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The Analysis of Relation between Physical Activity Level with Paratormone and Calcitonin in Middle aged Women's

Mahmoud Soltani*, Safdar Soltani*, Ladan Hosseini Abrishami**, Leili Zeiaadini and Marzieh Ashkanifar*******

**Department of Physical Education, Mashhad Branch, Islamic Azad University, Mashhad, IRAN*
***Sama Technical and Vocational Training College, Islamic Azad University, Mashhad Branch, Mashhad, IRAN*
****Ph.D. student of Physical Education and Sport Sciences, Islamic Azad University, IRAN*
*****Department of Physical Education, Mashhad Branch, Islamic Azad University, Mashhad, Iran and PhD student of Physical Education and Sport Sciences, Neyshabur Branch, Islamic Azad University, Neyshabur, IRAN.*

(Corresponding author: Marzieh Ashkanifar)
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ABSTRACT: Osteoporosis is the most common disorder of bone and mineral metabolism that affects approximately 40% of women over 50 years old. The disease is associated with the decreased bone density and the loss of quality of bone microstructure, leading to the increased fragility and risk of bone fracture .the Objective is to study on the relationship between physical activity level (low, medium, high) and PTH hormones level and calcitonin in the middle-aged women.

This study is considered as the applied research in term of objective, but considered as one of the solidarity schemes in terms of collecting and analyzing data called the research project. so, out of (research population with) 35-45 year-old middle-aged women, 75 subjects were selected by sampling method after doing medical examinations and having no history of disease. They were placed in three groups, 25 patients in group with low levels of physical activity, 25 subjects in group with average level of physical activity and 25 patients in group with high level of physical activity. We tried to unify the diet three days before blooding. Blood samples were taken by the laboratory technicians in order to determine the PTH and calcitonin hormones level. According that the level of physical activity was a nominal sequential, Spearman correlation test was used in analyzing data. There is significant relationship between the level of physical activity and PTH of subject's serum (p = 0.0001). There is no significant relationship between the level of physical activity and calcitonin of subject's serum (p = 0.634). Regular physical activity can be an effective treatment to prevent the decreased bone density. Intense exercises and the increased number of exercise sessions per week can increase PTH which is a harmonic factor. Also, the reduced hormone is associated with the increased calcium.

Key words: PTH, calcitonin, physical activity level, middle-aged women

INTRODUCTION

Bone is a living tissue that reconstructs and modernizes itself throughout the life and like other body organs has blood vessels and nerves and lymph ducts, and if it does not work or not be pressed, the atrophy will happen. Osteoporosis is the most common disorder of bone and mineral metabolism that affects approximately 40% of women older than 50 years (Lappe, 2008). This disease is associated with the decreased bone density and loss of quality of the bone microstructure, leading to the increased fragility property and the risk of bone fractures. According to the reports of (Rheumatology Research Center) out of 50 to 60 million people in Iran, 2.5 million women who are extremely vulnerable to osteoporosis, are facing with bone fractures. Accordingly, it is an important issue for Iran's medical system that its spread dimensions are revealing (Bennell, 1996). The results show that almost all adults agree with the idea that exercise is important for happiness and health and regular physical activity is essential for them and their children. However, only 25% of adults in the developing countries, at least 5 sessions per weeks and each session do light to moderate exercise for 30 minutes. About 25% of people in the developed countries don't move and have no physical activity no in leisure (Schaffler, 1990). The experience evidence shows that physical activity has a positive effect on skeletal mass (Hind, 2006). Long-term regular physical activity can affect bone metabolism markers and prevent from the more dwindling of the bone, and also prevent from the loss of calcium and other minerals in bone tissue by increasing the calcitonin and reducing parathyroid.

The mechanical bar induced by physical activity has the useful effects on bone mass and the geometric compatibility in places of bearing bone (Yamazaki, 2004). Thus, the question arises whether active lifestyle and regular physical activity can have an impact on the process of bone loss or those who have regular physical activity are different from those who are inactive, in term of bone loss process. In other words, Whether PTH levels and bone metabolism markers in middle-aged women with high or moderate physical activity are different from those who are inactive.

