

# Magnesium and potassium deficiencies in women with pre-menstrual syndrome

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## Zusammenfassung

Magnesium-Mangel wurde in Frauen mit prämenstrueller Syndrom (PMS) festgestellt. Das Serum-Mg und das Ery-Magnesium wurden in 17 Frauen mit starker PMS gemessen. Diese Resultate bestätigen die Entdeckung von einem intrazellulären Mangel an Magnesium.

Serum-Magnesium

0.748 ± 0.05 mmol/L Normal 0.6–1.2

Ery-Magnesium

1.67 ± 0.08 mmol/L Normal 1.7–2.6

Ery-Potassium

81.69 ± 2.39 mmol/L Normal 80.5–96.5

14 Frauen hatten einen Mangel von Ery-Magnesium und 6 Frauen hatten einen Mangel an Ery-Potassium.

Mangel an Magnesium oder Magnesium und Potassium können auch zu PMS beitragen. Messungen von diesen Mineralien und Korrektur von diesem Mangel können diese Symptome von PMS erleichtern.

## Summary

Magnesium deficiency has been described in women with Pre-Menstrual Syndrome (PMS). Measurement of serum and red cell magnesium levels in 17 women with severe PMS confirms the previous finding of an intracellular deficiency of magnesium.

Serum-Magnesium

0.748 ± 0.05 mmol/L Normal 0.6–1.2

Red Cell-Magnesium

1.67 ± 0.08 mmol/L Normal 1.7–2.6

Red Cell-Potassium

81.69 ± 2.39 mmol/L Normal 80.5–96.5

A total 14 women had depressed red cell magnesium levels (14 subnormal).

In addition red cell potassium levels were also depressed.

Deficiency of magnesium or magnesium and potassium may contribute to PMS.

Measurement of these nutrients and correction of their deficiency may help to alleviate the symptoms of PMS.

## Résumé

Manque de Magnésium été découvert dans les femmes avec le syndrome prémenstruelle (SPM)

Le magnésium sérique et érythrocytaire été mesurés dans 17 femmes avec forte SPM.

Magnésium-sérique

0.748 ± 0.05 nmol/L Normal 0.6–1.2

Magnésium-érythrocytaire

1.67 ± 0.08 mmol/L Normal 1.7–2.6

Potassium érythrocytaire

81.69 ± 2.39 mmol/L Normal 80.5–96.5

14 femme avait un manque de magnésium érythrocytaire. 6 femmes avait un

manque de potassium érythrocytaire. Un

manque de magnésium ou magnésium et

potassium peut contribuer à SPM. Des

mesures de ces minéraux et une correction

de ces manque peuvent amélioré les

symptomes de SPM.

In the United Kingdom the magnesium content of food in the British household food supply averages 249 mgs per day [6]. The intake in relation to energy was 26 mgs/MJ Slightly lower than the average American and Canadian values of 29 and 31 mgs/MJ respectively [7]. This study was undertaken to determine the status of magnesium and potassium in women with PMS in the United Kingdom.

## Subjects

Seventeen women with severe long standing PMS were studied. The age range was 19 to 44 years, average 35.17 years ± 5.67 years. The presence of PMS was assessed by interview and use of questionnaire [1]. All women had been asked to cease using any vitamin and mineral supplements, hormones, tranquilizers and diuretics for at least four to six weeks prior to the study. Many women gave a history of using vitamin, but not mineral supplements, in the preceding one to two years.

Blood samples were taken in the fasting state between 10 and 12 a. m. during the pre-menstrual week.

## Method

Venous blood was taken into vacutainer tubes from the 17 women. Magnesium and potassium levels were estimated in serum as

well as plasma and whole blood by use of a Pye-Unicam PU9000. Flame atomic absorption spectrophotometer with PU9007 computer.

The laboratory and analysis method of *Abraham* [2] was followed. Red cell magnesium and potassium levels were calculated from knowledge of the plasma and whole blood concentrations and the haematocrit value. The haematocrit was measured by standard laboratory methods and the average of three separate samples was used for the calculation.

Normal ranges for serum magnesium, red cell magnesium and red cell potassium have been calculated from previous work by (J. H.) and been in long term use in the laboratory.

