COMPARATIVE STUDY BETWEEN MAGNESIUM SULPHATE 400mg AND BUPRENORPHINE 180mcg AS ADDITIVES TO 0.125% LEVOBUPIVACAINE FOR EPIDURAL ANALGESIA IN LOWER ABDOMINAL AND LOWER LIMB SURGERIES

1. Dr.INUKURTHI LAHARI PRIYA
2. Dr. R.PRABHAVATHI
3. Dr. TALLURI AJAY
4. Dr. B.HARIPRASAD REDDY
5. Dr. A.RAJITHA
6. Dr. K. KRISHNA CHAITHANYA.

Affiliations:senior resident[1] , Professor[2,4,6], postgraduate[3],Assistant Professor [5]

Department and institution : Department of Anaesthesiology, Narayana Medical College and Hospital, Nellore, Andhra Pradesh, India.

Corresponding Author: Dr. LAHARI INUKURTHI

Address: staff quarters

Narayana medical college doctors residential campus, Nellore rural, CHINTHAREDDY PALEM, NELLORE 524003, ANDHRA PRADESH,INDIA.

Phone number: 7382460255

E-mail address : lahari.Inukurthi@gmail.com

ABSTRACT

- BACKGROUND :

Epidural anesthesia is performed to provide anesthesia for surgical procedures carried on lower abdomen, pelvis, and lower limbs. It offers superior pain relief and early mobilisation especially when local anaesthetic is combined with an adjuvant.We compared the effects of adding magnesium sulphate to epidural Bupivacaine and buprenorphine to epidural bupivacainein patients undergoing lower abdominal and lower limb surgeries using combined spinal-epidural anaesthesia.

- METHODS AND MATERIALS :

60 patients with ASA 1 and 2 who are Patients posted for lower abdominal and lower limb surgery under spinal + epidural anaesthesia were selected and randomly assigned into 2 groups Group M received 10ml of 0.125% levobupuvacaine+ Inj 50%Magnesium sulphate 400mg given+ 0.2 ml NS and Group B 10ml of 0.125% levobupuvacaine+ Inj Buprenorphine 180mcg

In these 2 groups of patients the primary parameters observed

1. VAS SCORE AT1st,2nd,4th,6th,8th,12th and 24 HRS
2. DURATION OF POST OP ANALGESIA
3. NUMBER OF PATIENTS WHO NEED EPIDURAL TOPUPS IN POSTOPERATIVE PERIOD

RESULTS :

There was no significant difference in demographic data between the two groups. The resting VAS score at 1st,2nd, 4th,6th and 12th , 24hr after surgery in group M is lower than group B ($p<0.001$).Duration of post operative analgesia is 15.1 ± 2.12hrs in group M compared to group B which is 4.33 ± 5hrs ($p<0.001$).No.of patients who needed epidural top-ups in postoperative periodwas 26 patients for group B and 6 patients for group M.

CONCLUSION :

The addition of Magnesium sulphate to levobupivacaine for epidural has significantly improved the postoperative pain scores , reduced the total analgesic requirement and increased the duration of postoperative analgesiacompared to buprenorphine.

Keywords

Magnesium sulphate ,buprenorphine , regional anaesthesia, epidural analgesia, pain management, lower abdominal surgeries

INTRODUCTION

A local[1] anesthetic–opioid combination provides superior analgesia during perioperative period.This combination limits rapid regression of sensory blockade and possibly decreases the dose of local

anesthetic administered. Analgesia provided by epidural opioids is superior to that with systemic opioids.Opioids have both presynaptic and postsynaptic effects in the dorsal horn and affect the modulation of nociceptive input. Buprenorphine is a partial agonist at mu receptor, competetive antagonist at kappa receptor which can cause urinary retention, bradycardia.

Now a days non-opioid epidural analgesia is gaining popularity and it is very effective in postoperative analgesia according to recent studies.Magnesium[2] is the plentiful cation in the body. It has antinociceptive effects in human models of pain. These effects areprimarily based on the regulation of calcium influx into the cell that is natural physiological calcium antagonism and antagonism of N-methyl-d-aspartate (NMDA) receptor. It has been reported that Co-administration of epidural magnesium for postoperative epidural analgesia has provided a pronounced reduction in patient-controlled epidural consumption without any side-effects.

