"THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD ON HEMODYNAMICS IN PATIENTS UNDERGOING CESAREAN SECTION UNDER SPINAL ANAESTHESIA: A ONE YEAR RANDOMISED CLINICAL TRIAL"

By

(REG NO: BA0120002)

Dissertation

Submitted to the

KLE Academy of Higher Education & Research
Belagavi, Karnataka

In Partial Fulfillment of the requirements for the degree of

M. D.

in

ANAESTHESIOLOGY

JAWAHARLAL NEHRU MEDICAL COLLEGE,

BELAGAVI, KARNATAKA

JUNE / JULY – 2023

KLE Academy of Higher Education & Research

(Deemed University), Belagavi, Karnataka

ENDORSEMENT

This is to certify that the dissertation entitled **"THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD ON HEMODYNAMICS IN PATIENTS UNDERGOING CESAREAN SECTION UNDER SPINAL ANAESTHESIA: A ONE YEAR RANDOMISED CLINICAL TRIAL"** is a bonafide research work done by **REG NO. BA0120002.**

Dr. Rajesh Mane MD, DNB Professor and Head,

Department of Anaesthesiology,

J. N. Medical College,

Nehru Nagar, Belagavi – 10

Date: 19/01/2023

Place: Belagavi

Dr. (Mrs) N.S Mahantashetti MD(Paed)

Principal,

J. N. Medical College,

Nehru Nagar, Belagavi – 10

Date: 19/1/2023

Place: Belagavi

UNDERTAKING

I, **Reg. No. BA0120002**, hereby declare that the information and the data mentioned in my dissertation entitled **"THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD ON HEMODYNAMICS IN PATIENTS UNDERGOING CESAREAN SECTION UNDER SPINAL ANAESTHESIA: A ONE YEAR RANDOMISED CLINICAL TRIAL"** belongs to me and is original I am aware of the definition of plagiarism as detailed below.

- An act or instance of using or closely imitating the language and thoughts of another author without authorization and the representation of that author's work as one's own, as by not crediting the original author.

- A piece of writing or other work reflecting such unauthorized use or imitation
- The deliberate or reckless representation of another's words, thoughts or ideas as one's own without attribution in connection with submission of academic work whether graded or otherwise

I hereby declare that the dissertation prepared by me is original one and does not involve plagiarism anywhere. In case at a later stage, it is found that I have indulged in plagiarism, then I am solely responsible for the same and the institution is at liberty to take any disciplinary action against me including cancellation of dissertation or any other penalties imposed by the University.

Date: 19/1/23

Place: Belagavi

REG NO. BA0120002

PLEGARISM CERTIFICATE

KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH

JAWAHARLAL NEHRU MEDICAL COLLEGE

(Recognized by Medical Council of India, New Delhi)

Accredited 'A+' Grade by NAAC (3rd Cycle) **Placed in Category 'A' by MHRD (GoI)**

Nehru Nagar, Belagavi- 590 010, Karnataka, INDIA

0831 - 2471350 0831 - 2470759 www.jnmc.edu principal@jnmc.edu

Ref No: MDC/PG/

Date: 17-01-2023

ACCEPTANCE LETTER

The softcopy of thesis entitled: "THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD IN PATIENTS UNDERGOING CESAREAN SECTION UNDER SPINAL ANAESTHESIA: A ONE YEAR RANDOMISED CLINICAL TRIAL " has been submitted for Anti-Plagiarism check through Turnitin software. The scan has been carried out and the scanned output reveals a match percentage of 2% which is within the acceptable limits of **10%** as per the guidelines given by UGC.

Guide.

KAHER * J.N. MEDICAL COLLEGE * BELAGAVI

Dr. (Mrs.) N.S. Mahantashetti.
Chairperson-Antiplagiarism Committee &
Principal,
J. N. Medical College, Belagavi.

To,
Reg. No. BA0120002
Postgraduate Student,
2020-21 Batch,
Department of Anaesthesiology,
J. N. Medical College, Belagavi.

ETHICAL CLEARANCE CERTIFICATE

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed – to- be- University)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)

JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)

Website: http//www.jnmc.edu
E-Mail : dome@jnmc.edu

Phone: (+ 91-(0)831 Office : 2472550
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ 93 **Date: 25/01/2021**

REG NO. BA0120002

PG student in Anaesthesiology,
J.N.Medical College,
BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"COMPARING THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD ON HEMODYNAMICS IN PATIENTS UNDERGOING CESAREAN SECTION: A ONE YEAR RANDOMISED CLINICAL TRIAL",** is ethical and justifiable.

The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Smita Sonoli)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Harsha Hegde)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD ON HEMODYNAMICS IN PATIENTS UNDERGOING CESAREAN SECTION UNDER SPINAL ANAESTHESIA: A ONE YEAR RANDOMISED CLINICAL TRIAL

ABSTRACT

Introduction: Spinal anaesthesia, most common mode of anaesthesia used for lower segment caesarean section has certain complications like hypotension which has adverse effects on both mother and fetus. Administration of fluid is one of the measures to manage post spinal hypotension. So, the present study aims at comparing preload and coload of crystalloid on hemodynamics in patients undergoing elective LSCS.

Objectives: 1) To compare the hemodynamics between preload and coload groups.

2) To study the effect of preload and coload on requirement of ephedrine.

Materials and Methods: Total of 110 patients participated in the study, 55 in each group. After recording baseline vital parameters, Group A received preload of 15ml/kg Ringer Lactate 20 minutes prior to spinal anaesthesia and Group B received coload of 15ml/kg ringer lactate after spinal anaesthesia. HR, SBP, DBP, MAP, PI are recorded every minute after induction of spinal anaesthesia in both groups and the results are compared. Ephedrine is used as vasopressor in case of hypotension and the total amount required is recorded.

Results: Mean age, mean weight and baseline hemodynamic parameters are comparable between both groups. Incidence of hypotension is 65.4% in group A and 63.6% in group B. 47% and 31% of patients in preload and coload group respectively required ephedrine and mean dose required is 4.4 ± 5.3 mg and 2 ± 3 mg in two groups respectively.

Conclusion: Incidence of hypotension is high in both groups when crystalloid is used alone regardless of timing of administration with respect to induction of spinal anaesthesia. Ephedrine requirement is less in patients who received coloading when compared to preloaded patients.

Key words: preload, co load, post spinal hypotension

LIST OF ABBREVIATIONS USED

HR	-	Heart Rate
SBP	-	Systolic Blood Pressure
DBP	-	Diastolic Blood Pressure
MAP	-	Mean Arterial Pressure
PI	-	Perfusion Index
LSCS	-	Lower Segment Cesarean Section
SAB	-	Sub Arachnoid Blockade
ASA	-	American Society of Anaesthesiologists
IV	-	Intravenous
ML	-	Milli liters
RR	-	Respiratory Rate

CONTENTS

LIST OF TABLES

LIST OF GRAPHS

LIST OF FIGURES

LIST OF PHOTOGRAPHS

INTRODUCTION

Cesarean section is one of the most common surgeries done worldwide and spinal anaesthesia is the most commonly used mode of anaesthesia in 80 – 90% of those cases [(1)]. Spinal anaesthesia is superior to general anaesthesia in caesarean sections in terms of both maternal and fetal outcomes.

Spinal anaesthesia causes hypotension due to sympathetic blockade leading to peripheral vasodilation which decreases systemic vascular resistance reducing the venous return and cardiac output [(2)].

At term, pregnant women are more sensitive to local anaesthetics, less sensitive to vasopressors, and have less Mean arterial pressure [(3)]. Also, in pregnant women, the incidence of hypotension is high due to aortocaval compression by the gravid uterus. Due to the above reasons, spinal anaesthesia poses great threats like maternal hypotension, maternal nausea and vomiting, and fetal hypoxia [(4)].

Spinal anaesthesia induced hypotension occurs due to arterial and venous vasodilation resulting from the sympathetic block and also paradoxical activation of cardio inhibitory receptors [(5)].

Without preventive measures, the incidence of post spinal hypotension in patients can be as high as 82% [(6)].

Maternal hypotension after spinal anaesthesia becomes exacerbated by intravascular volume deficit which adds to the sympathetic blockade during spinal anaesthesia [(7)]. Autoregulation in placental blood flow does not exist and so the flow is pressure dependent. Prolonged maternal hypotension leads to fetal hypoxia [(8)].

Preloading the patient with crystalloid i.e., giving the fluid 20 minutes before subarachnoid blockade induction was recommended traditionally for the prevention of post spinal hypotension. Some studies have shown that preloading with crystalloid has

poor efficacy in preventing post spinal hypotension [9,10]. This might be because crystalloids are rapidly redistributed to extracellular space on administration and so only a small amount of fluid remains in the intravascular space by the time vasodilation starts after the administration of the spinal drug into subarachnoid space [11].

This method also induces the release of Atrial Natriuretic Peptide (ANP) which further increases vasodilation and aggravates hypotension [12].

Maternal hypotension occurs immediately after injection of spinal drug and hypotension cannot be prevented with fluid that is administered during this period which is called co – load and preload may be beneficial [13,14].

So the present study aims at comparing the effect of crystalloid preloading and crystalloid co-loading on the incidence of post spinal hypotension in patients undergoing lower segment cesarean section.

OBJECTIVES

PRIMARY OBJECTIVE:

1. To compare Heart Rate, SBP, DBP, MAP, and PI in patients receiving crystalloid preload and patients receiving crystalloid coload.

SECONDARY OBJECTIVE:

1. To compare the amount of ephedrine requirement in both groups.

REVIEW OF LITERATURE

Fabrice Ferre et al did a study "Control of spinal anaesthesia induced hypotension in adults". This article was aimed at reviewing the mechanisms responsible for hypotension which is induced by spinal anaesthesia. The study concluded that coloading is more effective compared to preloading before Spinal Anaesthesia [(5)].

