INTRACUTANEOUS STERILE WATER INJECTION OVER SACRUM FOR THE RELIEF OF LOW BACK PAIN IN LABOUR

DISSERTATION SUBMITTED FOR

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CHENNAI, TAMILNADU

BONAFIDE CERTIFICATE

This is to certify that the dissertation entitled "**INTRACUTANEOUS STERILE WATER INJECTION OVER SACRUM FOR THE RELIEF OF LOW BACK PAIN IN LABOUR"** is a bonafide record work done by **Dr.R. PRIYADHARSINI** under my direct supervision and guidance, submitted to the Tamil Nadu Dr. M.G.R. Medical University in partial fulfillment of University regulation for M.D Branch II – Obstetrics & Gynaecology.

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DECLARATION

I, **Dr.R. PRIYADHARSINI** solemnly declare that the dissertation titled **"INTRACUTANEOUS STERILE WATER INJECTION OVER SACRUM FOR THE RELIEF OF LOW BACK PAIN IN LABOUR"** has been prepared by me. I also declare that this bonafide work or a part of this work was not submitted by me or any other for any award, degree, diploma to any other University board either in India or abroad.

This is submitted to The Tamilnadu Dr. M. G. R. Medical University, Chennai in partial fulfillment of the rules and regulation for the award of M.D degree Branch – II (Obstetrics & Gynecology) to be held in March 2011.

Place : Madurai **Dr. R. PRIYADHARSINI**

Date :

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CONTENTS

Interoduction

INTRODUCTION

"The delivery of the infant into the arms of a conscious and pain free mother is one of the most existing and rewarding moments in medicine" - Moir

It's never the fear of bringing a new life in to the world that frightens a woman. It is the fear of the pain she has to endure to do it.

From all the happiness mankind can gain is not in pleasure but in rest from pain – John Dryden

Melzak[29] et al 1981 – presented evidence that the labour pain is the most severe that have ever assessed.

Labour pain is considered to be one of the most intense and stressful experiences (Sheiner[39] et al 2000) especially for nulliparous woman. Although studies have found a significant rise in pain threshold during labour (Ohel et al 2007) it is an important goal to provide safe and effective methods of analgesia for woman in pain in order to obtain her maximum cooperation. (O' Hana et al 2008).

Most women in the first stage of labour feel pain predominantly in the lower abdomen, whereas other experience severe low back pain, in approximately 30% of cases the pain is continuous and

annoying known as back labour (Phiangjit and Wiruchpongsanon 2006)

The uterine cervix and corpus are supplied by afferent neurons ending in the dorsal horns of spinal segments (T10 – L1). Since the cutaneous afferents from lower back converge to the dorsal horns in the same segment, there is anatomical support for the assumption that low back pain in labour is referred pain (Wiruchpongsanon[47] 2006)

Based on gate control theory or counter irritation theory, various attempts have been made to relieve labour pain by treating dermatomes having the same cutaneous innervations with methods such as transcutaneous electric Nerve Stimulation, Intracutaneous Sterile Water Injections and acupuncture with varying results.

Pharmacological methods used to relieve labour pain like narcotics are not always warranted because of their maternal side effects such as drowsiness and loss of control and potential neonatal respiratory depression. (Shohreh Bahasadri[2] et al 2006)

While Epidural analgesia has become the gold standard for diminishing pain of labour and birth, it is associated with an increase in pyrexia during labour and possibility of long term backache and

neurological symptoms, also can cause sufficient motor block to adversely affect the mobility of the laboring woman and most lose the reflex desire to push. (Reynolds[38] 1994). It also had an impact on breast feeding leading to lactational failure.

Epidural analgesia, Nitrous Oxide and Pudendal block which are widely used are not always available in all centers and beside that none of these methods have proven to be effective in reducing low back labour pain. Therefore an effective, inexpensive and simple method with no serious side effect for reducing low back pain in labour would be very useful. (Shoreh Bahasadri[2] et al 2006).

Intracutaneous injection of sterile water in the skin over the sacrum have been shown to relieve the pain of labour without concerns that the method might harm the mother and / or fetus or slow the labour pattern. (Lena Martensson[27] et al 2008).

This technique could of particular use in hospitals that don't have access to epidural analgesia and it could be also be helpful for women who want to avoid medications during labour and birth. (Reynolds[38] 1994).

Aim of Study

AIM OF THE STUDY

1. To determine the effectiveness of intracutaneous injection of sterile water over sacrum in relieving low back pain during labour.
2. The aim of the study was to carry out a randomized control trial, including a placebo treated patient group with normal saline and comparing with sterile water injections treated patient group.
3. To assess parturient satisfaction with sterile water analgesia with a follow up questionnaire on the first post partum day.

History of Obstetric analgesia with Sterile Water Injection

HISTORY OF OBSTETRIC ANALGESIA

Pain relief in labour has always been surrounded with myths and controversies. Hence providing effective and safe analgesia during labour has remained an ongoing challenge.

Historically, the era of obstetric anesthesia began with James Young Simpson, when he administered Ether to a woman with a deformed pelvis during childbirth. His concept of etherization of labour was strongly condemned by critics. The religious debate over the appropriateness of anesthesia for labour continued till 1853, when John Snow administered Chloroform to Britain's Queen Victoria during birth of her eighth child, Prince Leopold.

History of sterile water injection

This technique is not new and has been mentioned in the literature by Halsted when he wrote – The skin can be completely anesthetized to any extent by cutaneous injection of water. Dr.Samuel Gant used it in connection with fistula and polyp surgery.

The method began to be used in the obstetric field in the late 1920. Sterile water injections have been used for pain other than labour pain with positive outcomes including acute attack of urolithiasis and for neck and shoulder pain after whiplash injury.

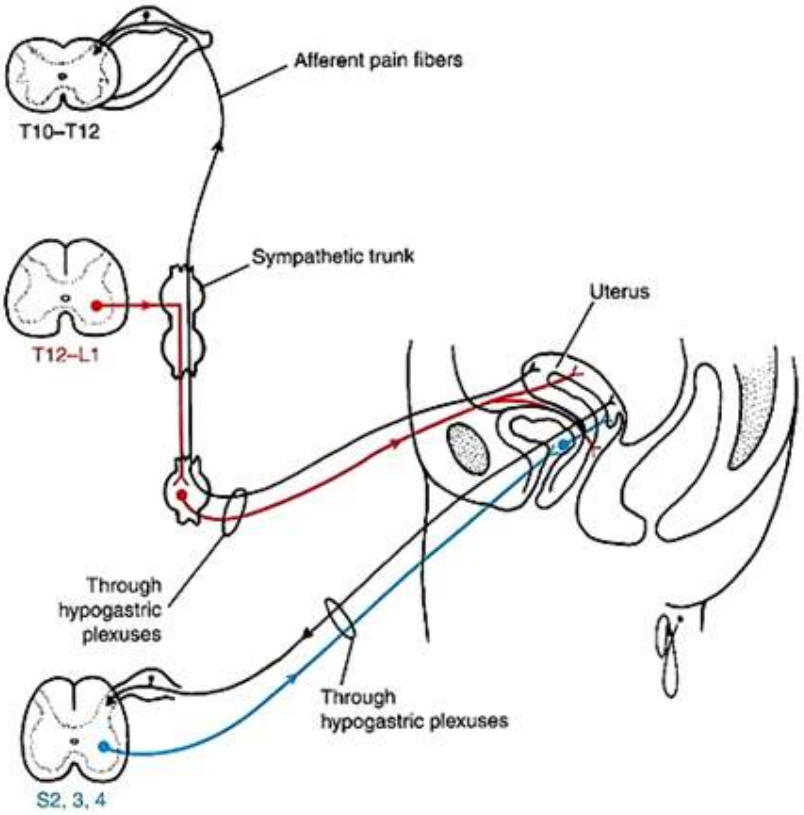
Pain Pathway

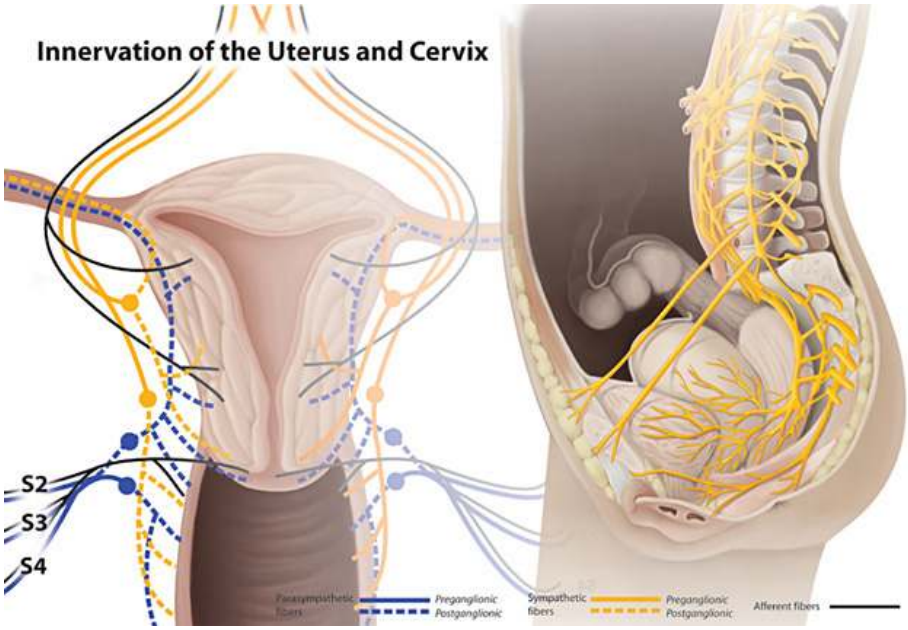
PAIN IN LABOUR : PATHWAYS AND MECHANISMS

PAIN IN LABOUR: PATH WAYS & MECHANISMS

Site of origin	Characteristic Stimulus	Neural involvement	Location
Uterus	Contraction-? Ischaemic? Plus acute stretch	Sympathetic out flow, root values T11/T12 spreading to T10 & L1	Referred to anterior rami of somatic roots; upper abdominal wall anteriorly down to groin; inner aspects upper thighs
Peri-uterine tissues, mainly posterior	Pressure-either with contraction or persistent. Usually associated with fetal malposition or unusual conformation of sacrum	Somatic roots of lumbo- sacral plexus	Distribution of posterior low and midback; also back of thighs
Lower birth canal	Distension of vagina and perineum in second stage	Somatic roots S2 / S3 /S4	Accurate site of stimulus not referred
Bladder	Over-distension; can be persistent or felt during contraction	Sympathetic T11 – ? L2 via hypogastric plexus, para sympathetic S2 / S3 / S4	Usually supra public only; rarely referred to distribution of somatic sacral roots
Myometrium and uterine visceral peritoneum	Abruption; scar dehiscence	T 10 – L 1	Accurate to surface marking of site of pathology

Major pathways of labour pain





PAIN PATHWAY

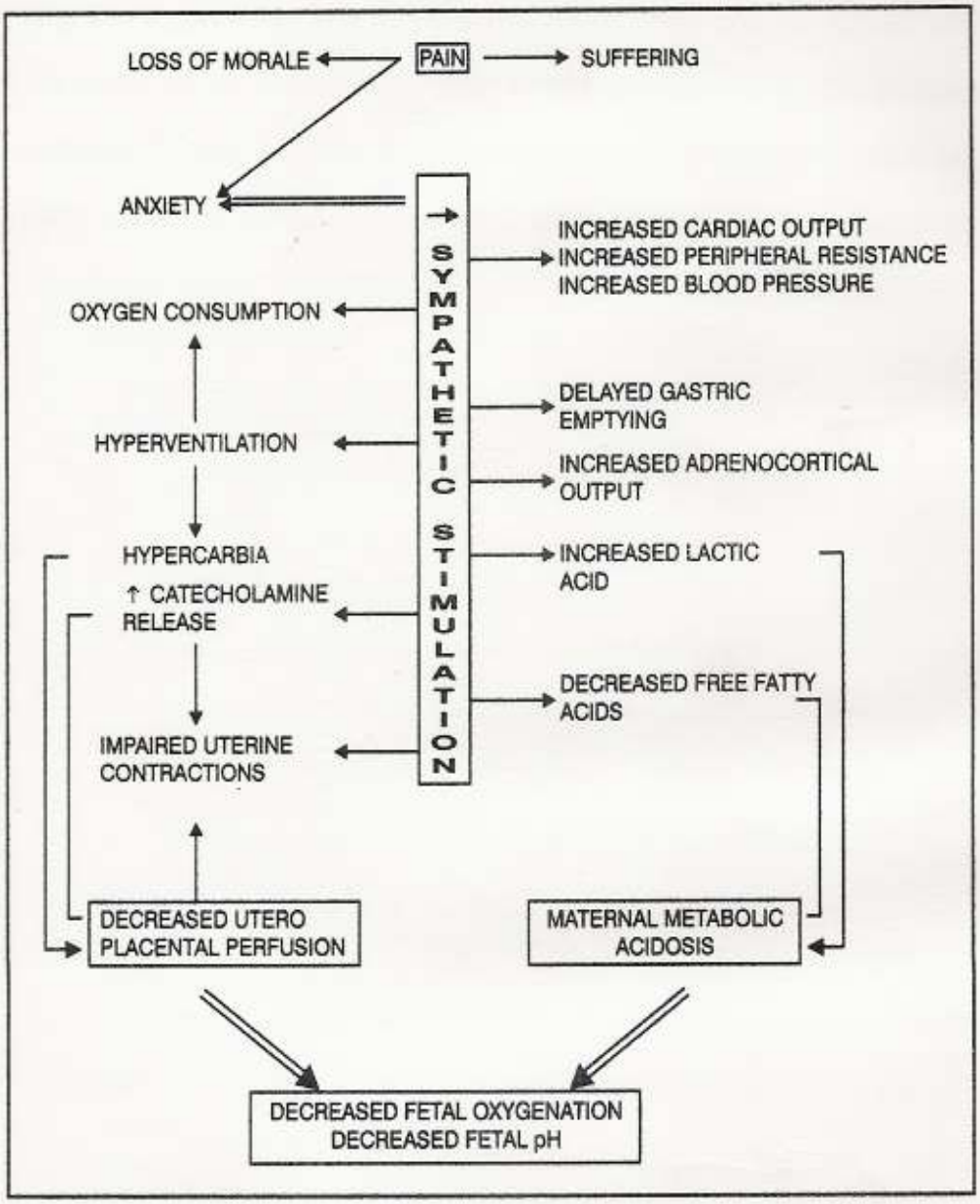
Pain in the first stage of labour is generated largely from uterus and is visceral in nature. Sympathetic visceral afferents transmit sensation of pain from the uterus, cervix and upper vagina through the Frakenhauser ganglion, the pelvic plexus, and the middle and superior internal iliac plexus in to the spinal cord through white rami communicantes associated with T10, T11, T12 and L1. Early in the first stage of labour, pain of uterine contractions is transmitted predominantly through eleventh and twelfth thoracic nerves.

Pain with vaginal delivery is somatic pain arising from stimuli from the lower genital tract. These are transmitted primarily through the pudendal nerve (S2,3,4) which provides sensory innervations to the perineum, anus and more medial parts of the vulva and clitoris.

Opinions regarding pain relief during labour invite divergent and widely polarized views. There are protagonists of the “laissez faire” policy of leaving things to nature but the distress felt by laboring women is so intense that there is a definite role for labour analgesia.

Role of Pain Relief and Theories of Pain

MATERNAL AND FETAL CONSEQUENCES OF UNRELIEVED PAIN IN LABOUR



ROLE OF PAIN RELIEF

Labour pains may be aggravated by anxiety, fear, maternal expectations and the mother's state of preparation for delivery. As with other forms of visceral pain labour pain stimulates an intense and complex autonomic response, it increases maternal oxygen consumption, cardiac output and circulating catecholamines (Schnider[39] et al 1983). The rise in serum catecholamines may cause fetal tachycardia or bradycardia and dysfunctional uterine contractions. Freedom from pain improves the environment for both mother and fetus and thereby improves obstetric outcome.

For the mother, obstetric analgesia provides relief from pain controls alterations in circulation, ventilation and undue muscular efforts. It ensures better patient co operation.

For the fetus, labour analgesia means shorter and less traumatic labour, protection against hypoxia and fetal respiratory depression at birth, and protection against needless instrumental assisted delivery necessitated by maternal distress.

To the obstetrician, it provides a better control of events emerging in course of labour, reduces pressure from the patients and

relatives to intervene and ensures optimum condition to prevail at the time of childbirth.

It is possible that pain reduction in the active phase of labour is associated with increased parasympathetic tone, which improves labour, resulting in descent of the fetus and improving the likelihood of vaginal delivery. Enhanced relaxation accompanying pain relief experienced with the sterile water injection promotes rotation of fetal occiput to a position favourable to vaginal delivery.

THEORIES OF PAIN

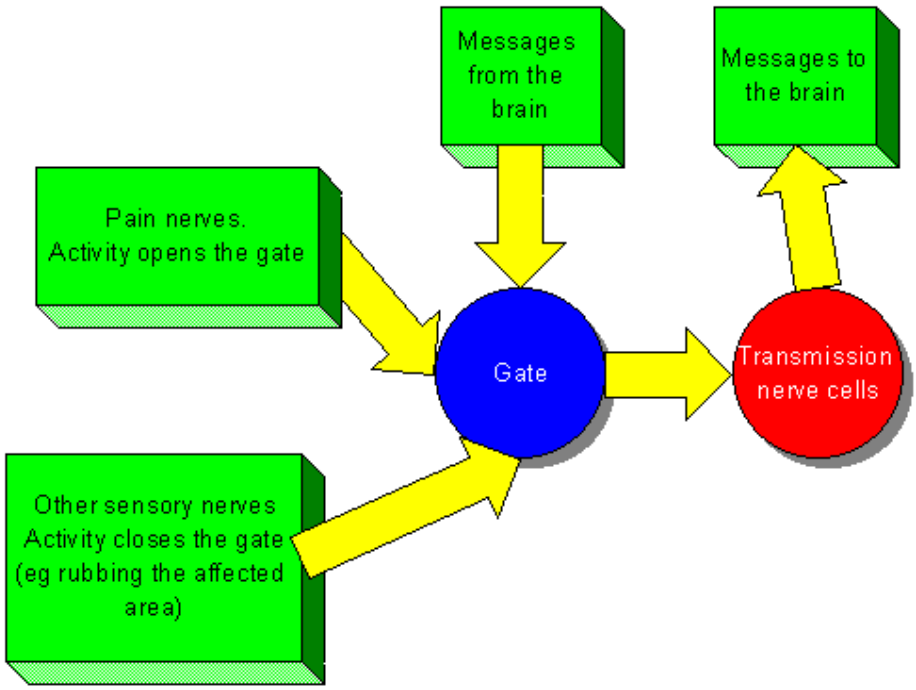
Specificity theory

Pain and touch sensors on the skin are viewed to a specific pain centre in the brain. This theory is biological and does not account for any psychological factors in the pain experience. Pain receptors carry the painful sensation directly to the brain, and any emotions displayed as part of pain when there is no organic basis for the pain.

Sensory Decision Theory

This theory relies heavily on the psychological perception of a painful stimulus. Painful stimuli is perceived according to the individuals cognitive processes eg., perceptual habits, beliefs, expectations, costs and rewards and memory of previous pain experiences. Therefore this theory espouses that individual characteristics and situational factors affect pain. It allows for the need to focus on the painful area in order to become aware of the pain signals.

PAIN GATE by Melzack and Wall



Conditions that open or close the gate

	Conditions that open the gate	Conditions that close the gate
Physical conditions	Extent of the injury	Medication
	Inappropriate activity level	Counter stimulation, eg. Massage
Emotional conditions	Anxiety or worry	Positive emotions
	Tension	Relaxation
	Depression	Rest
Mental conditions	Focusing on the pain	Intense concentration or distraction
	Boredom	Involvement and interest in life activities

Pattern theories

Pain conducting nerves are shared with other sensory nerves – pattern of activity from the nerve cells dictates how the pattern is interpreted.

Gate control theory

Proposed by Melzack[27] and Wall in the 1960's. Gate opened or closed by 3 factors (Banyard p160)

1. Activity in the pain fibres – opens the gate
2. Activity in other sensory nerves – closes the gate
3. Messages from the brain – concentrating on the pain or trying not to think about it.

Painful impulses from the pain receptors only reach the brain if the "Gate" is open.

Three variables control this gate

1. A - Delta fibres (Sharp Pain)
2. C - fibres (Dull pain)
3. A - beta fibres that carry messages of light touch

Special neurons located in the grey matter of the spinal cord make up the gate. This gate has the ability to block the signals from the a–delta and c– fibres preventing them from reaching the brain.

The **special neurons** in the spinal cord are inhibitory i.e, they keep the gate closed. These special neurons make a pain blocking agent called **enkephalin**. This is an opiate substance similar to heroin which can block Substance P the neurotransmitter from the C fibres and the A- delta fibres and this keeps the gate closed.

C- fibres and A- Delta fibres obstruct (inhibitory) the special gate neurons and tend to open the gate. **A-beta fibres are irritable (excitatory) to the special gate neurons and tend to keep the gate closed.**

If impulses in the C and A – Delta Fibres are stronger than the A- beta fibres the gate opens. A-delta fibres are always stronger.

Specialized nerve impulses arise in the brain itself and travel down the spinal cord to influence the gate. This is called the central control trigger and it can send both obstructive and irritable messages to the gate sensitizing it to either C or a – beta fibres.

Eg. If the central control sensitizes the gate to C fibres (dull pain) it is more likely to open. If it sensitizes to A- Beta fibres (light touch) it is more likely to close.

Hence cognitive processors influence the transmission of pain.

Cognitive processors that open the gate:

Anxiety, tension, depression eg persons having surgery and focusing on pain

Cognitive processors that close the gate

Happiness, Optimism, Distraction and Concentration eg. soldiers.

In summary whether or not pain impulses are received by the brain is dependent on a combination of the following

1. The strength of the C fibre impulses (opening the gate)
2. The strength of the A- beta fibre impulses (closing the gate)
3. The central control trigger's sensitization of the gate to C or A- beta Fibres (to either open or close the gate) eg. Rubbing area after a bump reduces the pain by stimulating the A-beta fibres of light tough to close the gate. Theoretically, Gate control theory is the most comprehensive and widely accepted theory at present.

Descending pain relief system

A painful stimulus activates the central pain inhibitory system's production of endogenous opioids. Sensory signals from the painful area pass ascending pathways to the brain. These signals stimulate areas such as the peri-acqueductal grey matter to produce β-endorphin and neurotensin and stimulate the great raphe nucleus to produce noradrenaline and serotonin. These substances proceed through descending pathways back to the dorsal horn and inhibit the nociceptive transmission at the spinal level.

Diffuse Noxious Inhibitory Control

Diffuse Noxious Inhibitory Control (DNIC) is another mechanism, ie. A physiological system based on the concept that pain can be controlled by stimulation at points distal to its source. The idea is to apply a painful stimulus elsewhere than the area to which the initial pain is projected, thus achieving a pain relief effect. The endorphin system is involved and it is not necessary to administer pain stimuli in the affected area since of the effect is general according to this explanatory model.

