

Research Article

Calcium Level is Lower in Women with Premenstrual Syndrome

Kadar Kalsium Serum Lebih Rendah pada Wanita dengan Premenstrual Syndrome

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Abstract

Objective: To know the relationship of calcium serum levels with the incidence of Premenstrual Syndrome (PMS).

Methods: Study subject that fulfil inclusion criteria were asked to fill questionnaires and venous blood sample was taken to measure calcium serum levels. The data is processed and analyzed statistically.

Result: The study was conducted on 45 women aged 20-35 years old. Groups of women with PMS found calcium levels between 8.50 to 9.40 mg/dl. Cut off point levels of calcium for PMS incidence was 9.40 mg/dl with 90.9% sensitivity, 75.0% specificity, and accuracy of 86.7%.

Conclusion: Women with PMS have lower calcium levels compared to women without PMS. Calcium levels significantly associated with incidence of PMS.

[Indones J Obstet Gynecol 2013; 37-2: 99-102]

Keywords: premenstrual syndrome (PMS), calcium serum

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Abstrak

Tujuan: Mengetahui hubungan kadar serum kalsium dengan kejadian Premenstrual Syndrome (PMS).

Metode: Subjek penelitian yang memenuhi kriteria inklusi, diminta mengisi kuesioner, kemudian diambil darah vena untuk mengukur kadar serum kalsium. Data diproses dan dianalisis secara statistik.

Hasil: Penelitian dilakukan pada 45 perempuan yang berusia 20 - 35 tahun. Kelompok perempuan dengan PMS didapatkan kadar kalsium antara 8,50 - 9,40 mg/dl. Cut off point kadar kalsium untuk kejadian PMS 9,40 mg/dl dengan sensitivitas 90,9%, spesifisitas 75,0%, dan akurasi 86,7%.

Kesimpulan: Perempuan dengan PMS mempunyai kadar kalsium yang lebih rendah dibandingkan dengan perempuan tanpa PMS. Kadar kalsium berhubungan bermakna dengan kejadian PMS.

[Maj Obstet Ginekolog Indones 2013; 37-2: 99-102]

Kata kunci: premenstrual syndrome (PMS), kalsium serum

INTRODUCTION

PMS was first discovered in 1931 by Frank and Horney, which is a set of symptoms in the form of physical and psychological changes experienced approximately 7-10 days before menstruation and disappear a few days after menstruation. The complaint that arise can be vary, from mild to severe or even worst until appear like mental or physical disorders.¹

PMS is a multi factorial disorder. Many factors can be indentified as a possible cause. In contrast to the proven clinical manifestations associated with disorders that arise during the period of cyclic premenstrual women of reproductive age, the etiology is still unknown clearly. Deficiency of certain mineral such as magnesium and calcium, which was absolutely needed by neuron at central nerv-

ous system to continue excitability and inhibit stimulus at synaptic level, is thought to be one of the cause.²

Estrogen causes a decrease in calcium serum, but in menopause, it increases the serum concentration of calcium instead. Estrogen is believed to lower the calcium serum through inhibition of bone resorption through the emphasis on the process of bone remodeling in mesenchymal transition and helps bone mineralization. Meanwhile, parathyroid hormone seems to work the opposite. Estrogen therapy on patient with mild primary hyperparathyroidism shows lower level of calcium serum and urine. Study by Stice SL in 1987 explained about the role of 4-hydroxilation estradiol in lowering intake of Ca^{2+} by smooth muscle cell of uterine artery

in Thys - Jacobs S about micronutrients and the premenstrual syndrome, showing that estrogen was a calcium antagonist which inhibits calcium and reduce the influx of calcium into the smooth muscle of blood vessels.^{3,4} During the menstruation cycle, estradiol reaches the maximum level twice, first happens immediately before the LH surge and ovulation while the second happens at the luteal phase. Increasing level of estrogen will cause a decrease of calcium concentration and as compensation can cause increased parathyroid hormones that prevents hypocalcemia. Therefore, it can be explained that woman who basically had been experiencing calcium disorder, such as those who suffering from PMS (lower calcium concentration, lower 25 hydroxicholecalciferol concentration and higher level of parathyroid hormone concentration), will experience a reduction in the concentration of calcium that is more due to the estrogen level during the luteal phase of the menstrual cycle.^{5,6}

