

# Level of Magnesium in Patients with Arrhythmias

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## ABSTRACT

**Background:** In literature many practical methods leading fewer complications were used to treat post surgical arrhythmias. There exist a controversy for magnesium (Mg) sulfate effectiveness in protecting post op arrhythmias. Many studies highlight its effective role and others are with unsolved questions.

**Aim:** To assess the Mg levels among patients with arrhythmias and its effective role.

**Methods:** The study design opted for the present research was observational cross section, where the cardiac patients were assessed for the levels of Magnesium in their blood serum at three points. The study duration was of six months from janurary to june 2017. The venue of the study was Faisalabad institute of cardiology, faisalabad . The exclusion criteria include all patients with renal failure, past surgical history and valvular heart disease whereas all the patients of both genders above 18 years of age with normal sinus rhythms of coronary artery bypass grafting (CABG) were included in this study.

**Results:** A total of 80 patients were recruited for this study. The mean age of the patients was  $54\pm 8.9$  with range 18-60. 25(31.3%) of the patient were in the age category of 36 to 45. Whereas 15(18.7%) belong to 18-35 and 40(50%) were above and equal 45 years of age. 52(65%) of the patients were male and 28(35%) were females. One patient reported complication because of high serum Mg level, and with Long CPB duration. But the level dropped to 3.5 and 5.3mg/dl on second point (ICU admission) and 3rd point (1st day post operative) respectively.

**Conclusion:** We may conclude a relation between serum Mg levels and the postoperative arrhythmias. The dose of supplemental Mg sulfate shows a defending role in arrhythmias occurrences.

**Keywords:** Coronary artery bypass graft (CABG), atrial fibrillations (AF), intensive care unit (ICU),

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## INTRODUCTION

After Coronary artery bypass graft (CABG) surgery the commonest complication is the atrial and ventricular arrhythmias. It doesn't elevate the mortality risk of patients, due to the occurrence of atrial fibrillations (AF) in common. However it may increase the intensive care unit (ICU) stay length and duration of hospitalization<sup>1,2</sup>. The factors involved in developing AF include, chronic pulmonary disease, any previous AF history, cross clump time and few others<sup>3</sup>. In addition ACE inhibitors and B blockers has protecting role against AF<sup>4</sup>. In literature many practical methods leading fewer complications were used to treat post surgical arrhythmias<sup>5,6</sup>. There exist a controversy for magnesium (Mg) sulfate effectiveness in protecting post op arrhythmias. Many studies highlight its effective role and others are with unsolved questions<sup>7-11</sup>. The main aim of the study was to assess the Mg levels among patients with arrhythmias and its effective role.

## MATERIAL AND METHODS

The study design opted for the present research was observational cross section, where the cardiac pts

were assessed for the levels of Magnesium in their blood serum at three points, a) immediately after anesthesia induction b) on ICU admission post operatively and c) on first day morning post operatively. The study duration was of six months from January to June 2017. The venue of the study was faisalabad institute of cardiology , faisalabad . The exclusion criteria include all patients with renal failure, past surgical history and valvular heart disease whereas all the patients of both genders above 18 years of age with normal sinus rhythms of coronary artery bypass grafting (CABG) were included in this study. Firstly the patient was observed for the first three days of surgery for supraventricular and ventricular arrhythmias. On appearing any kind of arrhythmias, paramedics reported the appearance and a physician visit confirm for the 12 lead ECG. Thus two groups formed on appearance and non-appearance of arrhythmias i.e. group A with arrhythmias and group B with no arrhythmias. All the adverse effects related to Mg level elevation were noted. Demographics information along with diagnostic history of all the participants was collected. All the required diagnostic values were collected from the blood samples by following their standard operating procedures in hospital laboratory. An informed consent was also taken from the patients or attendant of the patient. Ethical consideration was taken in to account by taking approval Hospital ethical Committee.

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**Statistical analysis:** All the collected data was stored electronically & analyzed later by using SPSS version 20. Descriptive statistics were applied to calculate mean and standard deviation. Frequency distribution and percentages were calculated for qualitative variables like gender, Mg level etc. Association/ correlation test was applied to draw inferences. Over all a P values less than 0.05 was considered statistically significant.

## RESULTS

Table 1: The baseline characteristics of HE patients.

