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Research Article

Investigation of cardiac function of overweight girls after combined training and kefir buttermilk consumption

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Abstract

Background: Inactivity and obesity are the two main factors related to the possibility of cardiovascular diseases. The aim of this study was to investigate the cardiac function of overweight girls after performing combined training and consuming kefir buttermilk.

Materials and Methods: 40 non-athlete women with an age range of 20-30 years and a body mass index of 25-30 kg/m2 were selected using available methods. The subjects were randomly divided into 4 groups of 10 people, combined training, kefir buttermilk consumption, combined training interaction and kefir buttermilk and control group. The training groups participated in combined resistance and endurance trainings three days a week for 8 weeks. Buttermilk consumption groups consumed 450 ml of kefir buttermilk daily with meals. Analysis of covariance and Tukey's post hoc test were used p≤0.05.

Results: The results showed that following combined training and consumption of kefir buttermilk, the heart rate, P-R interval and T wave voltage of overweight girls decreased and increased significantly compared to the control group, respectively, and these changes were greater in the training group and consumption of buttermilk than the training group. These three heart variables in the buttermilk consumption group also decreased and increased respectively, but it was not significant compared to the control group.

Conclusion: : Combined training along with consumption of kefir buttermilk can lead to improvement of heart function in overweight girls.

Keywords:
Cardiac function, overweight, combined training, kefir buttermilk

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1. Introduction

Obesity is a metabolic disorder that occurs as a result of an increase in fat in adipose tissue cells and an increase in the number of these cells (1). Various factors such as heredity, environment, energy consumption, food absorption, endocrine system and autonomic nervous system are effective in obesity (2). Evidence shows that obesity causes chronic inflammation and is associated with functional disorders of the metabolic system (1). Obesity increases the risk of cardiovascular diseases, diabetes, blood pressure, chronic kidney diseases, colon, esophagus, endometrial and breast cancer (3). Many epidemiological studies have identified factors such as high cholesterol, high blood pressure, and smoking as important factors related to diseases (4). Blood cholesterol levels are high in sedentary and obese people, and the possibility of coronary artery involvement is higher in them (3, 4). The cardiovascular system is responsible for the main task of transferring oxygen and nutrients to different tissues and active muscles and returning metabolic waste products to the excretory organs (5). Exercise activities increase life expectancy and quality of life. Physical exercises improve cardiovascular health, control obesity and increase mental and physical performance. Improving aerobic capacity, muscle strength and flexibility can lead to an improvement in biological age from 10 to 20 years, as well as a delay in aging and an increase in quality of life (4, 5). Lin (2017) found that physical fitness programs have a significant effect on the fat metabolism of obese people, and exercise training, even with low duration, repetition and intensity, has a beneficial effect on weight loss, aerobic capacity, and blood pressure (6). The effects of exercise on the structure and function of the heart depending on the type, intensity and duration of exercise; the level of initial physical fitness and gender (7).

Reduction of heart rate is the most important functional adaptation that is observed due to this type of sports activities. R-P and QT intervals of electrocardiogram change with changes in heart rate. The lower the heart rate, the longer these intervals (6, 7). Su Y et al. (2017), in a study on non-athletic workers with an exercise program (running three times a week and 45 minutes each session), showed that the cardiovascular fitness of people improved significantly (8) . Hong et al. (2022) mentioned physical activity as one of the factors influencing the improvement of heart function (9). Today, the use of supplements and herbal foods in the treatment of diseases and metabolic disorders has spread among the general public. Kefir is a type of drinking yogurt that is formed as a result of fermentation of a set of live bacteria useful for the body. These bacteria are called "probiotics “and the yeasts in it are able to make folic acid, which is a coenzyme that is a set of vital reactions for cell growth (10). Studies have shown that the compounds in kefir reduce food intake and reduce blood triglyceride, cholesterol and leptin levels by stimulating energy metabolism, it increases the amount of HDL in the blood (11, 12). Seo et al. (2022) and Nurliani et al. (2022) stated that kefir-containing supplements have a beneficial effect on the physiological and hormonal factors of obese people (11, 12). Following the development of cardiovascular diseases among obese and overweight people, it seems necessary to examine appropriate training and nutritional strategies. On the one hand, by examining the important benefits of kefir buttermilk on physiological indicators, a research gap is observed in the field of the interaction of this food and training on heart function, therefore this research was intended to examine the heart function of overweight girls after performing combined training and consume kefir buttermilk.

