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## THE EFFECT OF VARIOUS DOSES OF MAGNESIUM SULFATE ON INTRAOPERATIVE SEDATION AND RECOVERY DURING CATARACT SURGERY

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### ABSTRACT

**Background:** The selection of sedative method for cataract surgery which is mostly done for adults is more favored. In this study, we compared various doses of magnesium sulfate for improving the quality of anesthesia and recovery during Cataract surgery.

**Materials and Methods:** In this clinical trial, 150 patients candidate for Cataract surgery were studied in five groups of 30 individuals that 0(group 0), 10(group 10), 20(group 20), 30(group 30) and 40(group 40) mg/kg intravenous Magnesium Sulfate were added to the first to fifth groups at the onset of anesthesia in the common anesthetic method respectively. The consumption doses of sedatives and narcotics (Midazolam, Fentanyl and Propofol), hemodynamic, and respiratory variables during the surgery, and the incidence rate of pain, shivering, nausea and vomiting and the level of surgeon and patients' satisfaction were studied in all groups.

**Results:** 1) Demographic, hemodynamic and respiratory variables had no significant difference between the five groups. In the group 30 and 40, the consumption dose of Midazolam, Propofol and Fentanyl was considerably less than that in other groups ( $P < 0.001$ ). 2) The highest and lowest levels of satisfaction in patients and physicians were recorded in the group 30 and respectively ( $P < 0.001$ ). 3) None of the patients suffered from postoperative shivering. 4) The incidence of other complications including nausea, vomiting and pain at time of discharging from the operating room had no significant difference between the 5 groups.

**Conclusions:** Using Magnesium Sulfate, especially with the dose of 30 and 40mg/kg caused a significant reduction in need for sedative and narcotic drugs and increased satisfaction in patients and surgeons as well as minimal hemodynamic and respiratory effects during and after cataract surgery.

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### Introduction

Cataract surgery is the most common eye surgery all over the world. Most patients undergoing this operation are elderly and have underlying diseases. During surgery, relaxation and immobilization are required which needs adequate anesthesia

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[1]. Using specific anesthesia method causes fewer complications accompanied with more effectiveness and economic justification compared to the general anesthesia. Low dose of Narcotic, Benzodiazepine and Propofol are usually used for anesthesia [2]. In these patients, on one hand lack of adequate anesthesia which leads to patients' difficulties in motion and restlessness can be mentioned as anesthesia complications while on the other hand, much anesthesia, apnea and hemodynamic drop can be mentioned [3]. Now taking narcotic drugs as analgesia is restricted due to the incidence of serious complications in patients undergoing Cataract surgery who are usually elderly individuals. Thus, adding adjunct drugs to the program of anesthetic drugs in this surgery seems useful [3]. Magnesium Sulfate is an electrolyte replacement that is used as anti-seizure, Tocolytic and anti-arrhythmia drug [4] and today, its effect on anesthesia is under study. Based on the conducted studies, it has been determined that in most adults, Magnesium Sulfate can reduce the consumption dose of required anesthetic drugs and pain, shivering, nausea and vomiting during and after surgery [7-11]. Another problem of cataract surgery is the incidence of postoperative nausea and vomiting due to the anesthetic drugs [12]. Several studies have also shown that Magnesium Sulfate reduces the incidence rate of postoperative pain and nausea and vomiting [13, 14]. Also, Magnesium Sulfate causes shivering in the recovery room by an unknown mechanism [5]. Because cataract surgery is generally not associated with a lot of pain and due to the limitation of taking narcotics during surgery, Magnesium can be used. Most papers have evaluated the effect of Magnesium as intrathecal or intravenous processes for reducing postoperative pain and nausea in the recovery room [15-19].