METHODS

This study is a prospective analytical correlative with cross sectional approach, conducted with the aim of knowing the relationship of calcium serum levels with the incidence of PMS. The diagnosis of PMS made prospectively by motivating the subject to fill the daily record sheet (Daily symptom checklist) everyday for two months respectively and give a special sign at the day of menstruation. From the results of the daily symptom checklist data collection, the subject then sorted into PMS and non PMS groups. Blood sampling to measure calcium serum level was performed on all samples 7 days before menstruation at the third cycle of menstruation.

RESULT

Study has been conducted during the period of March to June 2012 at RSU GMIM Kalaooran Amurang to 45 subjects of women who met the inclusion criteria. The subjects consisted of 33 women with PMS and 12 women without PMS. The study subjects received explanation of the benefits, goals and methods of the study and signed a consent to participate in this study. The subjects' calcium serum levels were then examined.

Table 1. Characteristics of the Study Subjects Based on Calcium Levels.

Calcium Serum Level	PMS	Control
< 8.50 mg/dl	1	0
8.50 - 9.40 mg/dl	29	3
> 9.40 mg/dl	3	9

The group of women with PMS had the highest calcium levels between 8.50 to 9.40mg/dl, while in the control group of women without PMS, the highest calcium levels was of more than 9.40mg/dl.

Table 2. Test Results Relationship between Levels of Calcium and PMS Genesis.

Variable	Coefficient regression (β)	p (significance)
Calcium	-5.942	0.002
Konstanta	55.857	0.002

The result above shows there is a significant relation between calcium level with PMS incidence ($p < 0.01$). The graphical form of the relationship between calcium levels and the risk of PMS can be seen in the graph below.

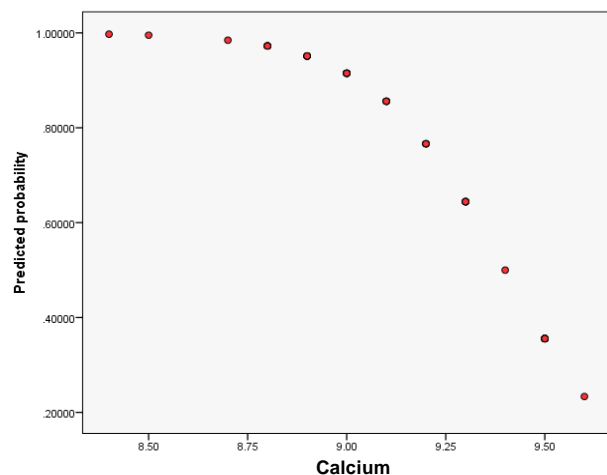


Figure 1. Relationship between Calcium Levels and the Risk of PMS Occurred.

If the value of the opportunities 0.5 is used as the cut off point of the incidence of PMS, the cut off point of calcium levels can be obtained as 9.40mg/dl. The cut off point levels of calcium 9.40mg/dl gives the value of 90.9% sensitivity, 75.0% specificity, and accuracy of 86.7%.

Table 3. Calculation of Value Sensitivity, Specificity, and Accuracy.

Calcium level	PMS	Control	Total
≤ 9.40 mg/dl	30 (90.9%)	3 (25.0%)	33
> 9.40 mg/dl	3 (9.1%)	9 (75.0%)	12
Total	33	12	45

DISCUSSION

The purpose of this study was to determine the relationship of calcium serum levels with the incidence of PMS. In this research, 45 women who met the inclusion criteria were examined calcium serum levels.

Table 1 describe characteristic of the subject based on calcium serum level. At the group of women with PMS obtained 1 woman with calcium level 8.4 mg/dl, 29 women with calcium level 8.5-9.5 mg/dl and 3 women with calcium level 9.5 mg/dl. In the group of women who did not experience PMS, there were 3 women with calcium level of 8.5-9.4 mg/dl, and 9 women with calcium level of more than 9.4 mg/dl. This data describe that calcium serum level in women with PMS is lower than in women without PMS.

