (cpm) was 650 in cyclist and 648 in non- cyclist. Fitness (ml/m$^{-1/}$kg^{-1}) was significantly higher in cyclist (49.6) than non- cyclist (46.2). Systolic blood pressure was 110 mm/Hg in cyclist and 108.2 mm/Hg in non- cyclist. Diastolic blood pressure was 70.6 mm/Hg in cyclist and 70.4 mm/Hg in non- cyclist. The difference was non- significant (P> 0.05). Total cholesterol, HDL and triglyceride level was higher in group II as compared to group I.*

Conclusion: *Physical exercise in from of cycling is useful for general body health. CVD can be preventable by adopting physical exercise. Cholesterol and triglyceride level found to be lower in cyclist than non-cyclist.*

Keywords: *Cardiovascular disease, Cycling, Physical exercise.*

Introduction

Physical activity is a key priority for most established health agencies. Active transportation by means of walking or bicycling to and from work and for other purposes is a type of physical activity that can be built into everyday life; for many, it constitutes a substantial proportion of the total daily health-enhancing physical activity and provides cost- and time-effective alternatives to commuting by car or public transport. Besides raising physical activity levels, active transport-tation may also reduce traffic congestion and air and noise pollution that plague many cities.[1]

Cycling is an easy and low-impact activity which can significantly improve individual fitness and which has the potential to have a major impact on public health. It can help to reduce the risk of a range of health problems, notably heart disease and cancer, the leading preventable causes of premature death.[2]

A decrease in habitual physical activity is suggested to be a contributor to rising levels of childhood overweight and obesity, although there are limited direct data to describe how children's physical activity has changed over recent decades. Indirect evidence for a decline in overall physical activity comes from transportation surveys, which have recorded a reduction in the proportion of journeys taken by foot and an increase in car travel. These trends are reflected in the decline in active travel to school reported in many countries.[3]

Whereas active transportation and walking have previously been associated with lower risk of cardiovascular disease and premature mortality in prospective studies in different populations around the world, only a few large-scale prospective studies have specifically assessed the cardiovascular health benefits associated with commuting by bicycle, and no study has assessed the impact of changing commuting mode to work. Estimating the magnitude and population impact of the cardiovascular benefits of commuter cycling is important because this would help inform health policy decision making and facilitate the prioritization of public health resources. Previous studies have estimated that physical inactivity is responsible for a substantial economic burden on healthcare systems.[4] The present study was conducted to assess the CVD risk factor profile in children and adolescents who cycled to school compared with noncyclists.

Materials & Methods

The present study was conducted in the department of Physiology. It included 560 students of high school. The school was informed regarding the study and informed written consent was obtained. It included 2 groups. Group I comprised of cyclists and group II consisted of non- cyclists.

General information such as name, age, gender, class etc was recorded. Height & weight was measured. BMI was calculated as weight (kg) / height.[2] The sum of the thickness of 4 skin folds (biceps, triceps, subscapular, and suprailiac) was measured using a Harpenden caliper, with the mean of 3 measurements used at each site.

Blood pressure was measured in all subjects. Five measurements were taken at two-minute intervals with the mean of the final 3 measurements used in all analyses. Blood samples were obtained after an overnight fast and stored at –80°C before analysis. All samples were analyzed for blood lipids, glucose, and insulin at clinical pathology accredited laboratories.

Heart rate (HR) was recorded continuously throughout the test using a heart rate monitor. Criteria for exhaustion were a heart rate > 185 beats per minute, failure to maintain a pedaling frequency of at least 30 rpm or a subjective judgment by the observer that the individual could no longer continue, even after encouragement. The maximal power output was calculated for each individual according to the formula: Wl + (Wi × T/180); where Wl = workload (in watts) at the last completed stage, Wi = the workload increment (in watts) at the final incomplete stage, and T = time (in seconds) at the final incomplete stage. Physical activity was assessed using the MTI accelerometer. The MTI accelerometer measures the vertical acceleration of body movement. Physical activity was monitored for 4 consecutive days—2 weekdays and 2 weekend days. Instruments were attached tightly at the hip. Minute-by-minute data were stored in memory and subsequently downloaded to a computer. Results were tabulated and subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I Distribution of subjects

