

Evaluation of Serum Vitamin D and Calcium in Pregnant Women Before and after Exercise in Patients Referred to Tehran Hospitals, 2014-2015

Farideh Shojaei^{1*}, Sajad Parastouk¹

1. Department of Physical Education, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran

Abstract:

Exercising is one of the major elements of a healthy life that improves both the individual's health and the society at large. The active form of vitamin D is effective on the homeostasis of minerals and bone metabolism. The stimulating effects of the vitamin is effective on the growth and development of the fetus at the beginning stages of pregnancy. The aim of this study was to Evaluation of Serum Vitamin D and Calcium in Pregnant Women Before and after Exercise in Patients Referred to Tehran Hospitals, 2014-2015. The present study has a cross-sectional design in which 100 pregnant women participated in 2014-2015. The information about the participants were collected using a researcher-developed questionnaire, and blood samples were taken before and after exercising in order to measure vitamin D and calcium. The data collected were analyzed by SPSS version 18 through using descriptive-analytical statistics. The mean age of the participants was 28.4 ± 3.91 , with the highest and lowest ages being 40 and 20, respectively. Of the 100 women investigated in this study, 46% were in their first three months of pregnancy, 39% in the second three months, and 15% in their third three months of pregnancy. There was a significant difference between serum level of calcium in pregnant women before and after exercising and BMI and age ($P < 0.05$). However, serum level of vitamin D before and after exercising was significantly related to BMI only ($P > 0.05$). The results of the present study showed that physical exercises are effective in increasing the level of vitamin D and calcium during pregnancy, corroborating the studies that have been conducted earlier. It is suggested that, in addition to vitamin D supplement, calcium supplements and sunlight be considered as important healthcare priorities in pregnancy hygienic and the improvement of pregnant women.

Keywords: Vitamin D, Calcium, Pregnant Women, Exercise, Tehran, Iran.

INTRODUCTION

Exercising is considered a healthy way to gain, maintain, and improve one's health that not only improves individuals' physical health but also positively affects their mental health and causes the majority of the society to be happy and lively [1]. Exercising increases basal metabolic rate in the body, which is accompanied by increased oxygen consumption by cells, and increases effective metabolism and burns extra fat in the body [2]. The effect that exercising leaves on the body depends on the type and intensity of exercising, varying from minor to substantial metabolic and physical effects [3, 4]. In the past, it was believed that most of the vitamin D required by the body is supplied through skin synthesis; however, recent studies have shown that the amount of vitamin D absorbed through skin synthesis is not enough for the daily need of the body, and that factors like season, latitude, low-level exposure to the sunlight, using sunscreen, being afraid of skin cancer, and wearing several layers of clothing cause the body not to get the amount of vitamin D required by the body [5, 6]. The hormones related to vitamin D are calcitonin and parathyroid, both playing a role in the calcium renal reabsorption. Vitamin D synthesis outside the kidneys is affected by cytokines and is necessary for regulating paracrine performance and cellular differentiation [7-9]. Lack of vitamin D is the reason for bone metabolic diseases like rickets, bone softness, osteoporosis, muscle weakness, and muscle mass reduction. Furthermore, recent studies have confirmed that lack of vitamin D is also plays a role in reducing immunity, especially the development of

pneumonia in infants, reducing fertility, delaying menstrual age, reducing insulin response to glucose, reducing heart contraction strength, and increasing blood pressure. In fact, the state of being prone to bone metabolic diseases is developed during the fetal age. Inadequate calcium store during pregnancy and breastfeeding causes infant bone development disorder, reduced bone density, and reduced breast milk secretion, which in turn leads to the development of rickets and osteomalacia both in the infant and the mother. In addition to causing rickets and osteomalacia to develop, a reduction in serum level of calcium is also of great importance in bone metabolic diseases [10]. Some studies have been conducted on animal modeling, cell culture, the physiological effects of inner-cell calcium on glucose transfer, lipogenesis, and lipolysis, and it has been stated that calcium seems to have a role in the incidence of obesity and diabetes [11]. Pregnancy is accompanied by certain changes in calcium metabolism, and calcium absorption through digestive tract is increased to provide enough calcium for the development and mineralization of the embryo skeleton with high densities of vitamin D. given the critical importance of calcium and vitamin D and their association with the chronic diseases mentioned above and their potential role in preventing restriction intrauterine growth, the present study was conducted to investigate the serum levels of vitamin D and calcium in pregnant women before and after exercising in 2014-2015 in Tehran.

MATERIALS AND METHODS

The present study has a cross-sectional design in which 100 pregnant women participated in 2014-2015. The criteria for entering the study were: pregnancy, the possibility of measuring the levels of vitamin D and calcium. The exclusion criteria were: having gestational diabetes and having preeclampsia. The participants were referred to the laboratory for the intended test after receiving the required information at the beginning of the study, and the levels of vitamin D and calcium before exercising were measured. Then, the intended sports exercises were trained by midwives in consultation with gynecologists, and were monitored for one month, and after one month another blood sample was requested, and the amount of vitamin D and calcium in the participants was measured after one month of exercising and being monitored. The prescribed exercises included 10 minutes of slow and gentle running to warm up the 15 minutes of stretching exercises, and doing the main sports exercises including push-ups and hamstring lifts. The whole exercises altogether lasted one hour per session and were done at least three sessions a week, while emphasizing the need to drink liquids during exercising and stopping the exercises if any of the following happened: body temperature going up, tiredness, sign of shortness of breath, dizziness, heart overbeating, pain in the chest, headache, and secretion of amniotic fluid. The data collected were analyzed by SPSS version 22 through using descriptive-analytical statistics and chi-squared statistical test (X^2 test)[13,14]. Moreover, $p < 0.05$ was considered as the significance level.

