

Effect of Intravaginal Use of Magnesium Sulfate on the Severity of Pain and Duration of the First and Second Stages of Labor in Nulliparous Women

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ABSTRACT

Background & Objective: Most pain relief methods are associated with some side effects and limitations. Magnesium sulfate, due to its osmotic properties and absorption of cervical water (moisture) can shorten labor duration and decrease labor pain via improving effacement and cervical edema. The aim of our study was to evaluate the effect of intravaginal magnesium sulfate on pain severity and duration of the first and second stages of labor.

Materials & Methods: In this double-blind randomized clinical trial study, 70 nulliparous women were allocated into two groups after the beginning of the active phase of labor. In group 1, 10 ccs of magnesium sulfate 50% was poured on the whole cervix during the vaginal examination. In group 2, a placebo (sterile water) in a similar way and amount was used. Then the two groups were compared in variables of demographic, obstetrics, clinical, pain severity, duration of the first and second stages of labor, and maternal and neonatal outcomes.

Results: In different dilatations, pain severity in group 1 was significantly lower ($P=0.0001$). The duration of the first and second stages of labor was shorter in group 1 ($P=0.0001$). The two groups were similar in neonatal outcomes, drug side effects, and treatment satisfaction ($P>0.05$).

Conclusion: Intravaginal magnesium sulfate improves the condition of the cervix, reduces the duration and the severity of labor pain, and has no medical or neonatal side effects.

Keywords: Magnesium sulfate, Labor pain, Delivery



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Introduction

Pain is an important and inevitable component in the vaginal delivery, and plays a key role in emotional disturbance and mental health (1, 2). One of the most significant current discussions on labor pain is its effect on maternal and neonatal morbidity (3). So, severe pain can cause reduction in uteroplacental blood flow, maternal hemorrhage, low neonatal Apgar, disorders in the progress of labor and failure of descent, instrumental delivery and increased rate of caesarian section (4-8). The most likely causes of labor pain are stimulation of nerve receptors, compression of the nerve ganglion in the cervix and pelvic contractions

which affects the pelvic viscera and lumbosacral areas (9-11). So, methods that reduce intra cellular calcium and increase cyclic adenosine monophosphate (cAMP) can reduce pain (12).

Other reasons that are involved in the severity of pain are physiological and psychological factors (13, 14) Recently, researchers have shown an increased interest in relief of labor pain. The key aspects of management can be listed as follows: pharmacological (systemic drug administration, inhalation and regional anesthesia) and non-pharmacological methods (Hypnosis, massage) (15-17). Magnesium sulfate is

one of the drugs that reduces the entry of calcium into the cell, increases the cAMP, absorption of water into the cervix and causes edema in the cervix which can reduce the pain (18-20). Most studies in the field of relief of pain have only focused on severity of pain and they did not pay attention to details such as Bishop's score and the duration of the first and second stages of labor (21, 22). The objective of the current study was to assess the efficacy of Magnesium sulfate in relief of labor pain and length of labor.

Methods

This study was a randomized double-blind that was performed on 70 pregnant women between 2020-2021 in Al-Zahra Hospital. At the beginning of the study, written consent was obtained from all participants. Inclusion criteria included 18-35 years old primiparous women with gestational age between 37-40 weeks who were in active labor phase, no intake history of calcium channel blocker and narcotic drugs, fetal estimated weight of 2500-4000 gr, and BMI (body mass index) of 19.8-30. Exclusion criteria included the previous history of infertility, drug abuse, and any contraindication for vaginal delivery. In this study, participants were randomly allocated into two groups receiving Magnesium sulfate (Group 1) and placebo (Group 2).