Methods for Pain Relief in Labour

METHODS FOR PAIN RELIEF

Since time immemorial there have been attempts to reduce the suffering of the laboring woman and from this has evolved several methods of alleviating pain during labour.

Non pharmacological methods

1. Hypnosis has been used periodically since Anton Mesmer first wrote about it in 1977. It produced effective analgesia in only 25% of mothers by producing a deep trans.

2. **Relaxation / breathing techniques / Massage**

These form of pain relief can allay anxiety, encourage relaxation, provide a focus of distraction from pain and tension and encourages a positive attitude.

3. **Positioning and movement**

Mobility and the adoption of a position of comfort will be advantageous to the woman. An upright or kneeling position is said to improve the dimension of pelvis and encourage forward rotation of the fetus. This may lead to a decrease in the use of regional anaesthesia and analgesics.

4. **Intradermal injection of sterile water**

Provides relief of pain and backache by injecting intradermally sterile water of 0.1 – 0.5 cc at 4 sites in the lower sacral region.

5. **Temperature modulation**

Hot or cold pack, hot or cold water.

Hot packs to the abdomen and back or the perineum in the second stage of labour have the potential to relieve the burning sensation of pain. For some women the use of extreme cold may be similarly useful.

6. **Transcutaneous electrical nerve stimulation**

It is thought to work by interrupting pain transmission along the sensory pathway and by stimulating endogenous opioids.

Commonly two electrodes are applied vertically over the woman's back parallel to her spine between the areas of T 10 down to S4.

The electric current used may be of low frequency and intermittent or high frequency and continuous.

Low frequency TENS stimulate the release of endogenous opioids while the high frequency current closes the pain gate- the

sensation experienced may be felt as a tingling or as a sharper electric shock sensation.

7. Acupuncture

A form of Eastern medicine said to relate to the flow of energy called Qi within the body where needles are inserted along specific pathways or meridians.

In action may be related to release of endogenous opioids.

8. Herbalism and Aromatherapy

These make use of natural plant extracts or essential oils. These remedies may improve physiological balance, strength and stamina within the mind and body. Knowledge of specific usage is important as the use of some of these remedies is contraindicated in pregnancy and labour, while others may have an adverse effect on the baby if it comes in direct contact with them.

PHARMACOLOGICAL METHODS FOR PAIN RELIEF DURING LABOUR

Systemic Analgesia

Parenteral administration of opioids and sedative hypnotics are a commonly used method of analgesia. Opioid receptors located in cardiac atria are activated by circulating opioids to excite vagal afferents. These in turn activate descending nerve fibres that are inhibitory to pain stimuli. Thus decreasing the sensation of noxious stimuli. In effect intravenous opioids produce spinal analgesia without spinal injection.

Intravenous patient controlled analgesia

The use of an intravenous PCA may be of use for women where the placement of an epidural is contraindicated. The total drug requirement to achieve adequate pain relief is usually less using this method than with intra muscular narcotics or a continuous intravenous infusion. Fentanyl (10µg/ml) is the drug of choice.

Inhalation Analgesia

ENTONOX (50 : 50 mixture of O_2 and N_2O) is used. This is a colourless, odourless gas. Used in higher concentration it can provide effective pain relief with the advantage that its effects are short lived

and there is minimal complication in the neonate. It is obtained by the woman's own respiratory effort via a piped supply. The Obstetric Association UK (2005) guidelines state that Entonox is being phased out from UK in view of poor analgesic efficacy and environmental pollution.

Analgesia is obtained within 20 – 30 seconds of commencement and maximum effort is felt after about 45 seconds. Self administration is the recommended method of use as the patient drops the mask or mouth piece if she absorbs too much of the gas.

Epidural analgesia

Epidural analgesia can provide an effective form of pain relief in labour. It may be beneficial for women having a long or painful labour, be required on the grounds of fetal benefit or administered for maternal or obstetric indications. It may also be provided at maternal request.

Complications include increased frequency of instrumental delivery, some degree of motor weakness, dural puncture, vascular placement, hypotension and insufficient block. Epidural analgesia prolongs duration of labour.

Review of Literature

REVIEW OF LITERATURE

On review of literature several studies have consistently shown that sterile water injections provide good pain relief particularly for back pain during labour.

1. **Saxena Kirti N[15] et al in Indian Journal of Anesthesia (April 2009)** reported that, sterile water given intracutaneously seems to be an efficient and simple method for antagonizing parturition low back pain.

2. **M.Kasperink EK Hutton[13] et al (2009) in BJOG**, evaluated caesarean section rates among women who received sterile water injection in labour with other form of treatment and concluded, Caesarean section rate was 4.6% in the sterile water injection group and 9.9% in the control group.

3. **Vikki Fogarty[45] et al (2008) Women and Birth**, concluded that intradermal injection of sterile water possesses powerful analgesic benefits for women experiencing low back pain in labour and their use in therapeutic setting is justifiable.

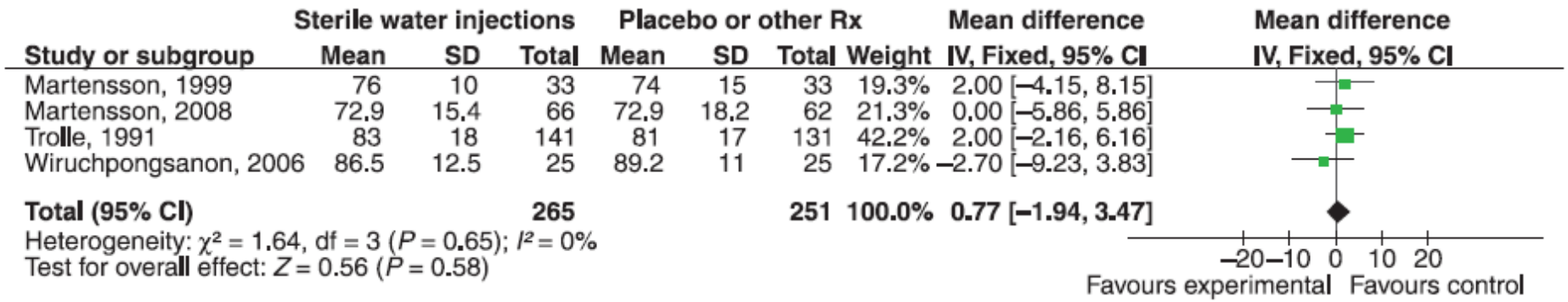


Figure 2. Meta-analysis results: baseline VAS pain scores before randomisation.

4. **Bahasadri[2] et al (2006) ANZJOG**, stated that the efficacy of SubCutaneous sterile water injection in reduction of labour pain compared with placebo. The median pain score in the sterile water group was significantly lower than the placebo group at 10 min, as well as 45 min after the injection.

5. **Wiruchpongsanon[47] (2006) Journal of the Medical Association of Thailand,** studied the effectiveness of Intracutaneous injection of sterile water in relieving low back pain during labor in Thai women. Mean pain reduction was significantly greater in the treatment group compared to the placebo group at 30 min, 1 and 2 hours after injection ($p < .001$).

6. **Martensson[27] et al (2006) Survey in Sweden Birth** investigated, whether during injections of sterile water, there is any difference in perceived pain between IntraCutaneous and SubCutaneous injections. IntraCutaneous injections of sterile water showed to be significantly more painful than

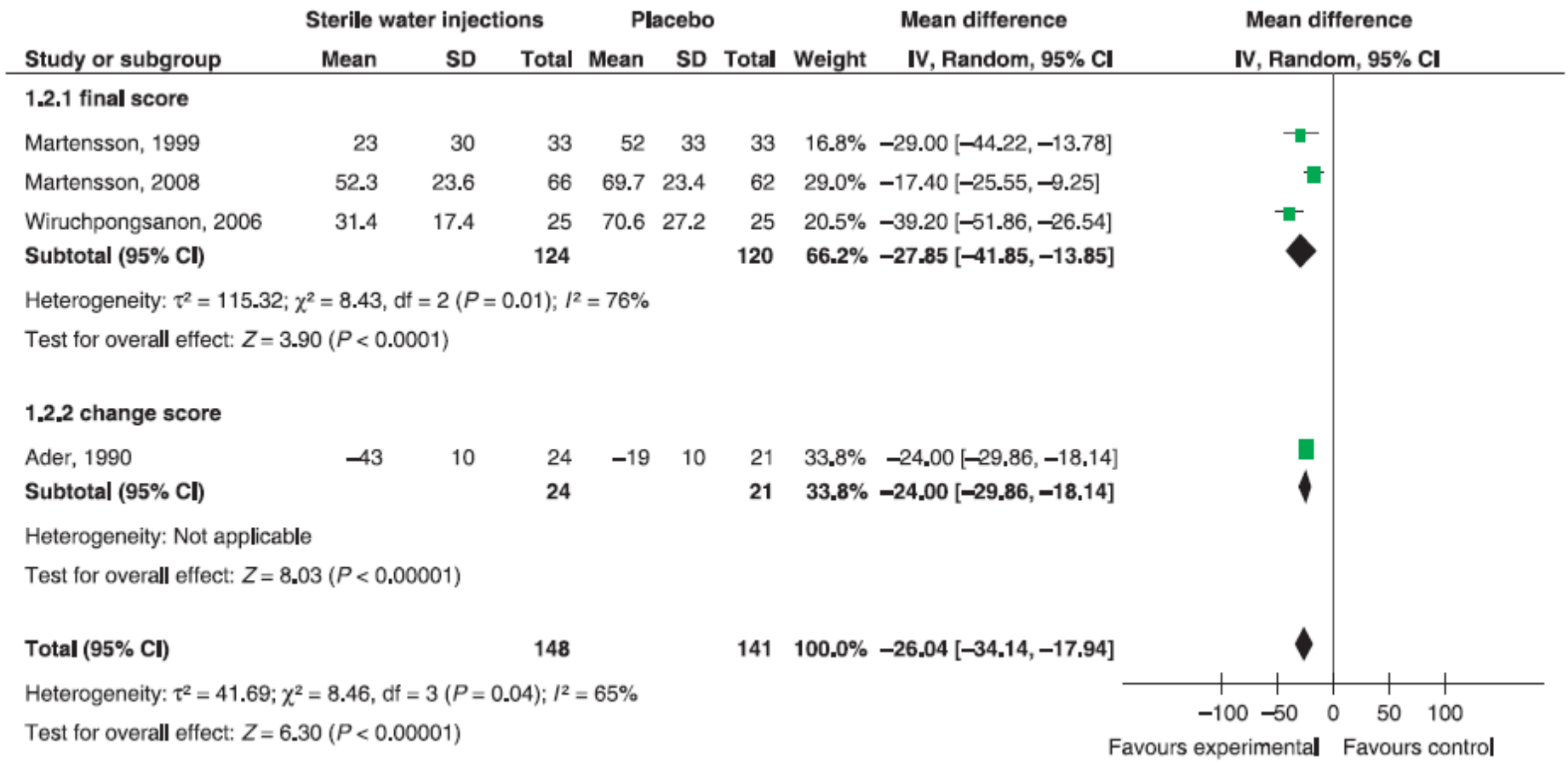


Figure 3. Meta-analysis results: VAS pain score at 10–30 minutes following intervention.

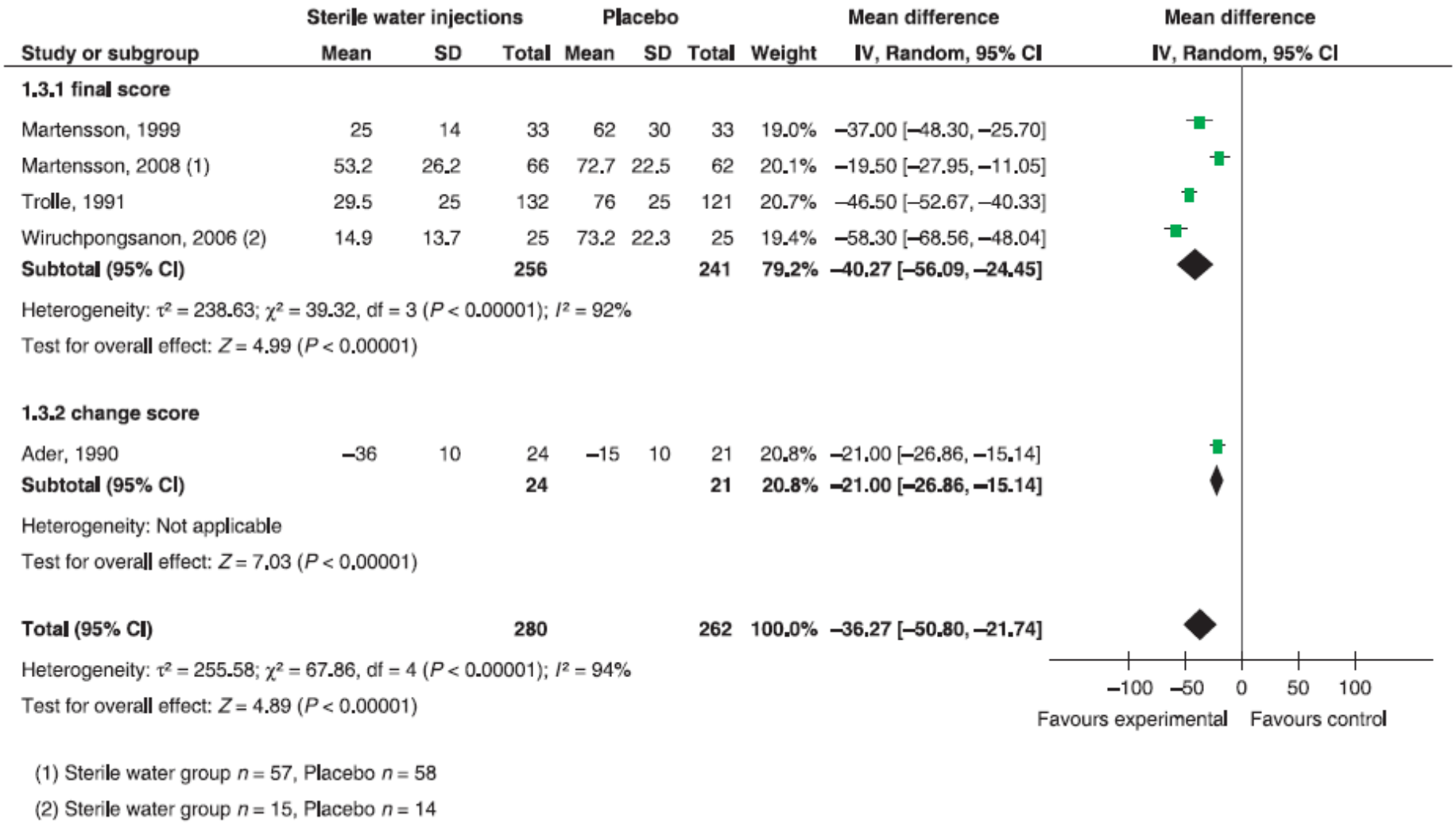
SubCutaneous injections even when trial, day and injection location were taken into consideration ($p < 0.001$)

7. **Peart K, James W and Deocampo[35,36] J 2006**. **Birth Issues**. Reported the Use of sterile water injections to relieve back pain in labour to be very effective.

8. **Martensson and Wallin[28] (1999) BJOG,** evaluated that the relief of pain in labor with SubCutaneous and intracutaneous injections of sterile water vs placebo. The pain reduction was significantly greater in both treatment groups compared to placebo at 10 and 45 min after treatment.

9. **Labrecque[17] et al (1999) Journal of family Medicine Practice,** compared with sterile water injections and TENS for low back pain during labor. Sterile water injections are more effective than standard care and TENS for low back pain.

10. **Dahl and Aarnes[8] (1991) Tidsskr Nor Laegeforen,** evaluated the method and factors possibly influencing the efficacy of Sterile water papules and found to have better



(1) Sterile water group $n = 57$, Placebo $n = 58$

(2) Sterile water group $n = 15$, Placebo $n = 14$

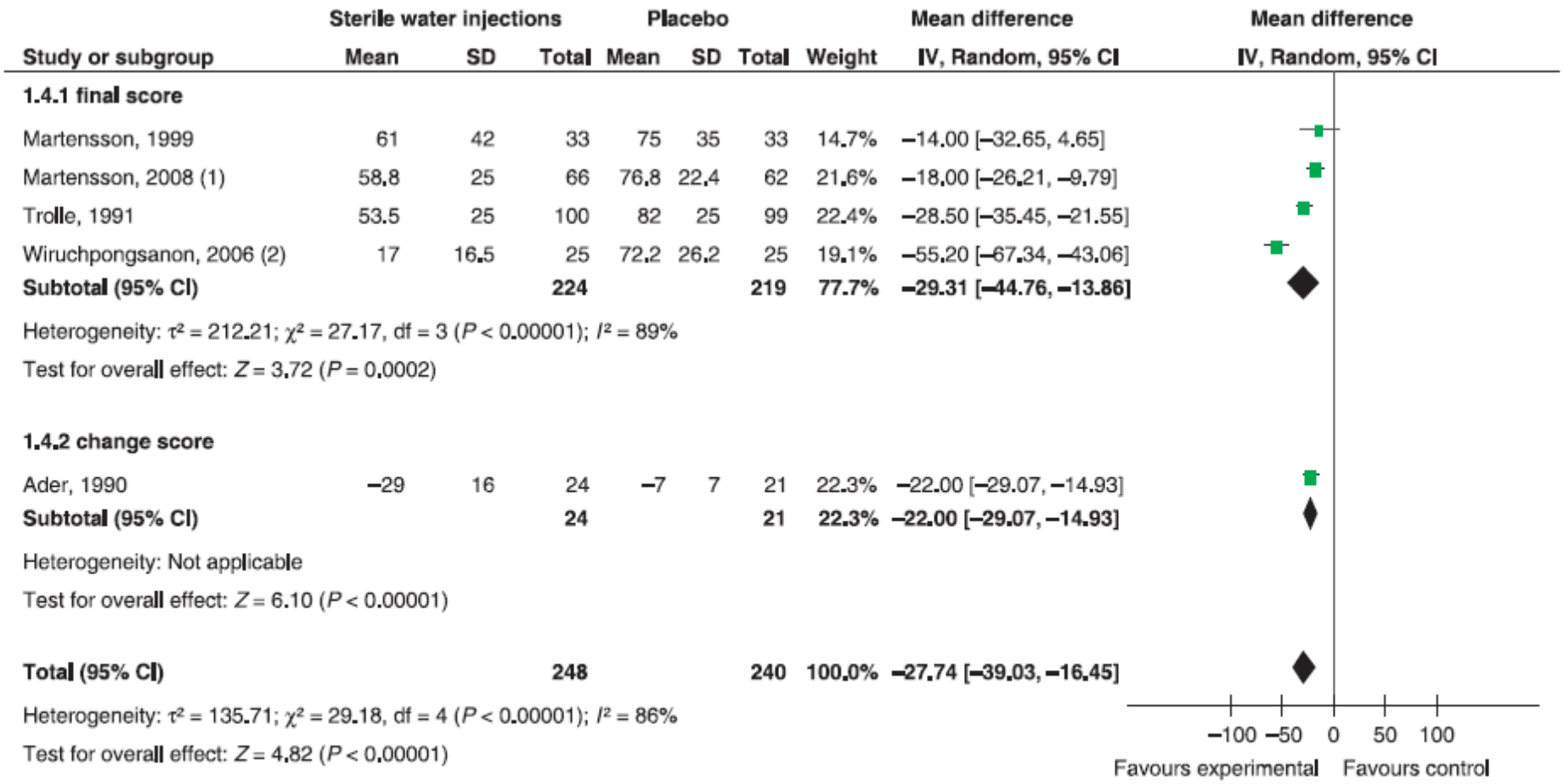
Figure 4. Meta- analysis results: VAS pain score at 45–60 minutes following intervention.

relief for labor pain in the IntraCutaneous group compared with the dry needle group early treatment yielded best effect.

11. **Trolle[44] et al (1991) American Journal of Obstetric Gynecology,** evaluated the analgesic effect of intradermal sterile water block for back pain during labor. Significantly greater reduction of VAS score in the sterile water group compared with the normal saline group, up to 90 min after treatment.

12. **Ader[1] et al (1990) Pain Journal,** investigated the efficacy of sterile water papules for back pain during labor. Significantly greater reduction of VAS score in the sterile water group compared with the normal saline group : analgesic effect up to 90 minutes.

13. **Lytzen[26] et al (1989) Acta Obstet Gynecol Scand,** evaluated that if sterile water papules can be an altenative for alleviating back pain. VAS score reduced significantly a hour after injection compared with just before administration.



(1) Sterile water group $n = 38$, Placebo $n = 34$

(2) Sterile water group $n = 6$, Placebo $n = 9$

Figure 5. Meta-analysis results: VAS at 90–120 minutes following intervention.

Table 1. Randomised controlled trials on the use of sterile water injections for labour pain

Author and country	Protocol	Outcome		Conclusion
		Experimental	Control	
Ader *et al.*[19] Sweden	Inclusion: term pregnancy; first-stage labour; severe low back pain; no analgesics within 3 h prior to participation. Intervention: intracutaneous sterile water versus subcutaneous isotonic saline injections given as 4 injections of 0.1 ml Outcome: VAS reported as reduction in mean score from baseline Sample size: $N = 45$ Quality score: 8	Intracutaneous sterile water ($n = 24$) Mean pain reduction: 10 min: 4.25 45 min: 3.6 90 min: 2.9 Caesarean section: 2/24	Subcutaneous isotonic saline ($n = 21$) Mean pain reduction: 10 min: 1.85 45 min: 1.5 90 min: 0.7 Caesarean section: 1/21	Mean reduction in pain significantly greater for sterile water group at 10, 45, 90 min.
Bahasadri *et al.*[29] Iran	Inclusion: term pregnancy; first-stage labour; low back pain; no analgesics prior to participation. Intervention: sterile water versus isotonic saline given as a single 0.5 ml subcutaneous injection at the point of most pain Outcome: Likert type 5 point Faces Scale. Sample size: $N = 100$ Quality score: 12	Subcutaneous sterile water ($n = 50$) Median pain score: Baseline: 4 10 min: 2 45 min: 2 Caesarean section: 2/50	Subcutaneous isotonic saline ($n = 50$) Median pain score: Baseline: 4 10 min: 4 45 min: 4 Caesarean section: 3/50	Median pain score was significantly lower in sterile water group.
Kushtagi and Bhanu[30] India	Inclusion: early part of active labour, low back pain; no analgesics prior to participation. Intervention: sterile water versus isotonic saline given as a single 0.5 ml subcutaneous injection at centre of Michaeli's rhomboid. Outcome: 10 point scale reported as median at 10 and 45 min. Sample size: $N = 100$ Quality score: 10	Subcutaneous sterile water ($n = 50$) Median pain score: Baseline: 8 10 min: 5 45 min: 4 Caesarean section: 4/50	Subcutaneous isotonic saline ($n = 50$) Median pain score: Baseline: 8 10 min: 7 45 min: 7 Caesarean section: 6/50	Median pain score was significantly lower in the sterile water group.
Labrecque *et al.*[21] Canada	Inclusion: first-stage labour, back pain, low obstetrical risk Intervention: intracutaneous sterile water given as 4 injections of 0.1 ml versus TENS versus Standard care Outcome: VAS, with pain intensity and pain unpleasantness score in mm collected at 15, 60, 90, 120 and 180 min post administration, but reported as a mean score during intervention. No baseline reported. Sample size: $N = 34$ Quality score: 10	Intracutaneous sterile water ($n = 10$) Mean pain intensity score during intervention: 32 Caesarean section: 0	Standard care ($n = 12$) Mean pain intensity score during intervention: 79 Caesarean section: 1 TENS ($n = 12$) Mean pain intensity score during intervention: 66 Caesarean section: 4	Mean pain intensity was significantly lower in the sterile water group compared to other 2 groups. Fewer women in intracutaneous sterile water group would use intervention again.