The result of the study about the characteristic of calcium serum level was in accordance with the study by Bertone - Johnson in 2005 about premenstrual syndrome. They found that the levels of calcium and vitamin D in the blood were lower in women with PMS and calcium supplements can reduce the severity of symptoms.^{7,8} In the study conducted by Dullo and Neeraj Puja VEDI on the changes in calcium serum and magnesium at different phases of the menstrual cycle, they obtained that calcium serum levels were lower in the luteal phase than in the follicular phase of the menstrual cycle. In this study, serum levels of calcium found in the luteal phase ranged from 9.29 to 9.81 mg/dl.^{9,10} In our study we found calcium levels in women with PMS lower than women without PMS, so it should be taken as a consideration for giving calcium carbonate to women with PMS.

In a study conducted by Thys - Jacobs in America at 1998 about calcium carbonate and PMS, the group of women who were randomly given calcium carbonate (1200mg/day) did not describe the reduction in PMS symptom after the first cycle. But

after administration in 3 cycle, they obtained 48% symptom reduced. Calcium carbonate was an effective therapy for PMS. Calcium carbonate is also relatively inexpensive and essential in preventing osteoporosis, thus recommended as the first choice for the treatment of PMS.^{11,12}

In this study, it was found that there was a very significant correlation between the incidence of PMS and calcium level ($p < 0.01$). This means that the lower the calcium level, the greater the risk of PMS. The graphical form of the relationship between calcium levels and the risk of PMS can be seen in Figure 1.

The results are consistent with research conducted by Stice SL et al in 1987 on the role of 4-hydroxylation of estradiol in lowering the retrieval of Ca^{2+} by the smooth muscle cells of uterine arteries in Thys - Jacobs about calcium supplementation in premenstrual syndrome.⁹ During the menstrual cycle estradiol levels reached a maximum of two times, the first immediately before the LH surge and ovulation, while the second at phase luteal.² Increased levels of estrogen will cause a decrease in the concentration of calcium and parathyroid hormone, which will in turn increase as a compensation to prevent hypocalcaemia. Therefore, it can be explained that women who have calcium disorders, such as those who suffer from premenstrual syndrome (lower calcium concentrations, lower serum 25 hydroxycholecalciferol, and higher parathyroid hormone concentrations), would experience a further decline of calcium concentration due to increased levels of estrogen during the luteal phase of the menstrual cycle.¹³⁻¹⁵

The reason why calcium supplements is needed to reduce the complaints of women with PMS is that a correction to the lower levels of calcium will suppress parathyroid hormone and decrease the neuromuscular irritability. Besides, calcium supplements can affect the health of many women. Another positive aspect of the calcium supplements are the cheap price, safety in pregnancy and a significant effect in bone health. However, the provider should be aware of using excessive doses, which can lead to the formation of kidney stones. Women with PMS recommended to be given calcium supplements every day and with the dose does not exceed the maximum recommended dose is 2,500 mg per day.^{1,15}

Table 3 illustrate the calculation of sensitivity, specificity, and accuracy of research. From the re-

search we have done based on statistical analysis of the results obtained by the cut off point calcium levels were 9.40 mg/dl. Cut off point levels of calcium 9.40 mg/dl gives the value of 90.9% sensitivity, 75.0% specificity, and accuracy of 86.7%. In an effort to deal with women with PMS, a laboratory investigations such as calcium levels is important. It is necessary for the determination of cut-off point of the level of calcium in the women with PMS.

CONCLUSIONS

Calcium level is significantly associated with incident of PMS Women with PMS have lower calcium levels compared to women without PMS. The results of the analysis of the relationship between calcium levels with the incidence of PMS acquired the cut off point of 9.40 mg/dl with 90.9% sensitivity, 75.0% specificity, and 86.7% accuracy.

As a suggestion, examination of calcium serum levels can be used as one of the investigation in the diagnosis and treatment of PMS. Further research is needed to determine the effectiveness of calcium supplementation in the treatment of PMS.

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