

The Circulating Concentration of Adiponectin in Postmenopausal Women with and without Osteoporosis.

Shaimaa S.Mutlak

Dept. of Basic Science / college of dentistry
university of Baghdad

Abstract:

The current study was carried out to evaluate serum adiponectin level in osteoporosis postmenopausal women, as well as to investigate a possible correlation between adiponectin, calcium, phosphorus and alkaline phosphatase. There are few studies on the effects of adiponectin on bone metabolism.

Osteoporosis is a common disease among postmenopausal women. Osteoporosis is a bone disorder in which bone mass in the body decreases.

postmenopausal non-diabetic 30 women were selected from Baghdad teaching hospital over the period November 2010- April 2011 with the clinical diagnosis of osteoporosis (mean age 60.93 ± 6.21 ; rang 49 to 70 years). 30 postmenopausal non-diabetic women serve as control (mean age 59.17 ± 4.0 ; range 55 to 68 years). This study was included normal BMI in both patients and control groups. Serum adiponectin level was measured by ELISA technique, while colorimetric method was used to determine serum calcium, phosphorus and alkaline phosphatase.

Serum adiponectin in osteoporosis postmenopausal non-diabetic women was significantly higher than postmenopausal non-diabetic women without osteoporosis ($p < 0.01$).

Introduction:

According to the American Medical Women's Association, osteoporosis is a common disease state affecting approximately 29 million people in the United States [1]. In women, it is believed that bone mass declines gradually after age 30 and that this decrease progresses markedly at menopause. In fact, it is estimated that 13% to 18% of women in the United States who are at least 50 years old have osteoporosis, and an additional 37% to 50% have osteopenia, which is the presence of less than the normal amount of bone mass [2,3]. This is an important finding, because osteoporosis causes 1 million fractures yearly, and the mortality rate following a hip fracture is 12% to 20% [1]. The disease may be classified as primary type 1, primary type 2, or secondary. The form of osteoporosis most common in women after menopause is referred to as primary

The Circulating Concentration of Adiponectin in Postmenopausal Women with and without Osteoporosis..... Shaimaa S.Mutlak

type 1 or postmenopausal osteoporosis. Primary type 2 osteoporosis occurs after age 75 and is seen in both females and males at a ratio of 2:1. Finally, secondary osteoporosis may arise at any age and affect men and women equally [4,5]. There is increasing evidence suggesting that adiponectin plays a role in the regulation of bone metabolism [6]. Adiponectin is a 30 kDa protein hormone its percentage in serum proteins is about 0.01%. It is mainly synthesized by adipocytes, but also muscle cells and hepatocytes have the ability to synthesize adiponectin [7]. Adiponectin can modulate a number of metabolic processes, including glucose regulation [8] and fatty acid catabolism [9]. Adiponectin is exclusively secreted from adipose tissue into the blood stream. The levels of the hormone are inversely correlated with body mass index in adult [10,11].

Subjects and methods:

Thirty postmenopausal non-diabetic women with history of osteoporosis are selected from Baghdad teaching hospital over the period November 2010- April 2011 (mean age 60.93 ± 6.21 ; rang 49 to 70 years). 30 postmenopausal non-diabetic women serve as control (mean age 59.17 ± 4.0 ; range 55 to 68 years). Both groups have normal BMI (mean 25.4 ± 4.2) for patients and (mean 24.7 ± 4.4) for control.

Five millilitres of venous blood from fasting subjects were withdrawn by utilizing disposable plastic syringes in the morning and transferred into a sterile test tube the blood was allowed to clot and centrifuged at 1000rpm for 10 minutes. Sera were then separated and stored at 20C until analysis. Serum adiponectin level was measured by ELISA technique. Colorimetric method was used to determine serum calcium, phosphorus and alkaline phosphatase. Statistical analysis was assessed using P (T-test).Correlation among different parameters was calculated by the spearman test and p values of $P < 0.01$ and $P < 0.05$ were considered significant.