Table 1. *(Continued)*

Author and country	Protocol	Outcome		Conclusion
		Experimental	Control	
Mårtensson and Wallin[17] Sweden	Inclusion: term pregnancy, first-stage labour; severe low back pain Intervention: intracutaneous sterile water (4 injections, 0.1 ml) versus subcutaneous injections of sterile water (4 injections 0.5 ml) versus subcutaneous injections of isotonic saline (4 injections, 0.5 ml) Outcome: VAS, with median pain score reported in cm at baseline, 10, 45 and 90 min after administration. Sample size: *N* = 99 Quality score: 12	Intracutaneous sterile water (*n* = 33) Median pain score at: Baseline: 7.6 10 min: 2.3 45 min: 2.5 90 min: 6.1 Median pain score of intervention: 7.7 Caesarean section: 1/33 Subcutaneous sterile water (*n* = 33) Median pain score at: Baseline: 7.4 10 min: 2.3 45 min: 2.0 90 min: 4.1 Median pain score of intervention: 7.0 Caesarean section: 1/33	Subcutaneous isotonic saline (*n* = 33) Median pain score at: Baseline: 7.4 10 min: 5.2 45 min: 6.2 90 min: 7.5 Median pain score of intervention: 2.5 Caesarean section: 1/33	Median pain scores were significantly lower in the two sterile water treatment groups compared with placebo. The pain of administration of subcutaneous injections of sterile water was slightly less than intracutaneous sterile water. Subcutaneous injection of isotonic saline was the least painful
Mårtensson *et al.*[34] Sweden	Inclusion: term pregnancy, first-stage labour; require pain relief; no analgesic, sterile water, TENS within 10 h of study; no epidural, spinal, paracervical block; no augmentation Intervention: subcutaneous injections of sterile water (4–8 injections of 0.5 ml) versus acupuncture Outcome: VAS, with mean pain score reported in mm at baseline, 30, 60, 90, 120, 150 and 180 min post administration. Sample size: *N* = 128 Quality score: 13	Subcutaneous sterile water (*n* = 66) Mean pain score at: Baseline: 72.9 30 min: 52.3 60 min: 53.2 90 min: 52.3 120 min: 58.8 150 min: 58.6 180 min: 62.7 Caesarean section: 4/66	Acupuncture (*n* = 62) Mean pain score at: Baseline: 72.9 30 min: 69.7 60 min: 72.7 90 min: 73.8 120 min: 76.8 150 min: 72.0 180 min: 79.5 Caesarean section: 5/62	Mean pain was significantly lower in the sterile water group at all time points following intervention.
Trolle *et al.*[16] Denmark	Inclusion: severe low back pain Intervention: intracutaneous sterile water versus intracutaneous injections of isotonic saline, 4 injections, 0.1 ml Outcome: VAS, with mean pain score in mm recorded at baseline, 60 and 120 min post administration. Sample size: *N* = 272 Quality score: 10	Intracutaneous sterile water (*n* = 141) Mean pain score at: Baseline: 83 60 min: 29.5 120 min: 53.5 Caesarean section: 6/141	Intracutaneous isotonic saline (*n* = 131) Mean pain score at: Baseline: 81 60 min: 76 120 min: 82 Caesarean section: 15/131	Mean pain score was significantly lower at 60 and 120 min and there were fewer Caesarean section in the intracutaneous sterile water group

Table 1. (*Continued*)

Author and country	Protocol	Outcome		Conclusion
		Experimental	Control	
Wiruchpongsanon[28] Thailand	Inclusion: term pregnancy; first-stage labour; severe low back pain (VAS>7); no analgesics within 3 h. Intervention: intracutaneous sterile water versus intracutaneous injections of isotonic saline, 4 injections, 0.1 ml Outcome: VAS with pain score in mm recorded at baseline, 30, 60 and 120 min post administration. Sample size: $N = 50$ Quality score: 10	Intracutaneous sterile water ($n = 25$) Mean pain score at: Baseline: 86.5 30 min: 31.4 60 min: 14.9 120 min: 17.0 Caesarean section: 0/25	Intracutaneous isotonic saline ($n = 25$) Mean pain score at: Baseline: 89.2 30 min: 70.6 60 min: 73.2 120 min: 72.2 Caesarean section: 3/25	Mean pain scores were significantly lower in the intracutaneous sterile water group at 30, 60 and 120 min

14. **Trolle[44] et al (1986) Ugeskr Laeger (Danish Journal),** evaluated if back pain during labor can be treated with IntraCutaneous sterile water papules. The treatment group experienced significantly better pain relief compared with the control group, up to 60 and 120 min after treatment. It was also noted that there were fewer caesarean sections in the intracutaneous sterile water group.

Mode of action of sterile water injection

Bonica states that, Uterine contractions are felt as back pain became rami of T10 – L1 supplying the uterus also supply the skin over the lumbo-sacral area. The cutaneous branches of the lumbar and lower thoracic nerves cover a considerable caudal area. They transmit referred pain from uterus to a skin area over the vertebrae L3 – S2.The injections were given adjacent to the Michaelis' rhomboid because this is the area where referred pain from the uterine contractions were felt.

Injecting solutions of Osmolality other than blood irritates biological tissues. Sterile water evokes intense pain, probably due to difference in osmolality. Irritation of skin during administration of

sterile water stimulates the gate control effect and thereby the endogenous opioid system.

In the clinically, controlled double blind study by Bengtsson[4] et al acute ureteric colic was treated by injecting four papules of sterile water over cutaneous area where projected pain from the kidney and the upper urinary tract was felt.

Because sterile water is **hypo-osmolar**, it probably irritates the nerve endings leading to brief pain initially which is followed by analgesia, while saline being **isoosmolar** with blood does not irritate the nerves at all and therefore does not lead to analgesia.

The analgesia mechanism of action was provided by gate control theory or counter irritation theory.

Interruption of the pathway of pain is the desired action of sterile water injections with Trolle[44] et al, first suggesting the area of Michaelis Rhomboid as the recommended site for injections because, subjectively, this is the area where the pain is felt acutely by labouring women. When the sterile water is injected under the skin it raises a small bleb or "papule" which causes local irritation and a

strong sensory stimulation of the surrounding skin nociceptors for about 30 s. A-hyperaemic zone is observed around the bleb for some hours after demonstrating a prolonged irritation of the cutis. The analgesia induced by this stimulation may be caused by gate control at the spinal level and seems to be an important factor for the treatment to be effective, but this area provokes conjecture in the literature. **Bahasadri[2] et al** concurs that the gate control theory may provide an explanation for the mode of action of sterile water injections but because the inhibition of pain is not restricted to one specific segment, he suggests that there must be a more nonspecific modulation of pain. **Ader[1] et al**. speculates that the analgesic effect is similar to the stimulation of endogenous opioids seen with the use of acupuncture or TENS in labour and may act as "a long lasting segmental acupuncture". The Danish perspective from **Trolle[44] et al**. tells us that hyperstimulation of a skin area can affect perception of visceral pain and it appears that ***"the mechanism of referred pain can be reversed to produce referred analgesia" .***

Counter irritation was described by **Melzack**[29] as the phenomenon of one painful stimulus reducing the pain caused by

another noxious stimulus and may explain the pain-reducing effect of both sterile water injections and acupuncture. The Swedish and later Iranian studies discussed the concept of **diffuse noxious inhibitory control (DNIC)** which is a physiological mechanism produced to explain the effects of counter irritation. DNIC is the inhibition of multireceptive neurons in the dorsal horn of the spinal cord, when a noxious stimulus is applied to a region of the body remote from the neurone's excitatory receptive field" This ultimately means that pain is reduced in areas remote from those where stimuli are present, thus supporting the use of sterile water injections during labour.

Materials and Methods

MATERIALS AND METHODS

This study was conducted after approval of the Institutional Ethical Committee at Government Rajaji Hospital, Madurai, attached to Madurai Medical College, from Jan 2010 to June 2010.

Under this study 200 consecutive patients who were admitted in clean labour theater and in active labour were enrolled for the study. Out of which 100 patients received the sterile water injection served as study group. The other 100 patients received the normal saline injection served as the control group.

In both study group and control group

50 patients were primigravidae

50 patients were multigravidae

The study group and control group was well matched in age, parity and labour characteristics.

Informed consent was obtained from parturient of both study and control groups.

Inclusion criteria :

The following criteria were applied prior to including the cases in the study.

1. Pregnant women with gestational age (37 – 41 weeks)
2. Age of the patient 18 – 30 years
3. Patient not receiving any analgesics prior to onset of labour
4. Single foetus with vertex presentation
5. Patient at the onset of active phase of labour with a cervical dilatation of 2-3 cms complaining of low back pain
6. No evidence of cephalo – pelvic disproportion

EXCLUSION CRITERIA

1. Patient not willing for the procedure
2. Patient with contraindication for spontaneous vaginal delivery
    - Fetal distress
    - CPD
    - Malpresentation
    - Placenta praevia
    - Macrosomic baby
3. Medical disorders associated with pregnancy
    - Diabetes
    - Hypertension
    - Neurological diseases

- Blood dyscrasias

4. Infection in the area of injection
5. Any observable spine lesions
6. Suspicious or presence of dermatological pathology interfering with injection
7. Patient in latent phase of cervical dilatation – more than 5 cms
8. Patient received analgesics less than 3 hours prior to injection.

Cases were selected after detailed history was taken. A thorough general and obstetric examination was done. Vital parameters were recorded. Basic investigations which included, urine examination for albumin, sugar., blood hemoglobin estimation, blood grouping and Rh typing were done. Ultrasound abdomen was performed to rule out any fetal abnormality to detect placental site, gestational age and amniotic fluid volume. Pelvic assessment to rule out CPD was performed. Patients with borderline and definite CPD were excluded from the study. Informed consent was obtained.

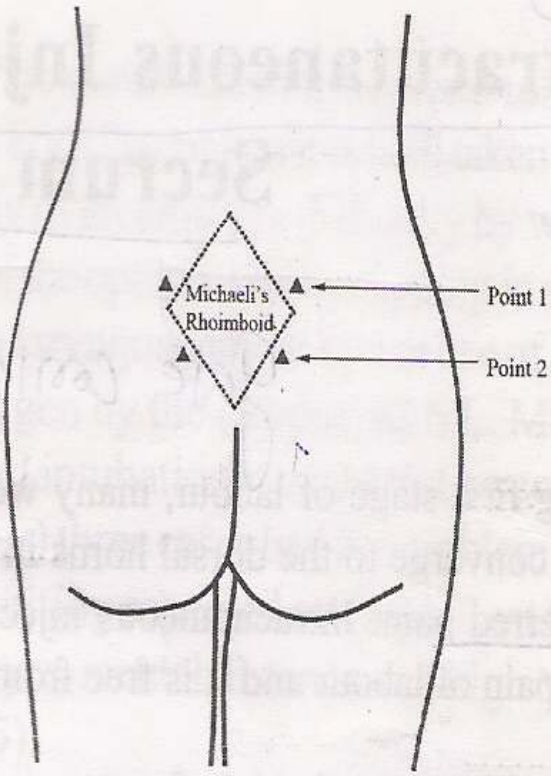


Fig 1 The Michaelis' rhomboid and points for injection (From: Martensson L, Wallin.G. Labour pain treated with cutaneous injections of sterile water: a randomized controlled trial. Br J Obstet Gynaecol,1999;106: 633-637).

The following parameters were monitored

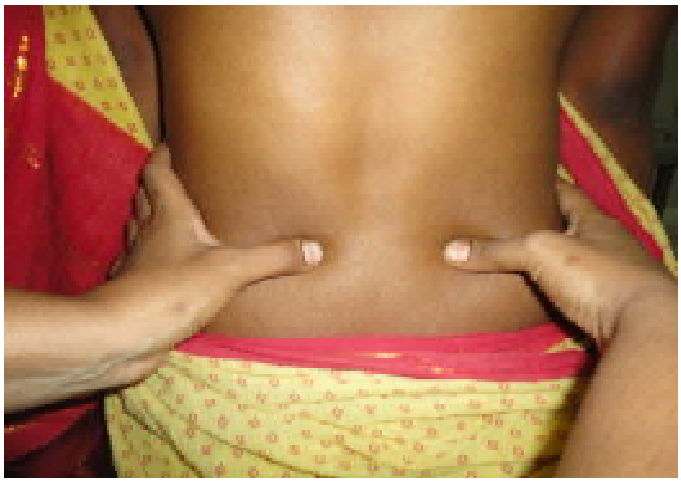
1. Progress of labour with partogram
2. Maternal well being
3. Fetal well being

Participants who fulfill the selection criteria were subjected for active management of labour in the form of

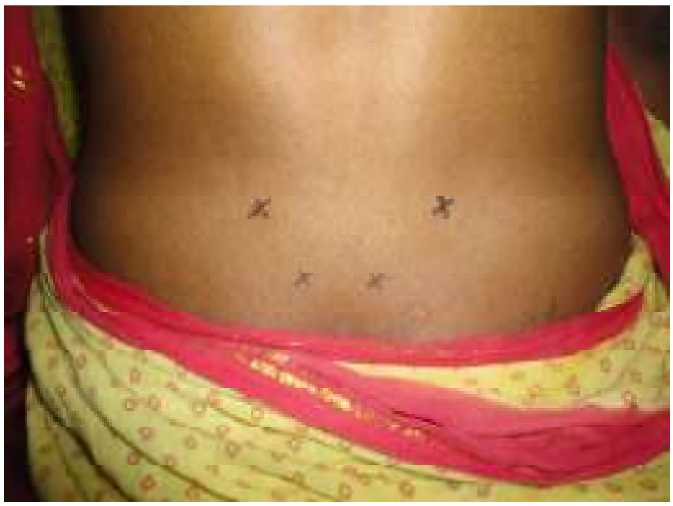
1. Nutrition in the form of liquids
2. Intravenous access in the form of IV canula
3. Prophylactic antibiotics after rupture membranes.
4. Subsequent observation and examination included.

- Maternal vital data every 1-2 hours.
- Uterine contractions – frequency and duration
- The aim is to produce cervical dilatation of atleast 1 cm per hour.
- In case of hypotonic uterine contractions, oxytocin drip was started, at the rate of 2 mU/minute and increased gradually till achieving uterine contractions lasting for 45 – 60 seconds and recurring every 3 minutes with a maximum infusion rate of 20 – 30 mU/minute.
- Fetal heart rate every 30 minutes to detect fetal distress.

PALPATION OF ANATOMICAL LAND MARKS



MARKING THE ANATOMICAL LANDMARKS



- Rate of cervical dilatation and head descent was assessed every hour by vaginal examination and the data was recorded in the partogram.

The women were randomized in to 2 groups

GROUP A – STERILE WATER INJECTION GROUP

GROUP B – NORMAL SALINE INJECTION GROUP

Materials

Materials needed are sterile water ampoules, normal saline ampoules, insulin syringe, alcohol skin wipes and Universal Pain Assessment VAS Scale.

Method of administration

Procedure

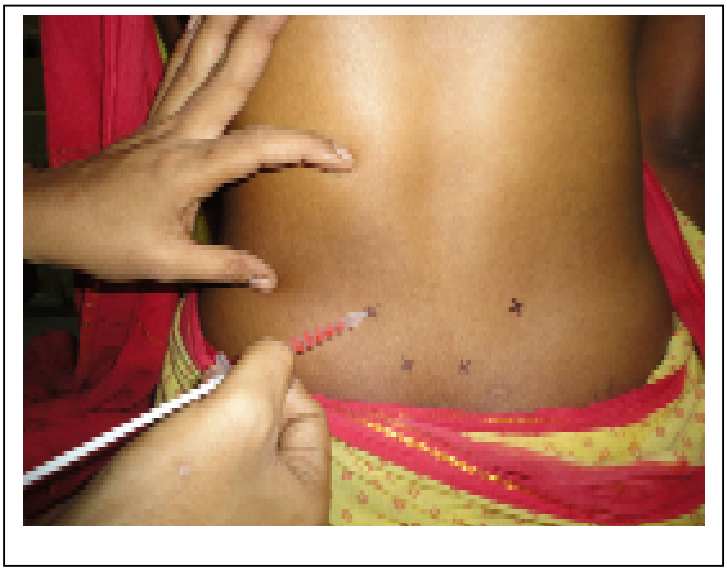
1. Patient position – sitting position.
2. Anatomical points located as follows

Point 1 - The posterior superior iliac spines (Dimple of Venus), palpated by feeling the bony prominences just lateral to the sacrum and below the iliac crest.

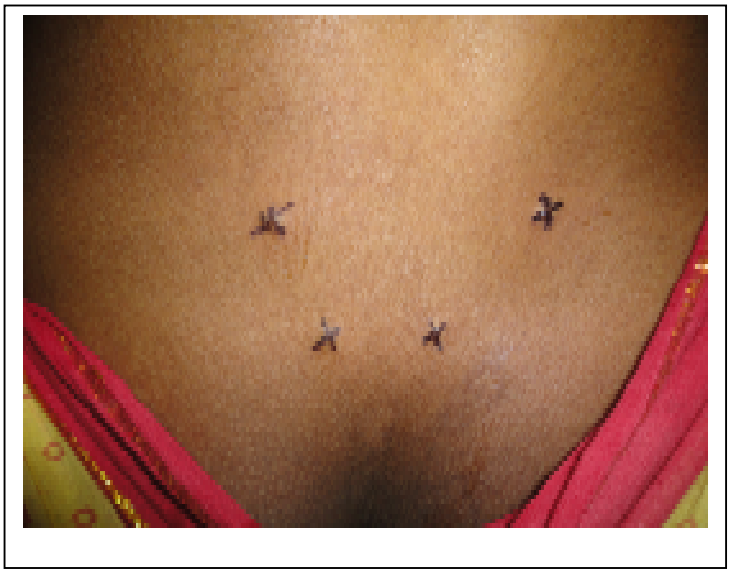
Point 2 – 3 cms below and 1 cm medial to **point 1**.

Point 1 and 2 on both sides form an area being referred as **Michaelis' rhomboid**[15.]

INJECTING 0.5cc WITH INSULING SYRINGE



FORMATION OF BLEB AFTER INJECTION



3. Skin was cleansed with alcohol wipes
4. Group A received 4 intracutaneous injections of 0.5 cc sterile water at the already marked 4 points in sitting position. These injections were administered with 1 ml insulin syringe with fine 30 gauge needle, during the peak of uterine contraction to mask any administration pain.
5. Group B received 4 intracutaneous injections of normal saline in the same region.

All the patients had a brief stinging pain when the injection was given. The stinging pain lasted longer in the sterile water group but subsided within few seconds.

Assessment of pain relief was performed using a visual analogue scale (VAS), before injection, at 10 minutes, 45 minutes and 90 minutes of post administration.

The acceptability of the technique by the patient was assessed in the first post partum day by a questionnaire, stating whether the patient will accept this technique in her future labour or not.

Results

RESULTS

Observation and Analysis of the Study

This study was conducted on 200 antenatal women out of which 100 patients were given sterile water injection at the onset of active labour, who served as the study group.

The remaining 100 women who served as controls were given normal saline injection.

Characteristics of the cases studied

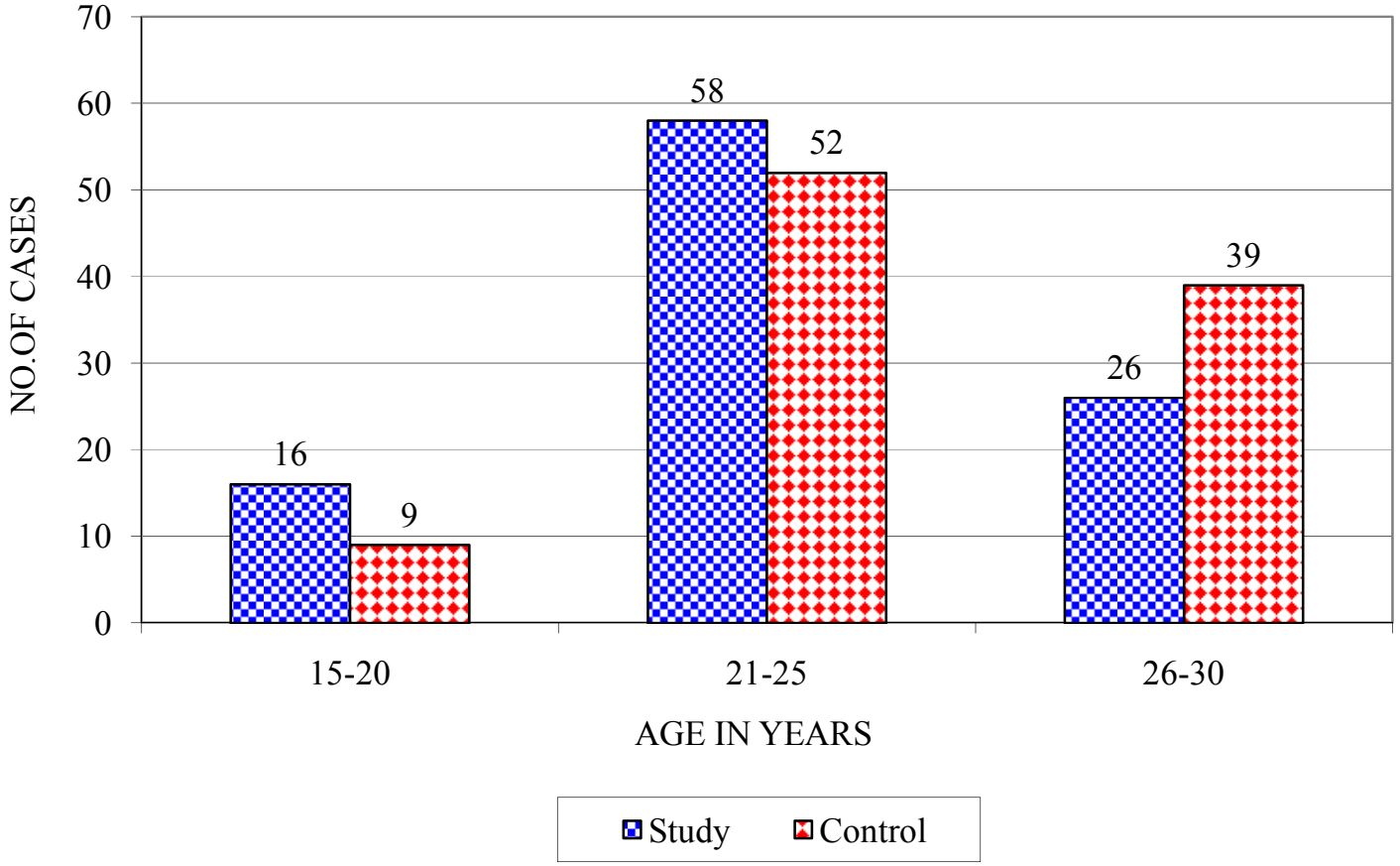
I. AGE

Distribution of cases according to age group.