The purpose of this study is to investigate the relationship between physical activity and PTH and some bone metabolism markers in the middle-aged women. Therefore, in order to solving the main problems of public health, investigating these factors is associated with the reduced mineral and as a result, osteoporosis; and out of the mentioned factors, PTH hormone plays a major role in calcium homeostasis and bone metabolism (Fuji Mora 1997). This hormone is the main component of bone mass in adults and has close relationship with the reduced bone density and osteoporosis and fractures. This hormone is secreted by the calcium (Torsen, 1997).

PTH in bone stimulates osteoblasts and osteoclasts directly and indirectly. This hormone has a double effect on bone metabolism; its high level in basic status, like hyperparatiroeid status, has catabolic effects and its moderate level has the anabolic effects. When calcium levels are low, PTH secretion is stimulated, while its amount is higher than normal, PTH secretion is inhibited (Maymon, 2005). In this mechanism, calcium is seen in the parathyroid cell membranes through interactions with receptors sensitive to calcium that regulates hormone secretion (Maymon, 2009). Given that the working women have fewer opportunities for exercise, and usually get engaged in the household after work, and they may face with osteoporosis that result in the serious problem, and due to the active use of bone indicators in studying the effects of exercise on bone metabolism in comparison to conventional methods, and since the researches in this area are very few, we tried to do the present study.

METHODOLOGY

The present study is considered as the applied research, in terms of the purpose. But it is considered as the descriptive projects in term of data collecting and analyzing method called the research design. The subjects participated according to the regular schedule and with full consent, in this study. All subjects were examined. Measurements of height, weight and BMI, resting heart rate was recorded in a special individual form. All these measures were done in order to match the research subjects. The population of the study is the middle-aged women with 35-45 years, who work at gardener hall. The demographic sample of the research includes 75 subjects who were selected by the sampling method, after doing the medical examination and having no history of disease. They divided into three groups, 25 in the group with low level of physical activity (after analyzing questionnaires) and 25 in the group with moderate level of physical activity (After reviewing the questionnaires) and 25 patients in the group with high level physical activity. They all justified for the research and uttered their written consent for blooding. The subjects of the research were selected out of the following qualified ones, including 35-45 years old women who not take any medication, have no history of disease and have form approved by the doctor. The survey instruments include biographic questionnaire (information about age and address of job for notification of test results and other information), disease history (such as, hypertension, cardiovascular disease and thyroid, etc and the last time that people see a doctor). In the international questionnaire of the physical activity level (physical activity level questionnaire of Bake translated by IUMS), the following method is used to determine three levels of activity (low, medium, high). Estimating the mean or median was done by using the index of the number of sessions per week spent for physical activity. These people all did aerobic exercise and, ultimately, the people who exercise three days a week placed in moderate group and those who exercise aerobics more than three days a week were placed in high level physical activity group. Those who exercise less than three days a week (according to one session), were placed in the low level physical activity group.

A band meter to measure the height and a digital scale to measure the weight of the subjects. Laboratory equipment's and devices and centrifuges system and standard with the determined °C. The required kites: Calcitonin and PTH and ELISA Reader as well as digital sphygmomanometer to measure blood pressure. Blooding from arm vein of the subjects were taken and sent for laboratorial analysis. Participants used the same and balance diet three days before blooding. Finally, for extracting the plasma, the samples were centrifuged with 1000 rpm for 15 minutes and the plasma transferred to freezer with certain °C.

RESULTS

In this study, the descriptive and inferential statistical methods were used for data analysis. In the descriptive statistics, the frequency tables and mean and standard deviation were used and in inferential statistics, Spearman correlation test was used regarding that the level of physical activity was sequence-name.

Table1: Frequency distribution based on weight of subjects.

Data/variable	Physical activity level		
	Low	Medium	high
Mean	67.16	74.56	63.2
S.D	9.67	9.27	9
Minimum	51	58	48
Maximum	84	92	79

Table 2: Frequency distribution based on height of subjects.

Data/variable	Physical activity level		
	Low	Medium	High
Mean	1.64	1.66	1.54
S.D	0.074	0.074	0.068
Minimum	1.54	1.56	1.45
Maximum	1.8	1.82	1.69

Table 3: Frequency distribution based on body mass index of subjects.