Made Artawan et al[(19)] 2020 conducted a study "comparison of the effect of preloading and coloading of crystalloid fluid on the incidence of hypotension after spinal anaesthesia in the cesarean section". The study was conducted among 51 subjects who are randomized into 3 groups: preloading, coloading and control groups. This study concluded that the incidence of hypotension is better in the group that received coloading when compared with the group that received preloading and the control group.

Sukhminder Singh Bajwa in his literary "co loading or preloading for prevention of hypotension after spinal anaesthesia! a therapeutic dilemma" stated that irrespective of which type of fluid is used, preload is not beneficial over coload. So, in the situations of emergency, the time required to administer the predetermined amount of fluid before the subarachnoid blockade [(10)].

Sahar M.Siddik-Sayyid et al in their randomized trial study stated that in many studies, crystalloid fluid coload is better than the conventional crystalloid preload approach. So in this study in contrast to crystalloid, authors have compared colloid preload vs colloid coload on the maintenance of hemodynamic stability after spinal anaesthesia in cesarean section. This study concluded that hypotension in women who were administered the colloid before the subarachnoid block initiation is comparable with its incidence when the colloid is administered just after the initiation of the spinal [(20)].

Ah-Young Oh et al in his study done in 2014 on the "influence of the timing of administration of crystalloid on maternal hypotension during spinal hypotension for caesarean delivery". In this study, 60 parturients are randomly allotted into two groups – preloading and coloading and the incidence of hypotension & ephedrine boluses required were studied. The authors concluded that coloading is more efficacious in preventing hypotension than preloading crystalloids during spinal anaesthesia [(7)].

Warwick D.Ngan Kee et al in 2005 published an article "prevention of maternal hypotension during spinal anaesthesia for cesarean delivery: An effective technique using combination phenylephrine infusion and crystalloid hydration". The study has concluded that the combined administration of phenylephrine infusion and rapid crystalloid coload is the first technique that is described as an effective method to prevent hypotension while giving spinal anaesthesia for caesarean delivery [(21)].

Hai – Fang Ni et al conducted a meta-analysis in 2017, of articles published on the comparison of effects of crystalloid preload and crystalloid coloading on the incidence of hypotension after spinal anaesthesia in PubMed, EMBASE, andomiz central register and other databases. This has concluded that for parturients receiving crystalloids, coloading is superior to preloading on the maintenance of hemodynamics. The article further stated that the use of intraoperative vasopressors was required in both groups but the need was high in the preloading group [(22)].

Parul Jain and Deepali valecha 2017 conducted a randomized clinical trial on "comparative evaluation of preloading and coloading of crystalloids to prevent spinal induced hypotension in the cesarean section". This study concluded that the incidence of hypotension, nausea and vomiting, and the requirement of vasopressors are comparable in both groups[(23)].

Benerjee A et al conducted a "meta-analysis on effects of preload vs coload for spinal anaesthesia for elective cesarean delivery" and concluded that there is no need for the surgery to be delayed to give the preloading dose of fluid. Despite the timing of fluid administration such as preload or coload, the incidence of maternal hypotension is a significant number of patients who required vasopressors to maintain hemodynamics[(24)].

Hunie M et al in a prospective cohort study on the effect of preloading and coloading in the prevention of hypotension among mothers who underwent cesarean delivery under spinal anaesthesia has concluded that crystalloid coloading is superior to preloading[(25)].

BASIC SCIENCES

During pregnancy, a woman undergoes significant anatomical and physiological changes to accommodate the developing fetus. These changes affect every organ system in the body [15].

The Number of cesarean deliveries increased over the last 2 decades even in developing countries [16]. Anaesthesia for cesarean sections is more challenging, as the care has to be taken for both mother and the unborn baby. Historically, general anaesthesia was given for cesarean deliveries, but now, regional anaesthesia with neuraxial techniques such as single shot spinal, epidural anaesthesia is considered a safer option for both labor analgesia for vaginal delivery and for cesarean delivery [17].

REASONS FOR PREFERENCE OF REGIONAL ANAESTHESIA OVER GENERAL ANAESTHESIA:

1. **Anatomical Changes in Airway:** Capillary engorgement with increased tissue friability and edema of the mucosal lining of the oropharynx, larynx, and trachea begins early in the first trimester. This leads to an increased risk of bleeding with manipulation of the airway.
2. **Increased Risk of Aspiration:** High progesterone and estrogen levels decrease the lower esophageal sphincter tone and delays gastric emptying. This leads to an increased risk of aspiration of gastric contents in pregnant.
3. **Physiological changes in lung volumes:** At the end of 3rd trimester, tidal volume increases by 45% and Functional Residual Capacity decreases by 20%. Prior Preoxygenation is required to prolong the apnea time.
4. **Effects of inhalational anaesthetics:** Inhalational anaesthetics interfere with the contraction of uterus which may lead to immediate postpartum hemorrhage due to uterine atony.

Advantages of Regional anaesthesia:

1. Safer local anaesthetic agents like Bupivacaine and ropivacaine are now available.

2. The Usage of multiple drugs required for general anaesthesia can be avoided.

ANATOMICAL AND PHYSIOLOGICAL CHANGES IN PREGNANCY THAT AFFECT NEURAXIAL ANAESTHESIA:

1. Increased lumbar lordosis decreases the inter spinous spaces and also it is difficult to achieve adequate flexion of spine due to gravid uterus. This may cause difficulty in neuraxial techniques. Due to this, tuffliers line might correspond to L3- L4 interspace rather than L4-L5.

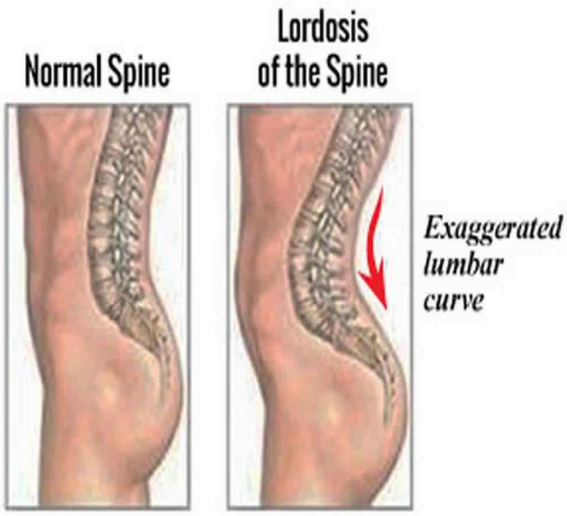


FIGURE 1 – EXAGGERATED LUMBAR LARDOSIS

2. The gravid uterus compresses the inferior vena cava and this leads to the engorgement of epidural veins and interforaminal veins. This engorgement along with raised intraabdominal pressure displaces the Cerebrospinal Fluid (CSF) from thoraco-lumbar space. The specific gravity of CSF also decreases during pregnancy. These

two reasons attribute to appropriate dose reductions that are required during spinal anaesthesia in pregnancy.

3. Peri vertebral ligaments such as ligamentum flavum softens due to increased progesterone and estrogen levels, so it is difficult to feel the loss of resistance while performing spinal and epidural anaesthesia.

PHYSIOLOGY OF PAIN PATHWAYS IN OBSTETRICS

Labor Pain has both visceral and somatic components. Pain during the first stage is due to uterine contractions and cervical dilatation, and, mainly visceral. The lower uterine segment and Cervix receive the same afferent nerve supply. Pain is transmitted by A delta and C fibers which travel along with sympathetic nerves to the uterine and cervical plexuses, inferior, middle and superior hypogastric and aortic plexuses. They then pass to the lumbar and lower thoracic sympathetic chain and terminate in the dorsal horn of the spinal cord at the T10 to L1 segments. Parasympathetic innervation does not play role in utero cervical pain mediation.

During the later first stage and the second stage, the visceral pain continues due to uterine contractions and distension of the lower uterine segment. As there is distension of the pelvic floor, vagina and perineum due to descending fetus, there will be a progressive increase in somatic pain during the second stage of labor.

This somatic pain is transmitted primarily by the pudendal nerve, which is derived from the anterior primary divisions of sacral nerves S2, S3, and S4. Peripheral innervation of the perineum is provided by the ilio-inguinal nerve and the genital branch of the genitofemoral nerve anteriorly and by the posterior cutaneous nerve laterally. Somatic pain is sharp and localized.

During caesarean delivery, additional nociceptive pathways are involved in the transmission of pain. A horizontal Pfannenstiel incision involves infra umbilical T11-T12 dermatomes. Additional dermatomal levels of 2-4 segments are required during surgery as skin stretching is done. Intra peritoneal manipulation and dissection involve poorly localized visceral pain pathways, therefore requiring a T4 level sensory block.

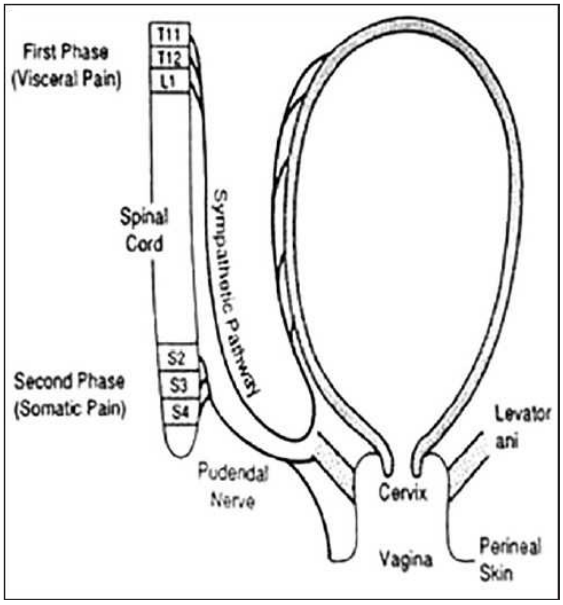


FIGURE 2[(18)] : INNERVATION OF UTERUS

ANAESTHESIA FOR CESAREAN DELIVERY

PRE-ANAESTHETIC EVALUATION:

1. It should include thorough past and present medical history, obstetric history and history of previous surgeries, and allergies.
2. Baseline recordings of Heart rate, blood pressure, and SpO2 should be obtained.
3. Airway examination and systemic examination of CVS, Respiratory system and CNS should be examined according to ASA guidelines.