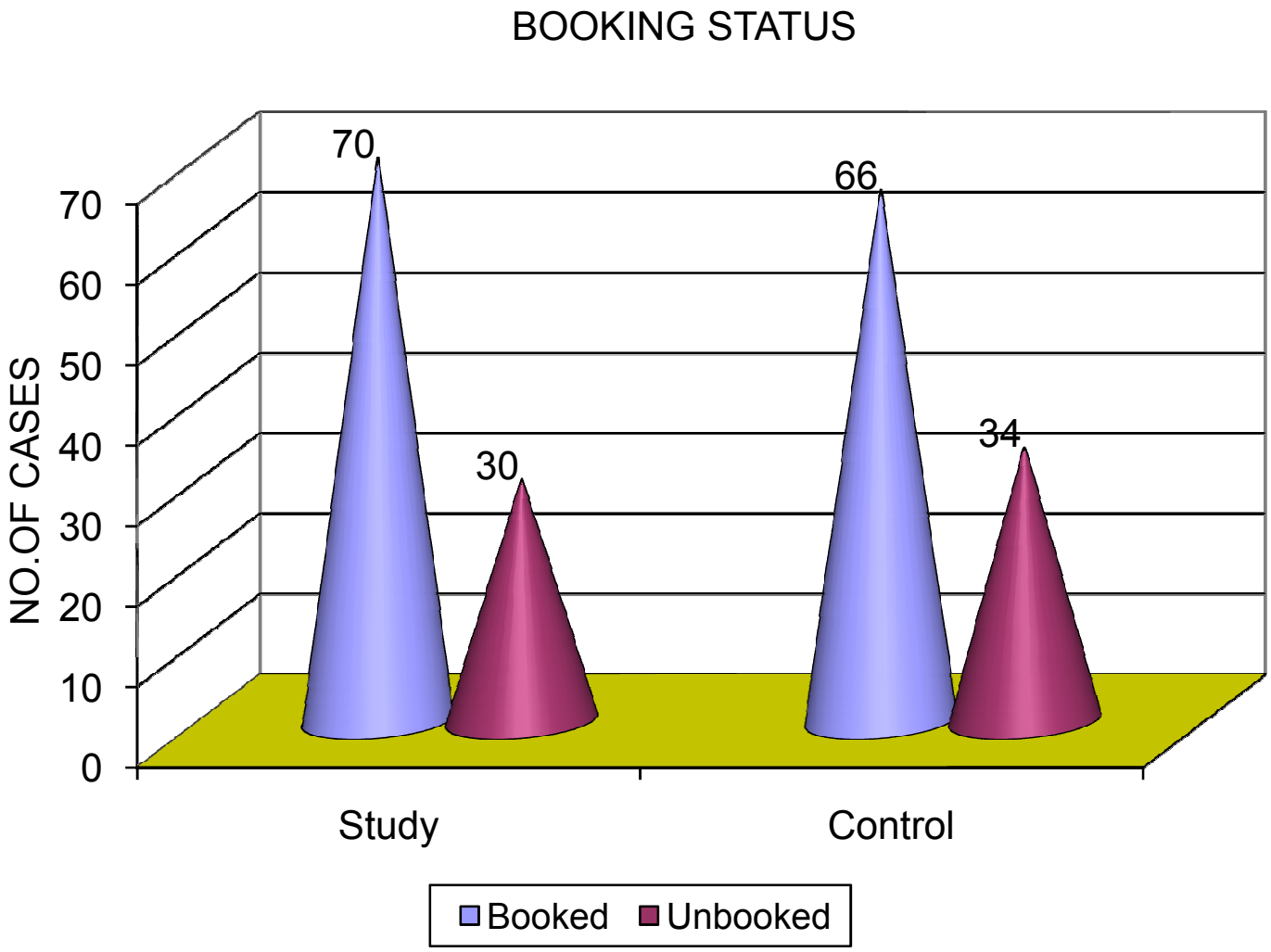
Age Group	Group A (Sterile water)		Group B (normal saline)	
	No.	%	No.	%
15-20	16	16%	9	9%
21-25	58	58%	52	52%
26-30	26	26%	39	39%
	100	100	100	100
Mean	23.80		24.39	
SD	3.06		3.09	

P = 0.177 Not significant

AGE DISTRIBUTION



On analysis of study group age wise, 16% of cases were in the age group of 15 – 20. 58% of cases were in the age group of 21 – 25. 26% of cases were in the age group of 26 – 30. The mean age of study group was 23.8 years. In control group, 9% cases were in the age group of 15 -20, 52% cases were in the age group of 21 – 25, 39% cases were in the age group of 26 – 30. The mean age of control group was 24.39 years. There was no statistical significance in age of both groups (P=0.177).


BOOKING STATUS
NO.OF CASES
70
60
50
40
30
20
10
0
70
30
66
34
Study
Control
Booked
Unbooked

2. Booking status:

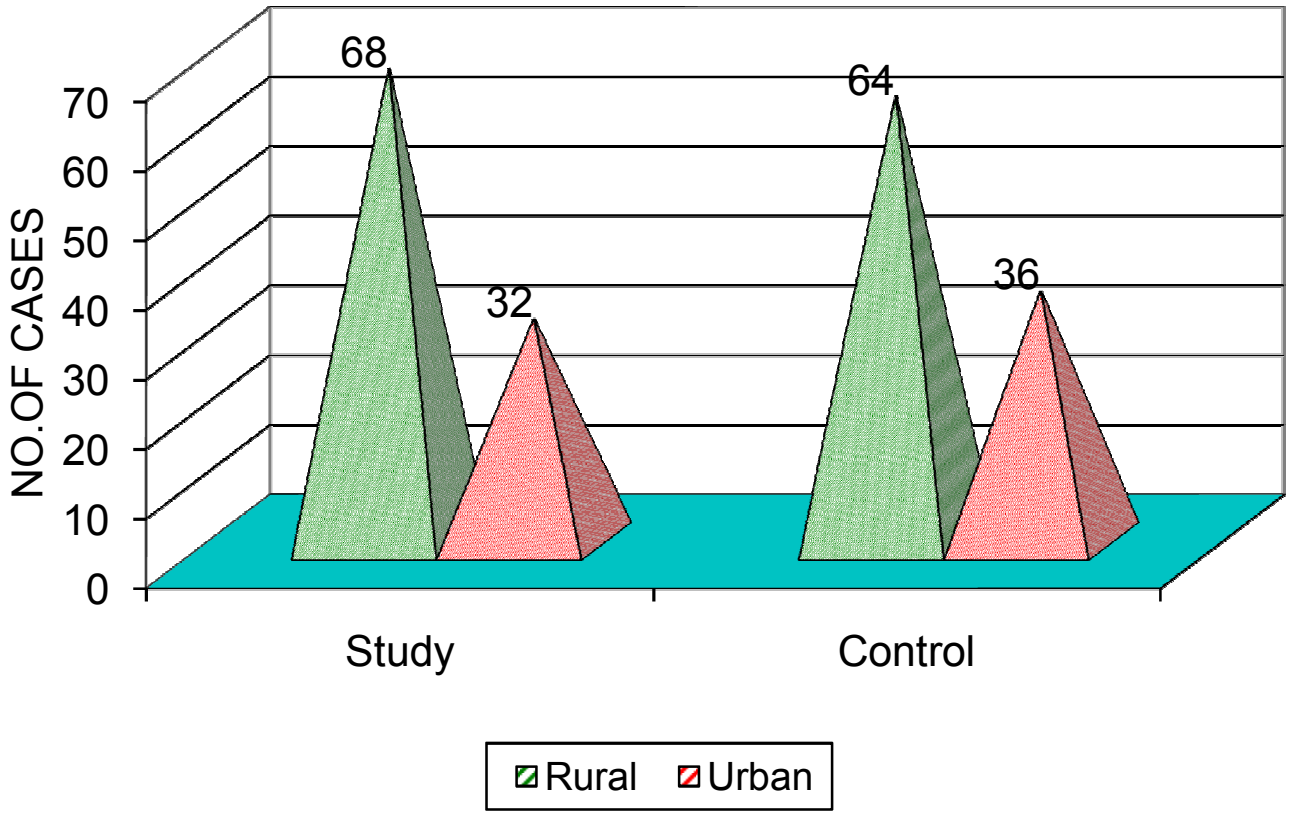
	Group A (Sterile water)		Group B (normal saline)	
	No.	**%**	**No.**	**%**
Booked	**70**	**70**	**66**	**66**
Unbooked	**30**	**30**	**34**	**34**

P = 0.086 (Not significant)

In study group, 70% of the cases were booked, 30% of the cases were unbooked. In control group, 66% of the cases were booked, 34% of the cases were unbooked.

The P value of 0.086 was insignificant.

DISTRIBUTION OF CASES ACCORDING TO RESIDENCE



3) Distribution of cases according to residence

	Group A (Sterile water)		Group B (normal saline)	
	No.	**%**	**No.**	**%**
Rural	68	**68**	64	**64**
Urban	32	**32**	36	**36**

P = 0.551 (Not significant)

In study group 68% of cases were from rural areas and 32% of cases from urban areas. In control group 64% of cases were from rural areas and 36% of cases from urban areas.

The P value 0.551 was insignificant.

4) Gestational age wise distribution

In both study and control group only term patients with gestational age ranging from 37-41 weeks were selected.

5) Distribution of parity:

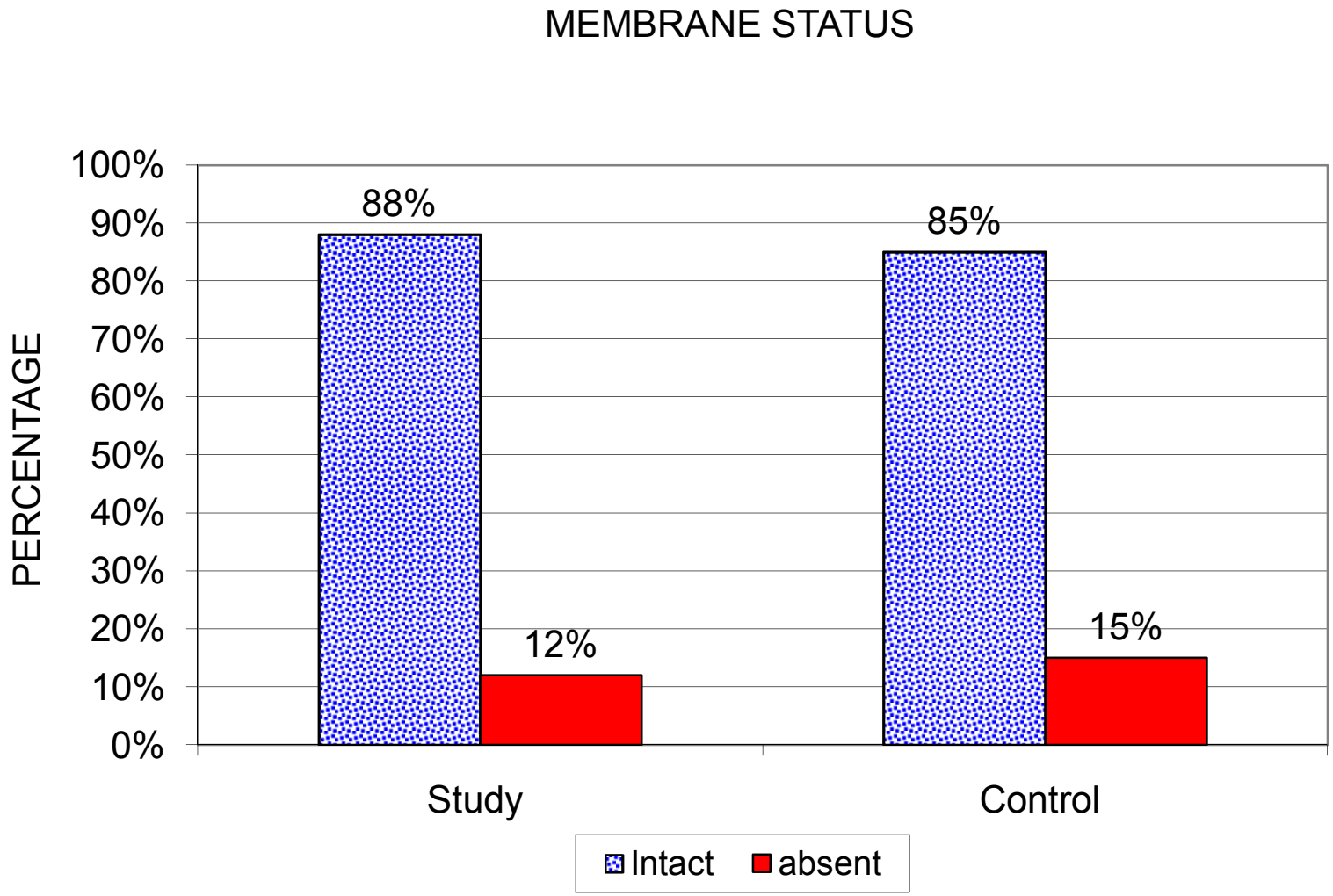
	Group A (Sterile water)		Group B (normal saline)	
	No.	**%**	**No.**	**%**
Primigravida	**50**	**50**	**50**	**50**
Multigravida	**50**	**50**	**50**	**50**
Total	**100**		**100**	

P = 1.005 (Not significant)

In both the study and control group parity was equally distributed

50% cases were primigravidae

50% cases were multigravidae


MEMBRANE STATUS
PERCENTAGE
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
88%
12%
85%
15%
Study
Control
Intact
absent

6) Membrane Status

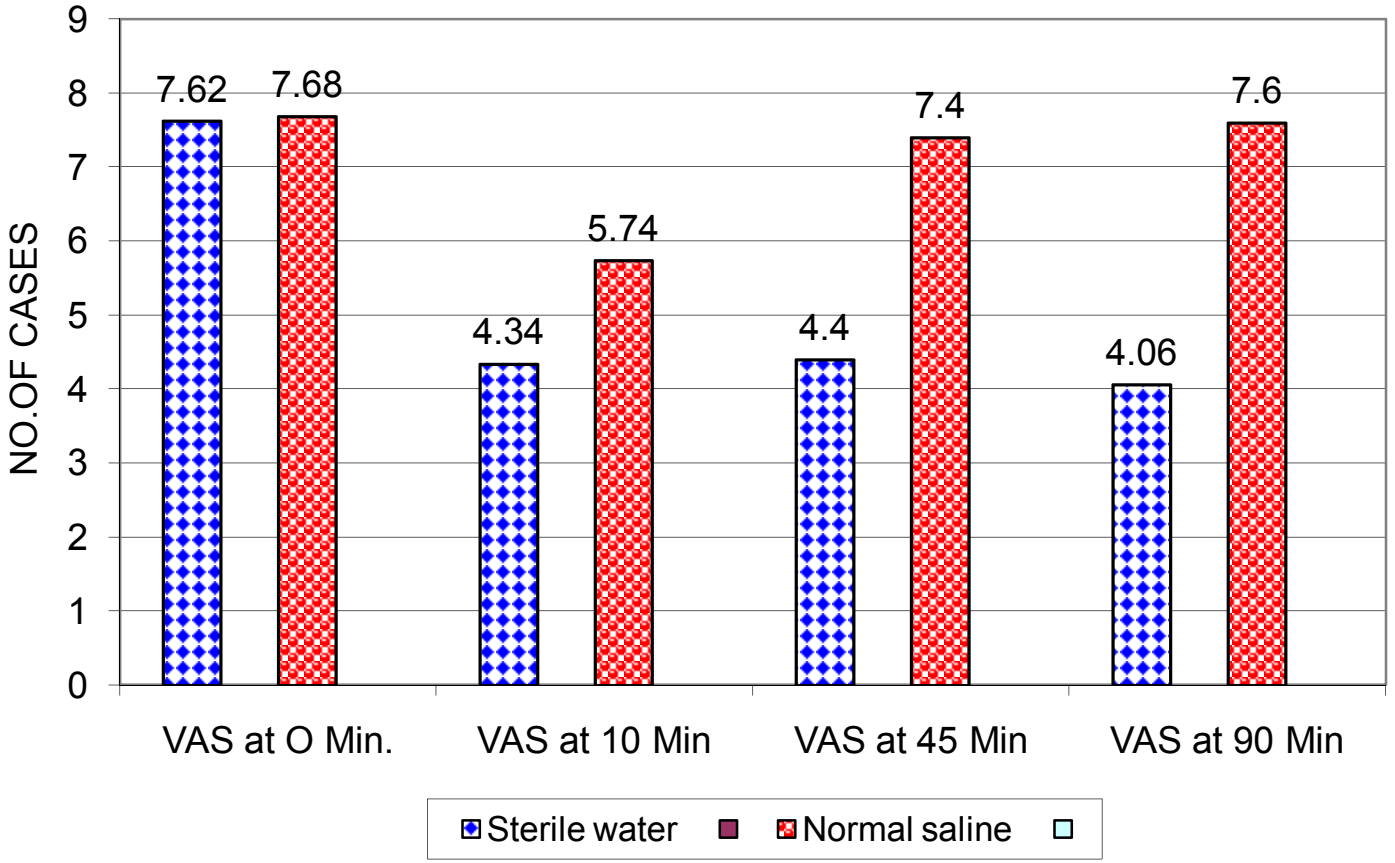
	Group A (Sterile water)		Group B (normal saline)	
	No.	**%**	**No.**	**%**
Intact	**88**	**88**	**85**	**85**
absent	**12**	**12**	**15**	**15**

P = 1.007 (not significant)

In study group 88% cases had intact membranes and in 12% of cases membranes were absent. In control group 85% cases had intact membranes and in 15% of cases membranes were absent.

The P value 1.007 was insignificant.

MEAN VAS SCORES - PRIMI GRAVIDA



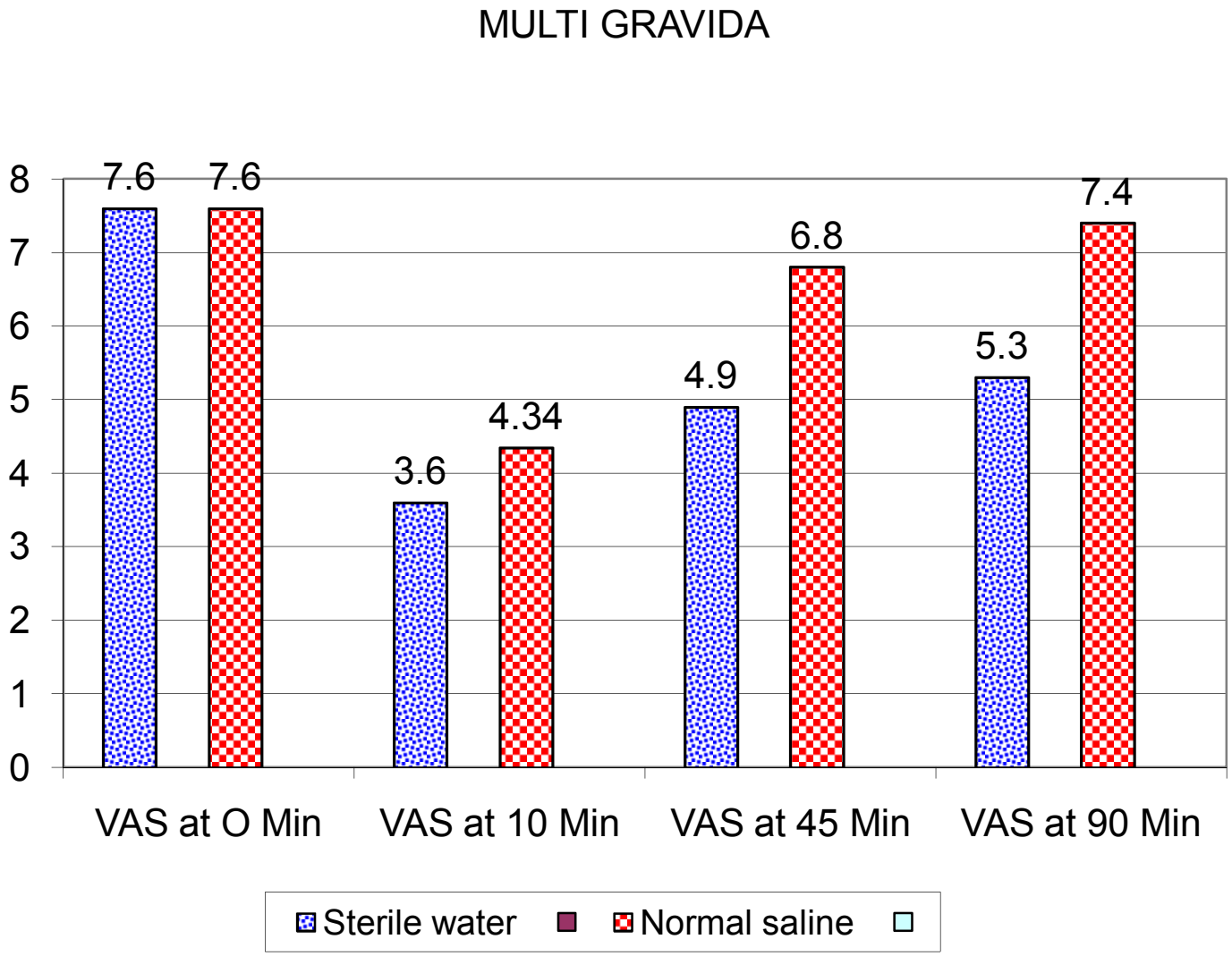
7) VAS scores after injection in study and control groups

MEAN VAS SCORES AT DIFFERENT TIMES

PRIMIGRAVIDA

Group	VAS at O Min.	VAS at 10 Min.	VAS at 45 Min.	VAS at 90 Min.
Group A (Sterile water)	7.62 ± 0.645	4.34± 1.099	4.4 ± 1.78	4.06± 1.09
Group B (normal saline)	7.68 ± 0.621	5.74± 1.818	7.4 ± 8	7.6± 0.25
P value sterile water vs normal saline	0.064 Not significant	0.043 Significant	0.001 Significant	0.004 Significant

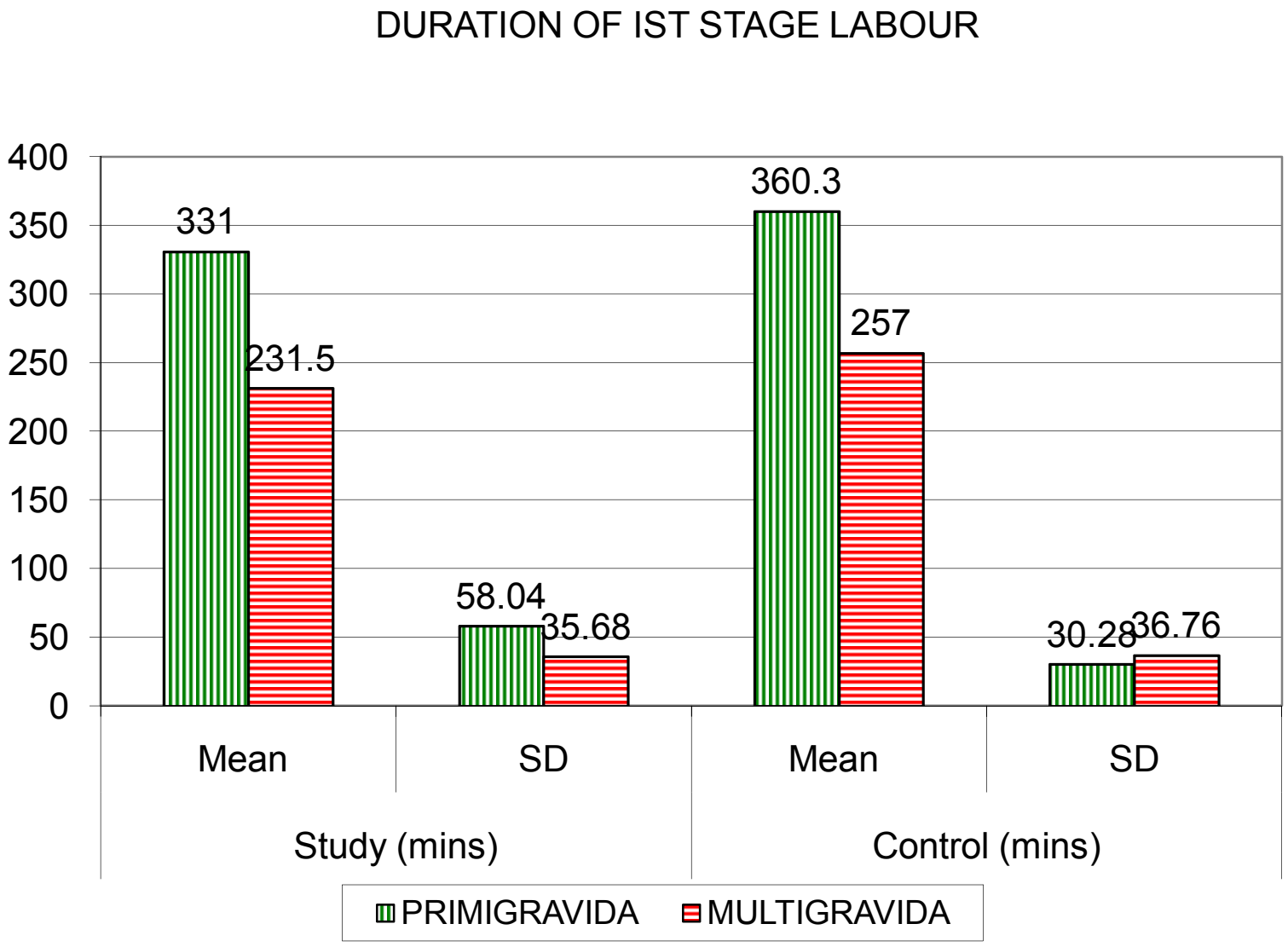
In study and control groups in primigravida, the VAS score before start of treatment was 7.62 in study group and 7.68 in control group, with statistical insignificance between the two groups(P=0.064). The mean pain scores at 10min, 45min and 90min showed a statistically significant reduction in the sterile water group when compared to the normal saline group (P<0.005).