Results:

The clinical characteristics of non-diabetic postmenopausal women with and without osteoporosis under study are shown in table (1). The mean value of age and BMI of patients (60.93 ± 6.21 year; 25.4 ± 4.2 kg/m²) respectively was not significantly different when compared to the age and BMI mean values of controls (59.17 ± 4.0 year; 24.7 ± 4.4 kg/m²).

Interestingly, the present study failed to find any significant differences in serum levels of calcium, phosphorus and alkaline phosphatase between patients and control.

This table shows that level of serum adiponectin in non-diabetic postmenopausal women with osteoporosis is significantly higher than non-diabetic postmenopausal women without osteoporosis $p < 0.01$.*

The Circulating Concentration of Adiponectin in Postmenopausal Women with and without Osteoporosis..... Shaimaa S.Mutlak

By simple linear regression analysis it was found that level of serum adiponectin positively associated with serum calcium in postmenopausal women ($r= 0.369$, $p=0.049$) figure (1).

Table 2 demonstrated the relationship of serum adiponectin to other parameters (age, BMI, Alp, Ca and ph) in Non-diabetic postmenopausal women with and without osteoporosis.

Table 1: basal characteristics of Non-diabetic postmenopausal women with and without osteoporosis.

Parameters	Non-diabetic postmenopausal women with osteoporosis (mean±SD)	Non-diabetic postmenopausal women (mean±SD)	p-value	Sig
No. investigated	30	30		
Age year	60.93 ± 6.21	59.17 ± 4.0	0.18	NS
BMI Kg/m ²	25.4± 4.2	24.7± 4.4	0.12	NS
Adiponectin µg/ml	12.97±5.01	9.4±2.8	0.01*	S
calcium mmol/L	2.2±0.22	2.24±0.17	0.19	NS
phosphorous mmol/L	1.25±0.17	1.26±0.22	0.43	NS
Alkaline phosphatase U/L	65.43±12.36	62.9±15.8	0.24	NS

S= Significant ($p<0.01$, $p<0.05$), NS= not significant.

The Circulating Concentration of Adiponectin in Postmenopausal Women with and without Osteoporosis..... Shaimaa S.Mutlak

Table 2: the relationship of serum adiponectin in Non-diabetic postmenopausal women with and without osteoporosis and compared to other parameters.

parameters		Adiponectin level in Non-diabetic postmenopausal women with osteoporosis.	Adiponectin level in Non-diabetic postmenopausal women without osteoporosis.
Age	r	-0.013	-0.013
	P-value	0.510	0.947
BMI kg/m ²	r	0.028	0.071
	P-value	0.883	0.708
Alp U/L	r	-0.280	-0.071
	P-value	0.134	0.710
Ca mmol/l	r	0.048	0.369
	P-value	0.803	0.045*
Ph mmol/l	r	-0.295	-0.059
	P-value	0.113	0.772