So far, no extensive research has been done on the role of Magnesium in analgesic techniques; accordingly, finding proper doses of Magnesium drug with the best effectiveness and least complications from its injection as an analgesic drugs seems quite essential. Furthermore, given the multiple effects of Magnesium on the cardiovascular and hemodynamic system and also, its role in control of pain and reducing nausea and vomiting and postoperative shivering, this study was conducted with the aim of determining the effect of various doses of Magnesium Sulfate on Cataract intraoperative sedation and finding its appropriate dose compared to the 0mg group.

### Materials and Methods

In this randomized and double blinded with control group clinical trial, after approval from Medical Research and Ethics Committee of the University and obtaining an informed patient consent, all patients who were candidate for cataract surgery under topical anesthesia with Tetracaine drop enhanced by sedation and analgesia were included in the study. Other inclusion criteria of patients into the study was as follows: age span below 75 years old and American society of Anesthesiologists (ASA) physical status I-II, no limitation to take Magnesium Sulfate, and lack of sensitivity or addiction to Opioids and or Benzodiazepines or Propofol. The sample size was determined using the estimation formula of sample size to compare the means and considering the confidence level of 95% ( $Z_{1-\alpha/2}=1.96$ ), test power of 80% ( $Z_{1-\beta}=0.84$ ) and standard deviation of the anesthesia estimated about 1.1 and the minimal significant difference between groups with the rate of at least 0.8 was determined for 30 patients in each. Before the study began, a random number table was used to generate a randomized schedule specifying the group to which each patient was assigned upon entry in to the trial. In case of exclusion, the next patient was randomized per schedule. The demographic characteristics of each patient were first asked and recorded in a particular questionnaire. In five groups, 0, 10, 20, 30 and 40mg/kg Magnesium Sulfate were respectively added to patients as bolus at the onset of anesthesia in the common anesthetic method (Midazolam, Fentanyl and Propofol). In all groups Magnesium Sulfate was diluted with sterile normal saline to give 10 ml solutions and the patients in group 0 received 10cc sterile Normal saline solution instead of Magnesium Sulfate. Hemodynamic parameters including systolic, diastolic, and mean arterial blood pressure, heart rate, respiratory rate and arterial oxygen saturation (spo<sub>2</sub>) of patients just before surgery and at 5th, 10th, 15th and 30th minutes and in the recovery room each 15 minutes to discharging to the ward were recorded by someone who was not aware of the group type of the patients, and consumption dose of anesthetic and narcotic drugs including Midazolam about 25 to 50 mg/kg (milligram per kilogram of patient body weight) every 10 to 15 minutes, Fentanyl about 1-2 microgram/kg every 10 to 15 minutes and finally, if necessary, Propofol about 30 to 60 microgram/kg every two minutes to achieve Ramsay sedation score 3 and fixing in this score were measured in each group. Questions about surgeons (at the end of surgery) and patients' (at the time of discharging from recovery room) satisfaction were asked and recorded using the following- Totally satisfied, satisfied, unsatisfied. Intensity of pain and nausea and vomiting was done with visual analogue scale (VAS, ranges 0-10 cm) and in the case severe pain (VAS > 3), intravenous pethidine with dose of 0.5mg/kg was injected intravenously. When vomiting or marked nausea (VAS > 3) was observed, intravenous ondansetron with dose of 0.1mg/kg was injected. Also shivering and the length of staying in the recovery room using the Modified Aldrete Score > 9 were evaluated in five groups and recorded in the study questionnaire. After collecting data, using SPSS software version 22 and Chi-square test, one-way ANOVA, and ANOVA with repetition of consumption and Kruskal-Wallis test, the study data were analyzed.

