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Original Research Article

A study to assess efficacy of lower dose ketamine in labor analgesia and its effect on maternal and perinatal outcome

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ABSTRACT

Background: Present study is planned to study the effectiveness of lower dose ketamine in labor analgesia and its effect on progression of labor, maternal and perinatal outcome.
Methods: After obtaining ethical approval from institutional ethical committee, a prospective randomized interventional case control study was conducted in Department of obstetrics and gynecology, N.S.C.B medical college, Jabalpur. Parturient in active labor without risk factors were given 0.2 mg/kg intravenous ketamine in bolus form and 0.1 mg/kg in maintenance dose at 30 minutes interval till full dilatation and the results were analyzed using VAS scale and WHO partogram.
Results: In present study, 280 parturient were included in the study. In 140 cases, induction-delivery interval was shortened in 47.10% cases. Pain relief was satisfactory (VAS 2-8) in 77.90% cases. However, 80.70% cases had transient light headedness. Overall satisfaction was significantly high in the intervention group (P<0.001).
Conclusions: A lower dose ketamine in bolus form with loading dose of 0.2 mg/kg followed by maintenance dose of 0.1 mg/kg could provide safe and acceptable analgesia during labor and delivery.

Keywords: APGAR, Ketamine, Labor analgesia, Maternal outcome, Perinatal outcome

INTRODUCTION

Labor pain is the result of many complex interactions, physiological and psychological which exert excitatory as well as inhibitory effects. Pain is virtually experienced in all the stages of labor and the severity of pain parallels the duration and intensity of uterine contractions. Pain can lead to maternal hyperventilation and respiratory alkalosis, compensatory metabolic acidosis, hormonal imbalance and elevated blood pressure.

It can further prolong the process of labor and ultimately leads to fetal distress. The aim of modern obstetrics is healthy mother and baby with lowest level of morbidity possible and a good experience of birth. It reduces stress related elevation of catecholamines, allows smooth cervical dilatation.[1] It is N-Methyl-D-aspartate receptor antagonist with excellent analgesic properties even in subanesthetic doses.[2] It is ready available and is being used currently even by non-anesthesiologists, to provide sedation for minor procedure.[3] In contrast to other anaesthetics, ketamine has potent analgesic properties in sub-anaesthetic doses.[4] Recent studies indicate that analgesia produced by ketamine is mediated through N-methyl-D-aspartate receptors so systematically administered ketamine is unlikely to produce respiratory depression.[5] It seemed to offer an obvious advantages over the narcotics in which major drawback is respiratory depression Thus in obstetrics, it is being used to provide analgesia during labor in intermittent boluses.[6-9]

In most primary and secondary level hospitals in India and other developing countries, the facility to provide adequate analgesia during labor and delivery is inadequate. Therefore, present study is aimed to assess efficacy of lower dose ketamine in labor analgesia and its effect on maternal and perinatal outcome.

With the above background, present study was undertaken to assess following objectives: to study efficacy of lower dose Ketamine in labor analgesia; to study the effect of lower dose ketamine on progression of first and second stage of labor and to study the maternal and perinatal outcome in the case group.

METHODS

Study design: After obtaining ethical approval from institutional ethical committee, a prospective interventional randomized case control study was conducted in Department of Obstetrics and Gynecology, N. S. C. B. Medical College and Hospital, Jabalpur (M.P.) over a span of 18 months from 1st March 2016 to 31st August 2017. Study groups: Control group (no drug) and case group (intravenous lower dose ketamine).

Inclusion criteria

Parturient in active phase of labor with single term pregnancy, vertex presentation, normal blood pressure, without cephalopelvic disproportion, with normal admission CTG and normal USG parameters at term were included in study.

Exclusion criteria

Parturient with malpresention, multiple pregnancies, high risk obstetrics problems, premature rupture of membrane, IUGR, previous uterine scar and on drugs like aspirin, acetaminophen, caffeine, isocarboxazid, selegiline, levomethadylacetate, phenelzine, tranylcypromine, gabapentin (to prevent drug interactions).