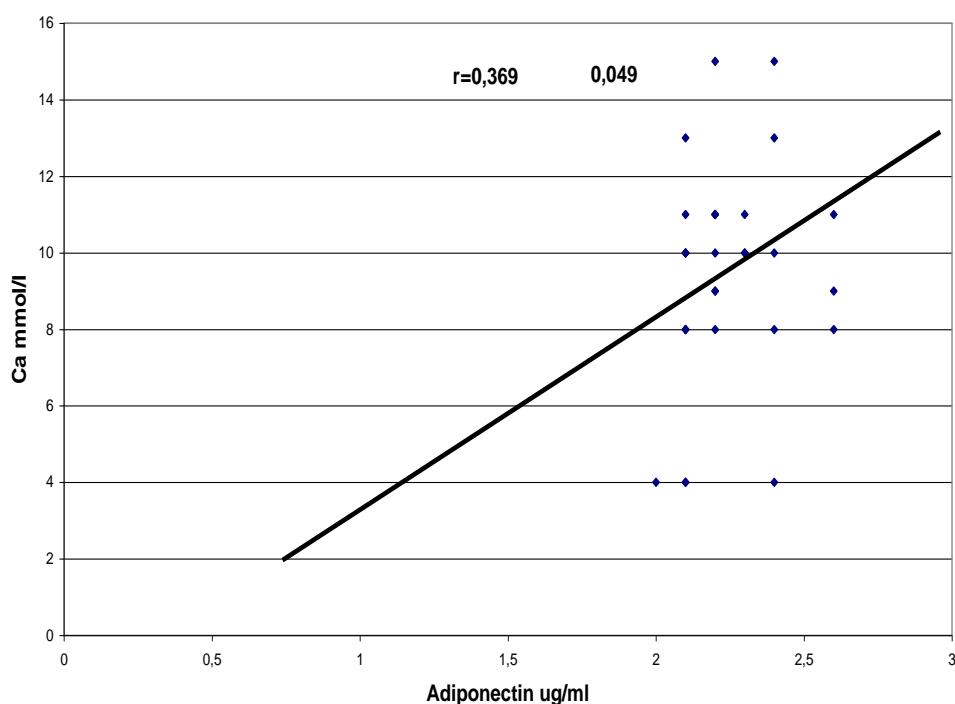


Figure (1)

The Circulating Concentration of Adiponectin in Postmenopausal Women with and without Osteoporosis..... Shaimaa S.Mutlak

The correlation between serum adiponectin ($\mu\text{g/ml}$) and serum level of calcium (mmol/l) in postmenopausal women.

DISCUSSION:

Osteoporosis is a disease of bones that leads to an increased risk of fracture [12]. Fractures are the most dangerous aspect of osteoporosis. Debilitating acute and chronic pain in the elderly is often attributed to fractures from osteoporosis and can lead to further disability and early mortality [13].

The field of bone turnover markers has developed considerably in the past decade. Biochemical monitoring of bone metabolism depends upon measurement of enzymes and proteins released during bone formation and of degradation products produced during bone resorption. Various biochemical markers are now available that allow a specific and sensitive assessment of the rate of bone formation and bone resorption of the skeleton [14]. Osteoporosis-related fractures increase morbidity and mortality in postmenopausal women [15]. Biochemical markers are being investigated as the predictor of bone loss rate and associated osteoporosis risk in postmenopausal women [16,17]. For postmenopausal women, hip fracture is the second leading cause of admission to nursing homes and is one of the major disorders that contribute to the loss of independence and quality of life [1]. In osteoporosis the bone mineral density (BMD) is reduced, bone microarchitecture deteriorates, and the amount and variety of proteins in bone is altered [18]. The results of this study demonstrate that serum adiponectin level was significantly higher in postmenopausal women with osteoporosis compared with postmenopausal women without osteoporosis ($P<0.01$). This finding is similar to that obtained by Dan Mellstrom [19] who revealed that raised levels of adiponectin in blood could be connected to osteoporosis.

In contrast Sodi et al [20] and Bulent et al [21] found that there are no significant differences in the circulating concentration of fasting early morning adiponectin in postmenopausal women with or without osteoporosis. The present study showed a positive significant correlation between serum adiponectin level and serum calcium in postmenopausal women (control).

Conclusion:

The present study demonstrated:

- 1) Serum adiponectin level is associated with bone metabolism.
- 2) Adiponectin may be used as a predictor for the rate of bone loss and fracture risk in postmenopausal women.

REFERENCES:

1. Waugh, EJ; Lam, MA, Hawker, GA, McGowan, J, Papaioannou, A, Cheung, AM, Hodsman, AB, Leslie, WD, Siminoski, K, Jamal, SA,

The Circulating Concentration of Adiponectin in Postmenopausal Women with and without Osteoporosis..... Shaimaa S.Mutlak

