Exercise Changed Body Mass Index and Lipid Profile Variably in Obese Male of Different Ethnic Groups in Quetta Population.

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Abstract:
The effect of exercise on body mass index (BMI) and plasma lipid profile was investigated in obese males of different ethnic groups of Quetta, Pakistan. The subjects were ethnically assigned into four groups i.e. Baloch, Pathan, Hazara and Punjabi. In two batches of 32 volunteers in each included 8 subjects from each ethnic group one who prescribed to exercise protocol and the controls with no exercise in their routine. Ten week of controlled study was done to find out its effect on BMI, total cholesterol, LDL-c, HDL-c and triglycerides. Fasting blood samples were collected from control and exercised subjects on the last day of tenth week.
The 10 week exercise elicited non-significant reduction in BMI in all the ethnic groups. Total cholesterol was non-significantly decreased in the volunteers of all the ethnic groups. Distinct and significant reduction in LDL-c was noticed in Punjabi subjects after prescribed exercise. The exercise group exhibited marked and statistically significant increment in HDL-c in Baloch, Pathan and Hazara volunteers. Exercise also showed its beneficial effects in reducing triglyceride level in Hazara and Punjabi subjects.
Key words: Obesity, cholesterol, HDL-c, LDL-c, TG, exercise.

Introduction

Overweight and obesity are a global health problem (1,2) and its prevalence rates have tripled since the 1980s (3). Obesity is now considered a major public health problem of epidemic proportion that threatens millions of lives in the United States (4,5) and worldwide (6).

Obesity is defined as an accumulation of excessive amounts of adipose tissue in the body (7). Obesity is linked to a number of chronic diseases (8) and lipoprotein disorder is linked with weight gain. It is earlier reported that weight loss is the most effective means of reducing lipid and lipoprotein risk factors in obese subjects (9) and commented that high-intensity exercise, even with low energy expenditure, may be a strategy to benefit lipoprotein metabolism. Resembling results have been reported with moderate aerobic exercise (10, 11, 12, 13).

The increase in physical inactivity over the past decades is one of the main causes of the increase in obesity (14). Lifestyle-related risk factors are associated with the metabolic syndrome and diabetes (15). The cross-sectional studies have reported that lower levels of physical activity are related to a higher risk of obesity in children, adolescents and adults (16,17). Poor lifestyle factors are thought to account for an increase in BMI, indirectly affecting the clustering of cardiac heat disease (CHD) risk factors (18, 19).

Exercise cause changes in lipid profiles is now well reported as **Tsekouras** suggested that high-intensity exercise induced changes in lipid profiles as reduced rate of VLDL-TG secretion was observed in the subjects who were trained by running on the treadmill for 8 weeks (20). Acute, high-intensity exercise with low energy expenditure induced changes in the cholesterol profile of the subjects (21), and induced a reduction in LDL-c and total cholesterol levels (22). **Lorenzo** demonstrated the efficacy of Hatha yoga exercise on fasting blood glucose, lipid profile, oxidative stress markers and antioxidant status in patients with type 2 diabetes (23). Conversely, there are reports with no evident alterations of lipids and lipoproteins after 8–10 weeks of combined strength and aerobic training (24 ,25). The failure of exercise effect on lipid profile in these studies probably reflects the variability in the effect of exercise in different populations because of genetic, life style and environmental factors.

Quetta is the capital of Balochistan is interestedly is inhabited by various ethnic groups effectively maintaining their genetic and pool and life style since centuries. The present study is carried out not only to study the effect of exercise on specific lipid profile but also to observe if effects demonstrate variations in different ethnic groups.

Materials and Methods

The obese subjects were chosen from the volunteers who consented to participate in the study from the different ethnic populations at Quetta city. The ethnic groups included and designated were Baloch (B), Pathan (P), Hazzara (H), and Punjabi (P). The selected volunteers also were not currently on an exercising program for at least 6 months prior to study, not smoking or did not have history of atherosclerotic or metabolic disease, cardiac artery disease, renal impairment or proteinuria, hepatic impairment, gout or hyperuricemia, diabetic neuropathy or retinopathy.