RESULTS

The mean age of the participants was 28.4 ± 3.91 , with the highest and lowest ages being 40 and 20, respectively. The history of the number of pregnancies was once in 80%, twice in 18%, and three times in 2% of the participants. Of the 100 women investigated in this study, 46% were in their first three months of pregnancy, 39% in the second three months, and 15% in their third three months of pregnancy. The mean BMI in the pregnant women was 25.5 ± 2.71 kg/m^2 , with the lowest and highest BMIs being 31.2 ± 19.7 kg/m^2 (Diagram). The highest frequency for serum level of vitamin D before exercising was in 53% deficiency (< 50 nmol), while the highest frequency of serum level of vitamin D after exercising was in 45% deficiency (< 50 nmol). The results showed that there was not a significant difference between serum level of calcium in pregnant women before and after exercising ($P > 0.05$). Also, the mean serum level of vitamin D exercising was 45.16 ± 19.5 before exercising and 47.49 ± 17.6 nmol ($P > 0.05$). There was a significant difference between serum level of calcium in pregnant women before and after exercising and BMI and age ($P < 0.05$). However, serum level of vitamin D before and after exercising was significantly related to BMI only ($P > 0.05$).

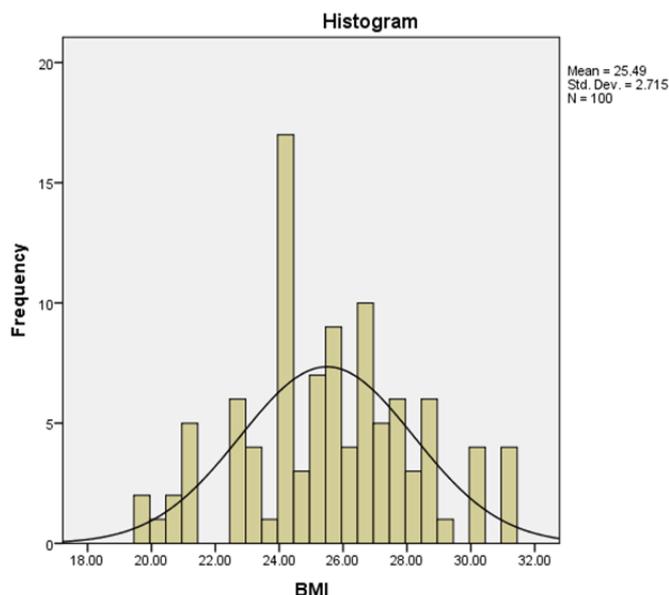


Diagram 1. Frequency of BMI in pregnant women

DISCUSSION

Exercising plays a substantial role in stabilizing natural blood circulation and other physiological activities in the body. Scientist believe that, despite living at the age of robots without much activity for humans, exercising can be a desirable tool for providing healthy entertainment and maintaining physical health. Exercising can have different effects on different populations. University students, as an example of a relatively inactive group, can improve their health by increasing the level of their daily physical activity [15]. The intensity, duration, and type of exercising can affect oxygen consumption in the body and its physiological results and changes [16]. Given the physiological differences in body during pregnancy and non-pregnancy conditions, these changes can be different in terms of performance and metabolism, for example, in serum levels of vitamin D and calcium [17]. In the present study, therefore, serum levels of vitamin D and calcium in pregnant women before and after exercising was studied in Tehran. The results showed that there was not a significant difference in serum levels of vitamin D and calcium in pregnant women before and after pregnancy ($P > 0.05$). The mean serum level of calcium was 8.83 ± 0.743 before and 8.9 ± 0.677 nmol after exercising, and the mean serum level of vitamin D was 45.16 ± 19.2 before and 47.49 ± 17.6 nmol after exercising. In Prentice et al. (2001) study in Gambia, it was reported that women need a different amount of vitamin D during pregnancy, and that physical activity is an important factor affecting the amount of vitamin D in the body [8]. In our study, the serum level of vitamin D increased after one month of physical exercising, but the amount of increased was not significant compared with the amount before starting the pregnancy exercises ($P > 0.05$).

In Lewis et al. (2010) in Australia, it was stated that the amount of vitamin D and calcium should be at a level that does not negatively affect the health of the mother and the fetus [9]. In an intervention study by Brunner et al. (2008) in America, it was reported that there was no relationship between the levels of vitamin D and calcium in pregnant women and their daily physical activities [18]. Based on the results of our study, no significant difference in the levels of vitamin D and calcium was seen before and after the exercises ($P>0.05$), a finding in line with the result of the above-mentioned study. Also, in Prentice et al. (2001), the results showed that women need a different amount of vitamin D during pregnancy, and that one of the factors affecting the level of vitamin D is people's physical activity [19], which is not in line with the results of the present study, probably due to type and intensity of activity in the individuals investigated in the study.