INFORMED CONSENT:

Written informed consent should be obtained for anaesthesia, surgery and blood transfusion whenever required.

RESERVE BLOOD PRODUCTS:

The patient's blood grouping should be done and cross matched blood should be reserved before starting the procedure.

ASPIRATION PROPHYLAXIS:

- Confirm Adequate time of Nil By Mouth:

  - Clear liquids: 2 hrs.

  - Solids: 6-8 hrs.

- Premedicate with

  - Non particulate antacid

  - H2 Receptor Antagonists (Ranitidine, Famotidine)

  - Proton Pump Inhibitors (Pantoprazole)

  - Prokinetic agent (Metoclopramide).

INTRAVENOUS ACCESS:

- 16 or 18G IV cannula to be secured and checked for good flow.
- Crystalloids (Ringer Lactate, Normal Saline), and Colloids (Hemaccel, Hetastarch) should be readily available.

MONITORING EQUIPMENTS:

- Electrocardiogram
- Non-invasive blood Pressure
- Pulse oximetry
- Capnography.

AIRWAY EQUIPMENT:

- Oxygen source
- Anatomical face masks of assorted sizes
- Oropharyngeal airways of assorted sizes
- Laryngoscope with good light source and blades of different sizes.
- Endotracheal tubes of assorted sizes
- Self-inflating bag for positive pressure ventilation
- A suction source with tubing's and a catheter.

DIFFICULT AIRWAY EQUIPMENT:

- Rigid laryngoscope blades of alternate design and size.
- Supraglottic Airway Devices
- Endotracheal tube guides (Bougie, Stylet)
- Flexible fiberoptic laryngoscopes for awake intubation.
- Surgical airway access equipment like cricothyrotomy.

SELECTION OF MODE OF ANAESTHESIA

Neuraxial Anaesthesia:

- Maternal desire to witness baby birth and avoid general anaesthesia

- Risk of difficult airway and aspiration

- Less fetal drug exposure.

General Anaesthesia:

- Maternal refusal of neuraxial technique

- Comorbid conditions that are contraindications for neuraxial anaesthesia

- Failure of neuraxial anaesthesia.

TECHNIQUES OF NEURAXIAL ANAESTHESIA:

1. Single shot spinal anaesthesia
2. Epidural anaesthesia
3. Combined spinal anaesthesia
4. Continuous spinal anaesthesia.

Single Shot Spinal Anaesthesia:

Advantages:

- Technically simple
- Lower dose requirement of local anaesthetic and opioids
- Preferred mode for uncomplicated cesarean delivery.

Disadvantages:

- Limited duration of anaesthesia
- Limited ability to titrate the extent of sensory blockade.

Epidural Anaesthesia:

Advantages:

- Dural puncture can be avoided
- Duration of anaesthesia can be increased by repeating the doses.
- Sensory level can be titrated
- Post operative analgesia can be provided

Disadvantages:

- Late onset of action.
- Large amounts of drug are required leading to maternal systemic toxicity and fetal drug exposure.

Combined Spinal Epidural Anaesthesia:

Advantages:

- Useful in obese individuals

- Produces rapid onset dense blockade and postoperative analgesia can be provided with the catheter in situ.

Disadvantages:

- Catheter function can be checked only after the spinal effect wears off.

Continuous Spinal Anaesthesia:

Advantages:

- Low doses of local anaesthetics and opioids

- Rapid onset dense blockade and the level can be titrated

Disadvantages:

- High incidence of post dural puncture headache

- High incidence of high and total spinal anaesthesia if the catheter is mistaken for an epidural catheter and large doses are given.

SPINAL ANAESTHESIA

Spinal anaesthesia is the most preferred mode of anaesthesia for caesarean section because of its advantages like low dose requirements, rapid onset dense sensory blockade and least risk of maternal systemic toxicity and fetal drug exposure. It is associated with predictable postoperative recovery.

Factors affecting the extent of the Spread of Spinal Anaesthesia:

1. Amount of drug: The extent of spread is directly proportional to the amount of drug. As the amount increases, the intensity, height and duration of the blockade increase.

2. The volume of solution: If the dose remains constant and the volume of solution is increased, the extent of anaesthesia increases. However, volume augmentation has a limited effect when the total volume is small only around 2-4ml.
3. Effect of decreasing the spinal fluid volume and extrathecal barbotage: if an equal amount of CSF and the amount of drug is removed, the extent of spread increases. Extra thecal barbotage is a technique where 8ml of CSF is removed and a local anaesthetic agent is mixed and injected back. This increases the extent of the spread.
4. The direction of needle insertion: The needle should be inserted with an angle of less than 50^0 with the vertebral axis. The steeper angles increase the cephalad spread of anaesthesia.
5. Speed of injection: Slow injection of hyperbaric solutions will not produce sufficient distribution and usually results in low levels or spotty anaesthesia. So the rate of injection should be moderate or fast to increase the level and distribution.
6. Effect of post injection position: In a horizontal supine position, a hyperbaric solution has a bimodal spread.
7. Role of vertebral venous plexus pressure: A change in position from lateral to supine will extend the level of anaesthesia by increasing the epidural space pressure causing venous engorgement and cephalad displacement of CSF.
8. Influence of obesity: A BMI of > 25 – 28 is associated with levels two to 4 segments higher.
9. Influence of pregnancy: Smaller doses produce higher levels in pregnancy.

- Mechanical factors: Compression of IVC causes shunting of blood into the vertebral venous plexus. This decreases the vertebral canal space and CSF volume.

- Hormonal factors: high progesterone levels and high endorphine levels increase the sensitivity of local anaesthetic agents. Also, the alkalinity of CSF is decreased.

PATHOPHYSIOLOGY OF POST SPINAL HYPOTENSION AND BRADYCARDIA

Local anaesthetics that are injected neuraxial have different potencies for different types of nerve fibers like motor, sensory and sympathetic nerve fibers. Preganglionic sympathetic fibers are the smallest and most sensitive to local anaesthetics (7). The preganglionic fibers originate from thoracic (T1 -T12) and lumbar (L1 – L3) and are called 'Thoraco-lumbar outflow'.

Neuraxial blockade at these levels causes sympathetic blockade leading to vasodilation which in turn leads to falling in systemic vascular resistance. This drop in systemic vascular resistance leads to peripheral pooling of the blood and decreased venous return, in turn reducing the cardiac preload. Decreased cardiac preload decreases the stroke volume by 5 – 15% after the neuraxial blockade and this leads to a decrease the blood pressure.

Cardioaccelerator fibers originate from T1 – T4 and neuraxial blockade at this level cause vagal predominance leading to bradycardia which can sometimes be profound and rarely cardiac arrest.

POST SPINAL HYPOTENSION DURING CESAREAN DELIVERY:

Maternal hypotension is defined as a 20 – 30% fall in the baseline value of systolic, diastolic and mean arterial pressures. Systolic blood pressure of <100mmHg is also taken as hypotension.

Prolonged severe hypotension leads to compensation of uteroplacental blood flow leading to fetal hypoxia, acidosis and fetal distress. Maternal complications include altered consciousness, nausea and vomiting.

METHODS TO PREVENT POST SPINAL HYPOTENSION

No single method is effective in treating the post spinal hypotension

1. Fluid administration.
2. Vasopressor administration
3. The left lateral tilt of the uterus
4. Elevation of lower limbs and wrapping of legs.

INTRAVENOUS FLUIDS: THE FIRST LINE OF MANAGEMENT

Administration of IV fluids is one of the most followed methods to prevent and treat maternal hypotension after spinal anaesthesia. Depending on the time relation of fluid administration to induction of spinal anaesthesia, it may be either called Preloading (15-20 mins before induction) or Coloading (immediately after spinal anaesthesia).

Total body water (TBW) is approximately 60% of total body weight in adults. This TBW is divided into anatomical and functional fluid compartments within the body.

The major division is Intracellular fluid (ICF) and Extracellular fluid (ECF).

The ECF is subdivided into different fluid compartments.

- Interstitial fluid: lymphatic and protein free fluid occupying cell spaces.
- Intravascular fluid: plasma volume
- Transcellular fluid: Includes gastrointestinal, CSF, pleural, peritoneal and joint fluids.

Fluid is interchangeable between interstitial and intravascular spaces and interstitium is called the ‘True environment of the body’ by Claude Bernard.

Intravenous fluids are classified into crystalloids or colloids based on their efficacy to stay in the intravascular space without distributing to the extracellular

fluid. Crystalloids are solutions of electrolytes in water and the infused electrolytes distribute freely throughout the ECF and water flows down the osmotic gradient. The net result is that only 20% of crystalloids remain in the intravascular space.

Colloids are large molecules of homogenous noncrystalline substance dispersed in substances like isotonic saline or balanced crystalloid.

BALANCED CRYSTALLOID SOLUTIONS: These solutions have a lower osmolarity than 0.9% NaCl with lower Na+ and lower Cl- concentrations. The reduction in anionic content is compensated by the addition of stable organic anion buffers like lactate, gluconate or acetate. The measured osmolality of balanced solutions is 265mOsm/kg and is slightly lower than plasma osmolality. So these solutions are mildly hypotonic with plasma.