A total 64 obese male were selected for the study. Among these participants 32 obese male (8 from each ethnic group) were treated as control and other 32 obese male (8 from each ethnic group) were prescribed exercise. Motorized treadmill (Green Master, China) was used for exercise. Exercise consisted of walking on the treadmill 4 times per week. Each session lasted about 50-60 minutes (min) including a warm up time (5-10 min), fat burning period (10 min), aerobic exercise (15 min) the main performance with treadmill exercise (15 min) and a cool down period (10 min). Meetings with the selected volunteers were held to explain the use of the treadmill. Four treadmills were dedicated for the trial. Two sessions each of an hour were available from mid-morning to noon time. Similarly two sessions were available in afternoon for the volunteers. There was no rigid protocol of the days of the exercise; however, each volunteer did exercise four days in six days duration from Monday to Saturday for a period of 10 weeks. The control batch volunteers were communicated once a week to monitor that they did not participate in any significant physical activity.

At the end of 10 week period the general data of body weight and height was used for BMI calculation to assess the status of obesity in both control and exercising batches. Similarly after 12 hour fasting blood samples were drawn from the volunteers of both the batches. To harvest serum samples were allowed to clot, the serum was carefully decanted and centrifuged for 10 minutes at 3000 rpm for clear serum separation. The straw color clear serum of each sample was separated and stored at -20°C in a deep freezer until used for analyses.

Body mass index was calculated with the standard formula from the data of body weight and height of the subject. Sera were used for the estimation of total cholesterol, LDL cholesterol, HDL cholesterol and triglycerides with commercial kits (Human Gesellschaft fur Biochemica und Diagnostica.

Statistical analysis was undertaken with statistical program of Sigma Stat 3.5. Student t test was used for completion between control obese and obese subjects with 10 weeks exercise and ($P = < 0.05$) was taken as statistically significant.

Results

Body mass index and the lipid profile comprising the monitoring of total cholesterol (CHO), low density lipoprotein cholesterol (LDL-c), high density lipoprotein cholesterol (HDL-c) and triglycerides (TG) concentration in sera were compared in the control and exercising subjects in each of the ethnic group.

Age

The age ranged between 37.9 ± 2.7 to 44.5 ± 4.3 and 41.25 ± 3.61 to 43.63 ± 3.87 years in control and exercised volunteers respectively. In comparison of average age in the controls and exercised subjects in each of the ethnic group, there was not any significant different statistically (Table.1).

Table 1. Age and BMI in control and exercising group in obese male of different ethnic groups in Quetta.

Ethnic groups	Age (Con)	Age (Exercise trainee)	BMI kg/m² (Con)	BMI kg/m² (Exercise trainee)
Baloch	37.9 ± 2.7	42.88 ± 4.11	40.9 ± 1.4	38.13 ± 0.88
Pathan	43.6 ± 5.2	41.25 ± 3.61	40.6 ± 1.3	39.00 ± 0.65
Hazara	44.5 ± 4.3	43.38 ± 3.77	40.9 ± 1.3	38.75 ± 0.41
Punjabi	41.1 ± 3.7	43.63 ± 3.87	41.3 ± 1.2	38.88 ± 0.61

Body Mass Index (BMI)

BMI noted prior to blood sampling in the controls subjects in all the ethnic groups ranged between 40.9 ± 1.4 to 41.3 ± 1.2 and 38.13 ± 0.88 to 39.00 ± 0.65 in 10 week exercised batch of all the ethnic groups prior to their blood sampling (Table. 1). In general exercised subjects BMI was lower than the controls. The statistical comparisons between exercised and control subjects of each ethnic group demonstrated that BMI was 6.8%, 4%, 5.3 % and 5.9 % non-significantly lower in exercised compare to corresponding controls groups of Baloch, Pathan, Hazara and Punjabi volunteers respectively. It was assumed that lower BMI in the exercised subjects is the result of regular exercise (Table 1).

Total Cholesterol

In 10 week exercised subjects of all the ethnic groups collectively total cholesterol ranged between 251.3 ± 4.4 to 268.6 ± 4.8 mg/dl in the control and 244.38 ± 3.2 to 258.00 ± 3.52 mg/dl In the exercised volunteers, Total cholesterol was 3.9%, 4.2%, 4.1% and 3.9% non-significantly lower in the exercising Baloch, Pathan, Hazara and Punjabi group respectively compared to their respective controls (Fig.1). It was foreseen that total cholesterol in exercising subjects of all the ethnic groups is lower compared to the controls due to the effect of exercise.