Data/variable	Physical activity level		
	Low	Medium	High
Mean	24.79	26.9	26.33
S.D	3.412	3.14	3.61
Minimum	18.72	20.7	19.92
Maximum	32.01	31.23	34.05

Significance level must be considered for normality determination ($p>0.05$). All variable data was normal.

Table 4: Spearman correlation test: relation between physical activity and PTH.

	Physical activity (low, medium, high)	
	Coefficient	Sig
PTH	-0.736	0.0001

Table 5: Spearman correlation test: relation between physical activity and calcitonin.

	Physical activity (low, medium, high)	
	Coefficient	Sig
Calcitonin	0.056	0.634

Kolmogorov Smirnov test was used to assess the normality of the data. For calculating, SPSS / PC (VER18) package was used. The amount of Spearman correlation coefficient between two variables, physical activity levels (low, medium, high) and PTH of subject's serum was equal to -0/736 and the likelihood of significant level is equal to 0/0001which is less than 0/05. Therefore, the null hypothesis is rejected; it means that there is significant relationship between the level of physical activity (low, medium, high) and subject's serum. As shown in Figure 1, PTH levels in patients with high levels of physical activity is less than moderate and the latter was lower than low physical activity level.

DISCUSSION

Physical activity is vital as the basic steps to prevent osteoporosis. All sports have not the same effect to bone tissue. Bone structure depends heavily on mechanical pressure applied on the bone. In fact, the activities which have high and irregular pressure on the bone, make the more osteogenic stimulation on bone compared to regular activities with low pressure. Several studies on the effect of exercise on bone metabolism markers have been conducted that have the conflicting results. Many of them have shown that exercise is associated with the increased markers of bone, and some have shown a lack of relations. Therefore, in this part, the results of this study were compared with the results reported by other researchers and the reasons for the possible inconsistencies were considered.

The results showed that there is a significant relationship between the level of physical activity and PTH of subject's serum.

The results of the research showed that PTH serum of those who exercised less was more than those who exercised moderately or higher, and there was significant difference between them. It should be mentioned that PTH of those who exercised moderately was more than those who exercised high, and there was significant difference between them.

The results of the following researches are in line with the results of the present study. Bone metabolism is influenced by multiple processes which are very complex. PTH and bone mechanical load have great influence on the bone evolution and change. Torsen *et al* (1995) and Bloomfield (1996) studied the woman who suffered from spinal cord injury, after exercise; and observed a reduction in PTH. Zyrat *et al* (1997) examined the effects of strength training in adult men that observed a decrease in PTH. Takada *et al* (1998) observed the effect of anaerobic exercise in adult women that showed a decrease in PTH. Radberg *et al.* (2000) observed a decrease in PTH in women, after exercise.

In John Eivamoto's study (2004), the treadmill effect on bone mass and bone metabolism in young rats was studied. It showed a decrease in parathyroid due to the increased bone mass by stimulating the longitudinal bone growth in young mice, which was accompanied by an increase in intestinal calcium.

Maymon *et al.* (2005) observed the increased PTH following the practice in adult men. Jan *et al.* (2005) believed that one of the factors affecting the hormone was the age of the subjects. He found, in his research on men with 20-29 years of age, that the level of this hormone decreases following aerobic exercise. Vainopa *et al.* (2009) observed reduction of PTH in the exercised subjects after 12 weeks exercising. Garnero *et al* (1996) obtained the less PTH in active postmenopausal women compared to inactive postmenopausal. Abraham *et al.* (1388) found, after eight weeks of running that PTH levels of subjects compared with control were significantly reduced.

In the research of Jonathan *et al.* (2010), PTH decreased after exercise. Ragerz *et al.* (2011) examined the response to an exercise session for those who exercised in term of entertainment, and observed a decrease in PTH level. In Marhava's research (2011), PTH decreased in Indian active women runners compared to inactive ones. Bone metabolism is influenced by multiple processes which are very complex. PTH and mechanical load have great influence on the bone evolution and change (Marhava, 2011). Reducing the preparation level of people can be a factor of increase in PTH. Intensity, duration and type of exercise activity have a significant impact on calcium and consequently, PTH of blood. The following studies are inconsistent with the results of this research. Maymon *et al.* (2005) studied the response of bone metabolism to a training session, in which the PTH level for those who exercised was more than those who untrained. This increase was associated with the reduced calcium. Maymon *et al* (2006) observed a large increase in PTH amount by comparing active and inactive woman cyclists.