RINGER LACTATE:

This is a balanced crystalloid solution with the following composition:

1 lt of fluid contains: Each 100ml contains:

Sodium: 130 meq Sodium lactate: 320mg

Potassium: 4 meq Sodium Chloride: 600mg

Chloride: 109 meq Potassium chloride: 40mg

Calcium: 3 meq Calcium chloride: 27mg

Bicarbonate: 28meq.

Ringer Lactate contains electrolytes similar to plasma concentrations and so rapidly expands intravascular volume and so it is very effective in treating severe hypovolemia.

Indications:

1. Severe hypovolemia

2. Replacement fluid in postoperative patients and patients with burns, fractures etc.
3. Diarrhea induced hypovolemia with hypokalemic metabolic acidosis.
4. In diabetic ketoacidosis, it produces glucose free water, and so corrects metabolic acidosis and it supplies potassium

Contraindications:

1. Liver disease: as lactate is metabolized in the liver, patients with liver disease can have lactic acidosis with the administration of RL
2. Along with blood transfusion: Calcium in RL binds to citrate anticoagulant and allows the formation of clots
3. In vomiting and continuous NG aspiration: in this case, hypovolemia is associated with metabolic alkalosis. RL produces bicarbonate and so worsens alkalosis.

EPHEDRINE

It is a synthetic sympathomimetic which is:

- Indirectly acting: stimulation of endogenous catecholamine release

- Direct acting: by stimulation of adrenergic receptors

Mechanism of action:

Ephedrine increases the heart rate and cardiac output by acting on the beta 1 receptor and increasing myocardial contractility.

By acting on alpha 1 receptors, it increases systemic vascular resistance and increases blood pressure.

Clinical uses:

- 5 to 10mg IV ephedrine increases blood pressure in the presence of a sympathetic blockade produced by a neuraxial blockade.

- It is preferred sympathomimetic during cesarean sections as it does not alter the uterine blood flow.

PULSE OXIMETRY

Pulse oximetry measures the hemoglobin oxygen saturation noninvasively. It is measured by a probe that is kept on highly perfused sites like fingertips, ear lobules, the tip of the nose etc.

A pulse oximeter estimates SPO2 from the differential absorption of red and infrared lights in the tissue based on Beer – Lambert's law. the oximeter pulses the red and infrared LEDs on & off several hundred times per second. Oxyhemoglobin is more transparent to red light and deoxyhemoglobin to infrared light.

MATERIAL AND METHODS

Type of Study: Randomized clinical trial

Duration of study and study population:

Patients between ages 18-35years with American Society of Anaesthesiology grades I and II undergoing elective Lower segment cesarean section at KAHER's Dr Prabhakar Kore Charitable Hospital And Medical Research Centre, Nehru Nagar, Belagavi -10 during the period from January 2021 to January 2022

Inclusion Criteria:

- American Society of Anaesthesiology physical status I and II.
- Age between 18 to 35 years.
- Patients undergoing elective lower segment cesarean section.
- Provides Consent

Exclusion Criteria:

- Patients with comorbidities like Gestational Diabetes Mellitus and PIH, pre-eclampsia and eclampsia.
- Patients undergoing emergency cesarean section.

Sample Size: 110

Sample size calculation:

Given below is the formula based on the mean and its standard deviation based on which the minimum number of samples required is calculated.

$$\text{“}n = \frac{(z_\alpha + z_\beta)^2 (s_1^2 + s_2^2)}{(\bar{X}_1 - \bar{X}_2)^2}\text{ ”}$$

where α = level of the significance

β = power of the test.

When $\alpha = 0.05$ (5%), $z\alpha = 1.96$

For the power of the test = 80%, $z\beta = 0.84$.

Reference article took for sample size calculation:

"Artawan IM, Sarim BY, Sagita S, Etty Dedi MA.Comparison of the effect of preloading and coloading with crystalloid fluid on the incidence of hypotension after spinal anesthesia in cesarean section. Bali J Anaesthesiol 2020;4:3-7" [19].

Mean of the 1st group ($\bar{x}_1$) = 91.8

Mean of the 2nd group ($\bar{x}_2$) =95.3

SD of the 1st group (s_1) =6.9

SD of the 2nd group (s_2) = 6.2.

By using the above values, the calculated minimum sample size in each group is 55.

Institutional Ethical Committee Clearance: clearance received.

In this study, a total of 110 patients undergoing elective lower segment caesarean section are randomly allocated into two groups by computer generated numbers – Group A and Group B.

Group A: The participants receive 15ml/kg of lactated ringer 20 minutes prior to the induction of spinal anaesthesia – **Preload with crystalloid (N = 55)**

Group B: The participants receive 15ml /kg of lactated ringer after induction of spinal anaesthesia within 15minutes- **co load with crystalloid (N = 55)**

METHODOLOGY:

History of the patient, general physical examination and systemic examination and routine investigations were done. Informed consent was received from the participants.

On the day of surgery, nil by mouth status was confirmed and anti-aspiration prophylaxis was given to all the patients. 18 G IV cannula was secured on the upper limb.

Patients were shifted onto the operating table and all standard monitors viz pulse oximeter, NIBP, ECG applied and baseline readings recorded.

Patients in a supine position with a leftward tilt prevent aortocaval syndrome.

Participants who were allotted group A had received 15ml/kg of crystalloid fluid – Lactated Ringer 20 minutes prior to administration of subarachnoid block.

All patients were administered spinal anaesthesia with 0.5% Bupivacaine Heavy in the left lateral position in L2 – L3, L3 – L4 interspace and made supine position with leftward tilt.

Immediately after that, participants who were allotted group B were administered 15ml/kg of crystalloid fluid – Lactated Ringer before a uterine incision is obtained.

The sensory level of the block was assessed by pricking with a 26G hypodermic needle along the midclavicular line 5 minutes after administering the spinal anaesthetic. All parturients intraoperatively received 5 lt/min oxygen via a face mask.

At the baby extraction time, 10 U of oxytocin was given intramuscularly and another 10 U of oxytocin is started as a slow infusion.

Vasopressor inj Ephedrine 6 mg boluses are administered when the BP reading falls to >20% of the baseline value.

PARAMETERS ASSESSED:

The patient's Heart Rate, Systolic BP, Diastolic BP, Mean Arterial Pressure, and Perfusion Index are recorded every 1 minute for 15 minutes until the baby is out. After that, BP is recorded every 5 minutes till the end of the procedure. ECG and SPO2 were continuously monitored throughout the procedure. A total dose of ephedrine required was recorded.

STATISTICAL ANALYSIS:

The present study is a randomized clinical trial with the following analysis plan. This study required a comparison of various variables within and in between the two groups. Mean ± SD was calculated for continuous quantitative variables. Student's unpaired t–test was used to calculate the p-value for the comparison of various variables between the two groups. To compare the baseline values of various variables between the two groups, Student's paired t–test was used. For all the tests a value of p less than 5% (0.05) will be considered significant.

The data analysis was represented in tables. Graphs and pie charts were used wherever required.

RESULTS

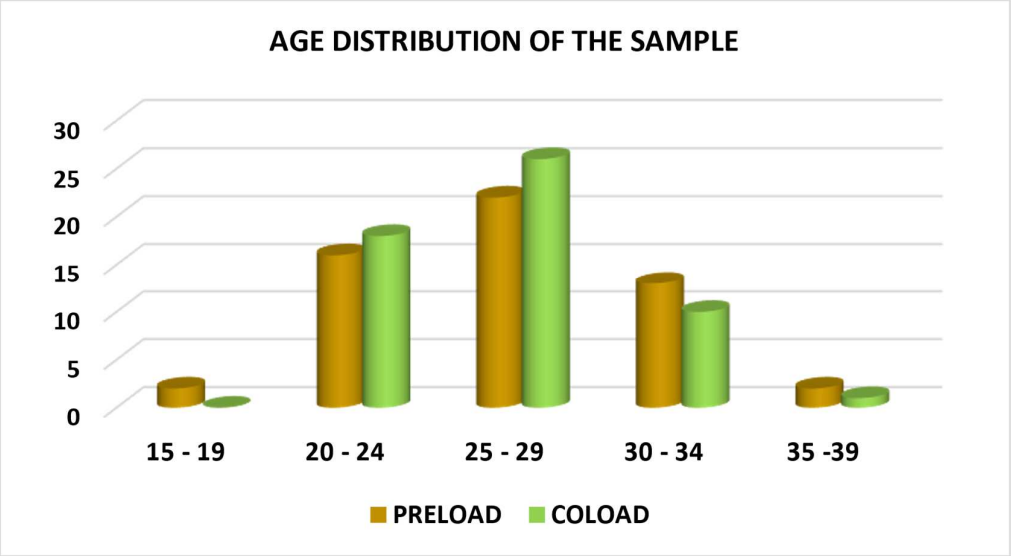
The data collected was analysed using SPSS (Statistical Package for Social Sciences) software.

DEMOGRAPHIC VARIABLES:

1. **MEAN AGE:**

	PRELOAD		COLOAD	
AGE	**NUMBER**	**%**	**NUMBER**	**%**
15 - 19	2	3.64	0	0.00
20 - 24	16	29.09	18	32.73
25 - 29	22	40.00	26	47.27
30 - 34	13	23.64	10	18.18
35 -39	2	3.64	1	1.82
TOTAL	55	100.00	55	100.00

TABLE 1



GRAPH 1

	PRELOAD				COLOAD					
	Mean	**St.Dev.**	**Minimum**	**Maximum**	**Mean**	**St.Dev.**	**Minimum**	**Maximum**	**p VALUE**	**INFERENCE**
AGE	26.93	4.26	19	37	26.67	3.62	20	35	0.7316	NS

TABLE 2

Age distribution of the participants is given in table 2 and graph 1. In both groups, majority of the participants are between 20 – 29 years. The mean age of two groups is shown in table 2 and the mean age difference is statistically insignificant.