In women with inclusion criteria, a written consent was obtained from those who volunteered to participate after explaining expected maternal and perinatal outcome. General systemic examination, per abdomen and per vaginum examination was done. The study was started at active phase of labor. The subjects were randomly selected by odd and even method (n=z2(p.q)/d2) assigned to receive either lower dose ketamine or 0.9% normal saline. Parturient's weight measurement was done, subjects in case groups were premeditated with glycopyrrolate 0.005mg/kg and then ketamine was given in a loading dose of 0.2mg/kg body weight. The drug was diluted in 10ml normal saline and administered slowly through the tubing of the infusion line (no' 18) as a bolus over a period of 2-10 minutes depending on the desire effect obtained. Time taken for the desired effect of drug was noted. The maintenance dose of 0.1mg\kg body weight was started after 30 minutes of induction dose, and it was given at an interval of 30 min and maximum up to 6-8 doses (total 40-50 mg of ketamine) were given. Partogram was maintained for assessment of labor progression. Intrapartum fetal monitoring was done with help of cardiotocography. Maternal vitals were monitored (pulse, BP, respiratory rate). The resident of pediatrics was called before delivery. Resuscitation tray was kept ready. Once the cervix reached full dilatation further dose of ketamine was not given and parturient was encouraged to bear down.

The same dose used in first stage was also continued in the second stage even if she perceived more pain. This enabled the patient to perceive a much-attenuated pain for bearing down. Augmentation with oxytocin was done when there were inadequate contractions. In the 140-control parturient, no method of pain relief was given. Monitoring was done as follows: time of induction, induction dose, onset of analgesia, total dose of ketamine in case group, mode of delivery, duration of first stage, second stage and third stage was noted. Induction delivery interval noted for assessing the efficacy of ketamine for pain relief. All parturient were observed for an hour after delivery in the labor room. Thereafter parturient were assessed to express overall quality of analgesia in pain relief which she perceived before giving drug.

The patient was asked to put a mark on the 1cm line at a point that corresponds to her pain intensity during labor in comparison to her perception of pain at start of labor prior giving drug.

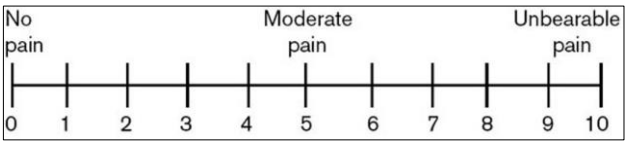

Figure 1: 0-10 VAS numeric pain distress scale.

Final assessment of analgesia was done using visual analogue scale as follows:

1. Excellent (VAS 0-1) who experienced no or minimal pain during labour.
2. Satisfactory (VAS 2-8) parturient had brief period of pain but it was bearable and parturient remained co-operative.
3. Unsatisfactory (VAS 9-10) who experienced unbearable pain or pain before labor analgesia.

RESULTS

In present study, according to Table 1, as compared to control group with no labor analgesia, cases who were given ketamine had some minor side effects like nausea, vomiting, light headedness which were transient and of low intensity with no significant effect on mother and fetus.

Majority of cases were found to have light headedness. In Table 1, 62.10% cases had light headedness and 18.60% cases had light headedness associated with nausea.

Table 1: Distribution of case and controls according to side effects seen after giving drug.

Side effect in mother	Case		Control	
	N	%	N	%
No side effect	5	3.60	105	75.00
Hallucination	2	1.40	0	0.00
Light headedness	87	62.10	0	0.00
Nausea	18	12.90	35	25.00
Hallucination, AR	2	1.40	0	0.00
Light headedness, Nausea	26	18.60	0	0.00
Total	140	100	140	100

Chi square=213.362; P=<0.0001

According to Table 2, Duration of first stage in 82.90% cases who were given ketamine was shortened by 3-4 hours while 84.30% controls had duration of first stage of 5-6 hours. It was found that 6.4% of controls had first stage of 7-12 hours. It was found that duration of first stage was reduced in case group.

Table 2: Distribution of case and controls according to duration of first stage of labor.

Duration 1st stage labour	Case		Control	
	N	%	N	%
<3 hour	24	17.10	13	9.30
3-4 hour	116	82.90	0	0
5-6 hour	0	0	118	84.30
7-12 hour	0	0.00	9	6.40
>12 hour	0	0.00	0	0.00
Total	140	100	140	100

Chi square=24.923; P=<0.0001

Table 3 shows that in 47.10% cases induction delivery interval was 3-4hrs while 48.60% had between 4-5 hrs despite of no use of oxytocin. Maximum cases given ketamine were delivered within 5 hours after 3 cm dilatation, thus total duration of labor was shortened. In control group, 52.20% controls had induction delivery interval of >6 hours.

Table 3: Distribution of cases and controls according to induction-delivery interval.

Induction delivery intervals	Case		Control	
	N	%	N	%
120-180 min (2-3 hours)	6	4.30	4	2.80
181-240 min (3-4 hours)	66	47.10	0	0.00
241-300 min (4-5 hours)	68	48.60	63	45.00
>300 min (>6 hours)	0	0	73	52.20
Total	140	100	140	100

Chi square=175.542; P=<0.0001

Table 4 shows that in case group, majority (95.70%) of cases had normal vaginal delivery and 4.30% cases landed up having caesarean section which was mainly indicated due to fetal distress. While 96.40% of controls were delivered vaginally. Thus, mode of delivery was almost same in cases and controls showing that ketamine had no effect on the course of labor.