There were studies comparing epidural burinorphine vs epidural dexmeditomedinand epidural fentanyl vs epidural clonidinebut there are very limited studies regarding comparison of epidural magnesium vs epidural burinorphine

MATERIALS AND METHODS

After obtaining institutional ethical committee approval (no-IEC/NMC/22.10.22-3)and informed and written consent, 60 patients posted for lower abdominal and lower limb surgeries under combined

spinal epidural anaesthesiaat Narayana Medical College and Hospital were included in the study .The study was prospective observational double blind study.

Inclusion criteria:Age-18 to 60 years,ASA 1 and 2.

Exclusion criteria:Patient refusal,ASA 3 and 4,local infection,history of drug allergy to local anesthetics,hemorrhagic diathesis,coexisting cardiac , pulmonary , hepatic and renal diseases.

Patients were randomly assigned into two groups:

- Group M received 10ml of 0.125% levobupuvacaine+ Inj 50%Magnesium sulphate 400mg given+ 0.2 ml NS.
- Group B 10ml of 0.125% levobupuvacaine + Inj Buprenorphine 180mcg.

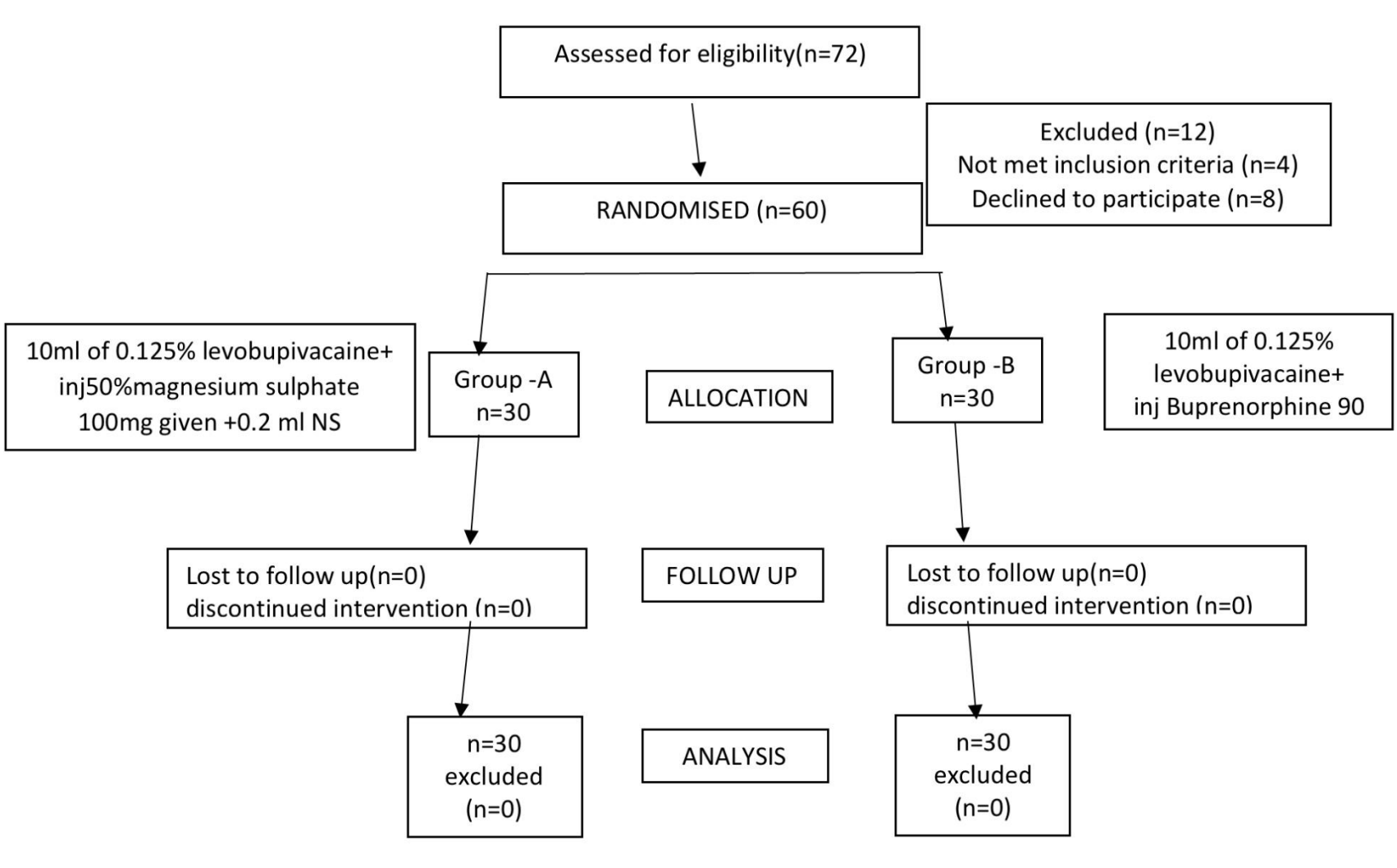
In these 2 groups of patients the primary parameters observed

