SERUM MAGNESIUM LEVELS ASSESSMENT IN POST-OPERATIVE CRITICAL PATIENTS RECEIVING PARENTERAL NUTRITION

Dr. Harjeet Singh[1]

1. Associate professor, Department of Biochemistry, SMS Medical College & Hospital, Jaipur

***Email id of corresponding author: drharjeetsingh26@gmail.com**

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ABSTRACT:

Background: This study is planned to study the alteration in serum magnesium level in patient on parenteral nutrition and also to find out the relation with the duration of parenteral nutrition, which could produce changes in these biochemical parameters. **Material & Methods:** There were 35 subjects included in this study after taking ethical clearance from hospital ethical committee. They will be grouped as Study Group: comprise of 25 patients receiving parenteral nutrition and Control Group: comprises of 10 patients. **Results:** The mean value of serum magnesium level at pre-operative was 1 .54 + 0.375 .On 1st group day of post-operative the mean value of serum magnesium was 1 .29 + 0.430 on 7th day and 14th day of post-operative the mean value was 1.14+0.388 and 1.01 + 0.401. It was observed that the mean value of serum magnesium level was decreasing gradually and significantly ($p<0.001$) as the duration of post-operative was increases. We observed that there was no significant difference in the mean Value of pre-operative and on 1st day of post-operative value of case group with the mean value of control group i.e $P > 0.05$ respectively. **Conclusion:** patients with parenteral nutrition or without supplementation oflipid emulsion the meanvalue of serum magnesium in pre & post-operative patients wasmore or less the same.Longer the duration of the parenteral nutrition More was the incidence of hypo magnesia requiring correction.

Key words: parenteral nutrition, serum magnesium, post-operative critical patients.

INTRODUCTION:

Total parenteral nutrition is a pharmacologic therapy whereby nutrients: vitamins, electrolytes and medications are delivered via central venous route to patients who are unable to tolerate enteral nutrition**(1)**. Prior to the development of parenteral nutrition in the 1960s, critically ill patients often died of malnutrition associated complications**(2)**.In the pre-nutrition support-era, patients either recovered rapidly and resumed eating or succumbed to tile weakening effects of malnutrition such as infection, impaired wound healing and multi-system organ dysfunction.In connection with the clinical observation, the new appreciation that improves premorbid nutritional status and nutrient administration were greatly influence the body's response to trauma and sepsis**(3)**.

The use of parenteral nutrition while controversial in some settings has been accepted as an effective means of sustaining life and promoting recovery in critically ill patients incapable of ingesting, absorbing or assimilating nutrients**(4)**. Total parenteral nutrition has also proved to Minimizing obligate nitrogen loss in the catabolic post injury state improving wound healing,Bolstering immune infection,

Influencing acid-base and Mineral homeostasis**(5)**.

Parenteral nutrition serves as a primary therapy for pure protein calorie malnutrition in such unstressed subjects Total parenteral nutrition increases net protein synthesis and increases body cell mass when combined with physical activity. The role of parenteral nutrition in critically ill patients however is mainly supportive.Total parenteral nutrition administration slows the deterioration of nutritional status which is rapid.in unsupported severely catabolic patients**(6)**.

In the stressed population, parenteral nutrition is capable of promoting visceral protein synthesis to a greater degree than it is able to decrease the breakdown of skeletal muscle. The overall effect is the net diminution but not complete inhibition of protein catabolism.With Today's available means of nutritional support, positive nitrogen balance and skeletal Muscle anabolism are not possible in critically –ill patients owing to their heightened metabolic response and Inactivity**(7)**.

There is no evidence of suggest that energy Balance is beneficial to stressed patients. In severely stressed patients for factor directly promotes the development of malnutrition is immobility, Anorexia, Anabolic in efficiency, increased catabolism. Of these consequences of illness, nutrition support (both enteral and parenteral) can remove the anorectic components from the equation. But has only a limited effect on the others.In this study it is considered that the replenishment is indicated or not indicated as the ultimate outcome in such patients**(8)**.The present study is aimed at assessing the effect of parenteral nutrition on serum magnesium and cholesterol level in post-operative critical patients. In these patients in present practice adequate parenteral nutrition i.e. Carbohydrate, proteins and fats is given regularly along with the monitoring of Sodium and potassium as a protocol,while the calcium is given as and when required.

MATERIALS & METHODS

The study was conducted among patients admitted pre-operatively and post-operatively in surgical ICU of SMS Hospital, Jaipur. There were 35 patientsincluded in this study after taking consent and ethical clearance from hospital ethical committee. They will be divided as Study Group: comprise of 25 patients who receiving parenteral nutrition andControl Group: comprises of 10 patients.Age and sex matched and control groupwasnot received parenteral nutrition. This group was be used only for comparison of findings.The blood sample was withdrawn at different intervals of hospital stay namely Pre-operative patients,onlstpostoperative day, on 7th Post-operative day and 14th Post-operative day respectively.