2. WEIGHT:

	PRELOAD				COLOAD					
	Mean	**St.Dev.**	**Minimum**	**Maximum**	**Mean**	**St.Dev.**	**Minimum**	**Maximum**	**p VALUE**	**INFERENCE**
WEIGHT	65.75	6.26	54	80	68.93	7.57	58	85	0.0180	S

TABLE 3

3. VOLUME OF SPINAL ANAESTHETIC:

	PRELOAD				COLOAD					
	Mean	**St.Dev.**	**Minimum**	**Maximum**	**Mean**	**St.Dev.**	**Minimum**	**Maximum**	**p VALUE**	**INFERENCE**
VOLUME	2.19	0.10	2	2.4	2.16	0.09	2	2.4	0.1165	NS

TABLE 4

Volume of spinal anaesthetic affects the level of sympathetic blockade which further aggravates the post spinal hypotension. The mean volume of spinal anaesthetic agent administered in both groups is given in table 4 and there is no statistically significant difference in both groups.

4. DIAGNOSIS:

	PRELOAD		COLOAD	
DIAGNOSIS	**NUMBER**	**%**	**NUMBER**	**%**
PRIMI	27	49.09	23	41.82
MULTI	28	50.91	32	58.18
TOTAL	55	100.00	55	100.00

TABLE 5

HEMODYNAMIC VARIABLES:

5. HEART RATE:

	PRELOAD				COLOAD					
	Mean	**St.Dev.**	**Minimum**	**Maximum**	**Mean**	**St.Dev.**	**Minimum**	**Maximum**	**p VALUE**	**INFERENCE**
BASE LINE	87.85	12.90	70	124	84.73	12.26	68	120	0.1954	NS
1 MIN	85.96	14.24	56	120	84.18	13.67	64	120	0.5047	NS
2 MIN	81.71	16.51	54	110	84.40	13.72	58	114	0.3547	NS
3 MIN	82.75	17.20	54	110	82.78	14.44	60	114	0.9904	NS
4 MIN	81.51	15.64	54	110	80.62	15.02	56	120	0.7611	NS
5 MIN	81.51	16.31	54	112	79.09	13.95	54	110	0.4051	NS
6 MIN	81.13	16.83	52	112	80.22	12.06	56	112	0.7454	NS
7 MIN	82.65	13.64	57	110	79.29	13.19	52	114	0.1914	NS
8 MIN	81.65	12.71	58	110	79.76	12.84	54	114	0.4392	NS
9 MIN	82.11	12.27	64	115	79.02	12.56	54	120	0.1945	NS
10 MIN	81.27	11.91	60	110	79.18	13.05	52	122	0.3820	NS
11 MIN	79.51	10.67	60	105	80.71	15.11	54	124	0.6314	NS
12 MIN	80.18	10.88	62	108	80.78	13.06	58	119	0.7940	NS
13 MIN	80.87	9.82	64	104	81.44	12.01	62	114	0.7881	NS
14 MIN	80.93	9.01	62	100	80.91	12.46	62	114	0.9930	NS
15 MIN	80.25	9.21	60	102	81.73	12.89	60	118	0.4920	NS

TABLE 6

The mean heart rate is compared between two groups at previously mentioned time periods. The heart rate differences are statistically insignificant

6. SYSTOLIC BLOOD PRESSURE:

	PRELOAD				COLOAD					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
BASE LINE	118.84	8.96	100	140	123.52	11.34	100	140	0.0184	NS
1 MIN	112.16	12.58	87	140	113.60	13.07	90	140	0.5582	NS
2 MIN	105.82	13.06	86	132	106.15	10.30	84	130	0.8842	NS
3 MIN	100.44	11.31	82	130	105.75	10.66	88	130	0.0127	S
4 MIN	101.22	10.00	82	134	105.64	11.29	86	140	0.0320	S
5 MIN	102.13	7.35	80	134	105.24	10.79	86	140	0.0801	NS
6 MIN	100.89	9.80	80	128	106.56	11.29	90	142	0.0058	VS
7 MIN	101.38	9.94	78	128	106.38	11.83	82	142	0.0181	S
8 MIN	103.64	10.69	80	134	106.27	9.86	86	138	0.1816	NS
9 MIN	104.87	10.40	80	134	107.29	10.26	84	138	0.2223	NS
10 MIN	105.16	8.05	78	128	108.29	8.29	90	140	0.0473	S
11 MIN	105.95	6.30	90	128	107.58	8.30	94	138	0.2466	NS
12 MIN	106.73	6.55	96	124	107.38	9.06	86	142	0.6649	NS
13 MIN	105.71	7.56	92	128	108.93	9.35	86	140	0.0497	S
14 MIN	106.67	7.67	90	128	108.67	8.97	91	134	0.2117	NS
15 MIN	107.56	7.18	90	128	108.44	8.64	97	138	0.5658	NS

TABLE 7

The Systolic Blood Pressure is measured at pre-set intervals in two groups. The intergroup difference is statistically significant at 3 minutes (P value = 0.0127), 4 minutes (P value = 0.0320), 7 minutes (P value = 0.0181), 10 minutes (P value = 0.0473), 13 minutes (P value = 0.0497).

7. DIASTOLIC BLOOD PRESSURE:

	PRELOAD				COLOAD					
	Mean	**St.Dev.**	**Minimum**	**Maximum**	**Mean**	**St.Dev.**	**Minimum**	**Maximum**	**p VALUE**	**INFERENCE**
BASE LINE	74.65	8.80	50	90	76.98	6.28	70	90	0.1133	NS
1 MIN	71.78	9.58	42	90	70.69	7.04	56	86	0.4975	NS
2 MIN	68.51	8.86	50	84	67.49	7.35	56	84	0.5132	NS
3 MIN	64.47	6.13	50	78	66.15	7.11	54	86	0.1893	NS
4 MIN	66.44	7.37	50	84	67.16	8.02	50	84	0.6214	NS
5 MIN	65.15	7.75	48	84	67.13	8.29	52	94	0.1979	NS
6 MIN	65.82	7.57	50	84	66.16	7.76	54	90	0.8137	NS
7 MIN	65.16	7.45	48	84	66.89	7.01	57	94	0.2134	NS
8 MIN	65.89	7.07	50	84	67.20	7.18	52	84	0.3373	NS
9 MIN	67.55	7.11	52	80	66.25	7.23	54	86	0.3471	NS
10 MIN	67.05	7.21	48	82	67.76	8.49	47	84	0.6377	NS
11 MIN	67.95	5.65	60	84	67.80	7.65	52	90	0.9099	NS
12 MIN	68.04	5.59	57	80	69.02	8.47	53	92	0.4747	NS
13 MIN	66.98	7.58	50	84	70.40	8.25	57	96	0.0256	S
14 MIN	66.96	5.75	54	80	68.51	9.14	43	92	0.2909	NS
15 MIN	68.07	5.70	60	84	67.42	8.66	47	92	0.6405	NS

TABLE 8

The diastolic blood pressure is compared between two groups at pre-set intervals. The differences are statistically significant at 13 minutes (P = 0.0256).

8. MEAN ARTERIAL PRESSURE:

	PRELOAD				COLOAD					
	Mean	**St.Dev.**	**Minimum**	**Maximum**	**Mean**	**St.Dev.**	**Minimum**	**Maximum**	**p VALUE**	**INFERENCE**
BASE LINE	82.73	7.99	65	104	87.82	7.76	72	104	0.0010	VS
1 MIN	79.24	10.15	57	98	80.25	8.29	66	102	0.5656	NS
2 MIN	72.82	11.13	55	94	75.45	7.91	58	98	0.1551	NS
3 MIN	69.38	8.49	56	94	72.58	8.63	58	94	0.0526	NS
4 MIN	68.55	7.84	58	88	72.15	8.81	58	98	0.0256	S
5 MIN	67.75	7.43	58	90	72.60	8.74	58	96	0.0022	VS
6 MIN	67.95	7.83	56	92	72.07	10.15	58	102	0.0187	S
7 MIN	68.85	8.95	54	92	70.04	8.58	58	98	0.4810	NS
8 MIN	68.95	7.74	56	92	71.75	7.33	60	92	0.0541	NS
9 MIN	69.71	8.05	56	88	72.62	7.25	58	90	0.0489	S
10 MIN	69.49	7.93	54	86	71.45	6.72	60	94	0.1641	NS
11 MIN	69.24	7.54	56	90	72.22	7.71	57	94	0.0427	S
12 MIN	70.51	6.88	58	94	73.85	8.37	59	98	0.0240	S
13 MIN	71.04	7.33	58	90	74.09	9.30	52	102	0.0583	NS
14 MIN	70.96	6.77	59	88	73.67	8.23	59	94	0.0621	NS
15 MIN	72.60	7.06	61	91	75.09	8.71	64	94	0.1025	NS

TABLE 9

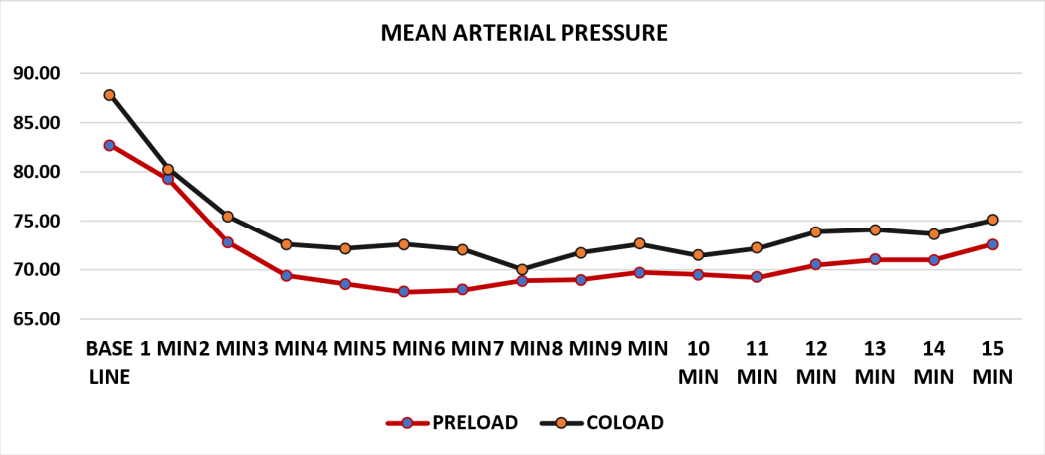


FIGURE 2

The MAP is compared between two groups at pre-set intervals. The difference is statistically significant at 4 minutes (P value = 0.0256), 5 minutes (0.0022), 6 minutes (P = 0.0187), 9 minutes (P = 0.0489), 11 minutes (P = 0.0427), 12 minutes (P = 0.0240).