MULTI GRAVIDA
8
7
6
5
4
3
2
1
0
7.6
7.6
3.6
4.34
4.9
6.8
5.3
7.4
VAS at O Min
VAS at 10 Min
VAS at 45 Min
VAS at 90 Min
Sterile water
Normal saline

MULTIGRAVIDA

Group	VAS at O Min.	VAS at 10 Min.	VAS at 45 Min.	VAS at 90 Min.
Group A (Sterile water)	7.6 ± 0.68	3.6± 0.768	4.9 ± 1.035	5.3± 1.6
Group B (normal saline)	7.64 ± 0.639	4.34± 0.895	6.8 ± 0.729	7.4± 1.82
P value sterile water vs normal saline	0.0652 (not significant)	P<0.001 (Significant)	P< 0.001 (Significant)	P< 0.001 (Significant)

In multigravida, the mean VAS score at the start of treatment was 7.6 in Sterile water group and 7.64 in Normal saline group, with statistical insignificance between both groups (P = 0.0652). The mean VAS pain score 10 minutes after treatment was found to be reduced in sterile water group, but not in normal saline group. Mean VAS pain scores at 45 and 90 minutes was also found to be reduced considerably in the sterile water group but not in the normal saline group (P<0.001)


DURATION OF IST STAGE LABOUR
400
350
300
250
200
150
100
50
0
331
231.5
58.04
35.68
360.3
257
30.28
36.76
Mean
SD
Mean
SD
Study (mins)
Control (mins)
PRIMIGRAVIDA
MULTIGRAVIDA

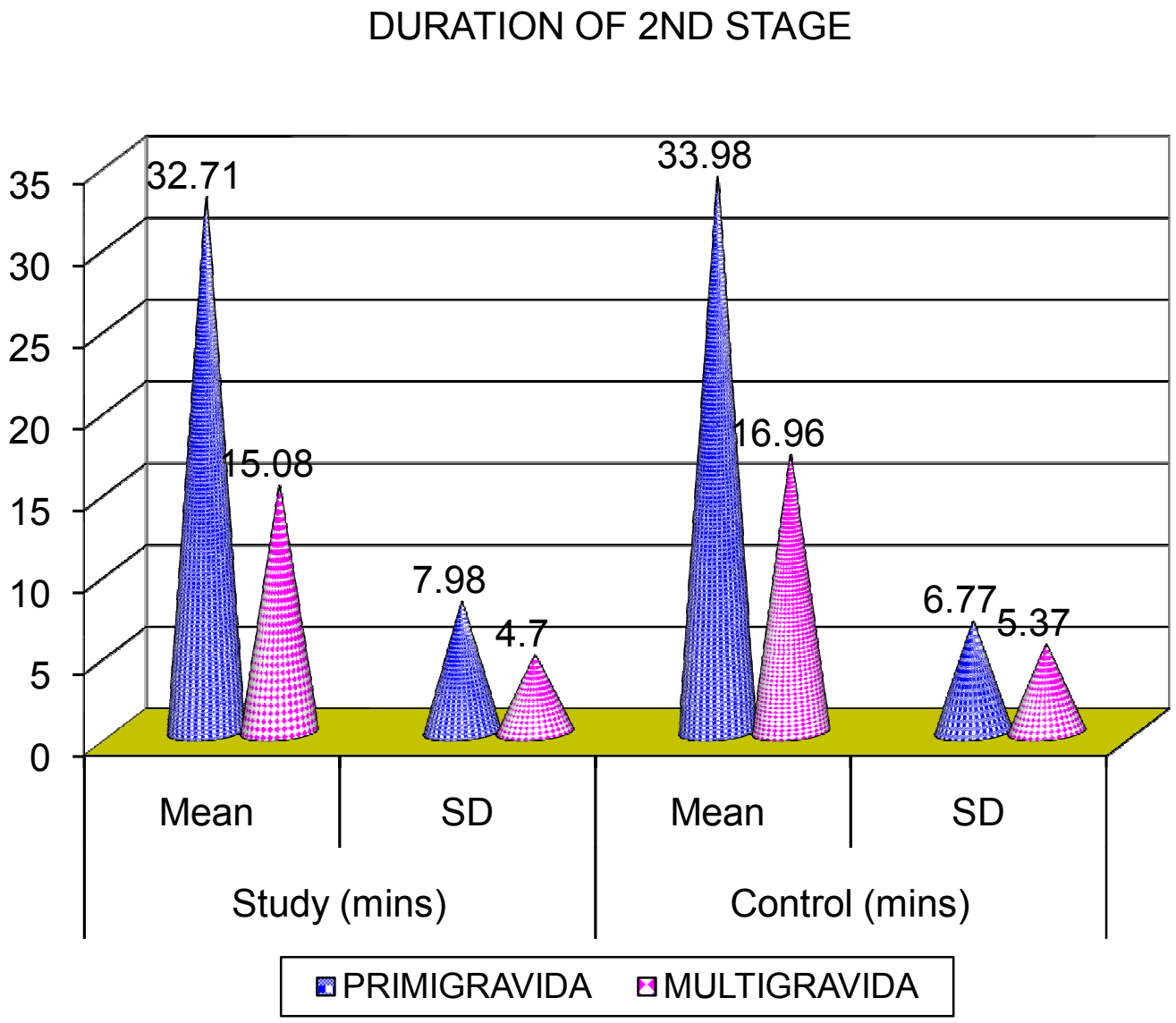
Duration of first stage of labour

	Group A (Sterile water) min		Group B (normal saline) min	
	Mean	**SD**	**Mean**	**SD**
PRIMIGRAVIDA	331	58.04	360.3	30.28
P value	**0.002**			
MULTIGRAVIDA	231.5	35.68	257	36.76
P value	**0.001**			
TOTAL	281		308.5	
P value	**0.003**			

In primigravida, in study group the mean duration of first stage of labour was 331 minutes. In control group it was 360.3 minutes. P value was 0.002, and it was found to be statistically significant.

In multigravida the mean duration of first stage of labour in study group was 231.5 minutes. In control group it was 257 minutes. P value was 0.001, and it was found to be statistically significant.

Mean duration of first stage of labour in study group was 281 minutes and in control group it was 308.5 minutes. P value was 0.003, the difference was statistically significant.


DURATION OF 2ND STAGE
35
30
25
20
15
10
5
0
32.71
15.08
7.98
4.7
33.98
16.96
6.77
5.37
Mean
SD
Mean
SD
Study (mins)
Control (mins)
PRIMIGRAVIDA
MULTIGRAVIDA

Duration of second stage

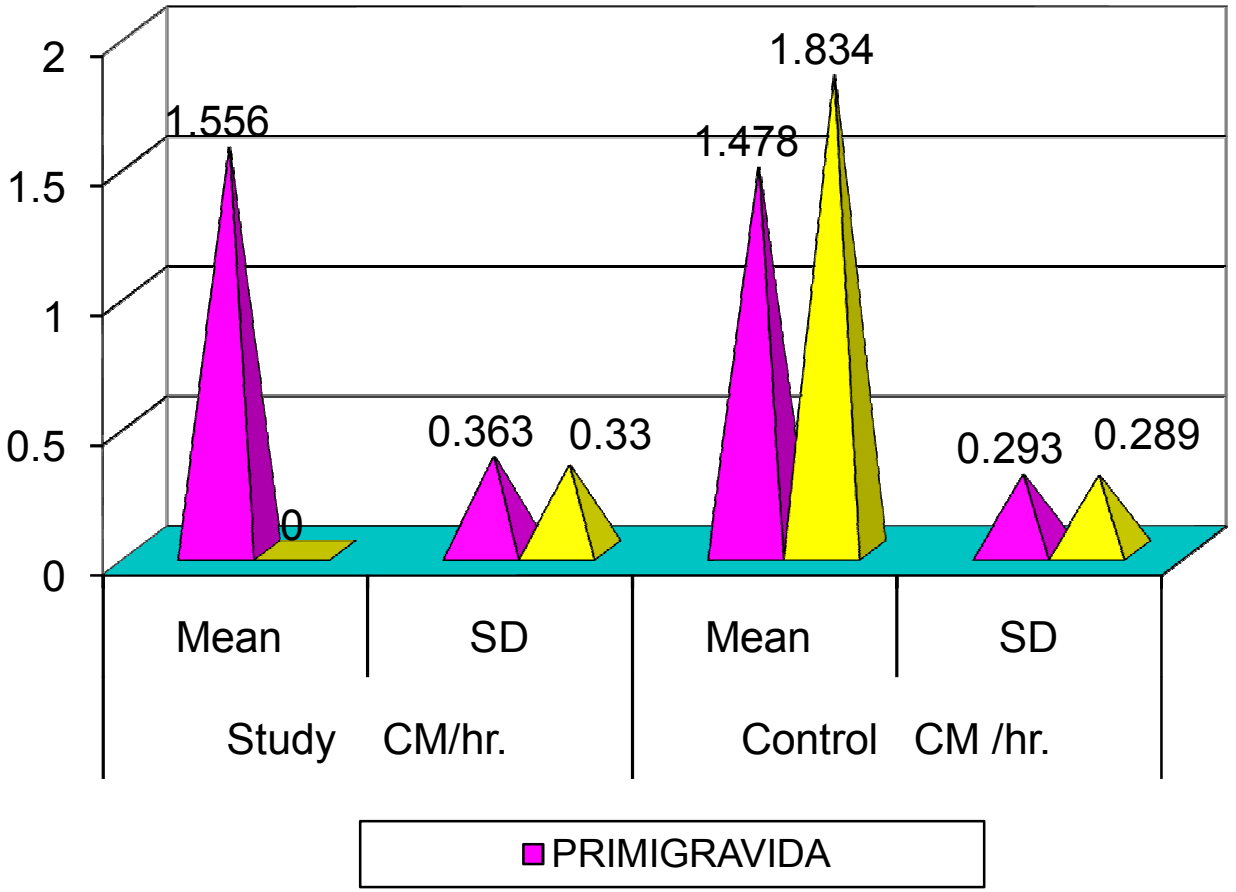
	Group A (Sterile water) min		Group B (normal saline) min	
	Mean	**SD**	**Mean**	**SD**
PRIMIGRAVIDA	**32.71**	**7.98**	**33.98**	**6.77**
P value	**0.393**			
MULTIGRAVIDA	**15.08**	**4.7**	**16.96**	**5.37**
P value	**0.065**			
Total	**23.89**		**25.47**	

P = 0.0528

In study group, in primigravida the mean duration of second stage of labour was 32.71 minutes, whereas in control group it was 33.98 minutes. In multigravida, the mean duration of second stage of labour was 15.08 minutes and in the control group it was 16.96 minutes.

Mean duration of second stage of labour was 23.89 minutes in study group and 25.47 minutes in control group. P value = 0.0528. it was statistically not significant. There was no prolongation of second stage of labour in the study group.

RATE OF CERVICAL DILATATION



Rate of Cervical dilatation (CM/hour)

	Group A (Sterile water) CM/hr.		Group B (normal saline) CM /hr.	
	Mean	SD	Mean	SD
PRIMIGRAVIDA	1.556	0.363	1.578	0.293
MULTIGRAVIDA	2.206.	0.330	1.834	0.289

P < 0.001

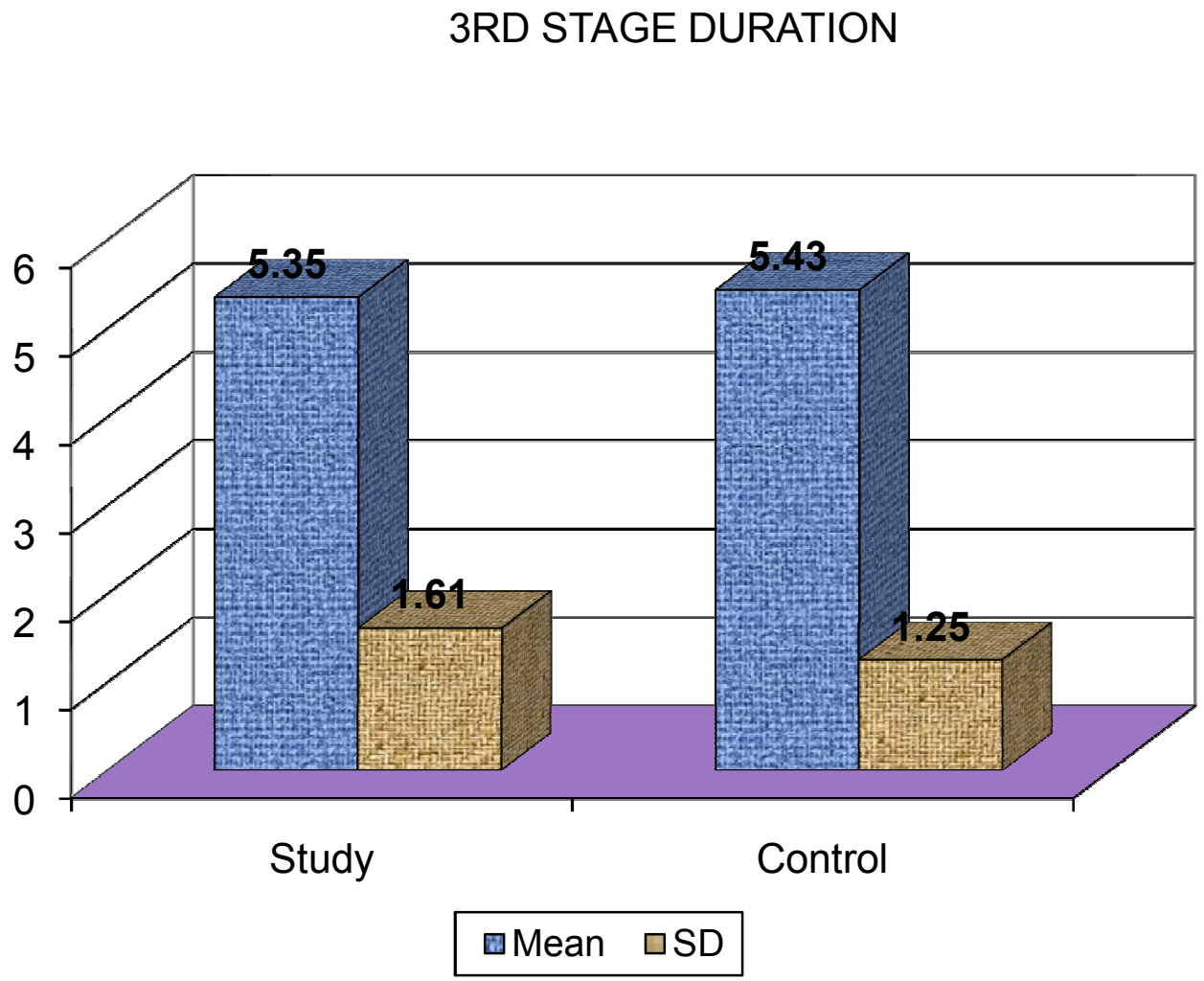
The cervical dilatation at the time of administration of injection was 2 cms – 3 cms

In study group, the mean cervical dilatation in the primigravida was 1.55 ± 0.363cm/hr and in the multigravida it was 2 .2± 0.3cm/hr.

In Control group, the mean cervical dilatation in the primigravida was 1.5 ±0.29 cm/hr and in the multigravida it was 1.8 ±0.2cm/hr.

Mean rate of cervical dilatation in study group was1.8cm/hr and it is 1.5cm/hr in control group.

There was a statistical significance between the two groups.

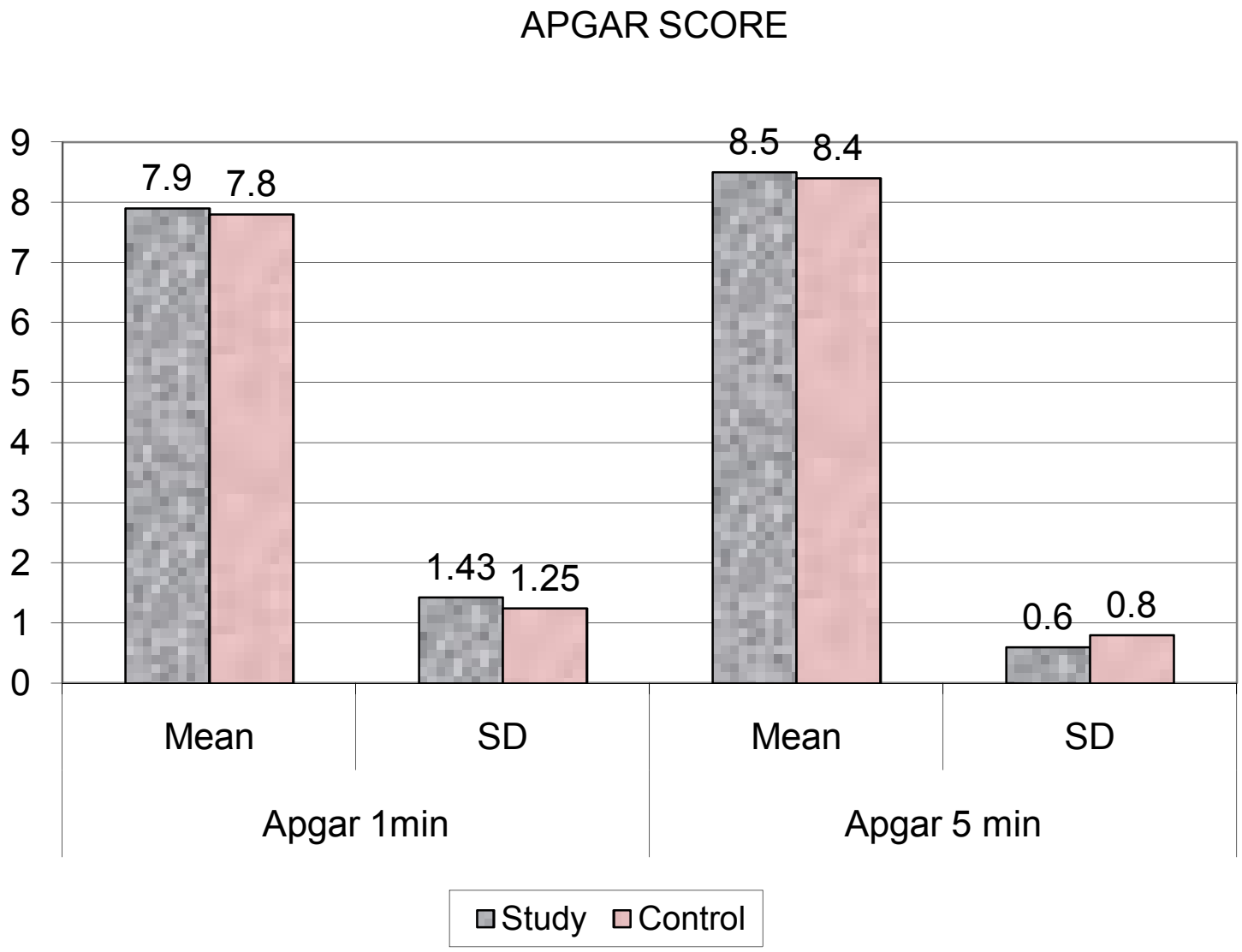

3RD STAGE DURATION
6
5
4
3
2
1
0
5.35
1.61
5.43
1.25
Study
Control
Mean
SD

Third Stage Duration

	Group A (Sterile water) (Min)	Group B (normal saline) (Min)
Primigravida	**4.14**	**4.46**
Multigravida	**3.56**	**3.4**
Mean	**5.35**	**5.43**
SD	**1.61**	**1.25**

P = 0.569

There was no statistical significance between both study and control groups in regard to the duration of third stage of labour.