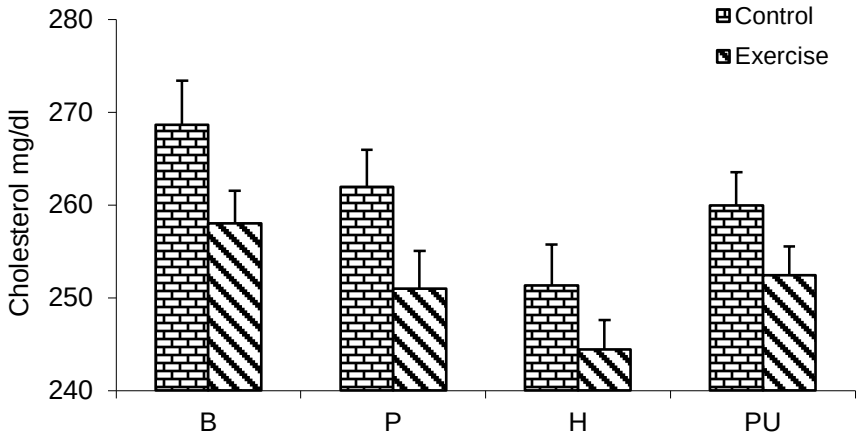

Fig. 1. Serum total cholesterol (mg/dl) in obese males, of control and in exercise performing groups of B (Baloch), P (Pathan), H (Hazara) and PU (Punjabi) ethnic groups.

Low Density Lipoprotein Cholesterol (LDL-c)

The LDL cholesterol concentration ranged between 191.6 ± 2.5 to 207.3 ± 1.9mg/dl and 186.31 ± 2.51 to 198.6 ± 3.54mg/dl in control and exercised batch comprising all ethnic groups respectively. The fraction was non-significantly lesser in Baloch (3%), Pathan (2.5%) and Hazara (4.8%) exercised groups compared to their respective controls. In Punjabi volunteers, however, 4.1% statistically significant ($P < 0.05$) lower fraction concentration was observed in exercise training subjects compared to their respective controls (Fig. 2).

The notable result of exercise on LDL-c is significant lowering of the fraction in the exercised Punjabi subjects group compared to the others. This may be taken as exercise influencing LDL-c variably in different ethnic groups.

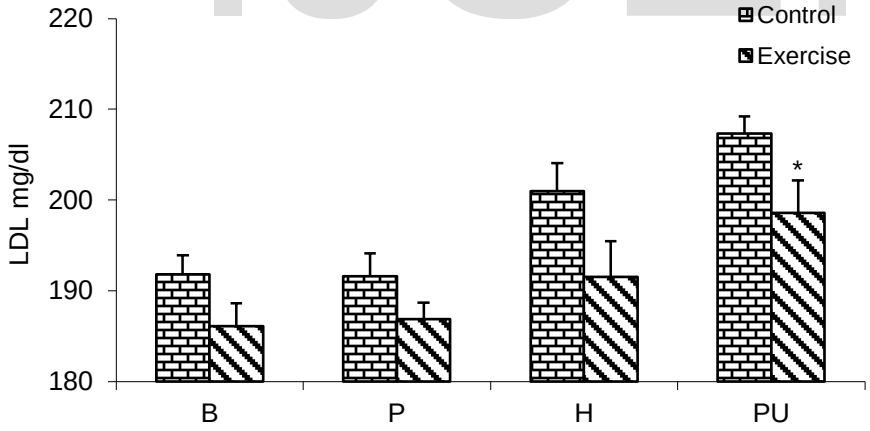

Fig. 2 Serum LDL cholesterol (mg/dl) in obese males, of control and in exercise performing groups in B (Baloch), P (Pathan), H (Hazara) and PU (Punjabi) ethnic groups. * $P < 0.05$.

High Density Lipoprotein Cholesterol (HDL-c)

In the control batch of all the ethnic groups HDL-c ranged 33.5 ± 1.8 mg/dl to 43.1 ± 0.8 mg/dl while in exercised groups' batch it ranged 43.1 ± 0.8 to 46.1 ± 1.49 mg/dl. The increase of HDL-c was marked and statistically significant in all studied sub-population of Baloch (9.7%), Pathan (28.6%), and Hazara (21.3%) groups, however, in Punjabi volunteers HDL cholesterol level range demonstrated non-significant increase of 7.8% (Fig. 3).