9. PERFUSION INDEX:

	PRELOAD				COLOAD					
	Mean	**St.Dev.**	**Minimum**	**Maximum**	**Mean**	**St.Dev.**	**Minimum**	**Maximum**	**p VALUE**	**INFERENCE**
BASE LINE	6.29	2.87	1.4	13.4	6.81	2.99	1.4	12.8	0.3531	NS
1 MIN	5.83	3.01	1.4	14.8	6.15	2.83	1.2	12.8	0.5721	NS
2 MIN	5.24	2.43	0.8	10.8	5.60	3.01	1.2	12.2	0.4932	NS
3 MIN	4.97	2.66	1.4	12	5.28	2.89	0.8	12.4	0.5607	NS
4 MIN	4.92	2.56	1	11.4	5.25	2.92	0.8	12.4	0.5243	NS
5 MIN	4.99	2.75	0.8	11.8	5.34	2.82	1.2	12.5	0.5085	NS
6 MIN	5.02	2.70	1	11.8	5.51	2.75	1.2	12.5	0.3529	NS
7 MIN	4.95	2.68	1.2	11.4	5.41	2.71	1.2	12.2	0.3804	NS
8 MIN	5.23	2.57	0.8	11.4	5.07	2.30	1.4	10.8	0.7400	NS
9 MIN	5.27	2.60	1.2	12.4	5.22	2.08	0.8	10.8	0.9098	NS
10 MIN	5.30	2.57	0.8	12.4	5.54	2.33	0.8	11.1	0.6143	NS
11 MIN	5.52	2.46	0.8	12.4	5.57	2.26	0.8	10.4	0.9103	NS
12 MIN	5.70	2.55	1.2	12.8	5.24	2.27	0.6	10.4	0.3242	NS
13 MIN	5.48	2.53	1.2	12.8	5.38	2.34	0.7	10.8	0.8300	NS
14 MIN	5.40	2.52	1.3	12	5.35	2.31	0.4	10.4	0.9247	NS
15 MIN	5.43	2.41	1.4	12	5.60	2.46	0.4	10.8	0.7102	NS

TABLE 10

Table 9 shows the trend of perfusion index and is compared between two groups at pre-set intervals. The difference is statistically insignificant between two groups.

10. INCIDENCE OF HYPOTENSION:

Hypotension - preload	Hypotension - coload	P - value	Significance
65.45%	63.63%	0.417	NS

TABLE 11

Table 10 shows the percentage of patients having hypotension in two groups. Hypotension defined as fall in mean arterial pressure more than 20% of baseline value.

11. EPHEDRINE REQUIREMENT:

Preload:

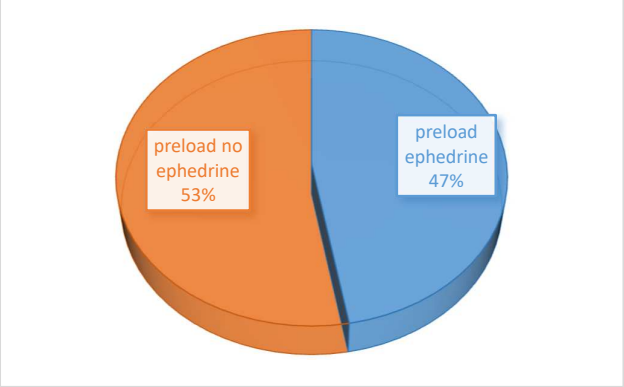


FIGURE 3

Coload:

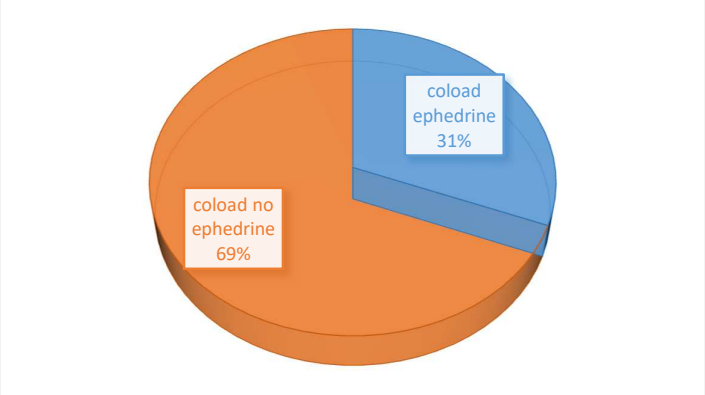


FIGURE 4

Figures 3 and 4 show the percentage of study population requiring ephedrine boluses for management of hypotension in group A and Group B respectively.

12. MEAN EPHEDRINE DOSE:

preload		coload			
mean	**SD**	**mean**	**SD**	**P - value**	**Significance**
4.47	5.39	1.96	3.03	0.000003	VS

TABLE 12

Table 11 shows the mean ephedrine doses required in group A and group B. the difference is statistically significant with P value < 0.001.

SUB GROUP ANALYSIS:

Sub group analysis of the hemodynamic variables has been done depending on the parity of the patient (primi or multi), volume of the spinal drug used and weight of the patient.

A. PARITY OF THE PATIENT:

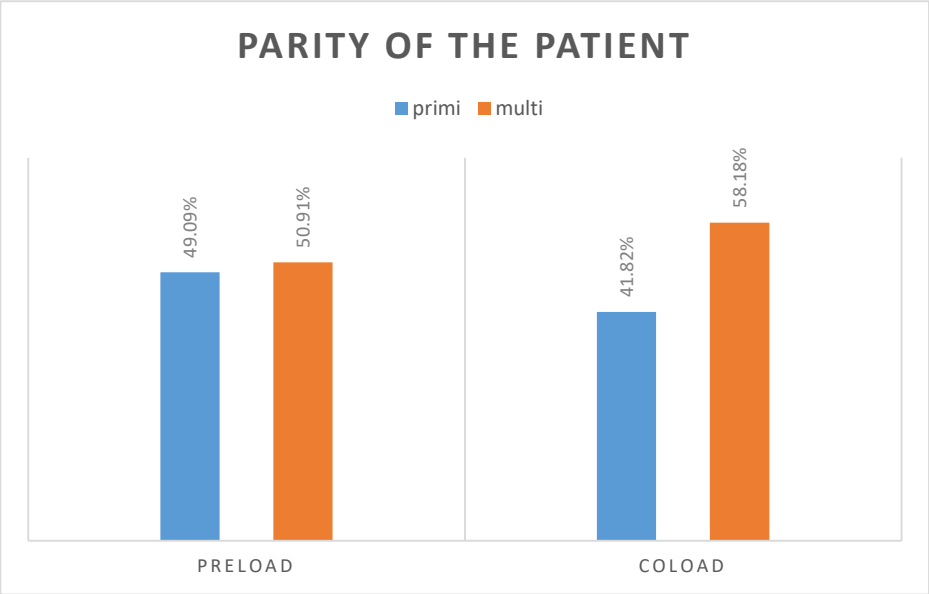


FIGURE 5

	PRIMI									
	PRELOAD				COLOAD					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
BASE LINE	118.37	9.61	100	140	125.39	12.05	100	140	0.0264	S
1 MIN	112.37	13.17	90	140	114.43	15.36	90	140	0.6112	NS
2 MIN	106.96	11.96	86	130	107.22	13.44	84	130	0.9438	NS
3 MIN	100.81	11.69	82	130	107.48	12.94	88	130	0.0618	NS
4 MIN	100.30	11.56	82	134	108.96	11.20	94	130	0.0101	S
5 MIN	101.78	9.54	80	134	105.70	13.33	86	140	0.2331	NS
6 MIN	100.93	11.01	80	128	108.65	13.51	90	142	0.0306	S
7 MIN	102.22	11.35	78	128	107.91	13.80	82	142	0.1160	NS
8 MIN	105.52	10.57	86	134	108.13	11.51	90	138	0.4075	NS
9 MIN	103.67	11.70	80	134	107.74	12.64	84	138	0.2429	NS
10 MIN	104.00	9.69	78	128	110.04	10.44	90	140	0.0391	S
11 MIN	105.63	6.63	98	128	109.57	8.76	94	138	0.0772	NS
12 MIN	106.70	7.27	96	124	108.48	9.28	98	140	0.4524	NS
13 MIN	106.22	7.96	92	128	109.04	9.54	98	140	0.2598	NS
14 MIN	107.07	8.42	90	128	109.65	10.01	98	134	0.3273	NS
15 MIN	108.00	7.19	94	128	109.74	9.27	98	132	0.4589	NS

TABLE 13

Table 13 shows the systolic blood pressure differences of primipara in preload and coload group. The difference is statistically significant at 1 min,4 min, 6 min, 10 min.

