The effects of aerobic exercise on lipid profile and immunoglobulin   in computer workers

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ABSTRACT *Aerobic exercise is advised for people with mental work. A total of 32 female computer's workers were main group, and 16 female were control group. Blood samples and saliva, before starting aerobic exercise and after the end were collected. Blood pressure and pulse was monitoring at the same manner. Clinical examination included skin, lungs and heart were done.Our results revealed significant difference before exercise in salivaryIgA and malondialdehyde between groups, in HDL-cholesterol, malondialdehyde and pulse before and after exercise.Salivary IgAand blood pressure show significant difference in main group, before and after exercise. In main group, 8 cases presented with muco-cutaneous manifestations. We concluded that electromagnetic field may affect salivary IgA that may be corrected by aerobic exercise and aerobic exercise can ameliorate the complications of prolonged computer exposure. Moreover, aerobic exercise may increase HDL-cholesterol and decrease heart rate.*

Introduction:

There are increasing of people report symptoms to a variety of electromagnetic sources including radio, TV, cellular phones and computer monitors (1). A personal computer (PC) user is exposed to an electromagnetic field (EMF) (2). EMFs play an important role and possible association with malignancy and cardiovascular, neurological, dermatological and psychological diseases in adults and children (3, 4, 5, 6). Aerobic exercise is always advised for people with mental work for long period and is considered beneficial for physical, social and psychological wellbeing (7, 8). Moreover, regular exercise improves the capacity in prevention of the toxic effect of lipid peroxidation (9). Aerobic exercise has many cardiovascular benefits on level of cholesterol, lowering blood pressure, improve diabetes and reducing risk of heart attack and stroke (10). Salivary IgA (S-IgA) is the main immunoglobulin in mucous secretion and S-IgA is the barrier against pathogens in mouth cavity and the upper respiratory tract (11).With many depot about the effect of aerobic exercise that may reflect humoral immunity,some studies indicated decrease (12, 13, 14), increased (15,16, 17) or unchanged levels of S-IgA response to aerobic exercise(18,19).

Patients &Methods:

A total of 32 female working on PC for at least 4 hours/days, 5 days/week were main group, and 16 female with no or less than 2 hours/week working on PC were control group. The age of the two groups was range between 19-32 years. All of themwere clinically examined before stating aerobic exercise and their clinical state was monitoring with ECG and Echocardiography. Two blood samples, before starting aerobic exercise program and after the end of the program were collected from the two groups. Arterial blood pressure and pulse was monitoring

at the same manner. We used the serum of each sample to determine its; cholesterol, triglycerides, DHL-cholesterol, LDL-cholesterol, malondialdehyde (MDA), IgG and total IgE. Serum cholesterol, triglycerides, HDL-cholesterol and LDL-cholesterol were done on auto-analyzer (BIOLYIS 24i). MDA content of samples was determined by thiobarbituric acid (TBA) activity by using the method of Esterbaur and Cheesman (20). MDA of the serum react with TBA to form a colored pigment measured its absorption by spectrophotometer at 535 nm. IgG was measured by immunoturbidimetric method provided from Greiner Diagnostic GmbH. At the same time of collecting blood samples, salivary flow was stimulated by chewing of sterile cotton swab, under the tongue, for at least 2 minutes. Saliva was collected into 17X100 mm plastic tube by hugging swab with the cover about two cm from the bottom of the tube and centrifugation at 500g for 15 minutes at room temperature (21).Salivary IgA(S-IgA) was measured by immunoturbidimetric method provided from Greiner Diagnostic GmbH. While, total IgE was measured by Human ELISA kit provided by Abcom.

Aerobic fitness program

Both groups were engaged in an 8 weeks physical exercise program for 5 days per week. Stretching and low intensity exercises for 10 minutes were given in each training session as warm-up prior to training. Subjects were instructed to exercise at 60% -70% of their maximum heart rate (Maximum heart rate was calculated by subtracting age from 226), their heart rates were measured manually by the attending physician or trainer. During each training session, participants performed different physical activity routines, subjects chose from a series of activities, e.g., cycling on a stationary ergometer, running on a treadmill or exercises aerobic dancing. They were given an initial goal of at least

20 minutes aerobic exercise per session and increased duration gradually every two weeks, up to 60 minutes. After the training session, cooling down was performed by jogging for 5-10 minutes. Heart rate, systolic and diastolic blood pressure were measured before and after the exercise in the sitting position. Recovery heart rate was measured at third minute of post exercise session (22, 23, 24).

