

A STUDY OF THE SERUM MAGNESIUM IN CASES OF NORMAL NONPREGNANT AND PREGNANT WOMEN IN DIFFERENT TRIMESTERS

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Magnesium was long considered as a microelement with an intermediate biochemical and physiological role. Leroy (1926) considered it to be essential for growth and maintenance of life. The plasma magnesium is maintained within very narrow limits and during the rapid formation of new tissues, the magnesium requirement goes up. Significant variation in magnesium levels have been described in various states of pregnancy, viz., threatened premature labour, habitual abortion, dysmenorrhoea, etc. (Watchorn and McCanee, 1932; Hall, 1957). In spite of the vast literature available, little planned work has been carried out to evaluate the place of this ion in pathogenesis of the above mentioned disorders. The present work has been undertaken to find out serum magnesium levels in normal healthy and pregnant women in all the three trimesters.

Material and Methods

All the women who were subjected to the estimation of serum magnesium were either admitted or were the attendants

of patients admitted in UISE Maternity Hospital, Kanpur. The patients were selected after a thorough general and systemic examination. A detailed history of the age, parity, period of gestation, pain, vaginal bleeding and uterine contractions was taken in pregnant cases.

A total of 53 women were subjected to the estimation of serum magnesium levels. This included 25 non-pregnant normal controls and 28 pregnant cases. In the later group 10 were in the first (up to 12 weeks), 10 in the second (13 to 28 weeks), 8 were (more than 28 weeks) in third trimester of pregnancy.

Serum Magnesium Study

The reproducibility of the results was judged by repeating the test in 8 cases of control series.

5 ml. of blood was collected from the antecubital vein by all glass, autoclaved dry syringe with all aseptic precautions in a clean test tube. It was kept for 2 hours at 37°C and serum was separated by centrifuging it for 10 minutes at 3,000 r.m.p. Samples showing haemolysis were discarded. Colorimetric estimation of serum magnesium was done according to Titan yellow method with a modification that lower concentration of Titan yellow was used in order to reduce the optimal

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density of the blank. Instead of 1 ml. only 0.5 ml. serum was taken and all reagents were taken in half the quantity recommended. Magnesium in the protein free filtrate complexed with Titan yellow in an alkaline medium and the resulting red lake was measured calorimetrically. The serum magnesium level was calculated as mg. per 100 ml. and mEq. magnesium per litre. The mean serum magnesium was calculated in different groups.

Fischer 't' test was applied to test significant and 'P' values were calculated. Other statistical analysis was done whenever required, as will be mentioned in observations.

Observations

The mean serum magnesium level in non-pregnant control group was found to

be 2.097 mg.% \pm 0.056. The range being 1.83 — 2.80 mg.%. Maximum number of non-pregnant cases were in the range of 2-2.4 mg.%. Most of the pregnant women in the first trimester had the similar range as the control group while most of those in the second and third trimester fell in the range of 1.6-2 mg.%.

Commonest age group in all the three categories was 20-25 years. We studied the age and paritywise distribution of all these cases and found that the commonest age group was that of 20-25 years of the women in first and second trimesters were primiparae, whereas women in third trimester were 3rd para.

The differences in the serum magnesium levels in two groups has been statistically significant.

TABLE I
Distribution of Non-pregnant and Pregnant Cases According to Serum Magnesium Levels

Serum Magnesium in mg. %	Non-Pregnant		Pregnant Cases					
	No. of cases	Percentage	Ist Trimester		IInd Trimester		IIIrd Trimester	
			No. of cases	Percentage	No. of cases	Percentage	No. of cases	Percentage
1.2 — 1.6	—	—	—	—	—	—	2	25.00
1.6 — 2.0	9	36.00	4	40.00	7	70.00	4	50.00
2.0 — 2.4	13	52.00	5	50.00	3	30.00	2	25.00
2.4 — 2.8	2	8.00	1	10.00	—	—	—	—
2.8 and above	1	4.00	—	—	—	—	—	—
Total	25		10		10		8	

TABLE II
Serum Magnesium in Non-pregnant and Pregnant Cases

S. No.	Type of cases	No. of cases	Serum magnesium mg.% \pm S.E.	P Value
1.	Non-pregnant (Control)	25	2.097 \pm 0.056	
2.	Normal pregnant	28	1.889 \pm 0.050	<0.05

TABLE III

S. No.	Trimesters	No. of cases	Serum	Magnesium mg. %	P Value
1.	First	10	Range 1.8-2.4	Mean \pm S.E. 2.06 \pm 0.073	
2.	Second	10	1.7-2.1	1.88 \pm 0.042	>0.05
3.	Third	8	1.3-2.1	1.69 \pm 0.104	>0.01

There has been a significant difference in serum levels of magnesium in first and second and first and third trimesters but no significant difference was observed in second and third trimesters.