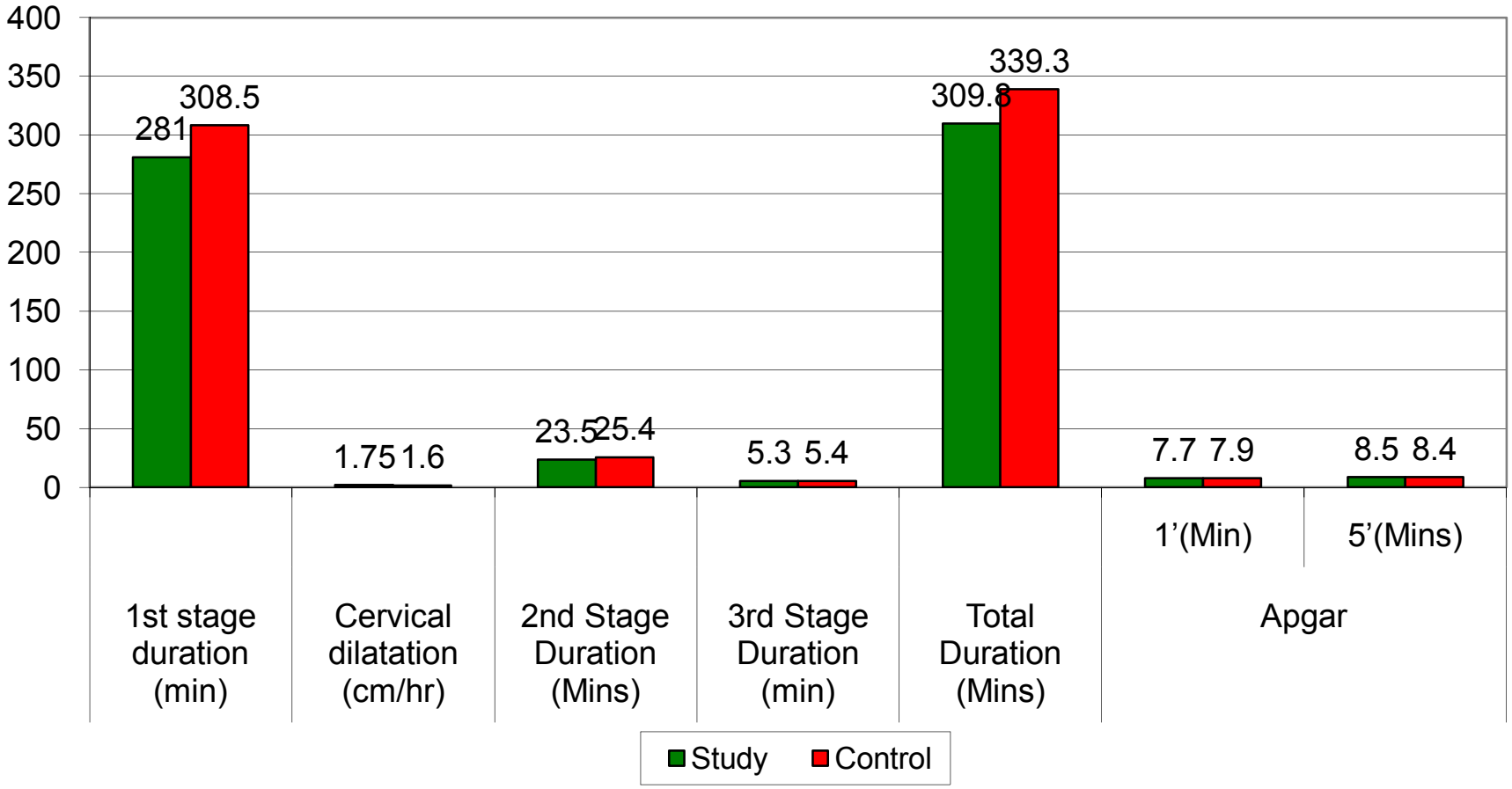

APGAR SCORE
9
8
7
6
5
4
3
2
1
0
7.9
7.8
1.43
1.25
8.5
8.4
0.6
0.8
Mean
SD
Mean
SD
Apgar 1min
Apgar 5 min
Study
Control

APGAR Score

	Apgar 1min		Apgar 5 min	
	Mean	**SD**	**Mean**	**SD**
Group A (Sterile water)	**7.9**	**1.43**	**8.5**	**0.6**
Group B (normal saline)	**7.8**	**1.25**	**8.4**	**0.8**
P	**0.1576**		**0.7599**	

There was no significant difference in the apgar scores of the two groups both at 1 minute and 5 minutes.

AVERAGE DATA

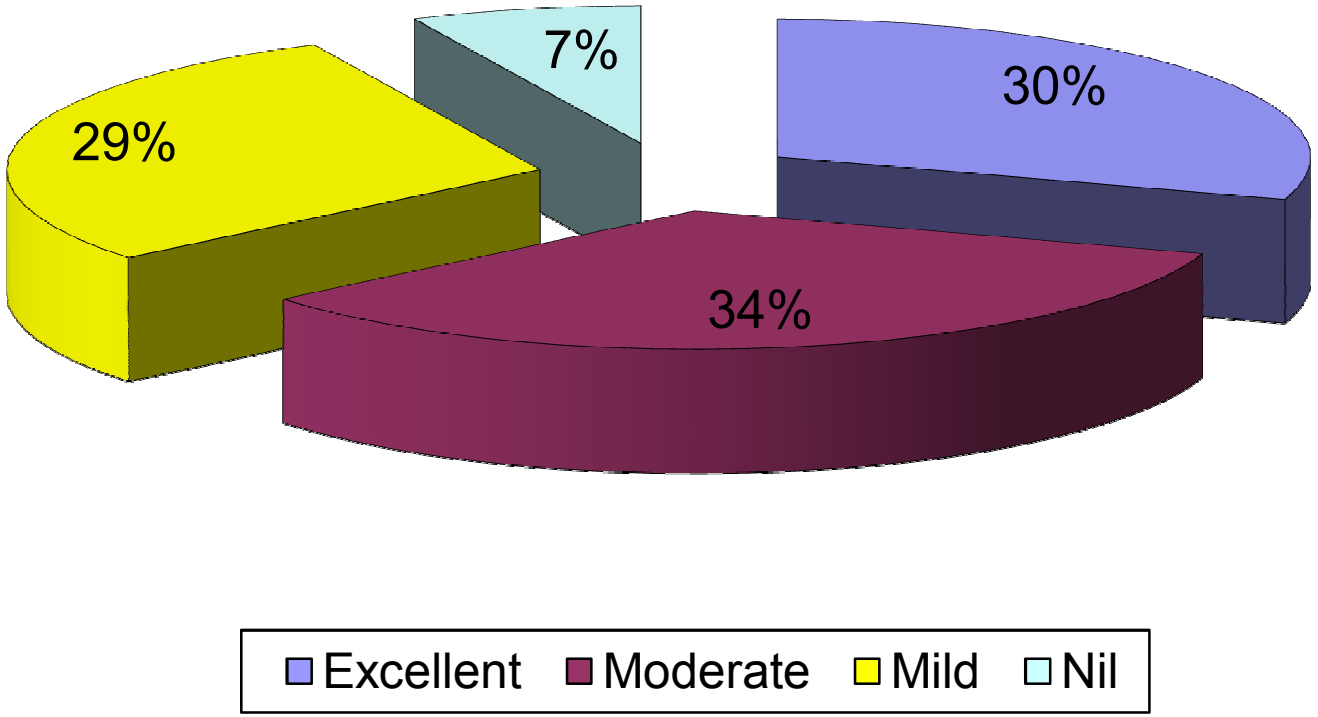


Average Data

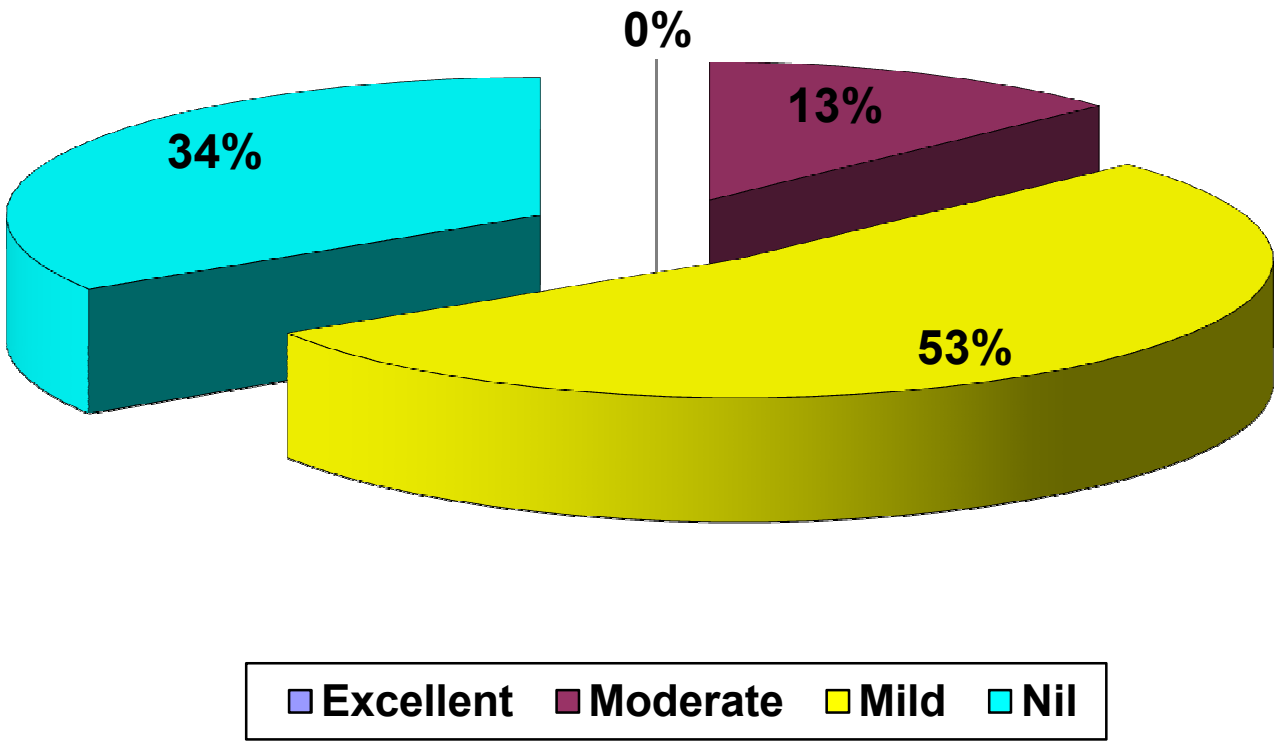
	1st stage duration (min)	Cervical dilatation (cms/hr)	2nd Stage Duration (min)	3rd Stage Duration (min)	Total Duration (min)	Apgar	
						1'	5'
Group A (Sterile water)	**281**	**1.75**	**23.5**	**5.3**	**309.8**	**7.9**	**8.5**
Group B (normal saline)	**308.5**	**1.6**	**25.4**	**5.4**	**339.3**	**7.8**	**8.4**

The total duration of labour in study group was reduced (mean duration = 309.8 min) when compared to that of the control group (mean duration = 339.3 min). There was significant reduction in duration of first stage in the study group when compared to control group. There was no prolongation of labour in the second stage. There was no significant difference in Apgar scores of both groups.

QUALITY OF PAIN RELIEF (STUDY GROUP)



QUALITY OF PAIN RELIEF - CONTROL GROUP

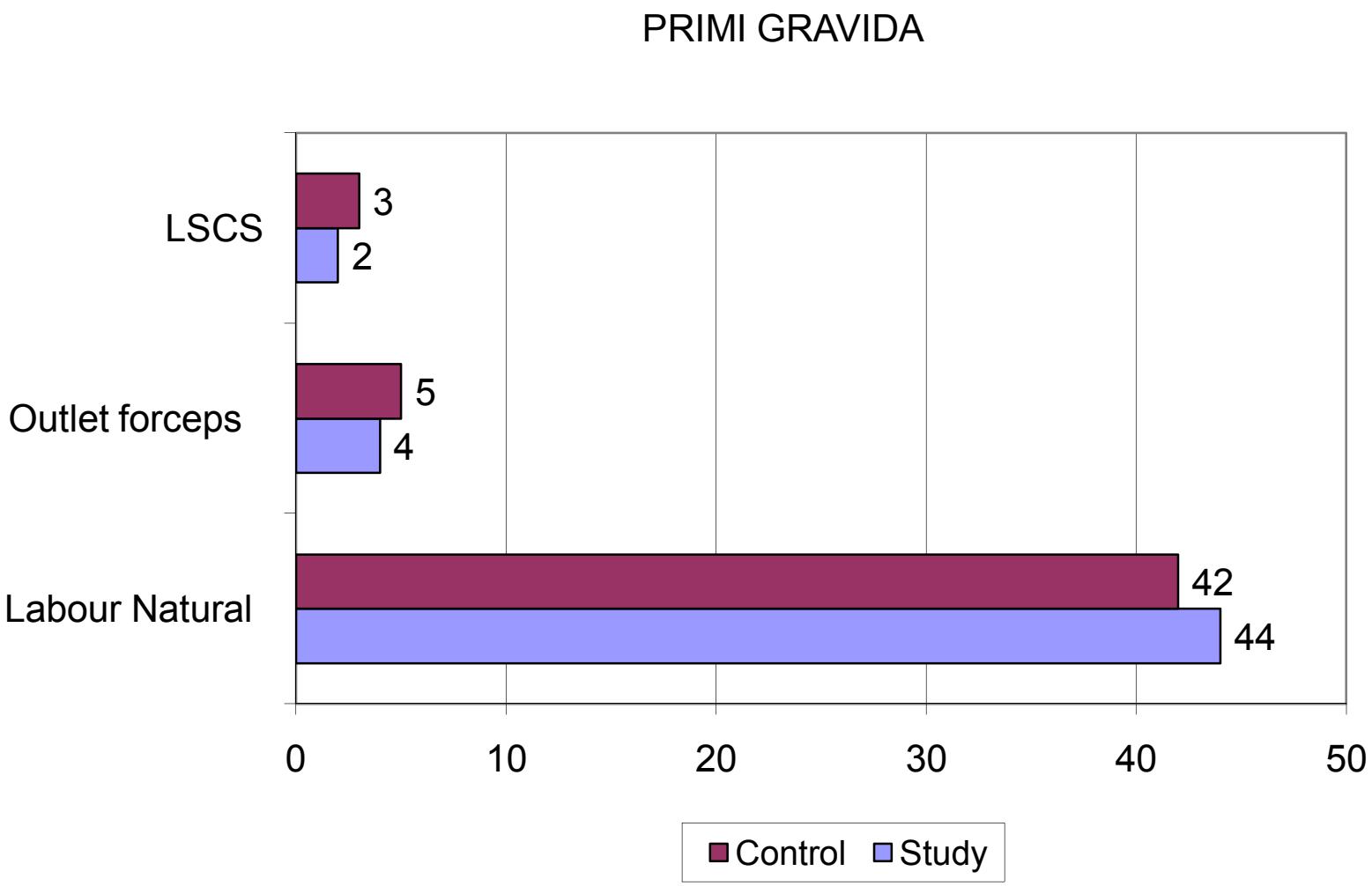


Quality of pain relief

Quality of pain relief	Group A (Sterile water)		Group B (normal saline)	
	No.	%	No.	%
Excellent	30	30	0	0
Moderate	34	34	13	13
Mild	29	29	53	53
Nil	7	7	34	34
Total	100		100	

Among the patients in the study group, 93% had pain relief. Out of them 30% reported excellent pain relief and 34% reported moderate pain relief, 29% had mild pain relief and 7% reported no pain relief.

Among the patients in the control group,13% of patients reported moderate pain relief, mild pain relief was present in 53% of cases and 34% reported no pain relief.


PRIMI GRAVIDA
LSCS
3
2
Outlet forceps
5
4
Labour Natural
42
44
0
10
20
30
40
50
Control
Study

Mode of delivery

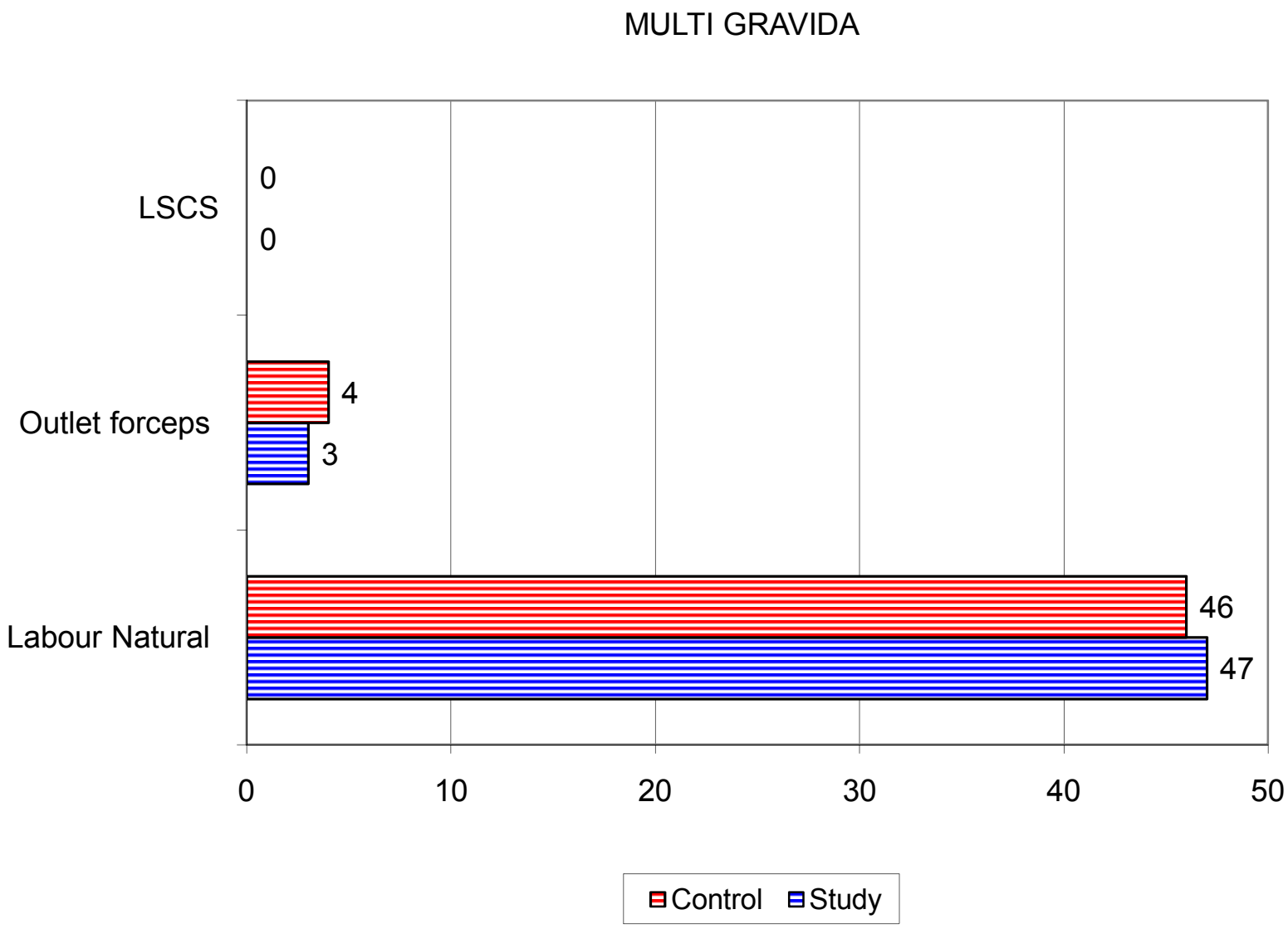
PRIMIGRAVIDA

	Group A (Sterile water)		Group B (normal saline)	
	No.	%	No.	%
Labour Natural	44	88	42	84
Outlet forceps	4	8	5	10
LSCS	2	4	3	6
Total	50		50	

MULTIGRAVIDA

	Group A (Sterile water)		Group B (normal saline)	
	No.	%	No.	%
Labour Natural	47	94	46	92
Outlet forceps	3	6	4	8
LSCS	Nil		Nil	
Total	50		50	

In the study group only 14% of patients required assisted delivery and 6% of patients were delivered by LSCS. In the control group 18% of patients required assisted delivery and 8% of cases were delivered by LSCS.


MULTI GRAVIDA
LSCS
Outlet forceps
Labour Natural
0
0
4
3
46
47
0
10
20
30
40
50
Control
Study

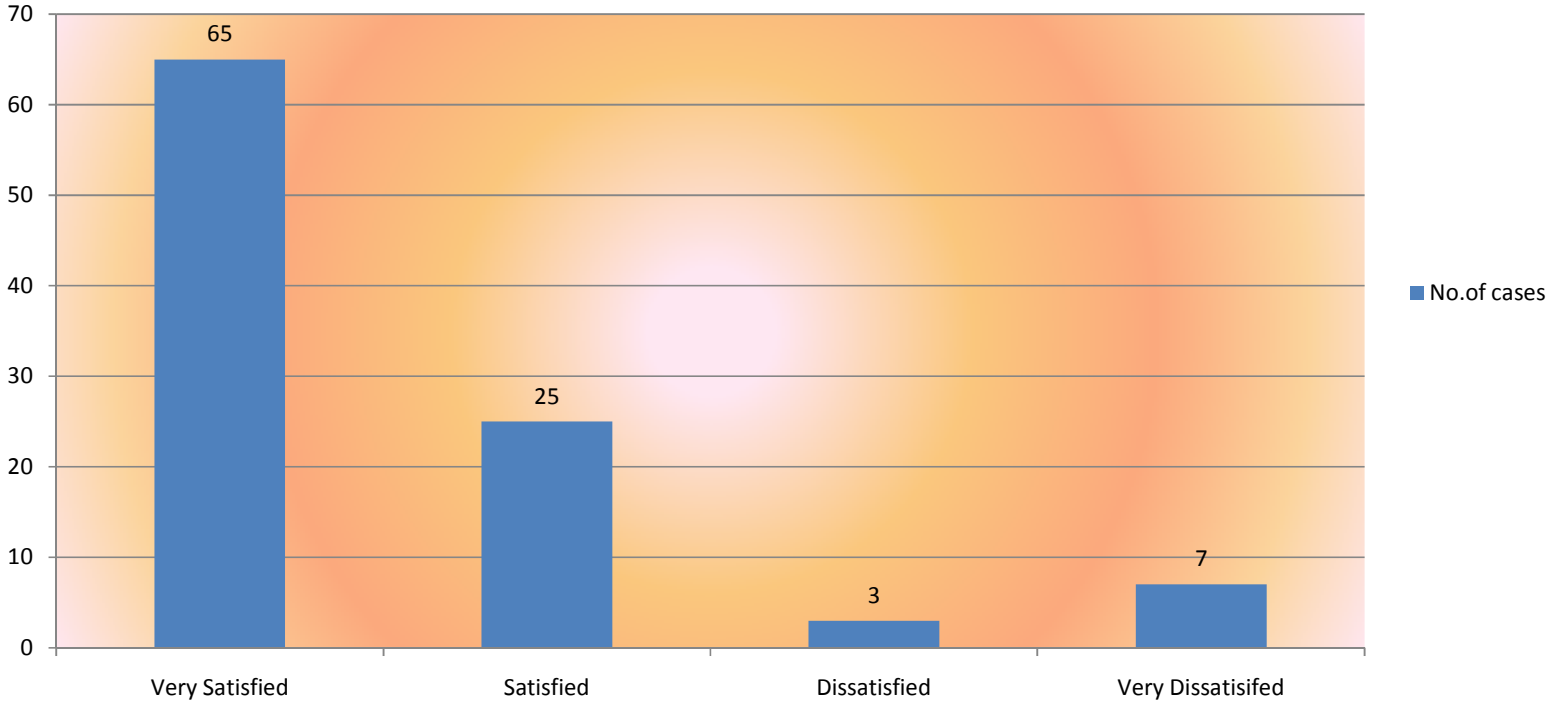
Indications for assisted delivery:

	Group A (Sterile water)		Group B (normal saline)	
	No.	**%**	**No.**	**%**
Failure of secondary forces	1	14.28	2	22.22
Prolonged second stage	1	14.28	1	11.11
Prophylactic Anemia, Severe PIH	4	57.14	3	33.33
fetal distress	1	14.28	3	33.33

LSCS indication

	Group A	**Group B**
Failure to progress	1	1
Fetal distress	1	2

Satisfaction of Women with Pain relief provided by sterile water



Discussion

DISCUSSION

Sterile water injections for back pain in labour have been shown to be an effective method for relieving low back pain in labour in a number of studies. (Peart[35,36]et al 2006; Reynolds[38]2002, Trolle[44]et al 1959)

Analgesic mechanism of action was provided by gate control or counter irritation theory.