1.VAS SCORE AT 1^{st},2^{nd},4^{th},6^{th},8^{th},12^{th} and 24 HRS

2.DURATION OF POST OP ANALGESIA

3.NUMBER OF PATIENTS WHO NEED EPIDURAL TOPUPS IN POSTOPERATIVE PERIOD

4.SIDE EFFECTS


Assessed for eligibility(n=72)
Excluded (n=12)
Not met inclusion criteria (n=4)
Declined to participate (n=8)
RANDOMISED (n=60)
10ml of 0.125% levobupivacaine+ inj50%magnesium sulphate 100mg given +0.2 ml NS
Group -A n=30
ALLOCATION
Group -B n=30
10ml of 0.125% levobupivacaine+ inj Buprenorphine 90
Lost to follow up(n=0) discontinued intervention (n=0)
FOLLOW UP
Lost to follow up(n=0) discontinued intervention (n=0)
n=30 excluded (n=0)
ANALYSIS
n=30 excluded (n=0)

preoperative evaluation with investigations like Complete blood picture,renal function tests ,liver function tests,bloodsugars,urineexamination,chestxray,standard 12 lead ECG,allWere done.All patients were kept fasting for a period of 8 hours pre-operatively and received tablet Alprazolam 0.25mg orally the night before surgery and 2 hours before surgery. Linear Visual Analogue Scale will be explained to all patients.After receiving the patient in Operation Theatre (OT), intravenous line with 18G cannula is to be established. Baseline Heart Rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Arterial Saturation (SpO2) and Respiratory Rate (RR) was recorded. All patients were preloaded with 10 ml/kg infusion of Ringer's lactate solution 15 minutes prior to establishment of epidural and spinal anaesthesia.

ANAESTHETICTECHNIQUE

All patients had an epidural anesthesia in lateral or sitting position. Under strict aseptic precautions, the back was sterilized using povidone iodine at the site of insertion, tips of lumbar spine were palpated and L2-3 or L3-4 space was selected. The epidural space was identified through a midline approach, using loss-of-resistance technique, an epidural catheter was then inserted into the epidural space, the catheter was advanced 3-5 cm beyond the previously-noted distance between the skin and epidural space and a test dose of 3 ml Lidocaine 2% was injected.spinal anaesthesia with 3ml of 0.5% bupivacainewas than administered according to standard technique .

Bolus dose of epidural analgesia was given in postoperative period as soon as the patient complains pain of VAS>3according to their respective groups.visual analogue scale 'VAS' score was assessed : value range from 0 (no pain) to 10 (worst pain imaginable).VAS scores were assessed at 1st, 2nd, 4th,6th and 12th 24hr,Patients were also evaluated for the side-effects related to epidural drugs,Epidural top-upwill be given for VAS >3.

STATISTICAL ANALYSIS :

All the collected data were entered into a Microsoft excel sheet. It was then transferred to SPSS(statistical package for social service) version 25 software for statistical analysis.

-Quantitative data were analyzed by student's t -test.

-Qualitative data were analyzed by chi-square test.

-P-value (<0.05) - statistically significant.

SAMPLE SIZE ESTIMATION :

Sample size was calculated keeping two sided alpha error at 5% and power at 80% by using below formula.

$$\text{sample size } (n) = \frac{2 \times (Z\alpha + Z\beta)^2 (\sigma)^2}{(X_1 - X_2)^2}$$

n = Sample size

Zα = Level of significance

Zβ = Required power

σ = Anticipated standard deviation

X_1-X_2 = Meaningful difference between two means

Minimum of 20 patients in each group was required. For better validation 30 patients are selected in each group.

RESULTS :

There was no significant difference in demographic data between the two groups.