Clinical Examination:
Clinical examination included skin (note any signs of atopic disease), head, ears, pharynx, nose (note presence of enlarged turbinate, erythema and/or congestion), sinus (note presence of tenderness), lungs and heart.

Results:
The results revealed that, before exercise, in main group the mean of S-IgA 71.38 ±52.58 µg/l, IgG 1.44±0.24 mg/dl, cholesterol 208.6±28.06 mg/dl, triglycerides 92.56±27.93 mg/dl, HDL-cholesterol 39.75±8.60 mg/dl, LDL-cholesterol 150.4±31.06 mg/dl, MDA 7.51±2.40 µmol/l, total IgE 132.15±122.17 IU/L, systolic BP 124.1±0.64 mmHg, diastolic BP 80.75±6.64 mmHg and pulse 77.75±6.26. While, in control group, before exercise, the mean of results were, S-IgA 102.0±16.92 µg/l, IgG 1.6±0.16 mg/dl, cholesterol 191.4±17.11 mg/dl, triglycerides 89.0±13.34 mg/dl, HDL-cholesterol 40.63±4.93, LDL-cholesterol 133.0±15.93, MDA 7.14±1.21µmol/l, total IgE 128.06±118 IU/l, systolic BP 120.1±4.39 mmHg, diastolic BP 79.13±5.33 mmHg and pulse 76.25±5.36.

After exercise program, the mean of results, in main group were S-IgA 83.13±52.18 µg/l, IgG 1.46±0.24 mg/dl, cholesterol 210.1±26.71 mg/dl, triglycerides 90.44±27.26 mg/dl, HDL-cholesterol 42.81±6.13 mg/dl, LDL-cholesterol 149.2±26.88 mg/dl, MDA 7.86±2.48 µmol/l, total IgE 128.06±118.15 IU/l, systolic BP 121.15±8.63 mmHg, diastolic BP 77.88±7.14 mmHgand pulse 73.06±7.00 and in control group were S-IgA 99.75±18.87µg/l, IgG 1.59±0.20 mg/dl, cholesterol 191.5±18.91 mg/dl, triglycerides 87.25±13.71 mg/dl, HDL-cholesterol 45.88±4.88 mg/dl, LDL cholesterol 128.2±18.11 mg/dl, MDA 5.78±1.56µmol/l, total IgE 113.38±85.25 IU/l, systolic BP 116.8±4.65 mmHg, diastolic BP 78.38±3.07 mmHg and pulse 71.88±5.03.

By using SPSS (version 16) program, t-test between main group and control group in all parameters before and after aerobic fitness program, revealed significant difference before exercise in S-IgA (p=0.047)and MDA (p=0.047), while no significant difference after exercise in S-IgA (p=0.269) and in MDA (p=0.634). On the other hand, there was no significant difference in all other parameters before and after exercise (p>0.05).

By doing pair-t test in all parameters before and afterexercise "table 1' in both groups, revealed that significant difference in S-IgA in main group (p=0.001), but not in control group (p=0.185). The same findings were in systolic BP, main group (p=0.005) while control group (p=0.116) and diastolic BP, main group (p=0.007) while in control group (p=0.773). Significant difference in both groups found in HDL-cholesterol (main group, p=0.009 and control group, p=0.027), MDA (main group, p=0.036 and control group, p=0.007) and pulse (main group, p=0.042 and control group, p=0.045). On the other hand, all other parameters showed no significant difference (p>0.05).

"Table 1:Comparisons between all tests before and after aerobic fitness program, in both main group and control group show pair t test'.

