Research Paper Medical Science

Role of Calcium in Premenstrual Syndrome

*** Dr. Veenodini Warhade**	Associate Professor, Sinhagad Dental College & Hospital, Pune 411041. * Corresponding author
Dr. Ashok Shinde	Associate Professor, Sinhgad Dental College & Hospital Pune, 411041

ABSTRACT

Premenstrual syndrome (PMS) is the psychological & somatic disorder occurring just 7 to 10 days before the menstruation. Common symptoms of PMS are mood swings, pain & breast tenderness, abdominal discomfort, lack of enthusiasm, severe headache, back pain & body pain, irritability, increased sensitivity to pain. The severity of symptoms varies from person to person.

Recent evidence has suggested that disturbances in serum calcium levels may increase the symptoms of PMS. Calcium supplementation may be effective therapy for PMS. This study was conducted with the objectives of reviewing various articles related to the subject. A Pubmed & Google search of various articles containing keywords was done.

KEYWORDS Serum calcium, Menstruation, Premenstrual syndrome, Calcium supplements.

Introduction

In the past there has been reluctance to accept PMS as a serious condition. According to the studies about 90% of women are affected by the same disorder.[1]. The temporal occurrence and recurrence of mood & physical symptoms during the luteal phase of the menstrual cycle have been recognized for centuries.This phenomenon has come to be known as the premenstrual syndrome [2]. Many women have just a few mild symptoms, but other suffers severe discomfort, leading to a disorder called a PMDD (Premenstrual dysphoric disorder).The term PMS was first introduced by Dalton in 1953. In 1987 the term Late Luteal Phase Dysphoric Disorder (LLPDD) was introduced to provide a systematic set of diagnostic criteria for premenstrual disorder. (Rapkin 1992) This clinical entity was later named as Premenstrual Dysphoric Disorder (PMDD)[3]

Guy Abraham, M.D. Classified the symptoms of PMS into 4 main categories,[4]

PMS – A (anxiety) mood swings, irritability, crying jags.

PMS – H (hyperhydration) bloating, weight gain, water retention, breast tenderness, constipation

PMS – C(Cravings) symptoms of hypo-glycemia (Low blood sugar), fatigue, vertigo (dizziness), sweet craving, food binging , heart palpitation, headache, migraine.

PMS – D (Depression) Crying bouts, insomnia, confusion, depression.

Acne and skin problems are also common.

In this article the review of the various studies showing fluctuations in serum calcium levels during different phases of menstrual cycle & the use of calcium supplementation for relieving the PMS symptoms was done.

Physiological Role of Calcium

It is the essential mineral with much biological importance. It has important role in development of growth of bones and teeth, control of heart beat and blood pressure, transmission of nerve impulses, muscle contraction and relaxation, maintaining membrane integrity and enzyme activation, also for the release of neurotransmitter in the neurons & the central nervous system. It is well known that estrogen which fluctuates during the menstrual cycle also regulates the calcium metabolism & absorption.

Calcium Metabolism

Almost all the calcium in the body (99%) stored in the bone, with only 1% in the extracellular fluid & 0.1% in the intracellular fluid. Normal range of serum calcium is 9-11mg%[5].

Sources

Although the great source of calcium is milk, but it is also can be found in large amount in vegetables, nuts seeds, beans, and fortified foods, wheat, brown sugar, milk powder, almonds, plain yogurt, boiled eggs, orange, white rice. The recommended daily intake of calcium for adult is 1000 mg to 1200 mg.

The absorption of calcium is dependent upon Vitamin D. Vitamin D_3 is converted to active form known as Calcitriol. Calcitriol promotes the synthesis of calcium binding protein needed for calcium absorption. The conversion of vitamin D_3 into calcitriol is done by the parathyroid hormone. So deficiency of PTH hormone also causes calcium deficiency. Normally 99% of filtered calcium is reabsorbed by the tubules with only 1% of filtered calcium is being excreted in urine.[5]

Serum calcium during the menstrual cycle

Multiple studies have shown that calcium level fluctuates in women during the different phases of menstrual cycle.

Thys-Jacobs in 2000 demonstrated that the Ovarian hormones mainly estrogen influences calcium, magnesium and Vitamin – D metabolism [6]. It has been found that estrogen specifically regulates calcium metabolism, intestinal calcium absorption, parathyroid gene expression and secretion, disturbing the serum calcium level during the menstrual cycle.