To randomize, the random number function of Excel was used. In group 1, 10 ccs of Magnesium sulfate 50 % was placed on the cervix by using a 10cc syringe in the dilation of cervix 5-6 cm, 7-8cm, and 9-10 cm. In the placebo group, distilled water was poured on the cervix in similar dilatations with group 1. A visual analog scale was used to assess pain severity in the dilation of cervix 5-6 cm, 7-8 cm, and 9-10 cm. This scale is a 10 cm numbered scale to assess pain severity, which is numbered from zero (Painless) to ten (most

painful). Paratograph curves were used to assess the progress of labor. To control for bias, measurements were carried out by another person and the intervention was also done by a gynecologist. The researcher, gynecologist, and patient were unaware of the type of study.

The main result of this study was the success of intravaginal use of magnesium sulfate on the severity of pain and duration of the first and second stages of labor in nulliparous women. The first stage of labor is defined as the beginning of dilatation till the cervix is fully dilated to 10 centimeters. The second stage of labor is from full dilatation of the cervix until the baby is born (12).

Statistical Analysis:

All the data was analyzed by (SPSS software, version 21, IBM, SPSS Inc., USA). To evaluate the relationship between variables, Mann-Whitney, t-test, chi-square test was used. P-values less than 0.05 were considered as significant cut-off values.

Ethical Consideration:

This study was approved by the Ethics Committee of Guilan University of Medical Sciences, Rasht, Iran (ethical code: IR.GUMS.REC.1399.087) and registered in IRCT with code IRCT20200510047377N1.

Results

In this study, 97 patients were interviewed. 21 individuals were excluded from the study on the basis of non-compliance with inclusion criteria and unwillingness to participate in the study. 6 cases underwent cesarean section due to fetal indication. Finally, 70 participants were studied ([Figure 1](#)).

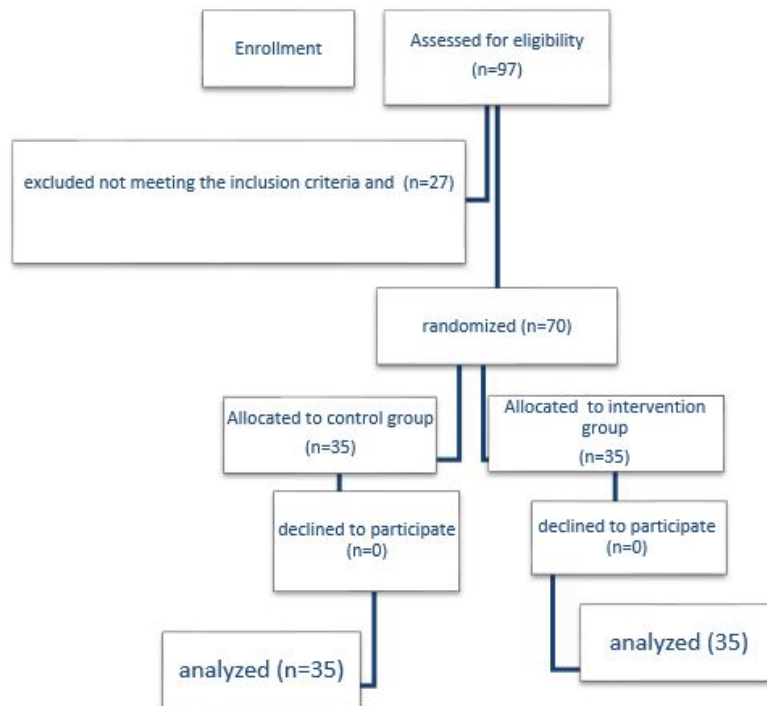


Figure 1. CONSORT flow diagram

There was a statistical difference in maternal age, BMI, and gestational age. In group 1, the age of patients was older, BMI was higher and the gestational

age was lower. None of the participants in the two groups had a history of miscarriage or stillbirth. ([Table 1](#)).