Characteristic	n(%)
n	80
Mean Age +SD	54±8.4
Male to female Ratio	2:1
History of COPD	3(3.7%)
History of CHF	12(15%)
Involvement of RCA	65(81.3%)
Cross Clamp Time	48 min
Mean Administration Mg	2.6 g

Table 2: Detailed summary of Mg level and arrhythmia

n (total)	24(30%)		
AF	6 (7.5%)		
Ventricular	14(17.5%)		
Other SVA	12(15%)		
<b>Mg level in blood serum (mg/dl)</b>			
1 <sup>st</sup> point (at beginning)	2.1±0.6		
2 <sup>nd</sup> Point (ICU arrival)	2.5±0.5		
3 <sup>rd</sup> Pont (First post-op day)	2.4±0.6		
Group wise Mg level mg/dl	<b>Point 1</b>	<b>Point 2</b>	<b>Point3</b>
Group A (with Arrhythmia)	2.3	2.5	2.5
Group B (w/o arrhythmia)	2.1	2.5	2.3
<b>Mg Level (mg/dl)</b>			
	<b>Point 1</b>	<b>Point 2</b>	<b>Point3</b>
Among ventricular arrhythmia	2.3	2.5	2.5
Among without ventricular arrhythmia	2.1	2.5	2.3
<b>Mg serum Level (mg/dl)</b>			
AF with SVA	1.8	2.3	2.0
AF without SVA	2.2	2.6	2.5
<b>Hypomagnesaemia patients (Serum Mg level &lt;1.5mg/dl)</b>			
1 <sup>st</sup> point (at beginning)	6		
2 <sup>nd</sup> Point (ICU arrival)	4.5		
3 <sup>rd</sup> Pont (First post-op day)	2		

A total of 80 patients were recruited for this study. The mean age of the patients was 54±8.9 with range 18-60. 25 (31.3%) of the patient were in the age category of 36 to 45. Whereas 15(18.7%) belong

to 18-35 and 40(50%) were above and equal 45 years of age. 52(65%) of the patients were male and 28(35%) were females. More of the patients' characteristics were given in table 1.

One patient reported complication because of high serum Mg level, and with Long CPB duration. But the level dropped to 3.5 and 5.3mg/dl on second point (ICU admission) and 3rd point (1st day post operative) respectively. Although the patient was feeling weak with hypotension, the probable reason might be the long CPB duration and intake of post op inotrope. More the arrhythmia types and mg levels among groups was given in table 2.

## DISCUSSION

The study was planned to determine the serum Magnesium level among patients with arrhythmias. We not only report various Mg values but also observed that the patient age and male to female ratio is less as compared to other published studies<sup>12-15</sup>. The occurrence of AF is usually at higher ages among other published studies [3,16] but in our study we never observed any significant difference among age categories. We reported in our study that there is no significant correlation among AF and CHF/COPD history, involvement of right coronary artery and cross clamp time. Similar findings were published in a study conducted by Kohno et.al and Nurozler et.al<sup>13,17</sup>. We observed in our study that the serum Mg level elevated under controlled range following surgery. Also the average Mg level on point 3 was reduced and no significant difference preoperatively. We reported lower postoperative Mg levels than preoperative in patients who received intra-operative Mg sulfate supplemental. This finding is confirmed by other literature<sup>9,18-19</sup>. In post CBP stage, we found decrease in Mg serum levels at point 3 reading. This decrease might be due to the contribution of various etiologies like, following myocardial hypoxia, ionized Mg chellation with heparin or blood preserving solution in case of allogeneic transfusion<sup>20,21,22</sup>. We reported no difference of Mg serum levels post operatively among patients with or without AF in our study. The measure was in normal range between both categories. No significant variances were observed in 2<sup>nd</sup> and 3<sup>rd</sup> time Mg levels in patients with ventricular arrhythmias, but the levels are high as compared to those without arrhythmia<sup>9,18,23,24,25</sup>. The clinical importance reduced due to the Mg normal ranges among all cases. This idea is supported by the fact of lack of significance difference among groups with three different times. Currently no studies in the local population and also fewer in number for others related to the administrative role of Mg sulfate by using bolus doses as we present in our study.

Evidence available to confirm the earlier statement<sup>26</sup>. In few other studies using the same doses post surgical ventricular arrhythmias was decreased compared to control group<sup>8,19,27</sup>.

## CONCLUSIONS

We may conclude a relation between serum Mg levels and the postoperative arrhythmias. The dose of supplemental Mg sulfate shows a defending role in arrhythmias occurrences.

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