Interruption of pain pathway by injecting hypoosmolar solutions like sterile water produces analgesia which is not seen with normal saline since it is isoosmolar with blood.

Our study compared two groups of patients, a sterile water group served as study group and a normal saline group served as control group.

1. Maternal age

In our study, the mean maternal age was **23.8 years** in the sterile water group and **24.3 years** in the normal saline group. In the study

conducted by **Bahasadri[2]et al, Ader[1] et al and Kushtagi[16] et al,** the mean age was 24.2 in the study group and 23.6 in the control group.

2. Parity

In our study 50% cases were primigravida 50% cases were multigravida in both study and control groups. Similarly in studies by **Laberque[17] , Bahasadri[2], Wiruchpongsanon[47], Martensson[27]**parity was equally distributed.

3. Gestational age

In our study all the patients were in the gestational age of 37-41 weeks. Similarly in studies conducted by **Vikkifogarty[45]et al, Bahasadri[2], Wiruchpongsanon[47], Martensson[27]et al, Ader[1]et al, Saxena[15]et al** included only term pregnancies.

4. Membrane status

In our study majority of the patients were from rural areas, regarding membrane status cases were equally distributed in both study and control groups.

In studies conducted by **Bahasadri[2]et al, Ader[1]et al, Wiruchpongsanon[47]et al, Martensson[27]et al, Trolle[44]et al**, **Labrecque[17]et al** cases in accordance with membrane status were equally distributed.

5. Median pain score – VAS score

In our study VAS score before administration was statistically insignificant between both study and control groups P(0.064). similarly in studies conducted by **Martensson et al, Trolle et al, Wirchpongsanon, Kushtagi et al**, the VAS score before administration was statistically insignificant P(0.065).

In our study among primigravida and multigravida after administration of injections mean pain reduction scores in the study and control groups were as follows:

Cases	Group A (Sterile water)	Group B (Normal saline)	P value
Primigravida (n=100)	**Median pain score** Base line – 7.6 10 min – 4.34 45 min – 4.4 90 min – 4.06	**Median pain score** Base line – 7.68 10 min – 5.74 45 min – 7.4 90 min – 7.6	 **0.064** **0.043** **0.001** **0.004**

Multigravida (n=100)	**Median pain score** Base line – 7.68 10 min – 3.6 45 min – 4.9 90 min – 5.3	**Median pain score** Base line – 7.6 10 min – 4.34 45 min – 6.8 90 min – 7.4	 **0.0652** **0.001** **0.001** **0.001**

In par with our study using the same **Visual Analogue scale** in the following studies the results are as follows:

Studies	Experimental	Control
Martennson and Wallin et al n=100	**Median pain score** Base line – 7.6 10 min – 2.3 45 min – 2.5 90 min – 6	**Median pain score** Base line – 7.5 10 min – 5.2 45 min – 6.2 90 min – 7.5
Bahasadri et al n=100	**Median pain score** Base line – 7.0 10 min – 2.0 45 min – 2.0 90 min – 5.3	**Median pain score** Base line – 7.6 10 min – 4.34 45 min – 4.8 90 min – 7.4
Kushtagi and Bhanu et al n=100	**Median pain score** Base line – 8.0 10 min – 5.0 45 min – 4.0	**Median pain score** Base line – 8.0 10 min – 7.0 45 min – 7.0

All studies concluded mean pain score was significantly lower in sterile water group when compared to control group.other studies used numerical rating scale 100.

6. Route of administration and administration pain

In our study we administered all injections intracutaneously, which produced sharp intense pain sensation that lasted for 30 seconds or more in sterile water group. The same injections can be administered subcutaneously without compromising analgesic effect. According to **Martensson and Wallin et al** studies mean pain reduction score was lower in both intracutaneous and subcutaneous group, but the pain of administration is less with subcutaneous group.

Administration pain associated with the sterile water injections proved to be problematic. Despite providing significant reductions in pain levels, some women stated they were reluctant to repeat this treatment in future labours due to the transient sharp stinging sensation, Several researchers tried to modify administration technique. **Martensson and Wallin** argued that according to the concept of **Diffuse noxious inhibitory control** it was assumed that an intense stimulation, such as that obtained from **intracutaneous** sterile water injections, provided both osmotic stimulation from the salt-free water and distension of the firm cutaneous layers, was more effective than **subcutaneous injections** which merely induced osmotic stimulation.

7. Effect on FIRST stage of labour

In study group the mean duration of first stage of labour was 281 minutes and in control group it was 308.5 minutes. (P value=0.003, statistically significant). There was statistically significant reduction in duration of first stage of labour. **Trolle et al** Danish study identified the analgesic effect of sterile water injection was not associated with any impairment of labour progress. As per

Kasperink et al studies the pain reduction in the active stage of labour is associated with increased parasympathetic tone which improves labour, resulting in descent of the fetus and for correcting malrotation improving the likelihood of vaginal delivery.

8. Rate of cervical dilatation

In our study the mean cervical dilatation in the sterile water group in primigravida was 1.55 ± 0.36 cm/hr in multigravida it was 2.2 ± 0.3 cm/hr. In normal saline group the mean cervical dilatation in primigravida was 1.5 ± 0.29 cm/hr and in multigravida it was 1.8 ± 0.2 cm/hr. The mean cervical dilatation in study group was 1.8 cm/hr and in control group it was 1.5 cm/hr ($P < 0.001$) and was found to be

statistically significant. Similarly **Hutton et al** observed pain relief in first stage of labour had an impact on decrease in cervical tension thereby favoring dilatation of cervix.

9. Effect on Second stage of labour

The mean duration of second stage of labour in sterile water group was 23.89 mts and in control group it was 25.47 mts (P = 0.0528) not statistically significant. It had been observed that patients on sterile water injection experience less pain during second stage with out affecting the desire to push. There is no undue prolongation of second stage. **Trolle et al** study suggest that the sterile water injection have an effect on the relaxation of pelvis and cervical tension.

10. Duration of third stage of labour

The third stage was actively managed in both groups. The mean duration of third stage of labour was 5.35 mts in the sterile water group and 5.43 mts in the control group (P = 0.569). The duration was not altered in both groups.

11. Mode of Delivery

In our study, among primigravida, 88% were delivered by labour naturale with episiotomy, 8%were delivered by assisted delivery and 4% were delivered by LSCS.

Among multigravida, 94%were delivered by labour naturale and 6% by assisted delivery.

In control group among primigravida 84% were delivered by labour naturale, 10% by assisted delivery and 6% by LSCS.

In control group among multigravida 92% were delivered by labour naturale, 8% by assisted delivery.

Caesarean section was 2% in the study group and 3% the in control group. Similar to our study, the caesarean section rate was 4% in the study group and 6% in the control group by **Kushtagi and Bhanu et al and in Vikki fogarty et al** study the caesarean section rate was 4.6% in sterile water group and 9.9%.

12. Effect on fetus:

The well being of the new born was unaltered in both groups as identified by identical APGAR Scores in both groups.

The mean apgar score at 1 minute in study group was 7.9 ± 0.6 in control group it was 7.74 ± 0.676. The mean apgar score at 5 minutes in study group was 8.02 ± 0.4 and in control group it was 8.27 ± 0.44.

13. Effect on mother

Except for the initial deep stinging sensation lasting for 30 seconds. There were no complications in the mother. They experience pain relief for a minimum of 90 minutes to upto 2 hrs post administration.

14. Quality of pain relief

In our study 93% of patients had pain relief out of them 30% of patients reported excellent pain relief and 34% of patients reported moderate pain relief and 29% of patients had mild pain relief, in control group only 53% of patients reported mild pain relief. In our study 85% of patients in the study group said that they will accept this

technique in their future labour similarly in **Kasperink et al** study 69% in the sterile water group express their willingness to have the intervention again.

Multigravida were better able to feel the difference and document the extent of pain relief and reported labour as much more satisfying.

The validity of placebo could be argued with the administration of normal saline being less painful to administer but not completely painless, theoretically inducing some degree of analgesia. **Bahasadri et al** stated that women were not told how the different kinds of injections would be experienced during administration, thus they should be unable to judge, whether they had received active treatment or placebo. Accordingly, in our study, we found that the placebo group patients experienced only a mild pain relief which was not statistically significant as the sterile water group.

Summary

SUMMARY

- The study was performed on 200 antenatal mothers in active labour well matched in age, parity, gestational age, dilatation of cervix and membrane status.
- The majority of patients belong to the age group of 21-25. In study group it was 58%, in control group it was 52%. The mean age of study group was 23.8 years. The mean age of control group was 24.3 years.
- 70% of study cases were booked and 66% of control cases were booked.
- Majority of the patients were from rural areas. 68% in study group and 64% in control group.
- Primigravida and multigravida were equally distributed in the study (50%).
- Median pain score of study and control groups were

Cases	Group A (Sterile water)	Group B (Normal saline)	P value
Primigravida (n=100)	**Median pain score**	**Median pain score**	
	Base line – 7.6	Base line – 7.68	**0.064**
	10 min – 4.34	10 min – 5.74	**0.043**
	45 min – 4.4	45 min – 7.4	**0.001**
	90 min – 4.06	90 min – 7.6	**0.004**

Multigravida (n=100)	**Median pain score**	**Median pain score**	
	Base line – 7.68	Base line – 7.6	**0.0652**
	10 min – 3.6	10 min – 4.34	**0.001**
	45 min – 4.9	45 min – 6.8	**0.001**
	90 min – 5.3	90 min – 7.4	**0.001**

Median pain score in the sterile water group was significantly lower than the placebo group at 10 mts, 45 mts, and 90 mts after injection ($P < 0.001$).

- The duration of first stage of labour was significantly shorter in the study group denoting the favorable effect of sterile water injection on first stage of labour ($P = 0.003$).
- There was no statistical difference in the duration of second stage of labour between study and control groups. The duration of second stage was not prolonged in the study group without affecting the ability of the patients desire to push ($P = 0.0528$).
- The duration of third stage of labour was unaltered in both groups ($P = 0.569$).

- The neonatal outcome shown by APGAR scores were almost the same for both study and control groups.
- In study group 91% of patients were delivered by labour naturale and in control group 88% of patients were delivered by labour naturale.
- The assisted delivery rate was 7% in the study group and it was 9% in the control group
- The major indication for assisted delivery in the study group and control group was prophylaxis since it included high risk cases. There was no undue prolongation of second stage in the study group.
- The cesearean section rate was 2% in the study group and 3% in the control group.
- Multigravida were better being able to feel the difference and reported labour to be more satisfying than primigravida, since they had previous labour experience.
- 93% of patients in study group reported pain relief, of them 30% of patients had excellent pain relief and 34% of patients moderate pain relief.

- There was no significant maternal or fetal side effects.
- The only adverse effect is a sharp, brief bee sting like pain sensation lasting for a maximum of 30 seconds.
- Placebo treated group had mild analgesic effect, but it was not statistically significant as the sterile water group.
- In the post partum follow up, 85% of patients reported that they will accept this technique in their future labour for pain relief.

Summary of proven benefits of sterile water injections

Sterile water injections:

1. Provide rapid and effective low back pain relief during labour.
2. Have no apparent side effects
3. Offers simplicity of use and a high level of success.
4. Are non-pharmacological
5. Decrease the need for epidural anaesthesia
6. Delay the use of epidural anaesthesia
7. Have no effect on a mothers state of consciousness
8. Can be repeated
9. Don't limit a mothers ability to move about
10. May be used while waiting for a anaesthetist
11. Do not interfere in labour progress or ability to push
12. Have application for use in rural/remote areas and developing Countries
13. Have a role to play with their analgesic effect on pelvic floor Tone, cervical tension and fetal rotation.
14. Can be administered by a nurse or midwife.

Conclusion

CONCLUSION

Sterile water injections induce a statistically significant, dramatic analgesic effect on the low back pain experienced by women during labour lasting from a minimum of 10 minutes to 90 minutes and a maximum of 2 hours post administration.

It has a favorable impact on the progress of labour. It augments cervical dilatation and shortens the first stage of labour. Duration of second stage of labour is not affected. There is absolutely no untoward effect on mother and fetus.

To Conclude, Sterile water injections represent an important **safe, cost effective, drug free option** that should be made available to all woman experiencing unrelenting back pain during child birth.

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Proforma

PROFORMA

Name: Age:

IP No. LMP:

Unit : EDD:

Booked / Unbooked:

Date and time of admission: Obstetric Table:

Complaints

Past History :

Medical:

Surgical:

Menstrual History :

Marital history :

Personal History :

Obstetric History :

General Examination :

Level of consciousness Pulse

CVS Blood pressure

RS Temperature

Back and Spine Height Weight

Per Abdominal Examination:

Per Vaginal Examination:

Bishop's score:

Investigation :

USG abdomen

Group A

Intracutaneous Injection of Sterile water

Group B

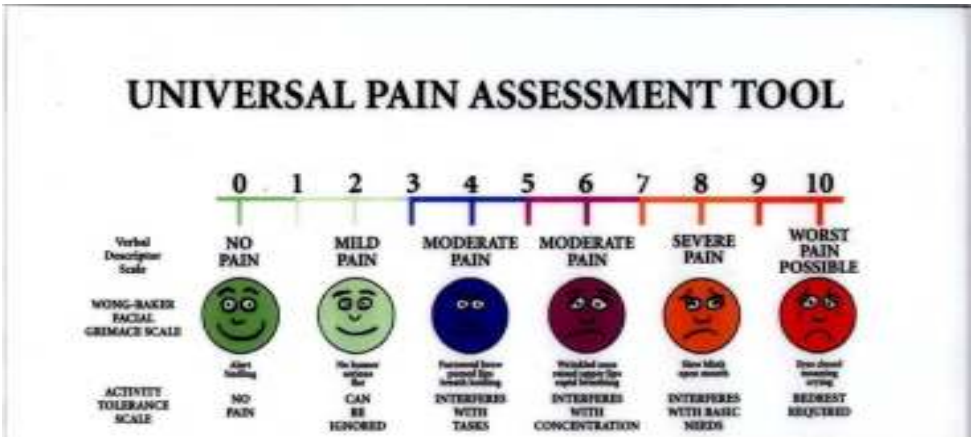
Intracutaneous Injection of Normal Saline

Number of Injections 1☐ 2☐ 3☐ 4☐

VISUAL ANALOGUE SCORE @ Time of Injection

0 min ☐ 10 mts ☐ 45mts ☐

90 mts ☐ 2 hrs ☐



No pain (0)

Slight pain (1-3)

Moderate pain (4-6)

Severe pain (7- 10)

Duration of first stage of labour

Rate of cervical dilatation

Duration of second stage of labour.

Duration of third stage of labour.

Date and Time of Delivery:

Mode of delivery:

Sex Birth weight.

APGAR 1 min ☐ 5 min ☐

Will she accept this technique in her future labour

Yes ☐ No ☐

Patients Satisfaction with sterile water injection

Very satisfied ☐ ` Satisfied ☐

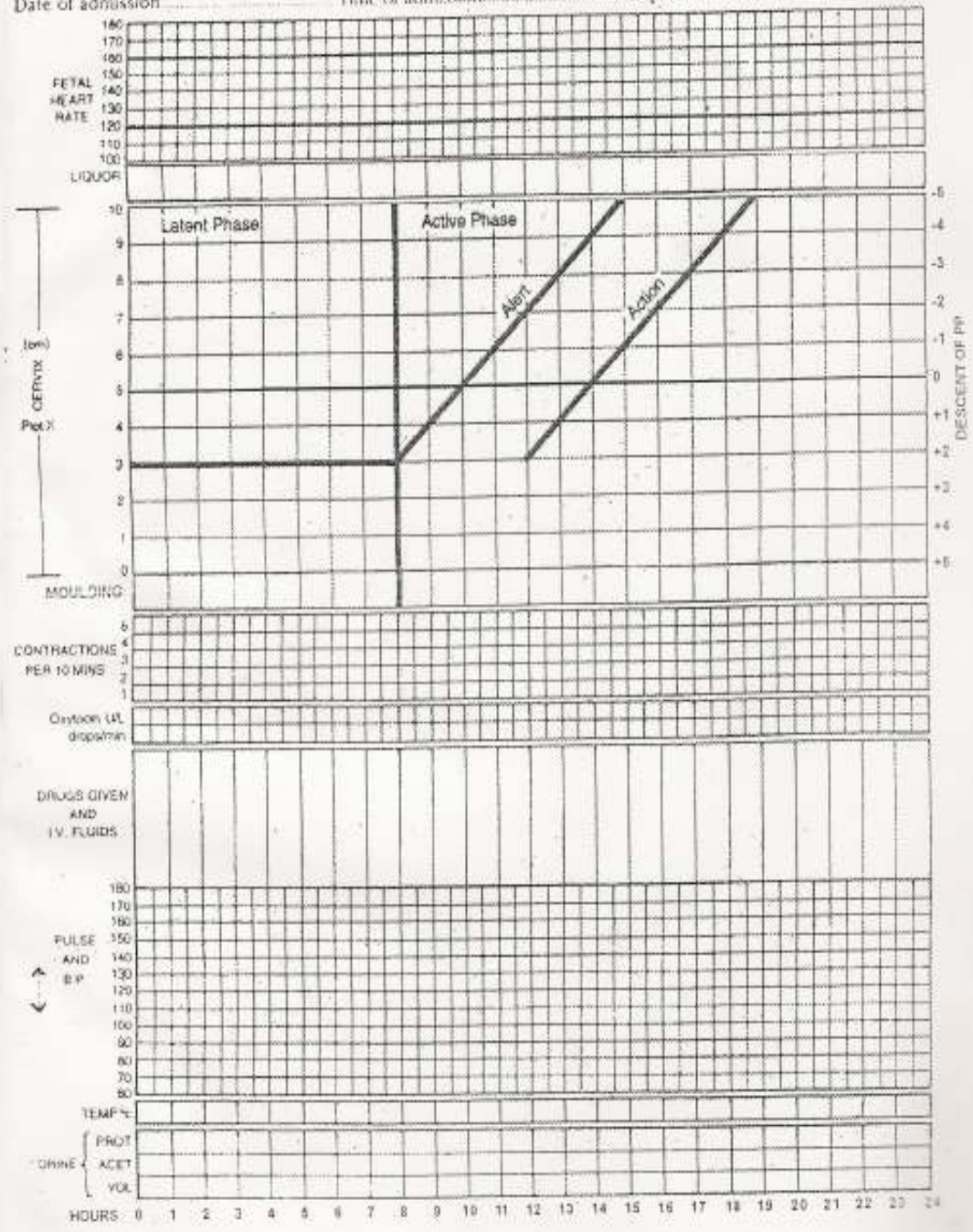
Dissatisfied ☐ Very dissatisfied ☐

Partogram

PARTOGRAPH

Name ..... Gravida ..... Para ..... Hospital No .....

Date of admission ..... Time of admission ..... Ruptured membranes ..... hrs



Master Chart

VAS SCORE

MASTER CHART

S.No	IP no.	Age	Parity	obs.risk	0 min	10 min	45 min	90 min	rate of cervical dilatation cm/hr	duration I stage	II stage (mins)	III stage (mins)	mode of delivery	deg of pain relief	baby wt.kg	apgar 1'(Min)	apgar 5'(Mins)
1	32304	19	primi	nil	7	6	6	7	1.4	4h 15m	40	10	LN - epi	moderate	2.8	8	8
2	32378	22	primi	nil	8	3	4	4	1.2	6h 15m	30	6	LN - epi	excellent	2.5	8	8
3	32767	20	primi	nil	7	4	5	6	1.1	6h 30m	35	7	LN - epi	moderate	2.4	8	8
4	32766	18	primi	nil	8	7	6	6	1.4	5h 00m	40	6	LN - epi	mild	2.7	8	9
5	30238	21	primi	nil	9	3	3	4	1.3	5h 45m	45	7	LN - epi	excellent	2.7	8	8
6	31980	24	primi	nil	8	5	6	6	1.2	6h	30	7	LN - epi	moderate	2.9	8	7
7	30616	25	primi	PIH	7	6	6	6	1	6h 40m	45	5	LN - epi	mild	2.8	8	8
8	36070	19	primi	PROM	7	5	5	6	1.2	6h	35	4	LN - epi	mild	3.5	8	8
9	36112	19	primi	nil	8	5	5	6	1.4	6h 30m	50	6	LN - epi	moderate	2.8	8	7
10	34761	24	primi	nil	9	3	4	4	1.1	6h 20m	40	7	LN - epi	excellent	2.7	8	8
11	37770	20	primi	nil	7	5	5	6	1.2	5h 40m	35	6	LN - epi	mild	2.7	8	8
12	36807	21	primi	nil	8	5	5	6	1.3	7h	35	5	LN - epi	moderate	3.2	8	8
13	37213	25	primi	nil	7	6	7	7	1.1	7h 10m	50	5	LN - epi	mild	2.8	8	8
14	38328	20	primi	Sev. PIH	7	7	6	6	2	5h 30m	30	8	outlet prophy	mild	2.5	7	8
15	37001	20	primi	nil	7	3	4	5	1.4	6h 30m	30	7	LN - epi	excellent	2.5	8	9
16	39484	26	primi	PROM	7	3	4	6	1.8	6h 20m	40	8	LN - epi	excellent	2.8	8	9
17	36711	23	primi	nil	7	3	6	6	1.1	7h	45	6	LN - epi	moderate	2.8	8	8
18	40301	24	primi	mild PIH	8	4	5	6	2	5h	30	8	LN - epi	moderate	2.5	8	10
19	38872	28	primi	hypothy	8	4	5	6	1.5	6h 15m	35	10	LN - epi	moderate	2.6	7	8
20	41001	20	primi	PROM	8	4	5	7	1.4	6h 30m	45	7	LN - epi	mild	3.3	7	8
21	40989	22	primi	nil	8	5	7	7	1.2	7h	40	6	LN - epi	mild	3.25	8	8
22	38983	20	primi	nil									LSCS	mild	3	7	8
23	42884	20	primi	PIH	7	4	6	7	1.8	4h 40m	30	6	LN - epi	mild	1.8	7	8
24	41631	24	primi	nil	8	4	6	7	1.8	3h 30m	40		LN - epi	mild	2.8	8	9
25	48507	22	primi	nil	8	6	6	7	1.7	5h30m	25	5	LN - epi	moderate	2.5	8	8