Table 1. Comparison of baseline characteristics between the two study groups

Variable	Group 1	Control group	P-value
Age (yrs), M±SD	28.7±5.04	25.9±5.3	*0.02
BMI (kg/m ²), M±SD	25±2.2	23.8±1.15	*0.01
Gestational age (wks), M±SD	38.3±0.95	38.7±1.3	*0.02
Pregnancy status, N (%)			
Wanted	30(85.7)	24(68.6)	**0.08
Unwanted	5(14.3)	11(31.4)	

*T-test, ** chi-square

In different dilatations, pain severity was lower in group 1. There was a significant positive correlation between the use of Magnesium sulfate and reduced pain severity in different cervical dilatation. In multivariate logistic regression according to the backward method after adjusting for confounding

factors, the relationship was still significant. In group 1, significant reduction in duration of the first and second stages of labor was found compared with control group after adjusting for confounding factors ([Table 2](#)).

Table 2. Comparison of Severity of pain and duration labor between the two study groups

Variable	Group 1 M±SD	Control group M±SD	*P-value
Severity of pain in cervical dilation 5-6cm	7.03±1.1	9.5±0.56	0.0001
Severity of pain in cervical dilation 7-8cm	7.7±0.83	9.9±0.32	0.0001

Severity of pain in cervical dilation9-10cm	8.2±0.82	10±0	0.0001
First stage of labor (minute)	195.1±20.5	270±18.9	0.0001
Second stage of labor(minute)	35.7±9.6	83.3±19.2	0.0001

*Mann-Whitney U test

There was no significant statistical difference in neonatal complications (Table 3). The Chi-square test

did not show any significant differences in drug adverse effects between the two groups.

Table3. Comparison of neonatal outcomes between the two study groups

Variable	Group 1	Control group	P-value
Neonatal weight(gr), M±SD	3.12±0.5	3.14±0.37	*0.85
Apgar1min, M±SD	5.8±0.35	8.8±0.4	*0.48
Apgar5min, M±SD	10	9.8±0.4	*0.07
Gender, N (%)	Female	19(54.3)	23(65.7)
	male	16(45.7)	12(34.3)
Excretion of meconium, N (%)	6(17.1)	4(11.4)	0.73

*T-test, ** Chi-square

Discussion

This study set out to assess the importance of Magnesium magnesium sulfate in the relief of labor pain and duration of labor. The most interesting finding was that Magnesium magnesium sulfate was able to reduce pain and shorten the duration of the first and second stages of labor which was also statistically significant. Another main finding was the same complications between the two groups and this finding supports previous research (23-25). These consequences are consistent with those of other studies and suggest that influence of topical use of Magnesium sulfate on the progress of labor and reduction of pain (22). There are several possible explanations for this result including reducing the entry of calcium into the cell, increasing the cAMP, activating protein kinase A, absorbing the water into the cervix and causing edema in the cervix which can reduce the pain (20). To date, little evidence has been found associating topical Magnesium sulfate with relief of pain. Up to now, the research has tended to focus on systemic Magnesium sulfate rather than on topical. Until recently, there has been little reliable literature that compares topical Magnesium sulfate with both severity of pain and the progress of labor. In reviewing the literature, a strong relationship between systemic Magnesium sulfate and relief of pain has been reported in the literature (23, 26, 27). These results agree with the findings of other studies, in which Magnesium sulfate was used inside the Cesarean section wound and reduced the pain (28). In accordance with the current results, previous studies have demonstrated no evidence for drug side effects and neonatal complications (22, 24).

Conclusion

Topical magnesium sulfate reduces pain and duration of the first and second stages of labor by improving the dilatation of the cervix and this condition increases the patient's satisfaction during labor, but surveys with a larger sample size are required. This conclusion has important implications for the increased rate of vaginal delivery and prevention of cesarian section and other consequences of complications. The key strengths of this study are assessment of both severity of pain and progress of labor. The limitation of this study was a small sample size.

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Conflict of Interest

All authors confirmed no conflict of interest.