2. Materials and Methods

The statistical population of the present study included non-athlete female students with an age range of 20-30 years and a body mass index of 25-30 kg/m2 from the Islamic Azad University, Tehran East Branch, and 40 of them were selected as the research sample using the available method. First, the necessary information about how to conduct the research was given to the subjects and the level of physical activity and health of the subjects was obtained through a questionnaire, and the consent form was presented to the subjects. Then the subjects were randomly divided into 4 groups of 10 people for combined training ،the consumption of kefir buttermilk, the interaction of combined training and the consumption of kefir buttermilk and the control group were divided. The criteria for the selection of the subjects was having complete cardiovascular health, not having any disease, and not having a history of regular sports activity. In addition to the questionnaire, the heart tape taken in the pre-test was checked to ensure the heart health of the subjects. The criteria for entering the research included not having any exercise training in the 6 months before the start of the research, not having underlying diseases such as cardiovascular, hormonal, diabetes, not taking supplements, smoking and alcohol, and not being treated with special diets and drugs. . After selecting the subjects, the groups participated in the protocol of training and consumption of buttermilk for 8 weeks.

Training protocol

Combined exercises for 8 weeks with a frequency of 3 times a week, each session for 50 to 60 minutes was performed in a gym equipped with treadmills and weights. All exercise sessions were conducted under the supervision of a researcher. These exercises included 2 times of 12 repetitions of special resistance exercise. Large muscle groups (leg press, knee bend, chest and armpit press with strap) were at 70% of maximum strength. The rest period between shifts was 2 minutes. The aerobic training program consisted of 3 sessions per week, including 4 times of 10 minutes of walking on the treadmill with an intensity of 70-75% of the maximum heart rate. The rest period between the shifts was 3 minutes (13). To control the intensity of the heartbeat, a Polar heart rate monitor was used. Subjects performed static stretching and relaxation before and after each training session.

Consumption of kefir buttermilk

Subjects in buttermilk groups used 150 ml kefir buttermilk produced by Kale Company for 8 weeks, 3 meals a day (14).

Electrocardiogram recording

The cardiac performance of the subjects was evaluated in the pre-test and post-test using a single-channel 12-lead ECG device (KENZ company, model ECG110, Japan). For recording, first, the subjects were asked to lie on their back for 5 minutes. Any metal objects such as watches, rings, etc. were removed from the person. ECG gel measuring 2 square centimeters was used for the respective locations. The subjects' ECG was recorded on heat-sensitive paper with a width of 50 mm and a speed of 25 mm/s. All measurements were performed on lead II and the amplitude of T waves as well as the duration of RR and PR intervals were recorded.

Figure 1 shows the research variables on the electrocardiogram.

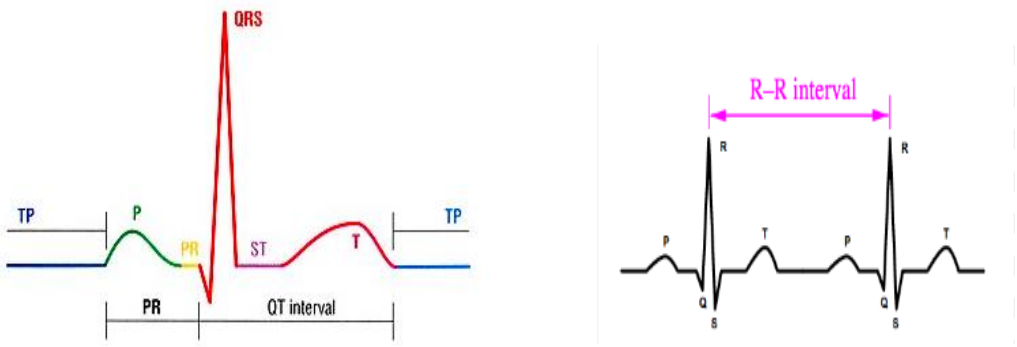

Figure 1. Research variables on electrocardiogram

The heart rate was measured by calculating the R to R interval, which indicates changes in heart rhythm. The P-R interval of the heart indicates the time spent for the depolarization wave to reach the atria to the ventricles. T wave it indicates the final stages of repolarization of the ventricles (7).