26	51879	21	primi	PROM	7	6	6	7	1.4	5h 15m	25	8	outlet/ fail of sec	moderate	2.6	7	8
27	52454	20	primi	Rh neg	8	3	4	4	1.2	6h 15m	30	6	LN - epi	excellent	3.3	8	8
28	42972	22	primi	nil	7	4	6	6	1.8	4h 40m	25	7	outlet/ fet distrs	mild	3.1	7	8
29	41441	24	primi	nil	8	4	5	6	1.6	5h	20	6	LN - epi	moderate	2.25	8	9
30	42076	20	primi	nil	8	5	6	6	2	4h 30m	20	5	LN - epi	moderate	2.8	8	8
31	38092	26	primi	nil	7	3	3	4	2.1	4h	25	7	LN - epi	excellent	2.7	8	8
32	48391	25	primi	nil	7	5	5	6					LSCS PROM FD		3.2	8	9
33	42992	23	primi	PROM	8	4	6	6	1.7	5h 15m	25	5	LN - epi	moderate	3	8	8
34	38455	24	primi	nil	7	3	4	4	2	4h 15m	25	6	LN - epi	mild	2.5	7	8
35	38447	21	primi	ong infertilit	7	4	4	6	1.7	5h	30	5	LN - epi	excellent	2.5	8	8
36	38419	21	primi	nil	7	4	7	7	1.6	5h 40m	35	5	LN - epi	nil	2.8	8	8
37	38929	24	primi	nil	7	4	5	5	1.4	6h 20m	30	5	LN - epi	mild	2.7	7	8
38	34050	26	primi	nil	7	4	8	8	1.2	7h	40	8	LN - epi	nil	2.25	8	9
39	38323	20	primi	anemia	8	4	5	6	1.6	5h	30	7	LN - epi	moderate	3	8	9
40	38324	22	primi	nil	8	3	4	4	1.4	5h 20m	20	5	LN - epi	excellent	2.6	8	8
41	38923	24	primi	nil	8	3	4	5	1.8	5h	25	6	LN - epi	excellent	2.3	8	9
42	38901	19	primi	PIH	8	3	6	6	2	4h	30	5	LN - epi	moderate	2.8	7	8
43	38912	22	primi	nil	8	4	5	6	2.2	4h 15m	35	5	LN - epi	moderate	2.9	7	8
44	38959	24	primi	nil	8	4	5	6	2.1	4h	30	6	LN - epi	moderate	3	8	9
45	38419	21	primi	PROM	8	4	5	7	1.8	4h	40	8	LN - epi	mild	3.1	8	8
46	32177	25	primi	nil	8	5	7	7	2.2	4h 15m	25	5	LN - epi	mild	2.7	8	8
47	31162	23	primi	nil	8	5	6	7	1.6	5h 40m	30	5	LN - epi	mild	3.2	7	8
48	20822	22	primi	nil	8	4	6	7	1.4	6h	35	6	outlet/failure of sec	mild	3.5	6	8
49	24139	24	primi	nil	8	4	6	7	1.2	6h	35	7	LN - epi	mild	2.8	7	8
50	24062	25	primi	PROM	9	6	9	9	2.5	3h 30m	15	2	LN - epi	nil	2.7	7	8
51	32421	29	G2P1L1	NIL	8	4	5	5	2.3	4h 15m	20	5	LN - epi	excellent	3	8	9
52	32942	28	4P1L1A	NIL	8	4	6	7	2.2	4h 20m	15	4	LN - epi	mild	2.75	7	8
53	36088	29	G2P1L1	NIL	8	3	4	4	2	3h 30m	12	3	LN - epi	excellent	2.5	7	8
54	36058	21	G2P1L1	PIH	9	4	6	6	2.6	3h 40m	10	2	LN - epi	mild	2.8	8	9
55	38074	25	G2P1L1	NIL	7	4	5	5	2.1	4h 15m	15	5	LN - epi	moderate	2.25	8	8
56	37989	26	G2P1L1	RH NEG	7	4	6	6	2.2	4h 15m	12	4	LN - epi	moderate	2.9	8	8

57	38325	22	G2P1L1	NIL	8	4	4	4	2.1	3h	10	6	LN - epi	moderate	2.5	8	9
58	33984	24	G2P1L1	PROM	7	4	5	6	1.8	5h 20m	25	7	LN - epi	excellent	2.8	8	9
59	36781	28	G2P1L1	NIL	7	4	6	5	2.5	3h	30	5	LN - epi	mild	2.9	7	8
60	39309	28	G2P1L1	NIL	8	4	6	7	2	3h	15	3	LN - epi	nil	3.1	8	9
61	39729	22	G2P1L1	NIL	8	3	4	7	2.5	3h 30m	20	2	LN - epi	excellent	3	8	9
62	39102	21	G2P1L1	ANEMIA	8	4	6	4	1.8	3h 15m	15	4	outlet prophy	mild	3.25	7	8
63	40967	23	G3P2L2	PIH	8	4	4	4	1.9	5h	20	4	outlet prophy	excellent	2.8	7	8
64	42935	25	G2P1L1	NIL	7	4	4	4	2.5	3h 30m	20	3	LN - epi	excellent	2.8	7	8
65	42990	22	G2P1L1	NIL	7	4	5	6	2	3h 40m	10	5	LN - epi	moderate	2.7	8	9
66	42972	24	G2P1L1	NIL	8	3	4	4	1.5	4h 15m	10	6	LN - epi	excellent	3.2	7	8
67	44219	26	G2P1L1	NIL	7	4	7	7	2.6	3h 15m	15	4	LN - epi	mild	3.5	8	8
68	42731	21	G2P1L1	NIL	7	4	5	6	2.5	3h 15m	20	3	LN - epi	moderate	2.7	8	9
69	47986	25	G2P1L1	NIL	7	3	4	4	1.8	4h	15	5	LN - epi	excellent	2.8	7	8
70	45166	28	3P1L1A	NIL	8	4	5	6	2.1	4h 15m	10	4	LN - epi	moderate	3	7	8
71	48193	26	G3P2L2	PIH	8	3	3	4	2.1	4h	10	6	LN - epi	excellent	2.8	8	9
72	48187	23	G2P1L1	PROM	9	3	6	7	1.8	3h	20	5	LN - epi	mild	2.6	8	9
73	48387	26	G2P1L1	NIL	7	3	4	4	1.4	3h 40m	15	5	LN - epi	excellent	2.7	8	9
74	48484	25	G2P1L1	NIL	7	4	6	6	1.6	5h 15m	15	4	LN - epi	moderate	3.2	7	7
75	48325	21	G2P1L1	NIL	7	7	8	7	1.8	3h 30m	10	3	LN - epi	nil	3.5	8	9
76	48815	28	G2P1L1	NIL	8	3	4	4	1.5	3h 30m	10	4	LN - epi	excellent	4	8	9
77	48930	27	G2P1L1	NIL	8	4	5	6	2.2	3h 45m	10	5	LN - epi	moderate	2.5	7	8
78	48938	24	G2P1L1	NIL	9	4	6	7	2.4	4h 50m	15	6	LN - epi	mild	2.7	8	9
79	40995	28	G2P1L1	NIL	7	4	5	5	1.9	4h 15m	20	3	LN - epi	moderate	2.8	7	8
80	41243	30	G2P1L1	NIL	7	4	5	5	2	4h	15	4	LN - epi	excellent	2	7	8
81	42148	26	G2P1L1	NIL	8	3	4	4	2.1	3h 40m	15	4	LN - epi	excellent	2.1	7	8
82	43747	25	G2P1L0	BOH	7	4	6	6	1.8	3h 30m	18	5	LN - epi	moderate	3	7	8
83	42163	24	G2P1L1	NIL	7	3	5	5	1.5	3h 40m	10	4	LN - epi	moderate	2.3	8	9
84	42659	26	G2P1L1	NIL	7	3	6	7	1.6	3h 35m	15	4	LN - epi	mild	2.5	8	9
85	42440	23	G2P1L1	NIL	8	3	4	4	1.7	4h	20	5	LN - epi	excellent	2.4	8	9
86	42464	20	G2P1L1	NIL	8	3	4	4	1.8	4h 15m	15	6	LN - epi	moderate	3.3	8	8
87	42134	30	G2P1L1	NIL	7	3	3	4	1.7	3h 30m	10	4	LN - epi	excellent	2.8	7	8

88	45018	32	G3P2L2	NIL	7	4	5	6	2.4	3h 40m	12	4	LN - epi	moderate	2.7	7	8
89	44430	25	G2P1L1	ANEMIA	8	4	5	5	2	4h	20	4	outlet prophy	moderate	3	7	8
90	42304	32	G2P1L1	PROM	8	3	4	4	1.8	3h	15	6	LN - epi	excellent	3	8	9
91	42518	29	G2P1L1	NIL	7	4	5	6	1.6	3h 40m	10	5	LN - epi	mild	2.5	7	8
92	40401	21	G2P1L1	NIL	7	3	4	4	2	3h	15	8	LN - epi	excellent	1.8	7	8
93	43857	25	G2P1L1	NIL	8	3	4	4	2.1	4h 10m	10	4	LN - epi	excellent	3.5	7	8
94	40984	24	G2P1L1	NIL	8	4	6	7	1.6	4h 15m	20	3	LN - epi	mild	3.25	7	8
95	40719	25	G2P1L1	PROM	9	4	5	5	2.4	3h	25	4	LN - epi	moderate	3.1	7	8
96	41683	21	G2P1L1	NIL	8	3	4	4	2.6	4h	15	8	LN - epi	excellent	2.8	8	9
97	43973	28	G2P1L1	NIL	7	3	4	4	1.8	4h 15m	10	6	LN - epi	excellent	2.6	7	8
98	42114	26	G2P1L1	NIL	7	6	6	7	1.9	4h 10m	15	5	LN - epi	nil	2.6	7	8
99	43141	25	G2P1L1	PROM	7	3	4	7	2.4	5h	10	4	LN - epi	moderate	2.5	7	8
100	42446	24	G2P1L1	NIL	8	3	4	6	1.8	4h 20m	15	3	LN - epi	moderate	2.4	7	8
101	419055	28	PRIMI	NIL	7	5	6	6	2.4	4h	30	6	outlet/fail of sec	moderate	3.5	6	9
102	41596	29	PRIMI	NIL	8	6	7	8	2.5	4h 15m	25	4	LN - epi	mild	1.8	7	8
103	41923	21	PRIMI	NIL	7	5	7	8	1.6	7h	40	8	LN - epi	mild	2.6	8	9
104	41933	21	PRIMI	NIL	8	4	7	7	2	5h	30	5	LN - epi	mild	3.25	7	8
105	41951	21	PRIMI	NIL	9	5	7	8	2.1	6h	25	8	LN - epi	nil	2.8	7	9
106	41976	19	PRIMI	NIL	8	6	7	8	1.8	6h 15m	30	4	LN - epi	mild	2.7	7	8
107	41979	18	PRIMI	PIH	7	5	7	7	1.5	5h 30m	40	8	LN - epi	mild	3.2	8	9
108	42379	25	PRIMI	EPILEPSY	7	4	8	9	1.3	7h	45	4	LN - epi	moderate	2.9	7	8
109	42374	23	PRIMI	NIL	8	5	8	8	1.2	6h 30m	30	5	LN - epi	nil	3.2	8	8
110	43748	19	PRIMI	NIL	9	6	8	8	1.6	6h 20m	35	6	LN - epi	nil	3.25	7	8
111	42143	24	PRIMI	NIL	7	6	7	7	1.8	6h 20m	25	6	LN - epi	mild	2.25	7	9
112	43060	23	PRIMI	NIL	8	5	7	7	1.5	5h 40m	40	4	LN - epi	nil	2.5	8	9
113	42850	21	PRIMI	PROM	7	5	7	8	1.3	6h 30m	30	4	outlet/fetal distress	nil	3.2	6	8
114	44156	20	PRIMI	PROM	7	4							LSCS	nil	2.6	7	8
115	44112	26	PRIMI	NIL	7	5	8	9	2	5h	25	6	LN - epi	moderate	2.9	8	8
116	45275	27	PRIMI	NIL	7	4	8	7	1.8	5h 15m	40	5	LN - epi	mild	3	7	8
117	45264	19	PRIMI	NIL	7	4	7	7	1.6	6h	35	8	LN - epi	nil	3.2	8	9
118	42232	20	PRIMI	PROM	8	4	7	7	1.5	6h 15m	45	4	LN - epi	nil	26	8	9

119	42345	29	PRIMI	NIL	8	4	8	9	1.4	6h 20m	45	6	LN - epi	mild	2.8	7	8
120	44595	22	PRIMI	NIL	8	6	7	8	2	5h 30m	30	6	LN - epi	mild	3.25	8	9
121	44102	26	PRIMI	NIL	8	4	8	8	1.6	6h 15m	35	5	LN - epi	mild	2.75	7	8
122	41902	21	PRIMI	NIL	9	7	8	7	1.5	6h 15m	25	5	LN - epi	mild	2.4	6	8
123	42077	20	PRIMI	NIL	7	5	7	8	1.4	6h 15m	30	5	LN - epi	mild	2.75	6	8
124	42076	23	PRIMI	PIH	8	4	7	7	1.5	6h 30m	35	6	LN - epi	mild	3	6	8
125	42285	21	PRIMI	PROM	8	4	8	9	1.5	5h	45	8	outlet/fetal distress	nil	3.2	7	9
126	42415	20	PRIMI	NIL	7	4	7	7	1.4	5h 50m	40	8	LN - epi	mild	2.6	7	8
127	42411	22	PRIMI	NIL	8	4	8	8	1.3	5h 40m	30	8	LN - epi	mild	2.9	8	9
128	42230	23	PRIMI	NIL	7	4	8	9					LSCS		2.7	8	9
129	44065	26	PRIMI	NIL	8	4	8	8	1.5	6h 30m	35	6	LN - epi	moderate	1.8	8	8
130	42232	25	PRIMI	NIL	8	6	8	9	1.3	6h 20m	25	5	LN - epi	nil	2.4	8	8
131	40651	24	PRIMI	NIL	7	5	7	7	1.2	6h 15m	40	8	LN - epi	mild	1.9	7	8
132	40500	25	PRIMI	PROM	7	6	7	8	1.4	5h 50m	45	4	LN - epi	mild	2.5	7	8
133	42632	21	PRIMI	NIL	8	4	7	8	1.3	6h 30m	30	5	outlet/fail of sec	mild	3.7	7	8
134	42644		PRIMI	NIL	7	5	7	8	1.2	6h 15m	30	5	LN - epi	mild	3.1	7	8
135	43084	26	PRIMI	NIL	7	6	7	7	1.4	6h	40	8	LN - epi	mild	2.5	8	9
136	42825	26	PRIMI	NIL	7	4	7	7	1.8	6h 15m	30	6	LN - epi	nil	2.6	7	8
137	42804	23	PRIMI	NIL	7	4	6	8	1.5	6h 40m	35	5	LN - epi	mild	3.6	6	8
138	43005	20	PRIMI	ANEMIA	7	6	7	7	1.3	6h 15m	40	8	outlet/prophy	nil	2.4	7	8
139	42855	24	PRIMI	PIH	8	4	7	7	2	5h 40m	30	4	LN - epi	nil	3	6	9
140	42922	21	PRIMI	PROM	8	5	6	8					LSCS	mild	2.5	7	8
141	43120	21	PRIMI	NIL	8	5	7	7	1.6	6h	25	6	LN - epi	nil	2.8	7	8
142	42058	30	PRIMI	NIL	8	5	7	7	1.8	4h 40m	40	5	LN - epi	nil	3.2	6	8
143	43253	25	PRIMI	NIL	8	4	6	7	1.3	5h 50m	50	6	LN - epi	mild	2.25	7	9
144	43242	21	PRIMI	NIL	8	4	7	9	1.4	5h 30m	40	8	LN - epi	mild	2.6	7	8
145	42854	25	PRIMI	NIL	8	5	7	8	1.4	5h 50m	30	8	LN - epi	mild	2.4	8	9
146	43740	21	PRIMI	NIL	8	4	8	9	1.6	6h	25	8	LN - epi	mild	2.5	7	8
147	45520	24	PRIMI	PROM	8	4	8	8	1.5	6h	25	7	LN - epi	mild	2.6	7	9
148	42003	22	PRIMI	PIH	8	4	7	8	1.8	5h 15m	30	7	LN - epi	mild	1.8	6	9
149	42064	21	PRIMI	PROM	8	4	8	8	1.6	5h 40m	30	9	LN - epi	mild	2.5	7	8

150	41735	24	PRIMI	NIL	9	5	7	8	1.5	6h	35	6	LN - epi	mild	2.4	8	9
151	49352	28	G2P1L1	NIL	8	4	7	8	2	4h 15m	25	4	LN - epi	moderate	2.7	7	9
152	41752	24	G2P1L1	NIL	8	5	7	8	1.5	4h 30m	30	5	LN - epi	mild	2.5	8	9
153	41746	21	G2P1L1	PROM	8	5	8	8	2.3	3h 40m	18	2	LN - epi	mild	3.3	7	8
154	41963	24	G2P1L1	NIL	9	6	7	8	8	4h 40m	20	4	LN - epi	mild	2.5	7	8
155	41962	24	G2P1L1	NIL	7	6	7	8	1.5	4h 15m	15	6	LN - epi	mild	2.8	8	9
156	41749	28	G2P1L1	PIH	7	5	7	8	1.2	5h	25	5	LN - epi	mild	1.9	7	9
157	41796	27	G2P1L1	ANEMIA	8	5	6	8	2	4h 30m	20	4	LN - epi	nil	3.5	8	9
158	41527	28	G3P2L2	PROM	7	5	7	8	2.4	3h 40m	10	3	LN - epi	nil	3.25	8	9
159	42369	29	3P1L1A	NIL	7	5	7	7	2.3	3h 30m	15	5	LN - epi	nil	2.2	7	8
160	42476	30	G2P1L1	NIL	8	5	8	8	2.2	5h	25	5	LN - epi	nil	2.4	7	8
161	42126	25	G2P1L1	NIL	8	4	6	8	1.8	4h 15m	15	2	LN - epi	mild	2.3	8	9
162	44109	26	G2P1L1	NIL	8	4	7	8	2	4h 30m	10	4	LN - epi	nil	2.4	8	9
163	45258	25	G2P1L1	NIL	8	3	7	7	1.6	4h	12	5	LN - epi	mild	2.2	7	9
164	42602	24	G2P1L1	NIL	7	3	7	8	1.6	3h 40m	18	6	LN - epi	mild	3.3	7	8
165	40307	21	G2P1L1	NIL	7	4	7	8	2	3h 20	15	2	LN - epi	mild	3	6	8
166	43898	21	G2P1L1	NIL	8	4	6	8	8	5h	15	4	LN - epi	moderate	2.6	7	9
167	43954	25	G2P1L1	PIH	7	4	7	8	1.5	5h	20	4	outlet prophy	moderate	2.3	7	8
168	41354	28	G2P1L1	NIL	7	3	6	7	2.1	4h 40m	10	5	LN - epi	moderate	1.8	8	9
169	43989	27	G2P1L1	NIL	7	3	7	8	2.2	4h 30m	10	5	LN - epi	mild	2.3	7	8
170	42162	29	G2P1L1	NIL	8	4	6	8	1.8	4h 40m	15	6	LN - epi	mild	2.4	7	8
171	42410	28	G2P1L0	NIL	8	4	7	8	1.5	4h 15m	18	6	LN - epi	mild	2.7	8	9
172	42525	28	G3P2L1	NIL	9	4	6	8	1.9	3h 40m	20	4	LN - epi	mild	3	8	9
173	42082	28	3P1L1A	PROM	7	5	5	8	2	3h 20m	25	2	LN - epi	nil	3.2	8	9
174	44084	30	G3P2L2	NIL	7	4	5	8	1.4	4h 40m	25	5	LN - epi	mild	3.1	7	8
175	44066	25	G2P1L1	NIL	7	5	5	8	1.6	4h 15m	15	2	LN - epi	mild	2.8	7	8
176	42080	24	G2P1L1	PROM	8	4	5	8	1.6	5h	10	4	LN - epi	mild	2.7	7	8
177	40840	28	G2P1L1	NIL	8	4	5	8	1.8	4h 30m	12	5	LN - epi	moderate	2.6	6	8
178	40642	28	G2P1L1	NIL	9	5	5	8	2	3h 40m	18	6	LN - epi	mild	2.5	6	8
179	45161	27	G2P1L1	NIL	7	6	6	8	2.1	3h 30m	15	2	LN - epi	nil	3	7	8
180	43089	26	G2P1L1	NIL	7	6	6	8	2.2	5h	15	4	outlet/fetal distress	nil	3.25	7	8

181	45381	28	G2P1L1	NIL	8	5	6	8	2	4h 15m	20	4	LN - epi	mild	2.5	8	9
182	49479	29	G2P1L1	PIH	7	4	5	8	2.1	4h 30m	10	5	LN - epi	moderate	2.8	8	9
183	45546	27	G2P1L1	PROM	7	3	5	8	1.4	4h	10	5	LN - epi	moderate	2.5	8	9
184	43245	26	G2P1L1	NIL	7	5	6	8	1.5	3h 40m	15	6	LN - epi	mild	2.6	7	9
185	45491	21	G2P1L1	NIL	8	4	6	8	1.6	3h 20	18	6	LN - epi	nil	2.5	7	9
186	45848	24	G2P1L1	NIL	8	3	6	8	1.7	6h	20	5	LN - epi	nil	3.5	7	8
187	43128	22	G2P1L1	NIL	7	4	6	8	1.8	5h	15	5	LN - epi	nil	3.8	7	8
188	42878	21	G2P1L1	NIL	7	3	6	8	2	4h 40m	20	4	LN - epi	nil	3	7	8
189	43233	24	G2P1L1	NIL	8	4	7	8	1.4	4h 30m	25	5	LN - epi	nil	2.6	8	9
190	43252	25	G2P1L1	PROM	8	6	7	8	1.8	4h 40m	30	6	outlet/fail of sec	nil	1.8	8	8
191	43091	28	G2P1L1	NIL	7	5	7	7	2	3h 30m	10	6	LN - epi	nil	2.5	8	9
192	43035	27	G3P2L2	NIL	7	4	5	8	1.6	4h 20m	15	4	LN - epi	moderate	2.3	8	9
193	43092	27	G2P1L1	ANEMIA	8	4	5	8	2.2	4h	20	3	outlet/prophy	moderate	2.2	6	8
194	49036	29	G2P1L1	NIL	8	6	6	8	2.2	4h	20	4	LN - epi	mild	2.1	8	8
195	41915	28	G2P1L1	NIL	9	4	5	8	1.8	3h 40m	10	5	LN - epi	mild	1.8	8	9
196	42071	27	G3P2L2	NIL	8	4	6	8	1.7	3h 30m	12	3	LN - epi	mild	2.25	8	9
197	42296	24	G2P1L1	PROM	7	4	7	8	1.8	4h 20m	15	2	LN - epi	nil	3	8	9
198	41765	21	G2P1L1	NIL	7	4	5	8	2	4h 30m	15	5	LN - epi	nil	2.5	6	8
199	41828	21	G2P1L1	NIL	7	4	5	8	2.1	4h 15m	12	5	LN - epi	nil	2.4	8	8
200	45268	24	G2P1L1	NIL	8	3	6	8	1.4	4h 20m	20	6	LN - epi	mild	2.3	8	8