In multipara, there is no statistically significant variation of systolic blood pressure in between the two sub groups.

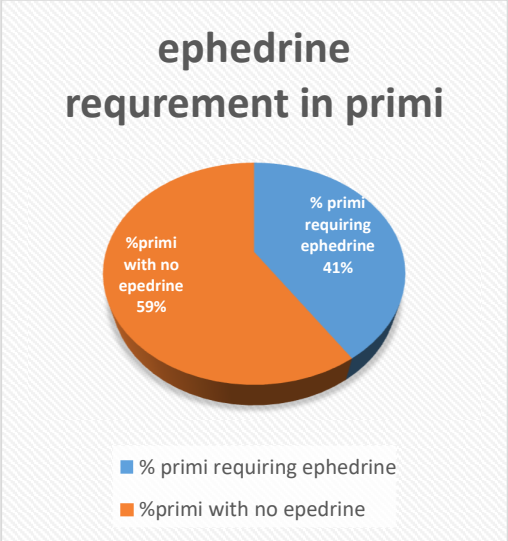
The difference in Mean Heart Rate, Diastolic Blood Pressure, Perfusion Index is statistically insignificant among primipara and multipara in both preload and coload groups.

	PRIMI									
	PRELOAD				COLOAD					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
BASE LINE	82.96	9.18	65	104	89.22	8.50	72	104	0.0166	S
1 MIN	80.26	11.22	58	98	80.57	9.34	68	102	0.9179	NS
2 MIN	72.89	10.72	56	94	75.78	10.44	58	98	0.3405	NS
3 MIN	69.93	8.34	58	94	72.78	9.93	58	94	0.2743	NS
4 MIN	67.15	8.12	58	88	74.17	9.35	62	98	0.0065	VS
5 MIN	67.04	7.30	58	84	72.91	9.84	62	96	0.0194	S
6 MIN	67.26	7.77	58	84	72.30	10.59	58	98	0.0584	NS
7 MIN	68.15	8.56	54	90	69.91	8.41	58	88	0.4674	NS
8 MIN	68.41	8.06	58	92	72.52	8.51	60	90	0.0860	NS
9 MIN	68.63	9.15	56	87	72.91	8.59	58	90	0.0962	NS
10 MIN	69.26	9.20	54	86	73.65	7.97	60	94	0.0801	NS
11 MIN	67.74	8.00	56	90	73.17	8.37	62	94	0.0233	NS
12 MIN	69.07	7.69	58	94	74.09	8.41	64	96	0.0326	S
13 MIN	70.59	8.10	58	90	74.35	8.48	64	96	0.1165	NS
14 MIN	70.07	7.53	59	88	74.57	7.06	68	92	0.0356	S
15 MIN	71.48	7.22	61	84	76.43	8.52	64	94	0.0308	S

TABLE 14

Table 14 shows the Mean Arterial Pressure changes in Primipara in between two groups. The difference is very significant at 4 mins after induction and significant at 5 min, 12 min, 14 min, 15 min.

In multipara, there is no statistically significant difference of mean arterial pressure among two groups.



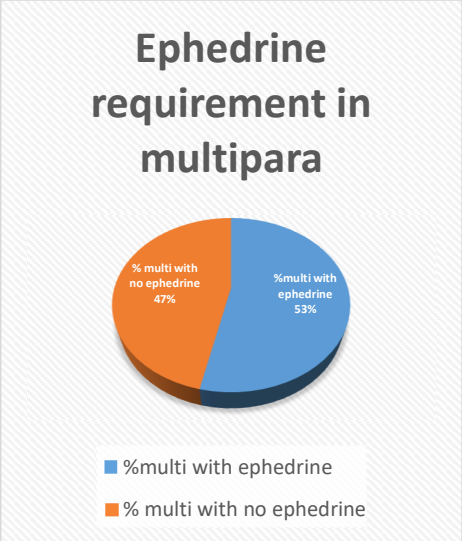
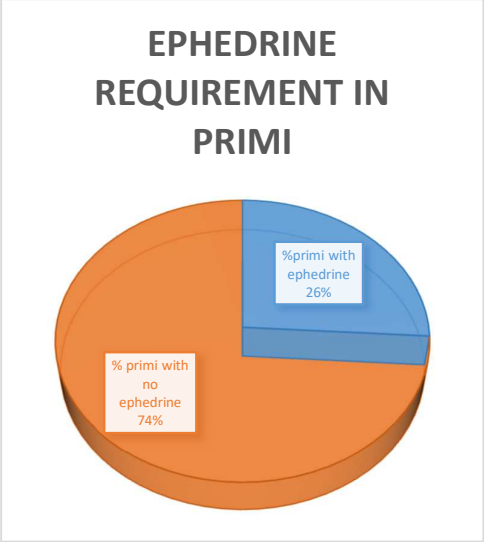


FIGURE 6 **FIGURE 7**

Figures 6 & 7 show the ephedrine requirement of primipara and multipara respectively in preload group. It is more in multipara compared to primipara.



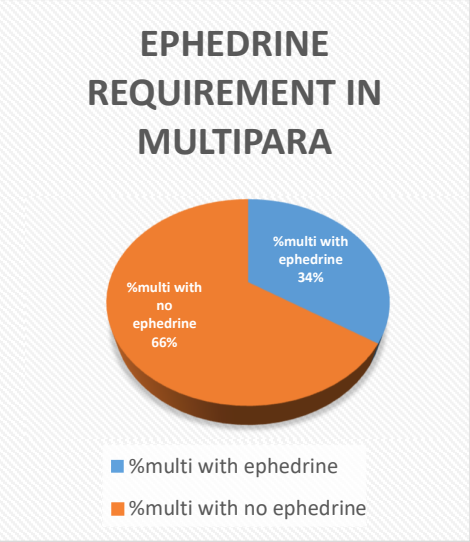


FIGURE 8 **FIGURE 9**

Figures 8 & 9 show percentage of ephedrine requirement in primipara and multipara respectively in co load group. In co load group also ephedrine requirement is high in multipara compared to primipara.

B. VOLUME OF SPINAL DRUG:

	PRELOAD		COLOAD	
VOLUME	**NUMBER**	**%**	**NUMBER**	**%**
2	9	16.36	13	23.64
> 2	46	83.64	42	76.36
TOTAL	55	100.00	55	100.00

TABLE 15

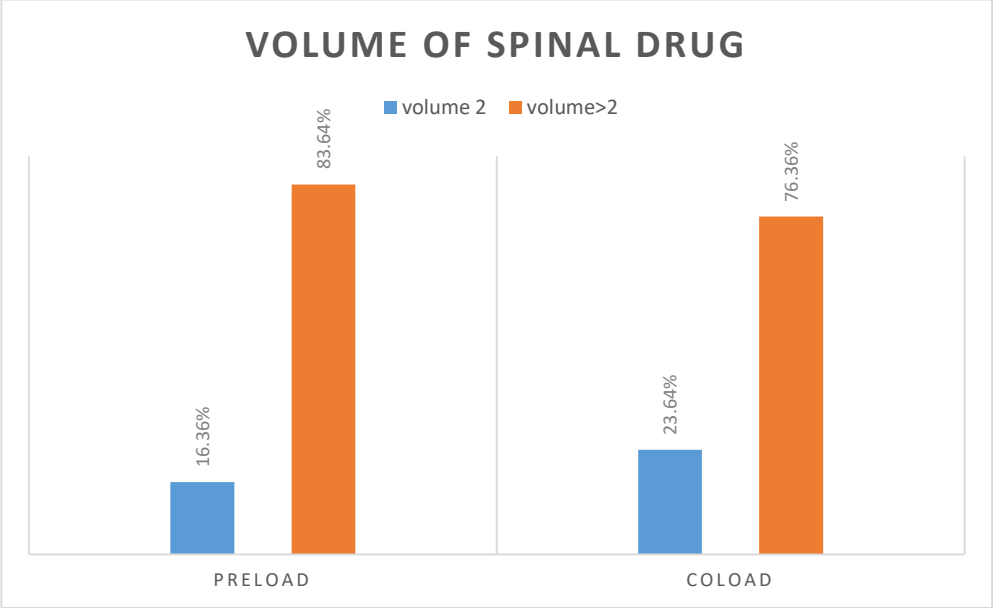


FIGURE 10

Two sub groups (sub group 1: Volume 2 ml, sub group 2: Volume >2 ml) have been divided depending on volume of spinal drug given. Table 15 shows the percentage of cases that fall in sub group 1 and sub group 2 in both groups.

	VOLUME 2									
	PRELOAD				COLOAD					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
BASE LINE	92.44	10.28	74	100	84.00	11.72	70	102	0.0965	NS
1 MIN	86.00	12.81	76	108	80.46	10.59	64	100	0.2810	NS
2 MIN	85.89	11.92	76	106	80.00	10.52	58	100	0.2354	NS
3 MIN	90.11	14.02	74	110	78.23	10.43	60	94	0.0334	S
4 MIN	88.89	12.65	76	110	78.62	9.91	62	94	0.0452	S
5 MIN	89.11	17.69	64	112	76.15	11.44	54	94	0.0493	S
6 MIN	89.56	18.43	60	112	77.69	10.29	58	94	0.0670	NS
7 MIN	84.78	11.49	72	108	77.23	12.64	52	92	0.1688	NS
8 MIN	84.67	9.70	72	102	75.77	12.17	54	92	0.0830	NS
9 MIN	84.78	13.91	74	115	76.23	10.69	56	98	0.1185	NS
10 MIN	82.56	12.70	73	110	76.38	10.24	60	94	0.2220	NS
11 MIN	82.11	10.35	74	104	78.00	9.38	64	94	0.3439	NS
12 MIN	80.22	10.60	66	102	77.46	10.12	58	92	0.5441	NS
13 MIN	80.89	8.61	70	98	78.62	9.36	62	94	0.5695	NS
14 MIN	81.22	8.15	72	96	78.46	10.07	64	96	0.5038	NS
15 MIN	81.78	6.59	74	92	78.69	9.99	62	94	0.4279	NS

TABLE 16

Table 16 shows the Mean Heart Rate differences of sub group 1 among two groups. It showed statistically significant difference at 3 min, 4 min, 5 min after induction.