### Results

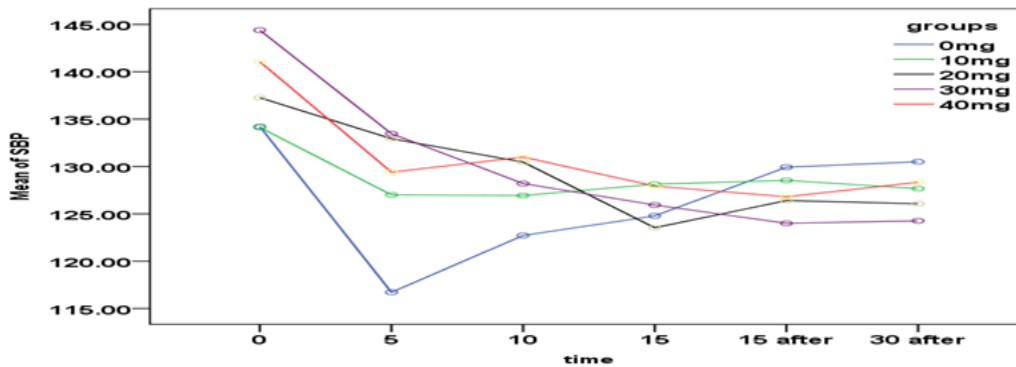
We performed a double blind, prospective, randomized clinical trial to assess the effect of various doses of Magnesium Sulfate on quality of cataract intraoperative sedation and recovery. One hundred and fifty patients were studied in five groups. In Table 1, the distribution of patients' demographic information is given. According to the tests of ANOVA, chi-

square and Fisher's exact test, the distribution of demographic variables had no significant difference among five studied groups ( $P>0.05$ ).

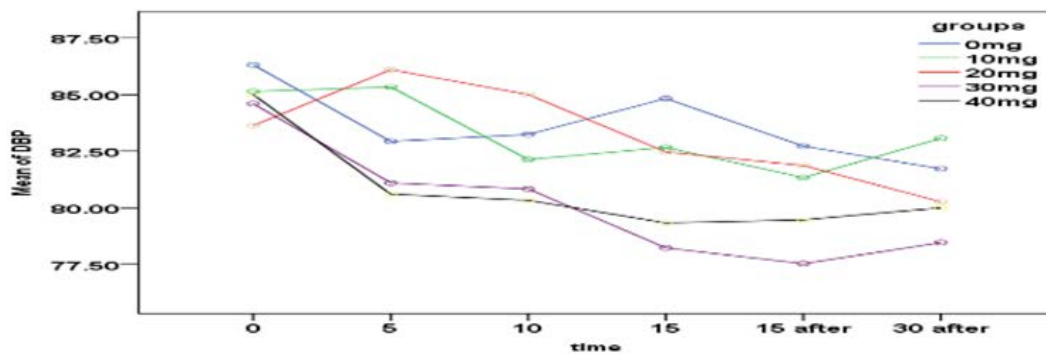
**Table 1.** Distribution of demographic variables in 5 groups

| Table 1: Distribution of demographic variables in 5 group Variable | Group Level | 0mg      | 10 mg     | 20 mg    | 30 mg     | 40 mg    | P-value |
|--|-------------|----------|-----------|----------|-----------|----------|---------|
| Age (year)   | Mean        | 9±63.1   | 11.8±61.5 | 8±60.4   | 10.5±61.4 | 6.7±65.7 | 0.23    |
| Sex  | Male (N)    | 16(53.3) | 16(53.3)  | 14(46.7) | 16(53.3)  | 24(80)   | 0.08    |
|  | Female (N)  | 14(46.7) | 14(46.7)  | 16(53.3) | 14(46.7)  | 6(20)    |         |
| ASA  | I           | 16(53.3) | 16(53.3)  | 14(46.7) | 14(46.7)  | 14(46.7) | 0.96    |
|  | II          | 14(46.7) | 14(46.7)  | 16(53.3) | 16(53.3)  | 16(53.3) |         |
| Weight   | Kg          | 8.3±72.9 | 9.5±71    | 8.8±71.7 | 8.5±72.3  | 9.3±72.3 | 0.93    |
| Smoking  | Yes         | 2(6.7)   | 4(13.3)   | 6(20)    | 2(6.7)    | 8(26.7)  | 0.12    |
|  | No          | 28(93.3) | 26(86.7)  | 24(80)   | 28(93.3)  | 22(27.3) |         |
| Drug abuse   | Yes         | 2(6.7)   | 2(6.7)    | 4(13.3)  | 0(0)      | 8(26.7)  | 0.09    |
|  | No          | 28(93.3) | 28(93.3)  | 26(86.7) | 30(100)   | 22(73.3) |         |