Exercise significantly increased HDL-c in most studied ethnic groups had been the prominent result. Further, lack of significant difference in Punjabi was the other noteworthy results and this showed that exercise had been affecting HDL-c variably in different ethnic groups.

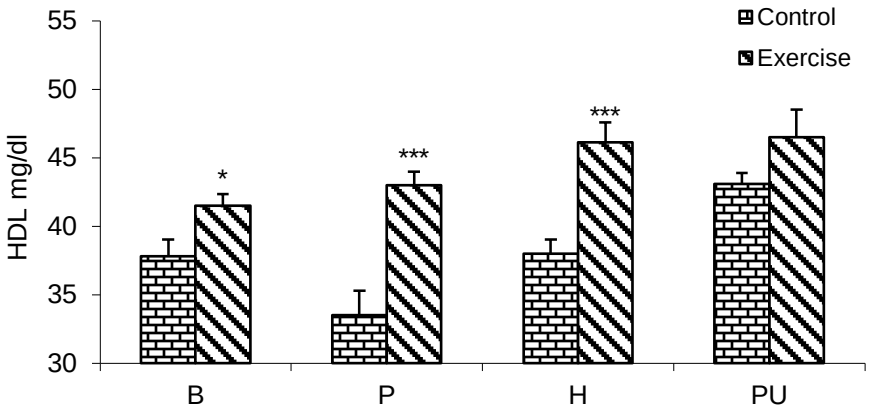

Fig 3. Serum HDL cholesterol (mg/dl) in obese males, of control and in exercise performing groups in B (Baloch), P (Pathan), H (Hazara) and PU (Punjabi) ethnic groups. * P < 0.05, *** P < 0.001.

Triglycerides

In obese control subjects triglycerides concentration ranged 219.8 ± 2.6 to 227.5 ± 2.99 to mg/dl and in exercised volunteers it extended between 210.25 ± 2.85 and 221.63 ± 2.93 to mg/dl. The fraction was found to be 3.8% and 2.6% non-significantly lower compared to their respective controls in Baloch and Pathan exercised group respectively. Conversely in Hazara and Punjabi group the fraction was significantly 4.1% and 4.4% respectively lower compare to their respective controls (Fig. 4).

The triglycerides were also found to be affected, following exercise, variably in the different ethnic groups.

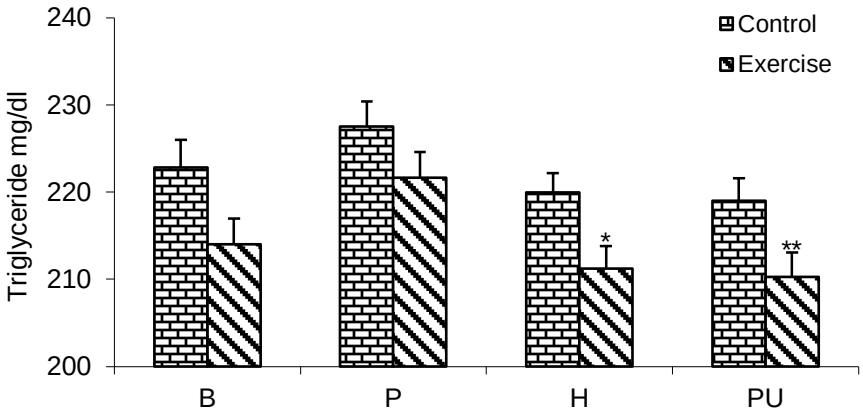

Fig. 4. Serum triglyceride mg/dl in obese males, of control and in exercise B (Baloch), P (Pathan), H (Hazara) and PU (Punjabi) ethnic groups. * P < 0.05 and **P < 0.01.

Discussion

The primary objective of this study was to evaluate the effects of an exercise on BMI and lipid profile in different male ethnic sub population of Quetta. In the present study it is observed that the exercise elicited noteworthy reduction in BMI, although non-significantly statistically, in all ethnic sub populations. This demonstrates that there is no notable difference in body weight reduction dependent upon the ethnicity. The sensitivity of the results in difference seems to be affected because of separate batches of controls and exercised

subjects were planned. The present result provokes that study may project more revealing results if more controlled study where the same subjects are used as controls prior to exercise trial.