CONCLUSION

The results of the present study showed that physical exercises are effective in increasing the level of vitamin D and calcium during pregnancy, corroborating the studies that have been conducted earlier. Furthermore, in the Iranian society, the insufficiency of dairy products in people's diet creates an adverse condition that affects vitamin D absorption and other nutritional measures in a negatively way. It is suggested that, in addition to vitamin D supplement, calcium supplements and sunlight be considered as important healthcare priorities in pregnancy hygienic and the improvement of pregnant women.

REFERENCES

- Carek PJ, Laibstain SE, Carek SM. Exercise for the treatment of depression and anxiety. *Int J Psychiatry Med.* 2011; 41(1):15-28.
- Short KR, Sedlock DA. Excess postexercise oxygen consumption and recovery rate in trained and untrained subjects. *J Appl Physiol.* 1997; 83(1):153-59.
- Thornton MK, Potteiger JA. Effects of resistance exercise bouts of different intensities but equal work on EPOC. *Med Sci Sports Exerc.* 2002; 34(4):715-22.
- Sedlock DA. Postexercise energy expenditure following upper body exercise. *Res Q Exerc Sport.* 1991; 62(2):213-16.
- Gannagé-Yared MH, Chemali R, Yaacoub N, Halaby G. Hypovitaminosis D in a sunny country: relation to lifestyle and bone markers. *Journal of Bone and Mineral Research.* 2000; 15(9):1856-62.
- Holick MF. Sunlight and vitamin D for bone health and prevention of autoimmune diseases, cancers, and cardiovascular disease. *The American journal of clinical nutrition.* 2004; 80(6):1678S-88S.
- Peifer M, Begerow B, Minne HW. Vitamin D and muscle function. *Osteoporos Int J.* 2002; 13(3):187-94.
- Evans KN, Bulmer JN, Kilby MD, Hewison M. Vitamin D and placental-decidual function. *J Soc Gynecol Investig.* 2004; 11(5):263-71.
- Sertac N, Kip E. Vitamin D₃ upregulates plasma membrane Ca²⁺-ATPase expression and potentiates apico-basal Ca²⁺ flux in MDCK cells. *Am J Physiol Renal Physiol.* 2003; 286(2):363-69.
- Ainy E, Mirmiran P, Mirsaied Ghazi A A, Mohammadi F, Azizi F. Daily Intake and Serum Levels of Calcium, Phosphorus, Magnesium and Vitamin D During Normal Pregnancy. *Feyz.* 2005; 9(1):16-20.
- Golafrooz Shahri M, Rivandi M, Kooshki A. The Relationship between Calcium Intake and Anthropometric Indices. *J of Sabzevar Uni of Med Sci.* 2011; 18(1):41-6.
- Mahmoodi Z, Behzadmehr M, Salarzaei M, Havasian MR. Examining High-Risk Behaviors and Behavioral Disorders in Adolescents with Addicted and Non-Addicted Fathers in Public School of Zabol in the Academic Year 2016-2017. *Indian Journal of Forensic Medicine & Toxicology.* 2017; 11(2):251-56.
- Shayan A, Jamshidi F, Tahmasebiboldaji V, Khani S, Babaei M, Havasian MR, Masoumi SZ. Impact of a Stress Management Intervention Program on Sexual Functioning and Stress Reduction in Women with Breast Cancer. *Asian Pacific journal of cancer prevention: APJCP.* 2017; 18(10):2787-93.
- Valizadeh R, Malekshahi F, Saki M, Kavarizadeh F. Concentration Extent of People with a History of Methamphetamine Consumption Via Measuring Brain Waves in Recovering Addicts who Referred to Taleghani Hospital of Ilam, Iran 2016. *Indian Journal of Forensic Medicine & Toxicology.* 2017; 11(2):246-50.
- Raza S, Sheikh MA, Hussain MF, Siddiqui SE, Muhammad R, Aziz S, Qamar S, Saleem MA, Waki N, Faruqi H, Zia A. Dietary modification, body mass index (BMI), blood pressure (BP) and cardiovascular risk in medical students of a government medical college of Karachi. *J Pak Med Assoc.* 2010; 60(11):970-74.
- Børsheim E, Bahr R. Effect of exercise intensity, duration and mode on post-exercise oxygen consumption. *Sports Med.* 2003; 33(14):1037-60.
- Kaushal M, Magon N. Vitamin D in pregnancy: A metabolic outlook. *Indian J Endocrinol Metab.* 2013; 17(1):76-82.
- Richard D. Vitamin D and smooth muscle function. *Osteoporos Int.* 2002; 13(3):187-94.
- Prentice A. Milk intake, calcium and vitamin D in pregnancy and lactation: effects on maternal, fetal and infant bone in low- and high-income countries. *Nestle Nutr Workshop Ser Pediatr Program.* Karger Publishers, 2011.