Biochemical Examination

5ml blood was collected in plain vial from patient admitted pre-operatively and post-operatively in surgical ICU of the SMS Hospital and serum wasseparated. Serum magnesium estimation was done by calmagite method. Principal was magnesium reacts with the blue dye, Calmagite in alkaline Solution to form a red complex. Protein interference and dye precipitation are avoided by including a 9 – ethylene oxide adduct of p-nonylphenol (Bion NE9) & polyvinyl pyrrolidone (Bion PVP).Calcium interference is avoided by preferential combination with EGTA and heavy metal interference is prevented by Cyanide. Measure the absorbence of the standard and test-sample against the blank within 30 Minutes and agains 532 nm**(9)**.

STATISTICAL ANALYSIS

All the findings were entered in a Excel spread sheet on Microsoft Excel 2010. The statistical

analysis was done using the Statistical software package SPSS v22 and Epi Info v7. A p-value <0.05 with 95% confidence intervals were considered statistically significant.

RESULTS

Out of total 11 patients of control group, 7 (63.64%) were males and 4(36.36%) were females. out of the total 31 patients of post-operative group 17 (54.84%) were males and 14 (45.16%) were females. The mean age of controls group patients was 41.54 ±9.83 years where as the mean age of post-operative patients was 46.62 ± 12.97 years. There was no significant difference between the mean age of two groups patients i.e. p >0.05. Out of 31 patients of post-operative group, at pre-operative the serum magnesium level was found to be normal in 19 patients whereas in 6 was found hypomagenesimia and in 6 was found hypermagnesimia.

Table no. 1 Serum magnesium levels pre and post-operative patients

	Preoperative patients	Post-operative patients		
		On 1st day	On 7th day	On 14th day
Normal	19 (61.29%)	13 (41.94%)	10 (32.26 %)	5 (16.13 %)
Hypomagnesimia	6 (19.35%)	15 (48.38%)	18 (58.06 %)	23 (74.19 %)
Hypermagnesimia	6 (19.35%)	3 (9.68%)	3 (9.68%)	3 (9.68%)

On 1st day of post-operative 15 patients hadhypomagnesimia and in 3was found hypermagnesimia.On 7th day of post-operative 18 hadhypomagnesimia and in 3 hadhypermagnesmia.Similarly on 14th day of post-operative 23 patients was found to be hypomagnisimia and in 3 was found to be hypermagnesimia.(**table 1**) It Was obvious that the serum magnesium level in 19 patients was found to be normal pre-operative and out of these 19 only in 5 (26.31%) patients serum magnesium level remains normal after post-operative period upto 14 days whereas out of remaining 14 (73.68%) patients became hypomagnesimic.

The mean value of serum magnesium level at pre-operative was 1 .54 + 0.375 .On 1st group day of post-operative the mean value of serum magnesium was 1 .29 + 0.430 on 7th day and 14th day of post-operative the mean value was 1.14+0.388 and 1.01 + 0.401. It was observed that the mean value of serum magnesium level was decreasing gradually and significantly (p<0.001) as the duration of post-operative was increases.

Table no. 2Mean + SD of serum magnesium in case and control

	Mean ± SD	Mean changes	P value
Control	1.30±0.241		
Pre-operative	1.54±0.375	-	-
Post-operative 1st day	1.29±0.430	0.25±0.226	p<0.001
Post-operative 7th day	1.14±0.388	0.40+0.303	p<0.001
Post-operative14th day	1.01±0.401	0.53+0.338	p<0.001

We observed that there was no significant difference in the mean Value of pre-operative

and on 1st day of post-operative value of case group with the mean value of control group i.e P >0.05 respectively.There was a significant difference between the mean value of serum magnesium of control and 7th day of post-operative case group i.e. P<0.05.(Table 2).

On 1st day of post-operative, the mean value of serum magnesium in both the sex was 1.35+ 0.334 and 1 .21 + 0.512 respectively. On 7th day of post-operative the mean value of serum magnesium in males was 1.21+0.360 and in females was 1.06 + 0.406 and on 14th day themean value of serum magnesium in males was 1.07 + 0.396and in femaleswas 0.95 + 0.398. The mean value of serum magnesium level in malesand females was decreased as the duration of post-operation was increased (table3).

