

SERUM MAGNESIUM CONTENT OF INDIANS

By

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98 adult healthy Indian subjects of both sexes representing all parts of India were investigated for serum magnesium level. Mean values of serum magnesium content of different groups of subjects have been found to be between 2.32 and 2.60 mg per cent. No significant variation of serum magnesium content due to age, sex, and season has been found. The present values are slightly higher than those of other Indian and Western workers. This difference has been discussed.

Importance of magnesium ions is not clearly understood. Magnesium ions are necessary in the enzymatic phosphorylation of glucose which initiates anaerobic glycolysis and also in the keto-acid carboxylations which occur in the citric acid cycle. Helen *et al.* (1947) had shown that there is fall of serum magnesium in diabetic acidosis. Magnesium content of normal individual is maintained at a fairly constant level of 1-3 mg/100 ml of serum indicating its importance in some body functions. Haury (1939) has shown that magnesium causes vasodilation. It has been shown that magnesium competes with available calcium and delays blood clotting in vitro (Greville *et al.*, 1944) and in vivo (Anstall *et al.*, 1959; Huntsman *et al.*, 1960). Recently it has been reported that remission has occurred in sickle-cell anaemia by administration of magnesium which signifies much importance of magnesium ions (Lehmann, 1963; Hugh Jones, *et al.*, 1964). The low serum magnesium and high calcium lead to hyper-excitability and convulsion. There is paucity of data regarding normal serum magnesium content of the cross-section of Indian population. Some work has been done (Kalgi *et al.*, Roychowdhury *et al.*, 1962) in India but none of them testify the normal values of serum magnesium of the cross-section of the Indian population, rather they give normal values of people of particular region only.

In Ludhiana there was the unique opportunity to study the representative population of India coming from different parts of the country. It was therefore undertaken in 1962 in order to establish broad-based average value of serum magnesium content of Indians.

METHODS

98 healthy adult Indian subjects of both sexes comprising of 50 students and 48 officers representing all parts of India (North India - 49%, South India - 16%,

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East India - 19%, West India - 12% and Central India - 4%) were investigated for serum magnesium. Subjects of age-group 18-25 years were investigated both in summer and winter months to note seasonal variation, if any.

The subjects were selected from staff and student population of Christian Medical College, Ludhiana and were healthy individuals as confirmed by medical examination. Their age, sex, dietetic habit, economic status and home address were noted. Anyone giving history of recent illness was excluded.

Height, weight, pulse, respiration rate, oral temperature and blood pressure were noted on the morning before collection of blood. 10 ml of fasting blood was collected in a dry and clean test tube from antecubital vein by a dry autoclaved all-glass syringe after taking proper aseptic measures. Serum was separated by centrifuging for half an hour at 3000 r.p.m. Sample showing haemolysis was discarded. All the investigations were carried out in duplicate and results were rejected if they differed by more than 5 per cent from each other.

Serum Magnesium Estimation: There is more than one method for serum magnesium estimation. Each has its own limitations and advantages. Considering all aspects modified Denis's (1922) method for serum magnesium determination was followed. Values of serum magnesium obtained by this method were compared with those obtained by titan yellow method (Spare, 1962) and they agreed well within variation of ± 5 per cent.

Calcium of serum was removed as oxalate and magnesium was precipitated as magnesium ammonium phosphate and phosphate was estimated by the method of Fiske-Subba Row, (1925). Precipitate was dissolved in 1 ml of molybdate I reagent. 1 ml of molybdate I reagent was added to 3 ml of standard phosphate solution (equivalent to 0.03 mg of magnesium). Colour of unknown and standard was developed with 0.4 ml of amino-naphthol-sulfonic acid reagent. Reading was taken in photo-electric colorimeter at $660 m\mu$ against a blank of 5 ml of distilled water and 1 ml of molybdate I reagent.

DISCUSSION

It is seen from the result in Table I that serum magnesium values of different groups of Indian subjects range between 1.6 and 4.3 mg%. No significant seasonal variation in serum magnesium value has been detected in the subjects of age group 18-25 years who were investigated both in winter and summer. Similarly, no significant difference in serum magnesium value has been revealed between male and female subjects of different age-groups. Average serum magnesium content of Indian male subjects of age group 18-25 years has been found to be 2.44 ± 0.62 mg% in winter and 2.60 ± 0.50 mg% in summer and that of female subjects of the same

TABLE I

Serum Magnesium level of Indian subjects (98 subjects) in winter and summer months

Age-group	Winter						Summer				
	Sex	No. of subjects	Serum magnesium (mg%)				No. of subjects	Serum magnesium (mg%)			
			Range	Mean	SD	SE		Range	Mean	SD	SE
18-25 years	M	26	1.8-4.1	2.44	0.62	0.14	23	1.6-3.5	2.60	0.50	0.05
	F	24	1.8-4.3	2.68	0.80	0.11	22	1.6-2.9	2.32	0.30	0.03
Total		50	1.8-4.3	2.54	0.66	0.07	45	1.6-3.5	2.46	0.44	0.04
26-60 years	M	34	2.0-3.1	2.48	0.22	0.02					
	F	14	2.0-2.7	2.44	0.18	0.03					
Total		48	2.0-3.1	2.46	0.20	0.02					

age group has been found to be 2.68 ± 0.80 and 2.32 ± 0.30 respectively. The male and female subjects of the age group 26-60 years have presented in winter, the same to be 2.48 ± 0.22 and 2.44 ± 0.18 respectively.

The above values are not in complete agreement with the values reported by Kalgi *et al.* (1962). Their values for male and female Indian subjects are 2.41 ± 0.54 and 2.34 ± 0.1 mg% respectively. The above authors, however, did not mention the age range nor the season when the investigation was done. Moreover, there may be some regional difference and some variation due to different methods used for serum magnesium estimation. The present study gives the representative average value for whole of India. Simonsen *et al.*, (1947) reported the average serum magnesium values for western male and female subjects to be 2.06 and 1.98 mg%, and Michael *et al.*, (1951) reported the average value for western subjects of both sexes as 2.27 mg%. Whereas the values of the present investigation as well as the values of Kalgi *et al.*, are somewhat higher than the above.

It is seen from above that for western subjects also there is slight difference in serum magnesium value as obtained by Simonsen *et al.*, and Michael *et al.*, and this difference may be due to more than one reason besides variable factors like, different methods used for estimation of serum magnesium. Slightly higher values of the Indian subjects particularly of the present series may be due to many such variable factors besides racial and geographic difference.

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