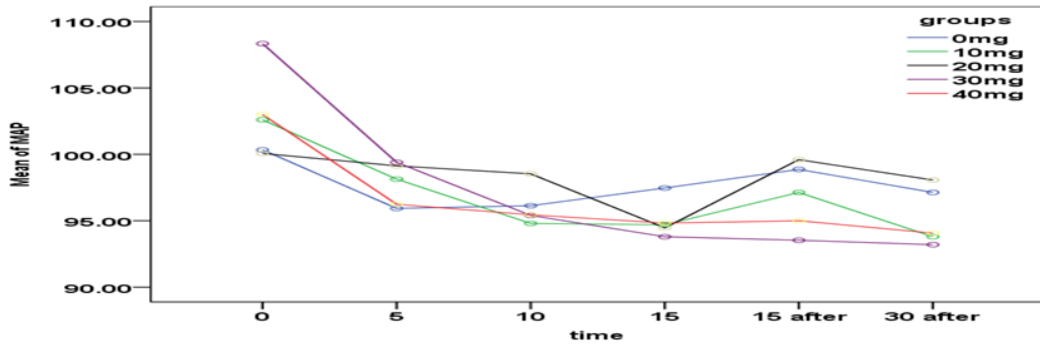
In diagrams 1-6, the mean hemodynamic parameters of patients in the five groups are shown at 5, 10 and 15 minutes during surgery and 15 and 30 after surgery. According to ANOVA with repeated observations, the mean hemodynamic parameters had no significant difference in the five mentioned groups ( $P>0.05$ ) while the mean systolic blood pressure has had more drops in the group 0 at the 5th minute and also, heart rate in groups 20, 30 and 40 was higher than the other groups at the 5th minute



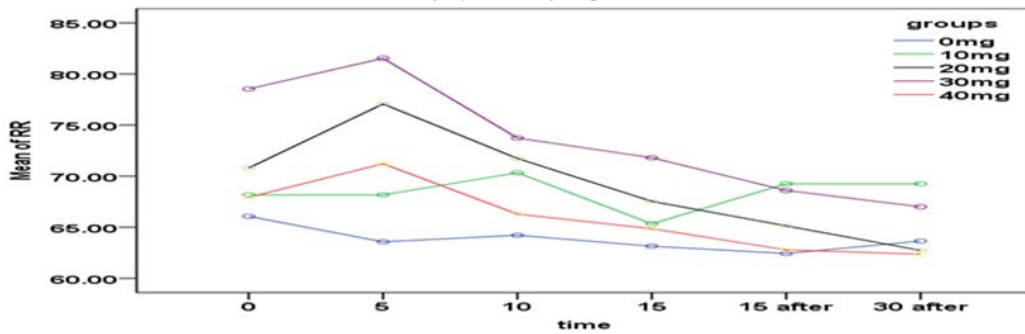
**Diagram 1.** The mean and standard deviation of systolic blood pressure at 5, 10 and 15 minutes during surgery and 15 and 30 after surgery in five groups ( $P=0.72$ )