Studies that investigated the effects of exercise program on BMI have shown mixed results. Some authors showed maintenance of BMI (26, 27, 28) whereas others reported decrease in it (29). In our study, BMI did not change significantly over the exercised period. The findings of present study are in agreement with many studies, which also exhibit decrease in body weight after exercise. **Ross** reported that 12 weeks of approximately 60 minutes of daily exercise without caloric restriction is associated with substantial reductions in body weight, total fat, abdominal fat, and visceral fat (30). Physical activity is reported to be one of the moderators that influence the steepness of the trajectory of weight gain (31). The accumulated data is revealing to strengthen the recommendation of U.S. Centers for Disease Control and Prevention since two decades earlier that regular, moderate-intensity physical activity, such as 30 to 60 minutes of brisk walking, be done on most days of the week (32).

In the present study the exercise has affected different targets of lipid profile in varying degree also in different ethnic groups. The fractions of total cholesterol in exercising volunteers were non-significantly lower than their respective controls in all the ethnic groups studied. The general lowering effect on total cholesterol without any indication of ethnic differences has been observed. The exercise in male obese subjects has shown noticeable effects on HDL-c, LDL-c and TG, however, in lowering effects have been variable based on the statistical significance in different ethnic groups. HDL-c was significantly lowered in all the ethnic groups studied except Punjabi subjects, LDL-c was significantly lowered in Punjabi group only and TG are significantly lowered in Hazara and Punjab groups only.

The aspect of exercise and lipid profile pattern has been in investigation since four decades. Several investigations have reported improvement in cardiovascular risk as an effect of exercise training, parallel to fitness increment but without losing body fat (28,33). The improvement on cardiovascular risk is certainly dependent upon lipid profile. **Lira** observed that acute, high-intensity exercise with low energy expenditure induces changes in the cholesterol profile (34). There are earlier studies which did not observe any significant changes in blood lipid levels after aerobic training (35,36) however, more evidence is accumulating on the significant improvements in lipid profile in exercise (28, 37, 38).

The results of present study are adding in the evidence that exercise improves lipid profile in general in the male obese subjects. Specifically it is observed that the improvement in lipid profile is significant in certain fractions such as HDL-c. These results are in agreement with other including the recent studies on the effect of exercise in subjects with degenerative diseases. **Cauza** found a significant improvement in lipid profile in patients with type 2 diabetes after 6 months of strength, but not after aerobic training (39). The findings of **Christos** demonstrated that a combined strength and aerobic training program significantly decreased the TG and increased the HDL-c (17.2%) in post-menopausal women with type 2 diabetes (40). Decrease in TGs from (41,42,43) and an increase in HDL-c has been reported (42,44).

The significant lowering effect of LDL-c, however, non-significant lowering of HDL-c in the Punjabi group compare to their respective controls is correlated. It will be useful to study this aspect further to rule out any anomaly in the results or ethnic variability of the exercise effect. Similarly the ethnic variability in significant lowering of TG in Hazara and Punjabi groups and not in other studied ethnic groups project ethnically variable effects of exercise on certain lipid targets.

Overall it may be proposed that exercise brings beneficial effects in the lipid profile of the obese volunteers. This may be through increase in HDL-c, decreases in LDL-c and triglycerides. Augmentation of HDL-c after exercise, apart from the general cardiovascular protection, reverses endothelial cell dysfunction, stimulates prostacyclin production, inhibit LDL oxidation and endothelial cell apoptosis (45).

The present study points out that the effect of exercise on lipid profile improvement may vary in different ethnic groups. There may be genetic, physiological and environmental factors contributing in the ethnic variability responses. The importance of these factors has been realized to be increased in recent years, the number of studies exploring the impact of environmental factors on physical activity and dietary behaviors, including in children and adolescents, has grown rapidly. Despite the large number of individual studies on environmental factors linked to obesity, it remains to be established whether some environmental factors are more important than others or whether the influences of some environments are better understood than those of others (46).

In conclusion, the present study demonstrated that long-term follow-up with larger sample size of exercised subjects in different ethnic groups will explore more avenues of understanding nutrition physical activity and cardiovascular health.

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