The resting VAS score at 1st,2nd, 4th,6th and 12th ,24hr after surgery in group M is lower than group B ($p<0.001$). Duration of post operative analgesia was 15.1 ± 2.12hrs In group M compared to group B which is 4.33 ± 5hrs ($p<0.001$).No.of patients who needed epidural top-ups in postoperative period is 26 patients for group B and 6 patients for group M.

COMPARISON OF VAS SCORES AT DIFFERENT TIME INTERVAL

VAS	GROUP B	GROUP M	Unpaired t	P value
5 min	3.4 ± 0.66	2.0 ± 0.64	8.3408	0.001
10 min	4.2 ± 0.69	2.5 ± 0.68	9.6115	0.001
15 min	5.7 ± 0.68	2.7 ± 0.63	17.7259	0.001
30 min	5.5 ± 0.86	2.6 ± 0.51	15.8863	0.001
1 hour	6.6 ± 0.63	3.5 ± 0.46	21.7667	0.001
2hours	6.4 ± 0.43	4.0 ± 0.32	24.5247	0.001
4 hrs	5.7 ± 0.68	2.7 ± 0.63	17.7259	0.001
8 hrs	5.5 ± 0.86	2.6 ± 0.51	15.8863	0.001
12 hrs	6.6 ± 0.63	3.5 ± 0.46	21.7667	0.001
24 hrs	6.4 ± 0.43	4.0 ± 0.32	24.5247	0.001