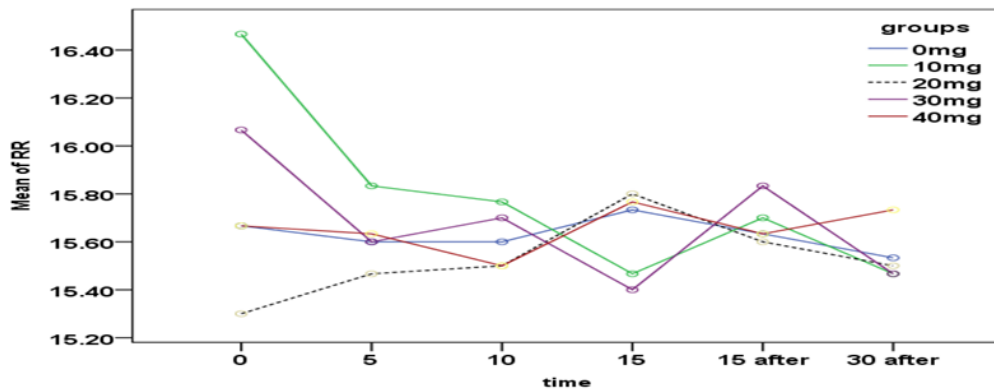
**Diagram 2.** The mean and standard deviation of diastolic blood pressure at 5, 10 and 15 minutes during surgery and 15 and 30 after surgery in five groups ( $P=0.1$ )



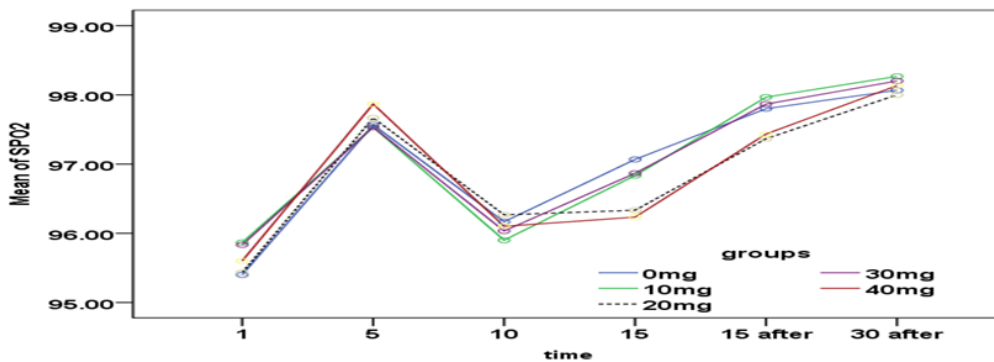
**Diagram 3.** The mean and standard deviation of arterial blood pressure at 5, 10 and 15 minutes during surgery and 15 and 30 after surgery in five groups (P=0.95)



**Diagram 4.** The mean and standard deviation of heart rate at 5, 10 and 15 minutes during surgery and 15 and 30 after surgery in five groups (P=0.07)



**Diagram 5.** The mean and standard deviation of respiratory rate at 5, 10 and 15 minutes during surgery and 15 and 30 after surgery in five groups (P=0.12)



**Diagram 6.** The mean and standard deviation of Spo2 at 5, 10 and 15 minutes during surgery and 15 and 30 after surgery in five groups (P=0.47)

According to Table 2, the amount of taking Midazolam, Propofol and Fentanyl in the groups 30 and 40 was significantly lower than that in other groups ( $P < 0.001$ ). On the other hand, the consumption dose of the above-mentioned drugs was significantly more in group 0 ( $P < 0.001$ ). The highest and lowest level of patients' and physicians' satisfaction was in the group 30 and 0, respectively ( $P < 0.001$ ). In terms of the incidence of postoperative complications, none of the patients experienced postoperative shivering. 2 case (6.7%) in group 0, 3 cases (10%) in group 10 and 1 case (3.3%) in group 20 suffered from postoperative significant nausea and vomiting and Ondansetron use while in the other two groups, no significant nausea and vomiting and Ondansetron use was observed and the difference among five groups was not significant ( $p = 0.31$ ). Also, 1 case (3.3%) in group 0, 2 cases (6.7%) in group 10, 2 cases (6.7%) in group 20, 1 case (3.3%) in group 30, and 1 case (3.3%) in group 40 had postoperative mild pain (VAS less than 3) and difference among the five groups was not significant ( $P = 0.99$ ). The mean length of staying in the recovery room is presented in Table 2. According to ANOVA, no significant difference was observed among the 5 groups in this regard ( $p = 0.76$ ).