Statistical methods

Descriptive statistics indices such as mean, standard deviation, frequency percentage were used. After confirming the normal distribution of the data using the Shapiro-Wilk test and the homogeneity of variances using the Levine test, the analysis of covariance statistical test was used to check the research hypotheses. If the hypotheses were significant, Tukey's post hoc test was used. The level of significance in all evaluations was considered $P \leq 0.05$ and the data were analyzed by SPSS 20 software.

3. Results

Table 1 shows the mean and standard deviation of research variables in four research groups.

After performing combined training and consumption of kefir buttermilk, the heart rate of overweight girls significantly decreased compared to the control group, and this decrease was more in the training group and consumption of buttermilk than the training group.

The heart rate decreased in the buttermilk consumption group, but it was not significant compared to the control group. After performing combined training and consumption of kefir buttermilk, P-R interval and T wave voltage of the heart of overweight girls increased significantly compared to the control group, and this increase was more in the training group and consumption of buttermilk than the training group. P-R interval and T wave voltage increased in the buttermilk consumption group, but it was not significant compared to the control group.

Table 1. Mean and standard deviation of research variables in four groups

Research groups / Variables	Statistics	Control		combined training		kefir buttermilk consumption		combined training + kefir buttermilk consumption	
		Pre-test	post-test	Pre-test	post-test	Pre-test	post-test	Pre-test	post-test
heartbeat (number.minute)	average	۲۰/۸۰	۶۰/۸۰	۳۰/۸۲	۱۰/۷۵	۲۰/۷۹	۷۶	۸۰	۷۰/۶۹
	Standard deviation	۹۶/۳	۰۶/۴	۸۳/۵	۷۲/۴	۹۰/۵	۷۷/۵	۰۵/۶	۰۵/۴
P-R interval (msec)	average	۴۰/۱۵۱	۲۰/۱۵۰	۷۰/۱۵۶	۲۰/۱۶۴	۲۰/۱۵۱	۱۰/۱۵۳	۱۰/۱۵۱	۳۰/۱۶۶
	Standard deviation	۹۴/۹	۹۲/۱۰	۰۲/۱۳	۴۷/۱۲	۳۹/۱۱	۸۵/۱۰	۲۶/۹	۴۹/۸
T wave (mv)	average	۶۹/۰	۶۹/۰	۷۰/۰	۷۸/۰	۷۰/۰	۷۲/۰	۷۲/۰	۸۷/۰
	Standard deviation	۰۴/۰	۰۵/۰	۰۷/۰	۰۵/۰	۰۵/۰	۰۵/۰	۰۴/۰	۰۵/۰

4. Discussion

The results showed that a period of combined training and consumption of kefir butter has a significant effect on the heart rate of overweight girls and causes it to decrease. This result is in agreement with the results of Bulbali et al (2021), Sattari et al(2020) and Azizi et al. (2020) (15,16,17). One of the most important changes after long-term physical activities is the decrease in resting heart rate, which is caused by the increase in the activity of the vague nerve. By strengthening the heart muscle, the number of heart beats per minute decreases and the heart sends blood with more force (7).

The low number of heart beats causes oxygen not to be wasted and the consumption of oxygen by the heart muscle is reduced, and this is completely in favor of the heart (8). By improving the function of the heart and reducing the sympathetic effect of the heart, combined exercises can, in addition to the functions of the diet caused by the consumption of kefir buttermilk, due to the availability of nutrients and also improving the condition of some blood and heart factors, including blood sugar and blood pressure, conditions for Improve the condition of heart rate (14).