- Perimenopause BMD Guidelines Subcommittee of Osteoporosis, Canada (2009 Jan). "Risk factors for low bone mass in healthy 40-60 year old women: a systematic review of the literature". *Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA* **20** (1): 1–21.
2. Reginster JY, Seeman E, De Vernejoul MC, *et al.* (2005). "Strontium ranelate reduces the risk of nonvertebral fractures in postmenopausal women with osteoporosis: treatment of peripheral osteoporosis (TROPOS) study". *J Clin Endocrinol Metab* **90** (5): 2816–22.
 3. Dalsky GP, Stocke KS, Ehsani AA, Slatopolsky E, Lee WC, Birge SJ (1988). "Weight-bearing exercise training and lumbar bone mineral content in postmenopausal women". *Ann. Intern. Med.* **108** (6): 824–28.
 4. WHO Scientific Group on the Prevention and Management of Osteoporosis (2000: Geneva, Switzerland) (2003). "Prevention and management of osteoporosis: report of a WHO scientific group" (pdf).
 5. Raisz L (2005). "Pathogenesis of osteoporosis: concepts, conflicts, and prospects". *J Clin Invest* **115** (12): 3318–25.
 6. Lenchik L, Register TC, Hsu FC, Lohman K, Nicklas BJ, Freedman BI, *et al.* Adiponectin as a novel determinant of bone mineral density and visceral fat. *Bone* 2003; 33:646-51
 7. Nakano, Y., *et al.*, isolation and characterization of GBP28, a novel gelatin-binding protein purified from human plasma, *J Biochem (Tokyo)*, 1996. 120(4):803-12.
 8. Higashiura, K., *et al.* correlations of adiponectin level with insulin resistance and atherosclerosis in Japanese male populations. *Clin Endocrinol (Oxf)*, 2004. 61(6):753-9.
 9. Zoico, E., *et al.*, Adipocytokines, fat distribution, and insulin resistance in elderly men and women. *J Gerontol A Biol Sci Med Sci*, 2004. 59(9):935-9
 10. Díez JJ, Iglesias P (March 2003). "The role of the novel adipocyte-derived hormone adiponectin in human disease". *Eur. J. Endocrinol.* **148** (3): 293–300.
 11. Nedvídková J, Smitka K, Kopský V, Hainer V (2005). "Adiponectin, an adipocyte-derived protein". *Physiol Res* **54** (2): 133–40.
 12. Brian K Alldredge; Koda-Kimble, Mary Anne; Young, Lloyd Y.; Wayne A Kravjan; B. Joseph Guglielmo (2009). *Applied therapeutics: the clinical use of drugs*. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins. pp. 101–3.

التركيز المنتشر للاديبونكتين لدى النساء الاصحاء والمصابات

بخلخلة العظام بعد سن اليأس

شيماء سبتي مطلق

فرع العلوم الأساسية

كلية طب الاسنان / جامعة بغداد

المخلص:

تضمنت الدراسة الحالية تقييم مستوى مصل الاديبونكتين لدى النساء بعد سن اليأس اللاتي لديهن خلخلة العظام بالاضافة الى دراسة العلاقة المحتملة بين الاديبونكتين، الكالسيوم، الفسفور و الالكالين فوسفاتيز. يوجد عدد قليل من الدراسات التي تتضمن تأثيرات الاديبونكتين على ايض العظم. خلخلة العظام مرض شائع بين النساء بعد سن اليأس. خلخلة العظام هو خلل يحدث للعظام يؤدي الى نقصان كتلة العظم في الجسم.

أختير 30 امرأة غير مصابة بداء السكري بعد سن اليأس تم تشخيصها ان لديها خلخلة عظام في مستشفى بغداد التعليمي للفترة من (تشرين الثاني 2010 الى نيسان 2011) متوسط العمر (60.93 ± 6.21) والمدى (49 الى 70 سنة). ثلاثين امرأة بعد سن اليأس غير مصابة بداء السكري أعتبرت المجموعة الظابطة متوسط العمر (4.0 ± 59.17) والمدى (55 الى 68 سنة).

تضمنت هذه الدراسة مستوى طبيعي من معدل كتلة الجسم لكلا المجموعتين (الاصحاء و المرضى). قيس مستوى مصل الاديبونكتين بواسطة تقنية الاليزا بينما استخدمت الطريقة اللونية لقياس الكالسيوم، الفسفور والالكالين فوسفاتيز.

وجدت زيادة معنوية في مصل الاديبونكتين لدى النساء بعد سن اليأس المصابات بخلخلة العظام اللاتي ليس لديهن داء السكري أكثر من النساء غير المصابات بخلخلة العظام بعد سن اليأس واللاتي ليس لديهن داء السكري.