Serum Magnesium Level In Diabetic And Osteoporosis-Risk Thai Female Subjects

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Citation

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Abstract

Osteoporosis is an important physiological change in elderly post-menopause female subjects. It can induce a lot of complications such as hip fracture. Similar to serum calcium and phosphorus, serum magnesium is decrease in the osteoporosis subjects. In the present day, a number of risk factor for osteoporosis (such as diabetes mellitus low BMI, high alcohol consumption and etc.) are mentioned. In this study, evaluation of serum magnesium levels among osteoporosis-risk Thai pre-menopause subjects comparing to low risk matched control group was performed. A total of 77 female subjects, 15 low risk control subjects and 62 osteoporosis-risk subjects (40 subjects with uncomplicated diabetes mellitus and 22 subjects with other risks) were included into this study. Serum magnesium determination by AAS method was performed. Average serum magnesium level in low risk control group and osteoporosis-risk group were 2.18 ± 0.27 mg/dl and 2.17 ± 0.56 mg/dl (2.12 ± 0.62 mg/dl for diabetic subjects and 2.25 ± 0.26 mg/dl for other risk subjects), respectively. There was no significant difference between low risk and osteoporosis-risk subjects ($P > 0.05$). However, a significant between low risk and osteoporosis-risk subjects in diabetic group ($P < 0.05$) was determined in our study. Conclusion that serum magnesium level cannot be used as general osteoporosis marker for pre-menopausal subjects was set.

INTRODUCTION

Osteoporosis is an important physiological change in elderly post-menopause female subjects. It is a disorder of decreased bone mass, microarchitectural deterioration, and fragility fractures. ([1]) It is widespread and can affect people of all ethnic backgrounds ([1], [2]), therefore, it is an important threat for all elders.

An essential element in preventing osteoporosis is the achievement of normal peak bone mass. Adequate nutrition, appropriate calcium and vitamin D intake, regular menstrual cycles and a well balanced exercise program of exercise are essential elements in achieving peak bone mass. At menopause women undergo accelerated bone loss. Thereafter, women gradually lose bone mass. ([1], [2])

Major risk factors for osteoporosis include low body weight, history of fracture, family history of osteoporosis, and smoking. Established risk factors for osteoporosis and associated fractures are increasing age, female sex, white race, removal of the ovaries at an early age, prolonged immobility, and prolonged use of corticosteroids. Furthermore, actors that probably or possibly increase risk in postmenopausal white women include a low calcium intake, cigarette smoking, and, at least for hip fractures, use of long half-life psychotrophic drugs and heavy alcohol consumption. ([3])

Because osteoporosis is usually asymptomatic until a fracture, especially for hip fracture, occurs, family physicians must identify the appropriate timing and methods for screening those at risk. ([4]) Similar to serum calcium and phosphorus, serum magnesium is decrease in the osteoporosis subjects. ([5], [6]) In this study, evaluation of serum magnesium levels among osteoporosis-risk Thai pre-menopause subjects comparing to low risk matched control group was performed.

MATERIALS AND METHODS

SUBJECTS

A total of 77 female subjects were included in this study.). The first group, comprising the study group 17 subjects, was a group of osteoporosis-risk subjects (40 subjects with uncomplicated diabetes mellitus and 22 subjects with other risks ([3])) were included into this study. The second group, 15 subjects, was the matched control group with low risk for osteoporosis. All subjects were asked for informed consent. Then random blood sample was collected for laboratory

analysis from each subject.

SAMPLE COLLECTION

For all blood collection, antecubital venipuncture by evacuated blood collection system was performed. For each subject, 3 mL blood samples was collected. Then collected specimens was refrigerated at 2 - 8 degree C and sent to analytical unit within 1 day.

SAMPLE PREPARATION

Contamination during sample collection was get rid off by precipitation using Lanthanum chloride in the ratio serum: Lanthanum chloride equaled to 1:40.

LABORATORY ANALYSIS

All blood samples were analyzed for magnesium level by atomic absorption spectrophotometer (AAS). In our study, 2 control samples were also analyzed for each run. The AAS system used was the Perkin Elmer 1100 B. This method for blood magnesium determination was described briefly as following. AAS is the analytical technique based on photelectric principle. ([7]) The principle behind atomic absorption is the absorption of radiation by atomized atoms. The atomized atoms absorb only the specific radiation which will raise them to an excited energy level. Radiation at any other wavelength is ignored. The excited electron will give off energy at a specific wavelength when it rapidly returns to its ground state. Radiant energy is supplied at a wavelength which will raise the ground state electrons to the excited state. The change in radiant energy before and after absorbance is measured. For magnesium analysis, the wavelength equals to 285.2 is used.

STATISTICAL ANALYSIS

Mean and standard deviations of blood magnesium levels in each groups was calculated. The average blood lead levels of each group were compared using the unpaired T-test with level $P \leq 0.05$ considered statistically significant.

RESULTS

Average serum magnesium level in low risk control group and osteoporosis-risk group were 2.18 ± 0.27 mg/dl and 2.17 ± 0.56 mg/dl (2.12 ± 0.62 mg/dl for diabetic subjects and 2.25 ± 0.26 mg/dl for other risk subjects), respectively. There was no significant difference between low risk and osteoporosis-risk subjects ($P > 0.05$). However, a significant between low risk and osteoporosis-risk subjects in diabetic group ($P < 0.05$) was determined in our study. (Table 1)

Figure 1

Table 1: Blood magnesium levels in control and osteoporosis-risk groups.

Group	Number	Blood magnesium level (mg/dL)	
		Range	Average
Control group	15	2.00 - 2.40	2.18 ± 0.27
Osteoporosis-risk group	62	1.80 - 2.90	2.17 ± 0.56
▫ Diabetes mellitus	40	1.80 - 2.90	2.12 ± 0.62
▫ Other risks	22	1.90 - 2.30	2.25 ± 0.26

DISCUSSION

Osteoporosis afflicts 75 million persons in the United States, Europe and Japan and results in more than 1.3 million fractures annually in the United States. ([1], [2]) Prevention is the most important step, and women of all ages should be participate in regular weight-bearing exercise, avoid medications known to compromise bone density, institute hormone replacement therapy at menopause unless contraindicated. ([1], [2]) All postmenopausal women who present with fractures as well as younger women who have risk factors should be evaluated for the disease. ([4]) In the present day, a number of risk factor for osteoporosis (such as diabetes mellitus low BMI, high alcohol consumption and etc.) are mentioned. ([3])

A number of trace elements including calcium, phosphorus, zinc and magnesium are decrease in post-menopause women and believed to relate to disorders of bone metabolism. Due to the previous study of Steidl et al ([8]), magnesium level among the osteoporosis subjects is significant lower than non-osteoporosis. However, there are also other factors associated with decrease blood magnesium level, especially diabetes mellitus, another common problem in elderly women. ([9]) Due to decrease of the net tubular reabsorption of magnesium in diabetic patients in presence of hyperglycemia, leading to hypomagnesemia can be resulted. ([10])

In this study, evaluation of the serum magnesium level among the osteoporosis-risk and matched control group was done. No significant difference between control and osteoporosis-risk subjects was observed. This result does not match the previous study, which mentioned the significant difference. ([9]) However, a significant between low risk and osteoporosis-risk subjects in diabetic group was found in further analysis. Therefore, it can confirm the hypomagnesemia in diabetic but not osteoporosis. Conclusion that serum magnesium level cannot be used as general osteoporosis marker for pre-menopausal subjects

was set.

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