**Table 2.** Drug use, satisfaction and postoperative complications in the five studied groups

| Variable                           |                          | 0mg        | 10 mg      | 20 mg      | 30 mg     | 40 mg     | P-value |
|------------------------------------|--------------------------|------------|------------|------------|-----------|-----------|---------|
| Midazolam(mg)                      |                          | 2±0        | 0.13±1.97  | 0.01±2     | 0.48±1.33 | 0.5±1.6   | <0.001  |
| Propofol(mg)                       |                          | 27±75.3    | 30.7±47    | 36.5±64    | 36.3±29.3 | 32.8±21.3 | <0.001  |
| Fentanyl(µgr)                      |                          | 51.4±116.7 | 29.2±113.3 | 17.3±106.7 | 24.9±80   | 17.3±93.3 | <0.001  |
| Patient's satisfaction             | Totally Satisfied (Nr-%) | 3(10)      | 2(6.7)     | 2(6.7)     | 8(26.7)   | 12(40)    | 0.003   |
|                                    | Satisfied (Nr-%)         | 23(76.6)   | 26(86.7)   | 25(83.3)   | 22(73.3)  | 18(60)    |         |
|                                    | Unsatisfied (Nr-%)       | 4(13.33)   | 2(6.7)     | 3(10)      | 0(0)      | 0(0)      |         |
| Doctor's satisfaction              | Totally Satisfied (Nr-%) | 2(6.7)     | 2(6.7)     | 2(6.7)     | 8(26.7)   | 12(40)    | 0.001   |
|                                    | Satisfied (Nr-%)         | 22(73.4)   | 26(86.6)   | 20(66.7)   | 22(73.4)  | 14(53.3)  |         |
|                                    | Unsatisfied (Nr-%)       | 6(20)      | 2(6.7)     | 8(26.7)    | 0(0)      | 2(6.7)    |         |
| Shivering (Nr-%)                   |                          | 0(0)       | 0(0)       | 0(0)       | 0(0)      | 0(0)      | 1       |
| Nausea & Vomiting (Nr-%)           |                          | 2(6.7)     | 3(10)      | 1(3.3)     | 0(0)      | 0(0)      | 0.31    |
| Post-operative pain (Nr-%)         |                          | 1(3.3)     | 2(6.7)     | 2(6.7)     | 1(3.3)    | 1(3.3)    | 0.99    |
| Use of Ondansetron (Nr-%)          |                          | 2(6.7)     | 3(10)      | 1(3.3)     | 0(0)      | 0(0)      | 0.31    |
| Duration of stay in recovery(min.) |                          | 35.2±97.7  | 32.1±91.7  | 32.5±91    | 36.2±99   | 34.11±90  | 0.76    |