References

- Zeng YS, Wang C, Ward KE, Hume AL. Complementary and Alternative Medicine in Hospice and Palliative Care: A Systematic Review. *J Pain Symptom Manag*. 2018;56(5):781-94.e4. [DOI:10.1016/j.jpainsymman.2018.07.016] [PMID]
- Tournaire M, Theau-Yonneau A. Complementary and Alternative Approaches to Pain Relief during Labor. *Evid Based Complementary Altern Med*. 2007;4:256475. [DOI:10.1093/ecam/nem012] [PMID] [PMCID]
- Mortazavi F, Borzoe F. Fear of childbirth, fatigue, and well-being in pregnant women. *J Obstet Gynecol Cancer Res*. 2022;4(2):45-50. [DOI:10.30699/jogcr.4.2.45]
- Jenabi E, Khazaei S, Bashirian S, Aghababaei S, Matinnia N. Reasons for elective cesarean section on maternal request: a systematic review. *J Matern Fetal Neonatal Med*. 2020;33(22):3867-72. [DOI:10.1080/14767058.2019.1587407] [PMID]
- Mascarenhas VHA, Lima TR, Silva FMDe, Negreiros FdS, Santos JDM, Moura MAP, et al. Scientific evidence on non-pharmacological methods for relief of labor pain. *Acta Paul de Enferm*. 2019;32(3):350-7. [DOI:10.1590/1982-0194201900048]
- Blix E, Kaasen A, Eri TS. Labor pain, birth experience and postpartum depression. *Scand J Pain*. 2020;20(4):859-60. [DOI:10.1515/sjpain-2020-0100] [PMID]
- Rotaru LT, Popescu RM, Boeriu C. Plurietiologic Possibilities and Difficulties of Seizures Management in Pregnancy. *Curr Health Sci J*. 2015;41(1):67.
- Parashi S, Kashanian M, Rabbani O. Comparison between entonox and oxygen on lowering labor pain and the progress of labor. *Razi J Med Sci*. 2013;20(112):45-52.
- Sood A, Sood N. Pain Relief in Labor. In: Sharma A, editor. *Labour Room Emergencies*. Singapore: Springer Singapore; 2020. p. 245-56. [DOI:10.1007/978-981-10-4953-8_26]
- Koutsospyros D, Epstein L. Pain in Pregnancy and Labor. In: Khelemsky Y, Malhotra A, Gritsenko K, editors. *Academic Pain Medicine: A Practical Guide to Rotations, Fellowship, and Beyond*. Cham2019. p. 305-9. [DOI:10.1007/978-3-030-18005-8_39]
- Trout KK. The neuromatrix theory of pain: Implications for selected nonpharmacologic methods of pain relief for labor. *J Midwifery Womens Health*. 2004;49(6):482-8. [DOI:10.1016/j.jmwh.2004.07.009] [DOI:10.1016/S1526-9523(04)00357-5] [PMID]
- Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman BL, et al. *Williams obstetrics*: McGraw-Hill Medical New York; 2014.
- Whitburn LY, Jones LE, Davey M-A, McDonald S. The nature of labour pain: An updated review of the literature. *Women Birth*. 2019;32(1):28-38. [DOI:10.1016/j.wombi.2018.03.004] [PMID]
- Abushaikha L, Oweis A. Labour pain experience and intensity: A Jordanian perspective. *Int J Nurs Pract*. 2005;11(1):33-8. [DOI:10.1111/j.1440-172X.2005.00496.x] [PMID]
- Shirazi M, Shahbazi F, Akhavan S, Sharifi Taskooh M, Azadi F. Hyoscine-N-Butylbromide and Progression of Labor at Different Stages. *J Obstet Gynecol Cancer Res*. 2016;1(3). [DOI:10.17795/ojcr-9532]
- Mousa O, Abdelhafez AA, Abdelraheim AR, Yousef AM, Ghany AA, El Gelany S. Perceptions and Practice of Labor Pain-Relief Methods among Health Professionals Conducting Delivery in Minia Maternity Units in Egypt. *Obstet Gynecol Int*. 2018;2018:3060953. [DOI:10.1155/2018/3060953] [PMID] [PMCID]
- McCauley M, Stewart C, Kebede B. A survey of healthcare providers' knowledge and attitudes regarding pain relief in labor for women in Ethiopia. *BMC Pregnancy Childbirth*. 2017;17(1):1-6. [DOI:10.1186/s12884-017-1237-4] [PMID] [PMCID]
- Soleimanpour H, Imani F, Dolati S, Soleimanpour M, Shahsavarinia K. Management of pain using magnesium sulphate: a narrative review. *Postgrad Med*. 2022;134(3):260-6. [DOI:10.1080/00325481.2022.2035092] [PMID]
- Dupont C, Hebert G. Magnesium sulfate-rich natural mineral waters in the treatment of functional constipation-a review. *Nutrients*. 2020;12(7):2052. [DOI:10.3390/nu12072052] [PMID] [PMCID]
- Ikarashi N, Mochiduki T, Takasaki A, Ushiki T, Baba K, Ishii M, et al. A mechanism by which the osmotic laxative magnesium sulphate increases the intestinal aquaporin 3 expression in HT-29 cells. *Life Sci*. 2011;88(3):194-200. [DOI:10.1016/j.lfs.2010.11.013] [PMID]
- Aghamohamadi D, Gol MK. An investigation into the effects of magnesium sulfate on the complications of succinylcholine administration in nulliparous women undergoing elective cesarean section: A double-blind clinical trial. *Int J Women's Health Reprod Sci*. 2019;7(4):520-5. [DOI:10.15296/ijwhr.2019.86]
- Heydari A, Kariman N, Naeje Z, Ahmadi F. Effect of Topical Application of Magnesium Sulfate on the Intensity of Labor Pain: Double Blind Clinical Trial. *Iran J Obstet Gynecol Infertil*. 2018;21(5):58-65.
- Agrawal J, Singh K, Mittal R, Choudhary B. A randomized clinical study to evaluate the effect of intravenous magnesium sulphate for postoperative pain relief in patients undergoing lower segment caesarean section. *J Evol Med Dent Sci*. 2015;