An attempt was also made to correlate serum magnesium levels with age in non-pregnant controls and normal pregnant women, but no significant observation was made.

Discussion

Mean serum magnesium level in control series (non-pregnant women of child bearing age) was found to be 2.097 mg.% or 1.72 mEq. per litre \pm 0.0556 S.E. with a range of 1.83 to 2.8 mg.%. Our findings have been in close conformity with various workers (Cope and Wolff (1936) 2.06 mg%; Brookfield (1937) 1.78 \pm 0.15 meq./litre). However, there are others who have reported lower levels (Lim. et al (1969): 1.67 \pm 0.14 m Eq./litre; Jain and Singh (1969), 1.94 mg.%) whereas higher values have been reported by Hoffman, (1937), 2.18 mg.%; Zutshi (1966), 1.87 \pm 0.63 m. Eq./litre; Haury (1942) 1.96 \pm 0.16 m. Eq./litre, Chapperwal and Pohowalla (1966) 0.01 m. Eq./litre; Gaikwar (1965), 2.15 \pm 0.20 m. Eq./litre).

There has been no significant change in serum magnesium levels in different age groups and similar reports have been made by Wacker and Vallee (1958) who also did not find any variation in serum magnesium levels in different age groups.

However, Orange and Rhein (1951), have reported higher values in adults (2.27 mg.%) than in infants (2.16 mg.%).

The difference in serum magnesium levels as reported by various authors may be due to seasonal variation as stressed by Banerjee (1964) since his studies were spread over summer and winter months and the subjects were investigated twice. The difference in values could also be because of the different methods employed by different workers. As such it becomes imperative that every laboratory should set up its own standard of normal values and the estimations should be repeated twice to, overcome any variation in serum magnesium levels. The mean serum magnesium level in normal pregnant women was 1.88 \pm 0.05 mg.% (1.55 mEq./litre) while mean values in first second and third trimesters were 2.06 \pm 0.073 mg.% (1.38 mEq./Litre), 1.88 \pm 0.042 mg.% (1.54 mEq./Litre) and 1.69 \pm 0.104 mg.% (1.38 mEq./Litre).

Difference in the serum magnesium levels in normal pregnant and non-pregnant cases has been statistically significant, 'P 0.05. There has not been any significant difference in the serum magnesium values of control group and in first trimester of pregnancy but mean values showed a gradual fall in second and third trimesters of pregnancy. The decrease has been greater from first to second trimester as compared to that from second to third trimester. However, the differ-

ence in serum magnesium values in Ist and IInd and Ist and IIIrd trimesters have been statistically significant, ('P') 0.05 and 0.01 respectively. Our findings have also been supported by number of workers who have also reported a gradual fall in different stages of pregnancy or have found lower serum magnesium values in pregnancy (Rosner and Gorfien, 1968; Dawson *et al* 1969; Lim *et al*, 1969). Hoffman *et al* (1937) have reported a fall during pregnancy which was more prominent around 3rd, 5th and 8th months of pregnancy. Zutshi (1966) reported an increase in the serum magnesium levels in pregnancy as compared with non-pregnant controls. Dawson (1969a) observed no significant alteration in serum magnesium values during pregnancy.

Summary

In the present study, maximum fall in serum magnesium level has been observed in IIIrd trimester of pregnancy with a greater statistically significant difference in Ist and IInd and Ist and IIIrd trimesters than in the IInd and IIIrd trimester. The factors responsible for the depression in serum magnesium levels in pregnancy are still not known. Hall (1957) ascribed this to physiological gestational hypervolaemia but if haemodilution was the cause, the level of all the blood constituents should have been

lower in normal pregnancy which is not true.

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