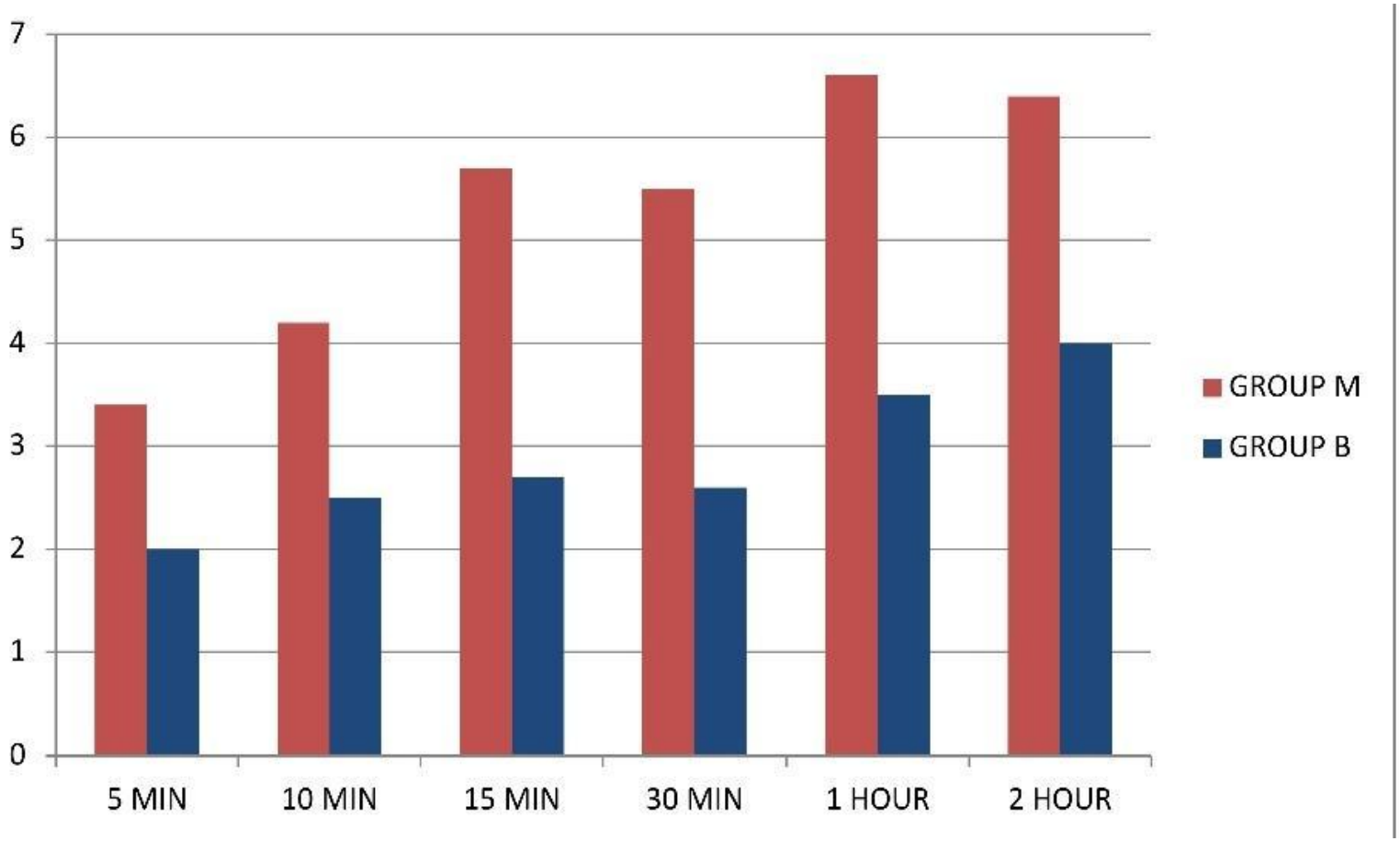
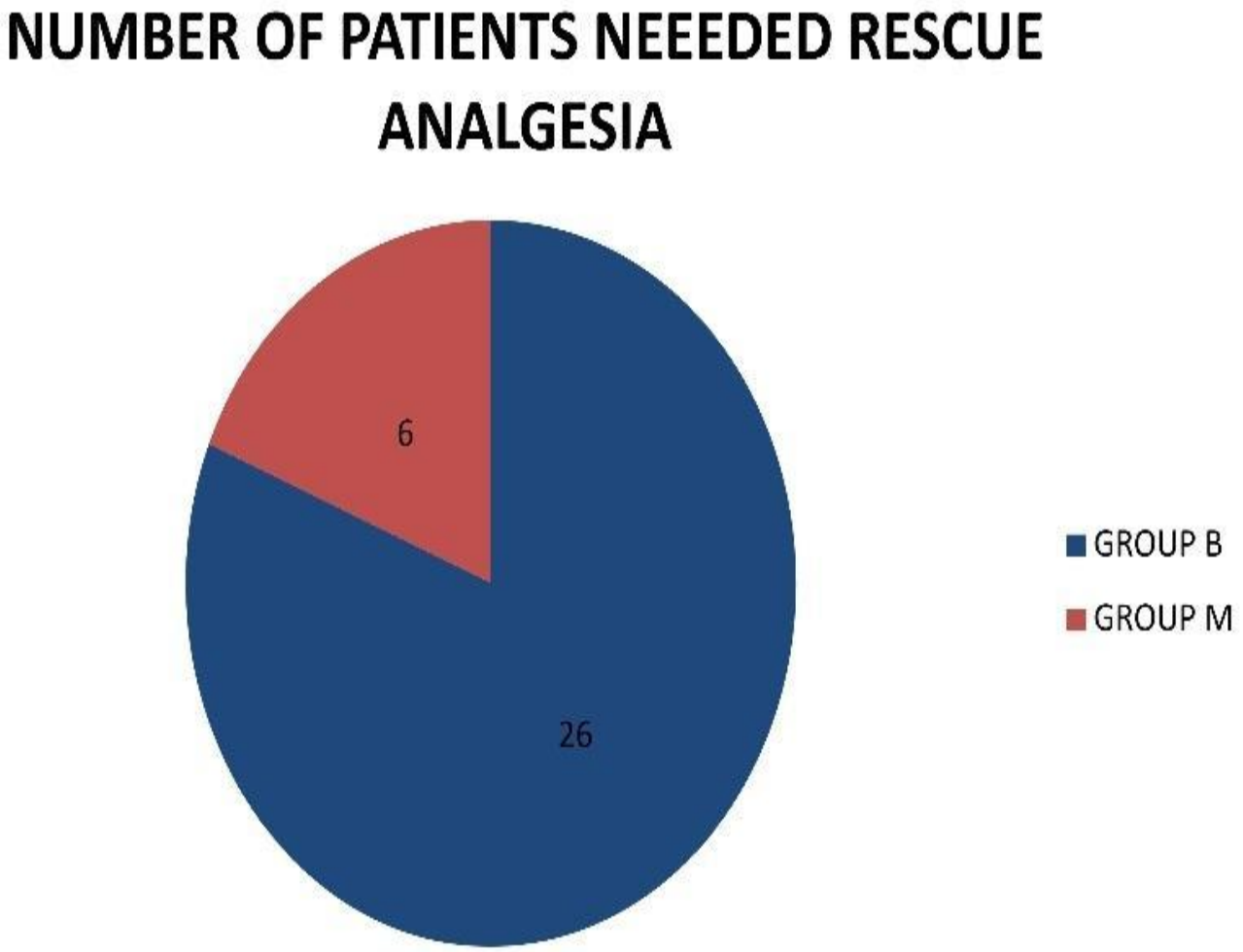