Test	Group	p	Significant
S-IgA	main	0.001	significant
	control	0.185	Non-significant
IgG	main	0.395	Non-significant
	control	0.882	Non-significant
Cholesterol	main	0.530	Non-significant
	control	0.077	Non-significant
Triglycerides	main	0.064	Non-significant
	control	0.667	Non-significant
HDL-cholesterol	main	0.009	significant
	control	0.027	significant
LDL-cholesterol	main	0.653	Non-significant
	control	0.083	Non-significant
MDA	main	0.036	significant
	control	0.007	significant
Systolic BP	main	0.005	significant
	control	0.116	Non-significant
Diastolic BP	main	0.007	significant
	control	0.773	Non-significant
Pulse	main	0.042	significant
	control	0.045	significant

In main group, out of 32 female working in PC, 8 cases presented with muco-cutaneous manifestations in the form of, recurrent aphthus stomatitis, ulceration of mucous membrane and chronic gingivitis with bleeding tendency from gum in three cases of them. Two cases represented with 2-3 cm dark hyper keratotic plaque, one case her right hand and the other case on the left elbow region and both were diagnosed as friction induced dermatoses due to prolonged pressure and friction. One case represented with scally erythematous vesicular patches and plaques on the palmer aspect of right hand which in direct contact with the computers mouse or mouth pad and was diagnosed as allergic contact dermatitis. One case developed roseacea like dermatitis with painful pruritis heat papules erythema and pustules and was diagnosed as screen dermatitis. Last case had atopic dermatitis.

Discussion:
In multiple laboratories, experiments have been conducted to examine alterations of biological functions by EMF. EMF may increase free radical life span and the free radical concentration in cells (25, 26, 27). In this study, there was significant decrease in S-IgA in main group than in control group (p<0.05) and there was significant increase in MDA in main group than in control one. These changes may be due to the effect of ELF on both S-IgA and MDA. Guler et al. (28) reported a significant increase in MDA levels by exposure to an EMF.Moderate exercise causes less lipid peroxidation in comparison with high intensity exercise. (29) Furthermore, aerobic exercise increased S-IgA significantly (p<0.05) in main group while no significant change in control group. Martins et al. (30) reported unchanged of S-IgA after aerobic exercise. Aerobic exercise increased HDL-cholesterol significantly in both main and control groups (p<0.05). While, there was no changes in total cholesterol, LDL-cholesterol and triglycerides in both groups. Gilliam and Burke (31) found a significant increase in HDL-cholesterol levels with no change in triglycerides levels after aerobic exercise. Blessing et al. (32) showed a positive alteration in triglycerides, HDL-cholesterol, and LDL-cholesterol levels after 16 weeks of exercise training. Stergioulas et al. (33)reported HDL-cholesterol levels increased significantly after 8 weeks training program.There was no significant change in total IgE in both groups. Mojtaba et al. (34) reported that, serum IgE was not changed while respiratory functional increased significantly after exercise program. On the other hand, Aldred et al. (35), showed that serum IgE significantly reduce in response to exercise

program. After aerobic exercise fitness program, cases with aphthus stomatitis showed complete cure with stoppage of bleeding from gum. While, the two cases with friction induced dermatoses showed no change in their lesion. A case with contact allergic dermatitis resolved completely after two weeks but had a recurrent scaly erythematous plaque pruritis on the palm of her right hand in the fifth week of the study. A case with screen dermatitis showed completely resolution of her lesion by third weeks after aerobic exercise but the case with atopy suffered from severe asthmatic attack with exacerbation of skin lesion after two weeks of aerobic exercise. In this study, both systolic and diastolic blood pressure were significantly decrease in main group ($p<0.05$) only. While pulse was significantly decrease in both groups ($p<0.05$). Shiotani et al. (36) reported a significant decrease in heart rate most prominent in the morning after aerobic exercise.

We concluded that EMF may affect S-IgA that may be corrected by aerobic exercise and aerobic exercise can ameliorate the complications of prolonged computer exposure but not in atopic patients who may deteriorate with exercise. Moreover, aerobic exercise may increase HDL-cholesterol and decrease heart rate that may be beneficial to cardiovascular system.

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