## Discussion

According to the results obtained from our study, patients who did not receive Magnesium Sulfate or received its low concentration, received relatively high doses of Midazolam, Fentanyl and Propofol; while by increasing the concentration of Magnesium Sulfate, the rate of Propofol and opioid intake was reduced. Other conducted studies have also shown that using Magnesium Sulfate as premedication can reduce complications and severity of postoperative pain. In a study by Gupta et al, the effect of infusing Magnesium Sulfate on postoperative pain and requiring postoperative opioid was studied in the surgery under general anesthesia in which the need for opioid for pain relief in the group receiving Magnesium Sulfate was significantly lower than that in 0mg group [7]. Also, in the study conducted by Steinlechner et al, the use of Magnesium Sulfate as premedication in patients undergoing cardiac surgery was associated with reducing postoperative pain and complications [8]. In a study by Seyhan et al, various doses of Magnesium Sulfate was used in gynecological surgery where the dose of using opioid and pain intensity in 0mg group was more than that in patients receiving Magnesium Sulfate [9]. In the study by Tauzin et al, the effect of different doses of Magnesium Sulfate on postoperative pain and complications in patients undergoing abdominal surgery was also evaluated in which patients receiving higher dose of Magnesium Sulfate had less postoperative pain intensity and need for opioid was lower [11]. Based on the results of our study, all patients receiving 30mg and 40mg of Magnesium Sulfate were satisfied with the applied method. Also, in the group receiving 30mg and 40mg of Magnesium Sulfate, a more number of surgeons were satisfied with the applied method and dissatisfactory cases were related to patients in 0mg group and patients with low dose of Magnesium Sulfate. Our data showed that hemodynamic parameters such as blood pressure, heart rate, respiratory rate and arterial blood oxygen saturation were not significantly different between the five groups during the study period ( $P > 0.05$ ). In addition, no case of hemodynamic instability and respiratory difficulty were seen in the five groups. However, the mean systolic blood pressure had more drop at 5 minutes in group 0. Although it was no significant it could be due to more consumption of anesthetic and narcotic drugs. At 5 minutes, mild increase in heart rate in groups 20, 30 and 40 was higher than that in other groups. In group 10, there was no change and in group 0, it reduced. This could be due to the direct effect of Magnesium Sulfate on Vagus nerve ability on heart however through reducing sympathetic ability, the indirect effect of anesthetic and narcotic drugs causes to drop in heart rate and systolic and diastolic blood pressure at the onset of the effect and patient's expectation for the surgery [6]. This effect can be important in patients; especially those who cannot tolerate changes in Bradycardia or that increasing hear rate is dangerous for them. On the other hand, postoperative complications such as shivering were not observed in any of the

studied groups and pain in the observed cases was mild and on nausea, no significant difference was also seen. Also, on the length of stay in recovery room, no significant difference was observed in the studied groups. So far various studies have been conducted on the effects of Magnesium Sulfate on reducing postoperative complications and most of the studies concluded of significant reduction in postoperative complications in the group receiving Magnesium Sulfate [7-11]. Also, Magnesium Sulfate led to reduced shivering in recovery ward through an unknown mechanism [5, 20, 21]. Therefore, given the results obtained from the study and comparison with other studies, the overall conclusion is that using Magnesium Sulfate especially at doses of 30mg and 40mg is associated with a significant decrease in need for anesthetic and narcotic drugs, increase patients' and surgeons' satisfaction and at least hemodynamic and respiratory effects on patients. Therefore, using the above-mentioned doses of Magnesium Sulfate is recommended in anesthesia of Cataract surgeries.

The limitation of our study was the small sample size and the fact that we followed patients with age span below 75 years old and ASA physical status I-II, only till discharging from the recovery room; however, the findings seem particularly robust in spite of this. Also we suggest altering the study design and further investigation.