- 4(72):12478-85.
[DOI:10.14260/jemds/2015/1797]
24. Gupta M, Kumari I, Sharma S, Aggarwal A. Evaluation of the Efficacy of MgSO₄ as an Adjunct to Ropivacaine and Fentanyl for Labour Analgesia. *J Obstet Anesth Crit Care*. 2020;10(1). [DOI:10.4103/joacc.JOACC 54 19]
 25. Mirzamoradi M, Behnam M, Jahed T, Saleh-Gargari S, Bakhtiyari M. Does magnesium sulfate delay the active phase of labor in women with premature rupture of membranes? A randomized controlled trial. *Taiwan J Obstet Gynecol*. 2014; 53(3):309-12. [DOI:10.1016/j.tjog.2013.06.014] [PMID]
 26. Davoudi M, Tahmasebi R, Zolhavareih SM. Evaluation of the Effect of Intravenous Magnesium Sulfate on Post-operative Pain after Cesarean Section under Spinal Anesthesia. *Avicenna J Clin Med*. 2013;19(4):20-6.
 27. Altıparmak B, Çelebi N, Canbay Ö, Toker MK, Kılıçarslan B, Aypar Ü. Effect of magnesium sulfate on anesthesia depth, awareness incidence, and postoperative pain scores in obstetric patients. A double-blind randomized controlled trial. *Saudi Med J*. 2018;39(6):579-85. [DOI:10.15537/smj-2018.6.22376] [PMID] [PMCID]
 28. Eldaba AA, Amr YM, Sobhy RA. Effect of wound infiltration with bupivacaine or lower dose bupivacaine/magnesium versus placebo for postoperative analgesia after cesarean section. *Anesth Essays Res*. 2013;7(3):336-40. [PMCID] [DOI:10.4103/0259-1162.123227] [PMID]

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