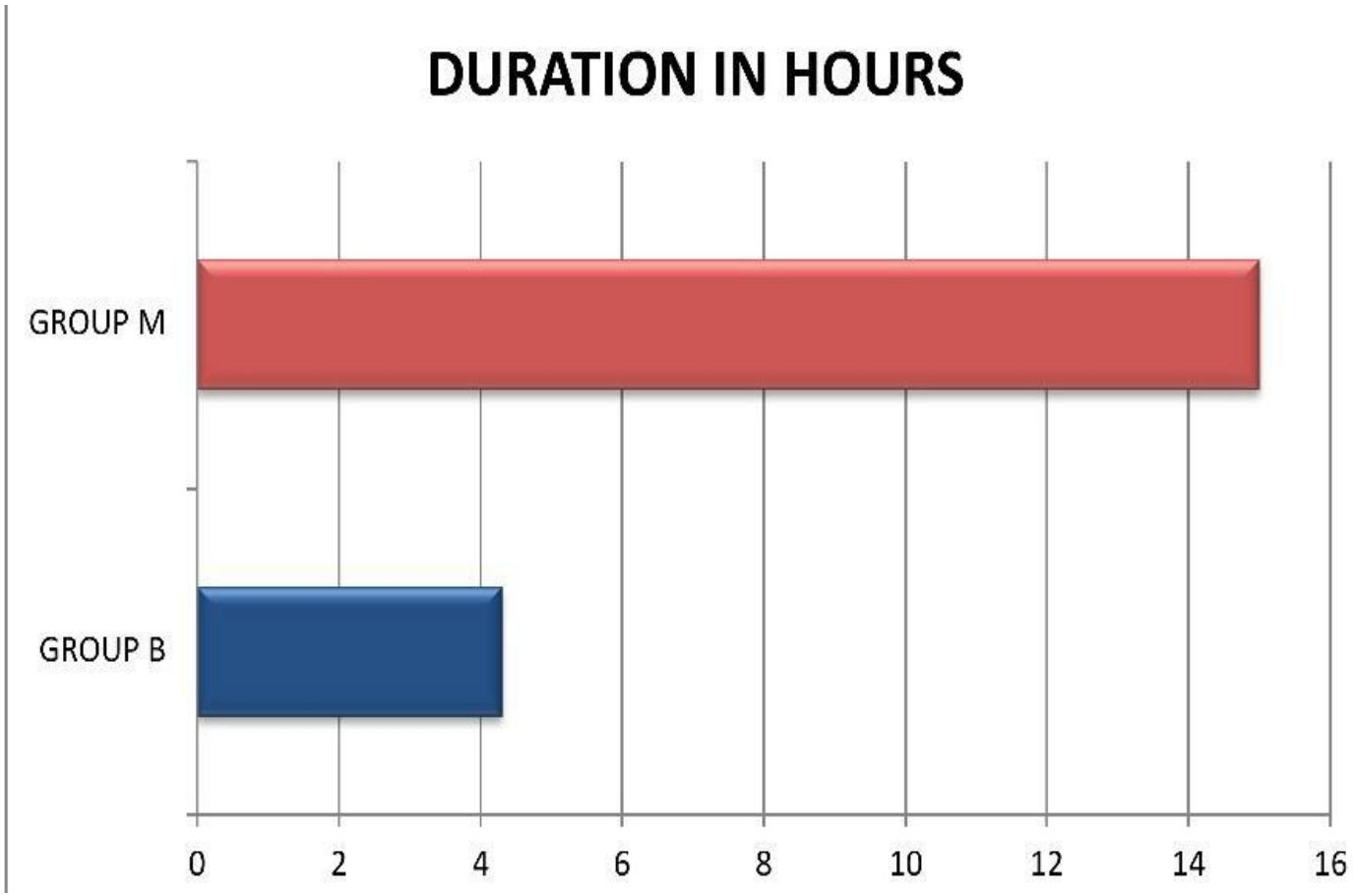