Table 4: Distribution of cases and controls according to type of delivery.

Type of delivery	Case		Control	
	N	%	N	%
Normal vaginal delivery	134	95.70	135	96.40
LSCS	6	4.30	5	3.60
Total	140	100	140	100

Chi square=0.095; P=0.7584

According to Table 5, in 96.40% case's baby had 7-8 APGAR at 5 minutes and had immediate cry while 88.60 % controls baby had 7-8 APGAR at 5 minutes.

Table 5: Distribution of cases and controls according to Apgar at 5 minutes.

Apgar 5	Case		Control	
	N	%	N	%
1-3	4	2.90	4	2.90
4-6	1	0.70	12	8.50
7-8	135	96.40	124	88.60
Total	140	100	140	100

Chi square=17.702; P=<0.0001

Table 6 shows that in present study, 77.90% parturients of case group experienced satisfactory pain relief. One (0.70%) parturient of case group experienced excellent degree of pain relief and remaining 21.40% cases experienced unsatisfactory pain relief which meant no relief in pain.

Table 6: Distribution of cases and controls according to degree of pain relief.

Degree of pain relief	VAS	Case		Control	
		N	%	N	%
Unsatisfactory	9-10	30	21.40	140	100.00
Satisfactory	2-8	109	77.90	0	0.00
Excellent	0-1	1	0.70	0	0.00

Chi square=181.176; P=<0.0001

DISCUSSION

In present study, loading dose of ketamine was 0.2 mg/kg and maintenance dose was 0.1mg/kg, while Jagatia et al used, 0.4mg/kg loading dose as bolus and 1mg/min maintenance dose as infusion.[10,11] Desai and Daftary induction dose was also similar to Jagatia et al.[10,12] In present study, 62.10% cases had light headedness, which was transient and tolerated by the parturient; in Joel et al 48.50 % cases had transient light headedness.[13] Sharma et al found minor side effects like dryness of mouth (80%).[14,16]

In present study, 82.90% cases had first stage duration of 3-4hours.Similar results were seen in Duggal et al and Sarkar and Sahu et al.[7,15] In Jagatia et al, low dose ketamine (0.4 mg/kg) was used therefore duration of first stage was less than 2 hour.[10] Thus, despite of using lower dose ketamine and no oxytocin, duration of first stage was shortened in present study. In present study, 47.10% cases were delivered within 4hours after induction by drug and 35% cases were delivered within 4-6 hours after giving loading dose of ketamine. In control group, 52.20% parturients were delivered after 6 hours of giving first dose of ketamine. Thus, in present study it was noted that duration of labor was overall decreased in case group as compared to control group. In other studies like, Jagatia et al, 64% of cases were delivered within 2-3 hours.[10]

In present study, 96.40% case's baby had 7-8 Apgar at 5 minutes and had immediate cry and baby were vigorous at the time birth. In 2.90% cases delayed cry with Apgar of 1-3 at 5 minutes, these were cases that had fetal distress and fetuses passed meconium at 4 cm. In Jagatia et al, ketamine had no effect on Apgar score at 1 min and at 5 min.[10] In Sharma and Parekh et al and Sarkar and Sahu et al, ketamine had no effect on Apgar score at 1 min and at 5 min.[7,16] In present study, 95.70% cases had vaginal delivery and only 4.30% cases landed up having caesarean section which was mainly indicated due to fetal distress. Similar results were observed in a study, Joel et al, in which out of 70 baby delivered 2 baby were delivered by caesarean section.[13] In present study,77.90% cases who were given lower dose of ketamine experienced satisfactory pain relief (VAS 2-8). In Jagatia et al, degree of pain relief was excellent in 90% cases in which low dose ketamine was given (0.4 mg/kg) as compared to Desai and Daftary, it was 70%.[10,12] So, in present study pain relief was satisfactory in 77.90% cases with lower dose (0.2mg/kg) of ketamine as compared to low dose (0.4mg/kg) where 90% had excellent pain relief and 8% had satisfactory pain relief.[10]

CONCLUSION

The present study concludes that lower dose of ketamine (0.2mg/kg loading dose) is safe and effective in reducing the duration of both first and second stage of labor. It reduces the maternal exhaustion by reducing the severity of labor pain and had minimal maternal and foetal complications. Hence the lower dose ketamine is safe and effective method for pain relief during labor in low resource country like India.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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