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### **References**

1. Williams A1, Sloan FA, Lee PP. Longitudinal rates of cataract surgery. *Arch Ophthalmol.* 2006 Sep;124(9):1308-14
2. Friedman DS, Reeves SW, Bass EB, Lubomski LH. Patient preferences for anaesthesia management during cataract surgery. *Br J Ophthalmol.* Mar 2004; 88(3): 333-335.
3. Tom Eke and John R Thompson. Serious complications of local anesthesia for cataract surgery: a 1 year national survey in the United Kingdom. *Br J Ophthalmol.* Apr 2007; 91(4): 470-475.
4. Micromedex T. Drug information for the Health care professional. 27th edition. United States: USPDI; 2007:1877-79.
5. Ronald D. Miller. Miller's Anesthesia. Seventh Edition. Churchill Livingstone; 2010: Chapter 48 : 1544
6. Ronald D. Miller. Miller's Anesthesia. Seventh Edition. Churchill Livingstone; 2010: Chapter 54 : 1714
7. Gupta. Mitra k, mukhevjee M, Roy s, SAFKAR A, kundu s, Goswami A, sarkar UN, sank p, mitra R. Effect of magnesium infusion on thoracic epidural analgesia. *Saudi Anaesth.* 2011 jan;5(1):55-61
8. Steinlechner B. Magnesium moderately decreases remifentanyl dosage required for pain management after cardiac surgery. *British Journal of Anesthesia* 96 (4): 444-9 (2006).
9. Seyhan TO. Effects of three different dose regimens of magnesium on propofol requirements, hemodynamic variables and postoperative pain relief in gynecological surgery. *British Journal of Anesthesia* 96 (2): 247-52 (2006).
10. Tauzin P. Wound infiltration with magnesium sulphate and ropivacaine mixture reduces postoperative tramadol requirements after radical prostatectomy. *Acta Anaesthesiol Scand* 2009; 53: 464-469.
11. Yousaf J. Complications of cataract surgery. Available from site: <http://www.slideshare.net/yousaf82/ataract-surgery-complications-17682217>
12. Hwang JY, Na HS, Jeon YT, Ro YJ, Kim CS, Do SH. .V. infusion of magnesium sulphate during spinal anesthesia improves postoperative analgesia. *Br J Anaesth.* 2010 Jan;104(1):89-93.
13. Abdulatif M, Ahmed A, Mukhtar A, Badawy S. The effect of magnesium sulphate infusion on the incidence and severity of emergence agitation in children undergoing adenotonsillectomy using sevoflurane anesthesia. *Anesthesia.* 2013 Aug 3:1238
14. J.-H. Ryu JH, Kang MH. Effects of magnesium sulphate on intraoperative anesthetic requirements and postoperative analgesia in gynecology patients receiving total intravenous anesthesia. *Br. J. Anaesth.* (2008) 100 (3): 397-403.
15. Mohammad Reza Hafeziahmadi, Mojgan Javedani, Bahare Ghiasi, Samiramis Ghavam, (2017). Investigation Of The Relationship Between Phase Angle And Micro-Albuminuria In Type 2 Diabetic Patients With A History Of More Than 5 Years Of The Disease In Ilam Province, Iran, *Acta Medica Mediterranea*, 2017, 33: 357. Pastore A, Lanna M, Lombardo N, Policastro C, Iacovazzo C. Intravenous infusion of magnesium sulphate during subarachnoid anesthesia in hip surgery and its effect on postoperative analgesia: our experience. *Transl Med UniSa.* 2013 Jan 4;5:18-21.
16. Albrecht E, Kirkham KR, Liu SS, Brull R. Peri-operative intravenous administration of magnesium sulphate and postoperative pain: a meta-analysis. *Anesthesia.* 2013 Jan;68(1):79-90.
17. Kiran S, Gupta R, Verma D. Evaluation of a single-dose of intravenous magnesium sulphate for prevention of postoperative pain after inguinal surgery. *Indian J Anaesth.* 2011 Jan;55(1):31-5

18. Benhaj Amor M, Barakette M, Dhahri S, Ouezini R, Lamine K, Jebali A, Ferjani M. Effect of intra and postoperative magnesium sulphate infusion on postoperative pain. *Tunis Med.* 2008 Jun;86(6):550-5
19. Abedi Gh, Ahmadi A, Rostami F. Assessment of quality of life in hepatitis B patients compared with healthy people, *Life Science Journal*, 2012; 9 (4):5339-5343.
20. Abedi, Gh, Mohammadi, A., Mohammadi, F, Alizadeh, A, Hosseini, H, Rostami, F. University students' personality profile based on casta & MaCrea five factor theory. *International Journal of Collaborative Research on Internal Medicine and Public Health.*