Table-2:

COMPARISION OF DURATION OF POST OP ANALGESIA AND NUMBER OF PATIENTS WHO NEED EPIDURAL TOPUPS IN POSTOPERATIVE PERIOD

	GROUP B	GROUP M	p VALUE
Duration of postop analgesia(in hrs)	4.33 ± 5	15.1 ± 2.12	0.001
No.of patients who needed epidural topups in postoperative period	26	6	0.001


NUMBER OF PATIENTS NEEEDED RESCUE ANALGESIA
6
26
GROUP B
GROUP M


DURATION IN HOURS
GROUP M
GROUP B
0
2
4
6
8
10
12
14
16

SIDE EFFECTS:

TABLE3:DISTRIBUTIONOFTHESUBJECTSBASEDONSIDEEFFECTS

Sideeffects		Groups		Total
		Group M	Group B	
Bradycardia	Count	0	2	2
	%	0.0%	6.7%	3.3%
Hypotension	Count	0	4	4
	%	0.0%	13.3%	6.7%
Nausea + vomiting	Count	4	0	4
	%	13.3%	0.0%	6.7%
No	Count	25	24	49
	%	83.3%	80.0%	81.7%
Pruritis	Count	1	0	1
	%	3.3%	0.0%	1.7%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%

Side effects like bradycardia and hypotension are seen in 7 %and 13% with MGSO4where as nausea +vomiting and pruritiswere seen in 13.3% and 3.3%in Buprinorphine, noside effects were seenin83.3% &80%ingroup Mand groupB

DISCUSSION :

Satisfactory pain[3] relief has always been a difficult problem in clinical practice for patients undergoinglower abdominal and lower limb surgeries . It is found that operative pain is more severe after surgery and there after gradually diminishes over the next 24 hours. Epidural anesthesia is good at providing postoperative analgesia and hence is widely being used especially in patients undergoing surgical procedures involving lower parts of the body.

Traditionally epidural bupivacaine (0.125%) is used for post-operative analgesia.The discovery[4] ofopioid receptors in the spinal cord made it clear that epidural administration of opioids is superior to traditional intravenous and intramuscular injections of opioids.Recent studies showed the importance of non-opioid epidural analgesiaWhere Magnesium has antinociceptive effects in human models of pain.Co-administration of epidural magnesium for postoperative epidural analgesia has provided a pronounced reduction in patient-controlled epidural consumption without any side-effects.

Dr Santosh Kumar[3] conducted a Comparative Study of Epidural, Bupivacaine with Buprenorphine and Bupivacaine with Fentanyl in Lower Limb Surgeries in 60 patients in the age group 20-60 years belonging to ASA I-II posted for elective lower limb surgeries were divided into two groups of 30 each and studied.Group A received 0.5% Bupivacaine 15ml with 150 ug Buprenorphine.Group B received 0.5% Bupivacaine 15ml with 50ug Fentanyl.It can be noted from the above table that duration of analgesia was significantly longer in Group A with mean duration of 766.6 minutes as compared to 471 min in Group B. ($p<0.05$),They concluded that epidural buprenorphine is better in providing prolonged satisfactory postoperative analgesia as compared to epidural Fentanyl.

In our study we compared magnesium sulphate 400mg andbuprenorphine 180mcg as additive to 0.125% levobupivacaine for postoperative analgesia in lower abdominal and lower limb surgeries.Addition of magnesium sulphate to levobupivacaine has significantly increased the duration of postoperative analgesia. Hemodynamic parameters are more stable in magnesium sulphate group.VAS scores are low in magnesium sulphate group.The resting VAS score at 1^{st},2^{nd}, 4^{th},6th and 12th , 24hr after surgery in group M is lower than group B ($p<0.001$). Duration of post operative analgesia is 15.1 ± 2.12hrs in group M compared to group B which is 4.33 ± 5hrs ($p<0.001$).No.of patients who needed epidural top-ups in postoperative periodwas 26 patients for group B and 6 patients for group M.