During the menstrual cycle, estradiol has two peaks, one immediately before the ovulation and second during the luteal phase. Increasing estrogen level would result in falling calcium concentration, but to compensate the falling calcium level, there is marked release of parathyroid hormone to prevent hypocalcaemia [3].

The most likely explanation for the relationship between the ovarian steroid hormones and the calcitropic hormones is that estrogen in particular influence the actions of the calcitropic hormones, specifically parathyroid hormone. Estrogen is be-

lieved to lowers serum calcium by inhibiting bone reabsorption in bone remodeling & promoting bone mineralization. Recent evidences suggest that estrogen has calcium antagonistic properties inhibiting calcium currents and decreasing calcium entry into vascular smooth muscle.[3]

Therefore it has been suggested that women who have already low level of serum calcium and those having some symptoms of PMS are more prone for the further decrease in the calcium level, during the luteal phase of menstruation (Thys-Jacobs 1998).

In further studies Thys-Jacobs observed that there is cyclical fluctuations in calcium regulating hormones during the menstrual cycle. The study found that there is lack of responsiveness in Vitamin D metabolism resulting in a decline in 1, $25(OH)_2$ D during the luteal phase of menstrual cycle which may serve as the biological trigger for the classical features of PMDD.(premenstrual dysphoric disorder[7].

Other studies also exist in support of the association of hypocalcaemia & PMS. In one retrospective study comparing women with confirmed vertebral osteoporosis & controls, researchers found a higher risk of osteoporosis in women with a history of PMS [8].

Calcium supplementation & Relieving of PMS Symptoms

Recent evidences suggest that fluctuations in serum calcium level may be responsible for the pathophysiologic characteristic of PMS [6].

According to a large and well-designed study published in a 1998 issue of American Journal of Obstetrics and Gynecology, calcium supplements are a simple and effective treatment for a wide variety of PMS symptoms. In a double-blind, placebo-controlled study of 497 women, 1,200 mg daily of calcium as calcium carbonate reduced PMS symptoms by half over a period of three menstrual cycles. These symptoms included mood swings, headaches, food cravings, and bloating[2]. Thys- Jacobs et al also reported a significant 50% reduction in symptoms in 33 women with PMS in a double blind, randomized, crossover trail on a daily calcium regimen of 1000 mg[9].

Two clinical investigations have shown that calcium supplementation relieves the symptoms such as irritability, depression, anxiety, social withdrawal, headache and cramps, all part of the symptoms of PMS. Penland and Johnson in 1993 noted that increasing dietary calcium intake in the amount of 1336 mg/day in 10 women also reduced mood, pain and water retention symptoms during the menstrual cycle. Penland's study also suggests that getting enough calcium may help to control the symptoms of menstrual pain also[10].

Further the study conducted by Shailesh et al has found that calcium supplementation effectively alleviates the luteal phase symptoms of PMS. Calcium treatment resulted in an approximately 50% reduction in total mean symptom scores with a significant benefit on symptoms such as depression, mood swings, Headache, irritability & breast engorgement. Calcium supplementation may act by replanting an underlying physiologic deficit, suppressing parathyroid hormone secretion , & ultimately reducing neuromuscular irritability & vascular reactivity[11].

From several small randomized trials by Elizabeth & et al found that calcium supplements to be effective in treating PMS, suggest that high intake of calcium & Vitamin D may reduces the risk of PMS[12].

Cleveland et al (1996) in their studies shows that among menstruating women the mean calcium intake ranged from 607 to 809 mg, suggesting that most of the women at risk of PMS are not taking the recommended intake levels, therefore it is advisable & safe to add 1.0-1.2 mg of supplemental calcium per day in their diet[13].

Puja Dullo in their study observed that serum calcium level decreases during the luteal phase by 7.86% while serum magnesium level increases during luteal phase by 19.45% during the luteal phase.He suggested that the increase Ca^{++}/Mg^{++} ratio may be responsible for PMS complaints[14]. Mauskop A, et al observed that elevated Ca^{++}/Mg^{++} ratios are also associated with the onset of migraine & tension headache[15].