**Results**

Results for serum magnesium, red cell magnesium and red cell potassium are given in Tab. 1. All women had normal serum magnesium but 14 of the 17 women (82 %) had depressed red cell levels —  $1.67 \pm 0.08$  mmol/L (normal range 1.7–2.6). Red cell potassium levels were found to be low in six women (35 %)  $81.69 \pm 2.39$  mmol/L (normal range 80.5 to 96.5).

There is no obvious correlation between red cell magnesium and red cell potassium levels in this small group of patients.

**Discussion**

The finding of low red cell magnesium in women from the U. K. confirms that of the American study by *Abraham* [2]. The contribution of magnesium deficiency to pre-menstrual syndrome by its possible effects upon brain biogenic amines, adrenal function and glucose metabolism have been discussed elsewhere [3]. The features of experimental

Tab. 1

	SERUM Mg mmol/L	RBC-Mg mmol/L	RBC-K mmol/L
<b>RESULTS</b>	$0.748 \pm 0.05$	$1.67 \pm 0.08$	$81.69 \pm 2.39$
Normal Range	0.6 – 1.2	1.7 – 2.6	80.5 – 96.5
Patient Range	0.64 – 0.81	1.57 – 1.94	77.8 – 86.7
Number of women with subnormal values	0	14 (82 %)	6 (35 %)

magnesium deficiency include apathy, nausea, loss of appetite and neuro-psychiatric changes [8].

The low red cell potassium in six of the seventeen women is a new finding. Inter-relationship between potassium and magnesium metabolisms in patients with cardiovascular disease has been described [9] and [10]. The low red cell potassium could be secondary to the magnesium deficiency.

The reason for low red cell magnesium (and potassium) include:

1. Poor dietary intake.
2. Reduced absorption from the gut.
3. Increased urinary losses.
4. Impaired intracellular transport.

Poor dietary intake may well be a factor as the magnesium in content is reflected by that in the British household food supply averaged 249 mgs per person per day (mainly women and children). This is compared with the value of 300 to 400 mgs R. D. A. [7]. Furthermore, dietary intakes of magnesium have been estimated to be falling in developed countries [11]. However, a study of post partum women showed no correlation between dietary magnesium intake and the level of magnesium in plasma or erythrocytes [12].

Impaired absorption from the gastrointestinal tract is also a possibility. The factors influencing magnesium absorption have been reviewed [13]. Possible adverse effects can occur because

of a wheat bran fibre and excessive dietary phosphorus. Interestingly oestrogen deficiency has been suspected as increasing intestinal absorption [14]. An artificial or natural menopause increases serum and urinary magnesium levels but had no effect upon red cell magnesium concentrations [15].

Increased urinary losses are another possibility and rare magnesium losing renal diseases have been described [16]. None of the patients had any indication or history of renal disease but it would be worth investigating urinary magnesium losses after an oral and parenteral magnesium loads in such women.

The cellular transportation of magnesium is known to be influenced by vitamin B6 which is often used as a treatment for PMS. Vitamin B6 at a dosage of 100 mgs twice a day for four weeks raised lowered blood cell magnesium in a group of pre-menopausal women who had subnormal values at the beginning of the study [17]. Vitamin B6 at a dosage of 2.3 to 10.4 mgs per day had no effect over a 48 day trial period in a group of normal women who had normal plasma or red cell magnesium levels to start with [18]. A recent study showed no difference between the vitamin B6 status of women with PMS and those without [19] although some 15 % of women in either group had subnormal pyridoxal-5-phosphate levels.

Finally there remains a possibility that there are genetic factors. A rare infantile hypomagnesaemia due to selective malabsorption of magnesium has been described [20]. This was thought to be due to a rare X-borne allele. Heterozygous expression in potential female carriers has not been described but perhaps there is a link with women with PMS and low red cell magnesium levels.

Before drawing any final conclusions as to the magnesium and potassium states of women with PMS it would be important to compare these results with those from a group of healthy menstruating women. Such normal women would need to be free of PMS, gynaecological, renal, hepatic, endocrine or other medical and psychiatric problems, not taking vitamin or mineral supplements, hormones or contraceptives, diuretics and not dieting, losing or gaining weight. Such women may prove hard to find.

In conclusion the finding of low red cell magnesium and potassium levels in British women with severe PMS is interesting and may have important therapeutic consequences. Further study of magnesium intakes, absorption, excretion and cellular transport are required before the reasons for this phenomena can be determined.

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