OsamhelalAhmed[4]conducted a study on Magnesium Sulfate versus Fentanyl as Adjuvant to EpiduralLevobupivacaine in Surgeries below Umbilicus, a prospective randomized double blind controlled comparative study conducted for patients scheduled to undergo elective surgeries below umbilicus in 90 patients ASA I/II were enrolled into the study where Group M (magnesium group): (30 patients): received in epidural catheter 14 ml of levobupivacaine 0.5% plus magnesium sulphate50 mg as a bolus dose initially., Group F (Fentanyl group): (30 patients) received in epidural catheter 14 ml levobupivacaine 0.5% plus 1 mic\Kg fentanyl.They concluded that magnesium sulfate and fentanyl are good adjuvants to local anesthetics when given epidurally, fentanyl provides more duration of analgesia but with more incidence of nausea vomiting and pruritis when compared to magnesium sulfate, but magnesium sulfate show more incidence of pain with injection.

In our study we compared magnesium sulphate 400mg and buprenorphine 180mcs as additive to 0.125% levobupivacaine for postoperative analgesia in lower abdominal and lower limb surgeries.In the above mentioned study the dose of magnesium sulfate used is only 50mg which could be a reason for short duration of analgesia in that particular group where as in Our Study we used 400mg magnesium sulphate to epidurallevobupivacainewhich has significantly increased the duration of postoperative analgesia. Hemodynamic parameters are more stable in magnesium sulphate group.VAS scores are low in magnesium sulphate group.

CONCLUSION :

The addition of Magnesium sulphate to levobupivacaine for epidural has significantly improved the postoperative pain scores , reduced the total analgesic requirement and increased the duration of postoperative analgesiawhen compared with epidural burinorphine.

REFERENCES :

1.Youssef AA, Amr YM. The effect of adding magnesium sulphate to epidural bupivacaine and fentanyl in elective Caesarean section using combined spinal epidural anaesthesia:A prospective double blinded randomised study.Int J Anesthesia. 2010 Oct; 19(4):401-4.

2.Bilir A, Gulec S, Erkan A , Ozcelik A. Epidural magnesium reduces postoperative analgesic requirement. Br J Anaesthesia.2007 Apr; 98(4) : 519-23.

3. Dr Santosh Kumar, Dr Lokesh Kumar KS, Dr Rajalakshmi J, A Comparative Study of Epidural, Bupivacaine with Buprenorphine and Bupivacaine with Fentanyl in Lower Limb Surgeries, IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 13, Issue 12 Ver. III (Dec. 2014)

4. Osama Helal Ahmed, Waheed Mohamed Ali, Yasser Mamdouh Kamel, Magnesium

Sulfate versus Fentanyl as Adjuvant to Epidural Levobupivacaine in Surgeries below Umbilicus,the Egyptian Journal of Hospital Medicine (October 2019) Vol. 77 (2), Page 4987-4992

5.Md. Nazmus Sakeb Chowdhury et al. Effects of Magnesium Sulphate(MgSO4) Versus Fentanyl as an adjuvant to Epidural Bupivacaine in LowerAbdominalSurgeries.SASJSurg,2021Nov7(11):658-665.

6.MohamedIbrahimEl-DesoukeyMohamed,SaharMohammedKamalMahmoud, Kareem Youssef Kamal, Effect of Adding Magnesium SulphatetoEpiduralBupivacaineComparedtoAdditionofFentanylinPatientsundergoingLowerLimbOrthopedicSurgeryunderCombinedSpinalEpidural Anathesia, QJM: An International Journal of Medicine. oct 2021;114(1):68-72.

7.Abraq Asma Riyaz,Ubaid Ullah Gul Salmani, Javaid Ahmad Dar : Anobservationalprospectivestudyontheeffectofbolusepiduralsingledoseofmagnesiumasanadjuvanttoepiduralfentanylforpostoperativeanalgesiainpatientsundergoingcombinedspinalepiduralanesthesia.Internationaljournaldentalandmedicalsceincesresearch.oct2020;5(2):134-140

8.Li, LQ., Fang, MD., Wang, C. et al. Comparative evaluation of epiduralbupivacaine alone and bupivacaine combined with magnesium sulfate inprovidingpostoperativeanalgesia:ameta-analysisofrandomizedcontrolledtrials.BMCAnesthesiol.Feb 2020;104(6): 20-39.

9 .Gupta Megha, Kumari Indira, Sharma Sandeep, Aggarwal AmulyaEvaluation of the efficacy of MgSO4 as an adjunct to ropivacaine andfentanylforlabouranalgesia.JOACC.March2020;10(1):10-15