Eli Tucson (2006) exercised the effect of a session of aerobic exercise with and without weight bearing on bone evolution in healthy young women that showed the increase in PTH. It is essential to note that the number of training sessions per week and the duration and intensity of the exercise are the fundamental factors in the bone response to mechanical or dynamic pressure. H. Varzi *et al* (2012) examined the effects of a session of endurance and resistance exercise on serum parathyroid and found the increased levels of PTH. Scott et al (2012) examined the effects of endurance exercise after 9 training sessions that showed an increase in PTH. In the research, we have brought some researches that showed no significant change in the PTH amount.

Nishiyama *et al* (1998) observed no change in PTH amount by comparing active and inactive male athletes. Shibata et al (2003) found no significant change; their plan was to walk 1000 steps. Joorimh *et al* (2006) examined the effect of exercise in active youth elite boatmen and observed no significant change. Lester *et al* (2009) investigated the short-term effect of activity on Osteogenic indices that no significant change was observed. Gill Ment (2009) observed no significant change out of active men, in riding. Kerschan-Schindl *et al.* (2009) examined the effect of 6 months of aerobic exercise on bone metabolism markers that showed no significant change in levels of PTH markers. Marcus *et al* (2011) observed no change PTH by comparing the effects of aerobic exercise in active postmenopausal women in comparison to the control group.

The results showed that there is significant relationship between levels of physical activity and the amount of calcitonin serum of the subjects. ALviya *et al* (1995) noted to increase the concentration of calcitonin following the short-term exercise on a ergometer bicycle in healthy men. Lester *et al.* (2009) reported no significant change in calcitonin following a walking exercise session with moderate level in immobile postmenopausal women that is in line with the result of this research. The relationship between changes in calciutropic hormone levels and short-term and intense exercise has been shown; but the effect of the long-term exercise is not much known. Moderate level exercise has shown the increasing or unchanging of calcitonin level that is associated with an increase or decrease in calcium serum. A possible reason for the increased levels of calcitonin in the present study is the participation of the subjects in a program of aerobic exercise; and not being significance of this increase can be attributed to insufficient duration of exercise or its intensity. Calcitonin reduces calcium plasma concentration.

In some young animals, the blood concentration of calcium ions is rapidly dropping within a few minutes following the injection of calcitonin. It is applied in two ways. An immediate effect of calcitonin results in the reduced osteoclast absorptive activity and may reduce the osteolitic effect of osteocytic membrane around the bone that causes to change the balance of bone exchangeable calcium minerals in favor of the calcium deposits. The second or longer effect is to product the new osteoclasts. And since bone osteoplastic resorption secondarily causes the activity of osteoblasts, reducing the number of osteoclasts also will lead to reduce the production of the osteoblasts; so in the long-term, the final result is the decrease of osteoplastic and osteoplastic activity and consequently in the long-term, the concentration of calcium ions in the plasma does not change. In other words, the effect of calcitonin on plasma calcium is mainly temporary and takes time from a few hours to a few days. Calcitonin has also little impact on the exchange of calcium in the kidney and colon tubules. These effects is opposite of the effects of PTH in the members. But it seems that these effects are of very little importance.

CONCLUSIONS

Regular physical activity can be an effective treatment to prevent bone density reduction. Physical activity has not any side effect, it is low cost and has the advantages such as strength and stability of physical state and it prevents from falls. Physical activity prevents from dwindling more the bone tissue by reducing the bone reconstruction and prevents from dwindling the bone tissue from calcium and minerals by reducing parathyroid. The results showed that intense exercises and increase the number of training sessions per week can increase PTH which is a hormone factor and prevent from osteoporosis; Decrease in the hormones is associated with the increased calcium and leads to increase in the estrogen levels. Although most studies show positive effects of exercise on bone metabolism markers, but the effect of exercise on bone biomarkers is not simply measurable and there are many contradictory results. It is hoped that future studies can solve these ambiguities.

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