The results showed that a period of combined exercise and consumption of kefir buttermilk has a significant increasing effect on the P-R interval of overweight girls. The results of the present research are in line with the results of the research of Azizi et al. (2020) (17). Heart rate and PR frequency are inversely related to each other (7). Also, exercise training creates an imbalance between the tonic activity of the sympathetic excitatory neuron and the parasympathetic inhibitory neuron in favor of greater vagal dominance. This response is initially mediated through an increase in parasympathetic activity and a small decrease in sympathetic discharge (18). By reducing the endogenous excitability of sinus atrial pacemaker tissue, combined training can lead to improved heart function and also affect the P-R interval of overweight girls (7, 18). Consumption of kefir buttermilk reduces the level of bad blood cholesterol and triglycerides, especially in overweight people (19). Therefore, drinking kefir buttermilk can help improve heart function. The obtained results are inconsistent with the results of Afghan et al. (2022) (18). This difference seems to be in different research samples and different intensity and duration of exercises.

The results of the research showed that a period of combined training and consumption of kefir butter has a significant increasing effect on the T wave of overweight girls. This result is in line with the results of Silva et al (2019) and Moller et al (2017) (19, 20). Regular sports activity leads to a number of automatic and physiological adaptations, the consequence of which is an increase in cardiovascular performance and an increase in the capacity of sports activity. A bigger and more powerful heart contributes to the increase in stroke volume and peak cardiac output. While a lower heart rate exposes the heart to less stress in any sub-maximal exercise intensity (15, 16).

Several factors affect T wave changes. Among these factors, physical exercises, hyperventilation, consumption of heavy food, anxiety, change in body position, lowering of blood pressure, race and age all affect the T wave shape (7, 19). Decreased heart rate, sometimes with its irregularity, is a characteristic symptom of sports heart. Atrial and ventricular irregularities may be evident on the ECG. These irregularities are clearly asymptomatic and disappear when the heart rate increases. The voltage of QRS and T waves in the electrocardiogram increases, which must be related to the decrease in heart rate (19, 15). On the other hand, kefir is rich in group B vitamins such as niacin, pyridoxine and folic acid, as well as calcium and protein, and it is likely to increase the voltage of the T wave by affecting the strength of the heart's contraction process (15). The obtained results are inconsistent with the results of Hajizade et al (2023) (21). It seems that this difference is in the training method, the type of supplement consumed and the different level of physical performance of the research samples. Lack of diet control, insufficient assurance of not performing physical activity in excess of the prescribed exercises during the study period (due to limited access to subjects) were among the limitations of the present study, which attention in future research can help complete the findings.

Conclusion

According to the results of the research on the effect of combined training and consumption of kefir buttermilk on the heart rate, the P-R interval ،T wave voltage of overweight girls was determined that combined endurance and resistance training along with the consumption of kefir buttermilk can lead to the improvement of the heart function of overweight girls by affecting the heart muscle and also providing some minerals needed by the heart. Therefore, to improve heart function, reduce the risk of cardiovascular diseases and have a healthy heart, it is recommended that trainers and specialists in sports centers use combined training to improve cardiac function of overweight girls. Also, in addition to sports training to improve the effectiveness of training; take advantage of kefir buttermilk consumption .

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Compliance with ethical standards

Conflict of interest None declared.

Ethical approval the research was conducted with regard to the ethical principles.

Informed consent Informed consent was obtained from all participants.

Author contributions

Conceptualization: M.R, M.H, B.R, H.F ; Methodology: M.R, M.H, B.R, H.F ;Software: M.R, M.H, B.R, H.F ; Validation: M.R, M.H, B.R, H.F ;Formal analysis M.R, M.H, B.R, H.F ;Investigation: M.R, M.H, B.R, H.F ;Resources: M.R, M.H, B.R, H.F ;Data curation: M.R, M.H, B.R, H.F ; Writing - original draft: M.R, M.H, B.R, H.F ;Writing - review & editing: M.R, M.H, B.R, H.F ;Visualization: M.R, M.H, B.R, H.F ;Supervision: M.R, M.H, B.R, H.F ;Project administration: M.R, M.H, B.R, H.F ;Funding acquisition: M.R, M.H, B.R, H.F .

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