	Boys	Girls	P value
Cyclist	140	210	
Non- cyclist	120	90	0.01

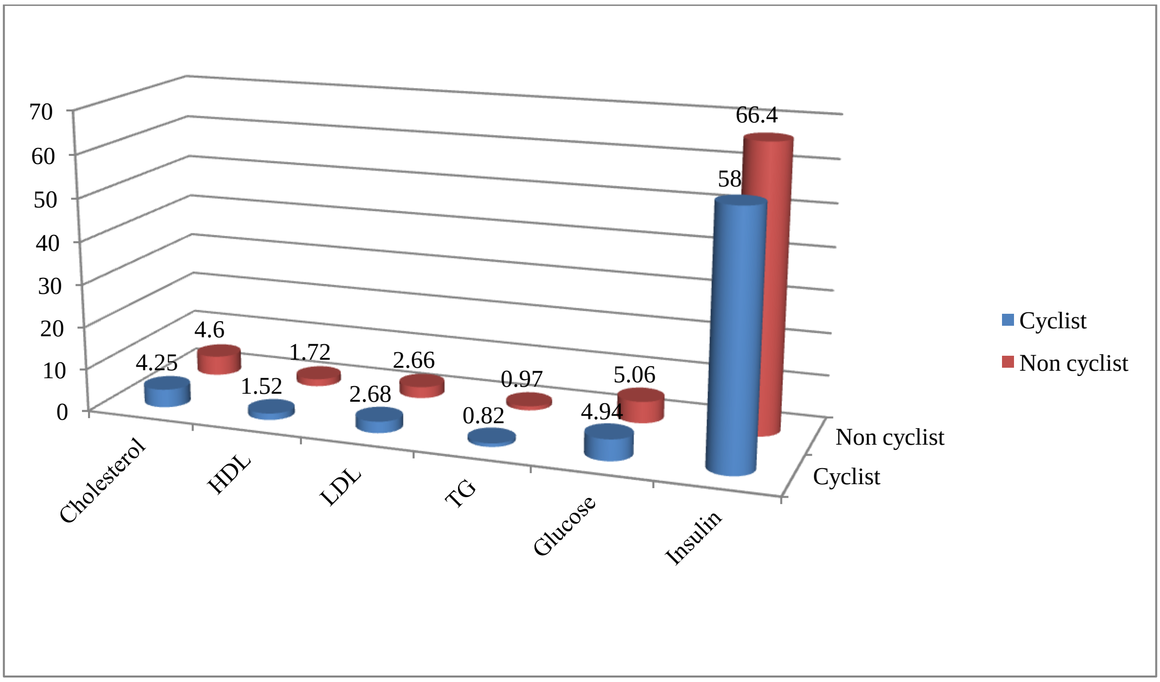
Table I shows that out of 560 subjects, cyclists were 350 (boys- 140, girls- 210) and non- cyclists were 210 (boys-120, girls- 90). The difference was significant (P-0.01).

Table II CVD risk in both groups

Variables	Cyclist	Non- cyclist	P value
BMI (Kg/m^2)	18.0	18.2	1
Skin fold sum (mm)	36.2	35.7	0.1
Waist circumference (cm)	57.2	58.6	0.24
Physical activity (cpm)	650	648	0.21
Fitness ($ml/m^{-1/}kg^{-1}$)	46.2	49.6	0.01
Systolic B.P	110.0	108.2	1
Diastolic B.P	70.6	70.4	1

Table II shows that BMI (Kg/m^2) in cyclist was 18 while in non- cyclist was 18.2. Skin fold sum (mm) was 36.2 in cyclist and 35.7 in non- cyclist. Waist circumference (cm) was 57.2 in cyclist and 58.6 in non- cyclist. Physical activity (cpm) was 650 in cyclist and 648 in non- cyclist. Fitness ($ml/m^{-1/}kg^{-1}$) was significantly higher in cyclist (49.6) than non- cyclist (46.2). Systolic blood pressure was 110 mm/Hg in cyclist and 108.2 mm/Hg in non- cyclist. Diastolic blood pressure was 70.6 mm/Hg in cyclist and 70.4 mm/Hg in non- cyclist. The difference was non- significant (P> 0.05).

Graph I Laboratories findings in students



Graph I shows that total cholesterol ($mmol/l^{-1}$) in cyclist was 4.25 and 4.6 in non- cyclist. HDL ($mmol/l^{-1}$) level was 1.52 and 1.72 in cyclist and non- cyclist respectively. The difference was significant (P< 0.05). LDL level ($mmol/l^{-1}$) was 2.68 and 2.66 in cyclist and non- cyclist respectively. Triglyceride level ($mmol/l^{-1}$) was 0.82 and 0.97 in cyclist and non- cyclist. The difference was significant (P< 0.05). Glucose level in cyclist and non- cyclist was 4.94 and 5.06 respectively. Insulin level ($mmol/l^{-1}$) was 58.0 and 66.4 respectively.

Discussion

Lack of physical activity is one of the most important risk factors for CVD. People who have a physically inactive lifestyle have up to double the risk of developing CVD compared to those who have an active lifestyle39. Higher levels of physical fitness have also been shown to lessen the harmful effects of other CHD risk factors such as smoking, high cholesterol and high blood pressure.[5] The present study was conducted to assess the CVD risk factor profile in children and adolescents who cycled to school compared with noncyclists.

In this study, out of 560 subjects, cyclists were 350 and non- cyclists were 210. Boys were 260 and girls were 300. We found that BMI, sum of skin fold and waist circumference was similar in cyclist and in non- cyclist. Physical activity and fitness was significantly higher in cyclist than non- cyclist. This is in accordance to Cooper.[6] Systolic and diastolic blood pressure was almost similar in both groups.

We observed that total cholesterol level was significantly higher in non- cyclist as compared to cyclist. HDL and triglyceride level was also significantly higher in group II as compared to group I. This is in agreement with Tudor et al.[7]

Regular physical activity reduces the risk of all cause mortality, meaning that being active reduces the overall risk of dying prematurely from any cause. Many studies show that the likelihood of death is lowest among those who are most active and the greatest benefits from increasing physical activity come to those who are least active to start with. The main forms of cardiovascular disease (CVD) are coronary heart disease (CHD) and stroke. About half of all deaths from CVD are from CHD and nearly a third are from stroke. CVD is the main cause of death in Europe, accounting for 4.35 million deaths each year.[8]

Earlier studies have reported higher physical activity levels in active commuters, and cycling has been associated with higher fitness level both in cross sectional and in longitudinal studies. The difference in fitness level between traveling modes in cross sectional studies could be attributed to selection, and commuter cycling could affect work efficiency during the fitness test, which could explain the higher work capacity. However, the study in adolescents of Andersen et al[9] showed no difference in submaximal oxygen uptake at a given work load and only showed differences in types of fitness which could be expected to be affected by cycling such as aerobic fitness and muscle endurance, and this may indicate that the higher fitness is a result of cycling.

Conclusion

Physical exercise in from of cycling is useful for general body health. CVD can be preventable by adopting physical exercise. Cholesterol and triglyceride level found to be lower in cyclist than non- cyclist.

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