Table no. 3 Mean + SD of serum magnesium among both sex

	Mean ± SD		Mean change		p-Value
	Male (n=17)	Female (n=14)	Male (n=17)	Female (n=14)	
Pre-operative	1 .57 ±0.272	1.5 ±.0.468			
Post-operative 1st day	1.35± 0.334	1 .21 ± 0.512	0.22 ± 0.209	0.29 ±0. 246	>0.05
Post-operative 7th day	1.21±0.360	1.06 ± 0.406	0.36 ± 0.334	0.44 ± .0.265	>0.05
Post-operative14th day	1.07 ± 0.396	0.95 ± 0.398	0.50 ± 0.385	0.55 ± 0.282	>0.05

TheMeanchange inserum magnesium level from pre-operative to various period of Pestoperative the mean change in serum magnesium level in male and female was 0.22 + 0.209 and 0.29 +0.246respectively. There was no Significance difference inmean change in serum magnesium level in both the sex i.e. p>0.05 on 7th day of post-operative the mean change in serum magnesium level in male was found to be 0.36 + 0.334 and in female was 0.44 + .0.265 but no significance difference was observed i.e. P > 0.05.Similarly on 14th day of postoperative the mean change was observed to be 0.50 + 0.385 in male and 0.55 + 0.282 in female. There was no significant difference in the mean change of serum magnesium in both male and female (table 3).

DISCUSSION

All critically ill patients admitted in ICU required a detailed nutritional assessment to notify who is likely to benefit from nutrition support and whether nutrition is to be provided via enteral route, parenteral route or a combination**(10)**. Three main principal criteria's predict, the need for nutrition support, current nutritional status (i.e. body composition) and the approximate duration of inadequate nutrient intake and presence of the stress responses**(11)**.

It is most commonly observed that majority of critically ill patients are malnourished, and are unable to eat for long durations and have aelevated systemic inflammatory response, most of them will require any kind of nutritional support**(12)**. Little is known of the attention in magnesium metabolism in pre-operative& post-operative critically ill patients.In the present investigations, serum magnesium & serum cholesterol have been studied.In the control: group the serum magnesium ranged from 1.0 mg% to 1.75 mg% with the Mean value of 1.39 mg%.

As we compare the mean values of serum magnesium of control group (1.30 + 0.241) with: the pre-operative and post-operative mean value of serum magnesium of case group. We observed that there was no significant difference in the mean Value of pre-operative and on 1st day of post-operative value of case group with the mean value of control group i.e P >0.05 respectively. Also be compare the mean value of serum cholesterol of control group with the mean value of pre-operative and post-operative of case group. It was noted that there was no significant difference was observed in the mean value serum cholesterol of control group with the mean value of pre-operative and post-operative of case group i.e. P>0.05.

The range of serum magnesium for normal healthy subjects was reported by earlier workers was 1.8 to 2.5 mg% among 88 healthy men and women aged between 18 and 66 years (Gullestad et al 1994),(13) 1.7 to 2.6 mg% among 106 apparently healthy subjects aged between 15 and 80 years(BG Danielson et al 1979), (14) & on Postoperative magnesium metabolism Sawyer & Drew found that the range of serum magnesium was 1.8 to 2.6 mg% **(15)**.

A study conducted by Speich M et al studied 34 normal men, ages 38 to 75 years (mean age,57.1), and 12 normal women, ages 38 to 75 years (mean age,52.1), who had been hospitalized and whose clinical and biologicalexaminations showed no indication of metabolic, cardiac, or vascular disease found that the range of serum magnesium was 1:8 to 2.5 mg%(1.5 to 1.9 mEq/L) **(16).**

In the preoperative patients the serum magnesium ranged from 1 .29 to 1.84 mg% with mean value of 1.54 mg%. A comparison of the serummagnesium level shows that 61.29% of the pre-operative patients give serummagnesium within the normal range. While 19.35% shows elevated and l6.35% showed decreasedMagnesium levels.Variability of serum magnesium in patients on parenteral nutritional isreported in the literatures. A number of earlier workers have reported low levels of serum magnesium in diabetes **(17)**. Jackson & Meir 1968 studied Serum magnesium levels were determined by atomic absorption spectrometry on 5,100 consecutive patients seen at a diagnostic clinic. The average value was 1.78 ± 0.15 mEq/liter with 90% of the values between 1.53 and 1.99 mEq/liter**(18)**.

Low levels of serum magnesium in pre-operative and post-operativehas been reported due to malnutrition, because during stay in ICU, patientswere only on parenteral nutrition. These patients were having nothing bymouth. According to literature the sources of magnesium is only external.pavel et al reportedthatobserved Plasma magnesium correlated negatively with blood glucose.There was a positive correlation between urinary glucose and magnesium excretion**(19)**.

To sum up, the result of the present studygives a glimpse of the fact that results suggests negative Correlation between serum magnesium and post-operative duration. Study results cannot be generalised because of small sample size of present study there is aneed of elaborative research on this field because it has wide scope toreduce the morbidity and mortality hence for furtherelaborative studies needed because of our limited resources.

CONCLUSION

We concluded from the present study thatin patients with parenteral nutrition or without supplementation oflipid emulsion the meanvalue of serum magnesium in pre & post-operative patients wasmore or less the same.Longer the duration of the parenteral nutrition Morewas the incidence of hypo magnesia requiring correction.In present study there is negative correlation was observed between serummagnesium and post-operative duration.

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