Conclusion

Despite its high prevalence, there is a continuous debate on its pathophysiology and therapeutic supplementation. Few therapeutic modalities such as calcium supplements have proved consistently effective in the treatment of PMS. In the future a therapeutic strategy i.e. Calcium supplementation during premenstrual phase can be used for long term effective treatment. Some studies on the basis of the data concluded that a cause and effect relationship has not been established between the dietary intake of calcium and reduction in the severity of symptoms related to the premenstrual syndrome. Co-ordinated research involving Physiologist, Nutritionist, Gynecologist can make significant difference to health of women those suffering from the premenstrual syndrome in the coming decades. A future would be witness for the proper treatment of these women. Apart from the standard suggestive treatment measures like exercise, relaxation techniques like yoga, music therapy, diet regime, calcium supplementation should form part & parcel of Physicians Prescription. Further intensive research is needed so that this supplementation could be officially recommended as an adjustment therapy.

REFERENCES

1) Singh, BB, Berman, BM, Simpson, R.L. et al, Incidence of premenstrual syndrome and remedy usage: a national probability sample study. Altern Ther Health Med. 4:3, May 1998, 75-9. | 2) Susan Thys – Jacobs MD, Paul Starkey MD, Debra Bernstain, PhD, Jason Tian, PhD, and the Premenstrual syndrome study Group. Calcium carbonate and the Premenstrual syndrome: Effects on Premenstrual and menstrual symptoms. Am J obstet Gyneco1, 1998 , Volume 179,444-52. | 3) Devisetty Aruna, Chandrakala Kambar and Chowdeswari, 'Study of serum calcium and magnesium levels during pre and post menstrual phases in Pre-Menstrual Syndrome, Compared to normal subjects. | International Journal of Basic and Applied Medical Sciences, ISSN – 2277-2103, 2014 Vol 4(1) January-April pp 116-126/ Aruna et al. | 4) Abraham, G.E. 1983. Nutritional factors in the etiology of the Premenstrual tension syndromes, Journal of Reproductive Medicine. 28:446-64 | 5) Textbook of Medical physiology,11th edition ,Arthur C. Guyton, pg no 371,7,372. | 6) Thys- Jacobs,S Micronutrients and The PMS: The cause for calcium. The Journal of American College of Nutrition 2000,19(2) 220-7. | 7) Thys-Jacobs S, Mcmahon et al. Cyclical changes in calcium metabolism across the menstrual cycle in women with premenstrual dysphoric disorder. JCEM The Journal of clinical Endocrinology & Metabolism. Vol. 92 Issue 8 August 1 2007 | 8) Lee,SJ; kanis,JA. An association between osteoporosis and premenstrual & postmenopausal symptoms. Bone & Mineral.24:127-134, 1994. | 9) Thys- Jacobs,S, ceccarelli S, Bierman A, Weisman H, Cohen MA, Alvir J. Calcium supplementation in Premenstrual syndrome: a randomized crossover trial. J. Gen Intern Med 1989-4:183-9 | 10) Penland JG, Johnson PE. Dietary calcium and manganese effects on menstrual cycle symptoms. Am J obstet Gynecol 1993; 168 141723. | 11) Shailesh Sutariya, Nitiben Talsania, Chintul Shah. An Interventional study (Calcium supplementation and Health education) on premenstrual syndrome – Effect on Premenstrual and Menstrual symptoms. National Journal of Community Medicine. 2011 vol. 2 Issue 1. | 12) Elizabeth R , Berton-Johnson ,et. al Calcium & Vitamin D Intake & Risk of Incident premenstrual syndrome. Arch Intern Med.2005;165(11):1246-1252. | 13) Cleveland L,Goldman J, Borrud L 1996.Results from USDA's 1994 continuing survey of food intakes by individuals & 1994 diet & health knowledge survey .Agriculture Research Service ,U.S .Department of Agriculture, Riverdale | 14) Puja Dullo, Neeraj vedi. Changes in serum Calcium, Magnesium and Inorganic phosphorus levels during different phases of the menstrual cycle. J Hum Reprod sci Issue 2 Volume 1 Jul-Dec 2008. | 15) Mauskop A, Altura BT, CraccoRQ,et al . Deficiency in serum ionized Mg but not total Mg in patients with migrane: Possible role of Ca++/Mg++ ratio. Headache 1993;33:135-8. |