	VOLUME 2									
	PRELOAD				COLOAD					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
BASE LINE	121.78	7.84	110	130	122.31	12.35	110	140	0.9108	NS
1 MIN	110.11	16.28	87	130	109.54	11.84	94	138	0.9246	NS
2 MIN	110.33	14.93	90	132	104.00	8.29	92	120	0.2155	NS
3 MIN	100.56	13.87	82	126	104.46	6.44	90	118	0.3825	S
4 MIN	101.11	13.07	82	126	104.46	3.38	98	112	0.3835	S
5 MIN	104.44	4.59	98	111	105.08	6.46	92	116	0.8035	S
6 MIN	97.22	9.59	84	110	107.85	7.05	98	126	0.0070	VS
7 MIN	101.78	7.97	90	110	106.15	5.91	96	116	0.1539	NS
8 MIN	102.44	10.94	88	112	103.31	5.59	94	112	0.8098	NS
9 MIN	105.78	8.74	94	118	104.00	7.44	84	114	0.6133	NS
10 MIN	106.44	6.84	98	112	105.54	3.93	98	114	0.6970	NS
11 MIN	107.44	4.50	98	112	106.46	2.85	102	112	0.5363	NS
12 MIN	108.00	8.00	98	116	107.38	4.79	98	116	0.8233	NS
13 MIN	101.22	5.47	94	113	108.31	3.57	102	114	0.0015	NS
14 MIN	103.67	5.39	94	113	108.77	6.56	98	126	0.0687	NS
15 MIN	106.44	7.54	98	122	106.00	4.40	98	112	0.8629	NS

TABLE 17

Table 17 shows Systolic blood pressure changes of sub group 1 among two groups. At 3 min, 4 min, 5 min the difference is significant and it is very significant at 6 mins post induction.

	VOLUME 2									
	PRELOAD				COLOAD					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
BASE LINE	86.44	4.98	80	94	85.38	9.29	72	102	0.7588	NS
1 MIN	78.00	13.18	57	92	76.62	6.45	66	86	0.7459	NS
2 MIN	78.33	12.08	60	92	74.85	5.91	64	84	0.3775	NS
3 MIN	70.22	8.23	58	84	72.54	8.82	59	90	0.5409	NS
4 MIN	68.00	7.35	58	78	72.08	6.49	64	88	0.1848	NS
5 MIN	67.67	5.52	62	80	74.31	7.02	68	86	0.0279	S
6 MIN	67.67	5.05	59	78	73.77	8.11	61	92	0.0595	NS
7 MIN	73.11	8.12	61	92	71.85	6.24	60	84	0.6835	NS
8 MIN	70.22	7.77	56	84	71.85	5.57	62	84	0.5732	NS
9 MIN	69.78	9.19	58	88	71.69	5.71	60	82	0.5522	NS
10 MIN	68.67	8.66	54	80	71.69	5.15	62	78	0.3156	NS
11 MIN	72.11	9.70	62	84	71.08	5.98	62	80	0.7596	NS
12 MIN	72.22	4.74	68	80	72.62	6.85	60	84	0.8832	NS
13 MIN	73.78	7.24	64	84	72.92	5.63	64	84	0.7586	NS
14 MIN	72.22	7.71	64	84	72.31	6.10	64	84	0.9771	NS
15 MIN	74.11	9.55	64	91	73.54	8.53	64	94	0.8842	NS

TABLE 18

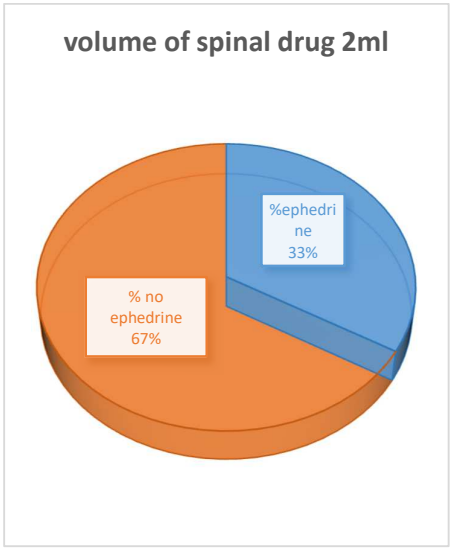
Table 18 shows the MAP differences for sub group 1 among two groups. It is significant only at 5min after induction

	VOLUME > 2									
	PRELOAD				COLOAD					
	MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
BASE LINE	82.00	8.30	65	104	88.57	7.18	72	104	0.0002	HS
1 MIN	79.48	9.61	58	98	81.38	8.53	70	102	0.3306	NS
2 MIN	71.74	10.74	55	94	75.64	8.48	58	98	0.0636	NS
3 MIN	69.22	8.62	56	94	72.60	8.68	58	94	0.0708	NS
4 MIN	68.65	8.00	58	88	72.17	9.49	58	98	0.0630	NS
5 MIN	67.76	7.80	58	90	72.07	9.22	58	96	0.0198	S
6 MIN	68.00	8.30	56	92	71.55	10.74	58	102	0.0851	NS
7 MIN	68.02	8.95	54	92	69.48	9.17	58	98	0.4537	NS
8 MIN	68.70	7.80	56	92	71.71	7.86	60	92	0.0742	NS
9 MIN	69.70	7.92	56	87	72.90	7.70	58	90	0.0576	NS
10 MIN	69.65	7.87	54	86	71.38	7.19	60	94	0.2866	NS
11 MIN	68.67	7.04	56	90	72.57	8.20	57	94	0.0186	S
12 MIN	70.17	7.22	58	94	74.24	8.83	59	98	0.0199	S
13 MIN	70.50	7.30	58	90	74.45	10.20	52	102	0.0383	S
14 MIN	70.72	6.64	59	88	74.10	8.81	59	94	0.0442	NS
15 MIN	72.30	6.57	61	84	75.57	8.81	64	94	0.0506	NS

TABLE 19

Table 19 shows the comparison of MAP for sub group 2 among two groups. There is statistically significant difference at 5 min, 11 min, 12 min, 13 min after induction of SAB.

There is no statistically significant difference of Heart Rate, SBP in sub group 2. Diastolic blood pressure, Perfusion Index are not significantly different among preload and coload groups for both sub groups 1 and 2.



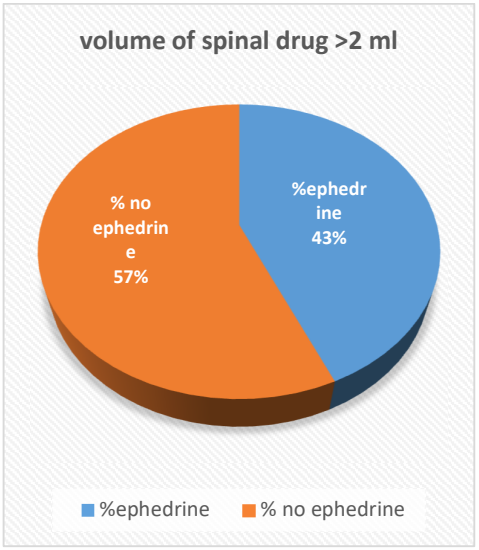


FIGURE 9 **FIGURE 10**

Figures 9 & 10 show the percentage of ephedrine requirement in patients who received 2 ml of spinal drug and >2 ml spinal drug respectively in preload group. It is higher in first sub group

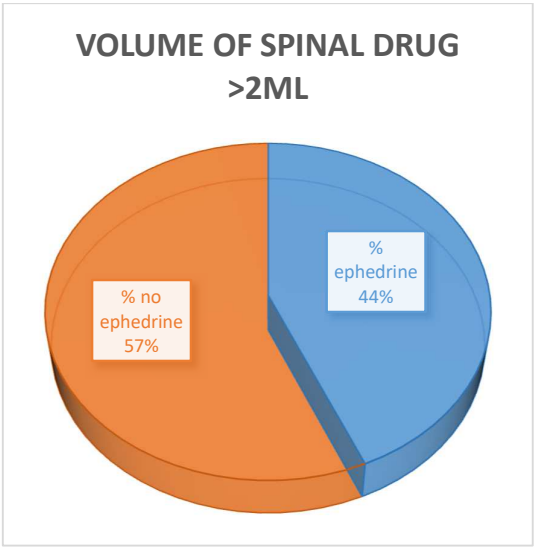


FIGURE 11

In co load group, no patient required ephedrine when the volume of spinal drug given is 2ml and in patients who received >2ml spinal drug, the percentage of ephedrine requirement is 44%.

C. WEIGHT OF THE PATIENT:

	PRELOAD		COLOAD	
WEIGHT	**NUMBER**	**%**	**NUMBER**	**%**
51 – 60	16	29.09	10	18.18
61 – 70	26	47.27	25	45.45
≥ 71	13	23.64	20	36.36
TOTAL	55	100.00	55	100.00

TABLE 20

Depending on weight, 3 sub-groups (sub group 1: 51-60 kg, sub group 2: 61 – 70 kg, sub group 3 - ≥ 71kg) are divided.

There no statistically significant difference of Mean Heart Rate, diastolic blood pressure for all 3 sub-groups among preload and coload groups.

Systolic Blood pressure difference among preload and coload groups is statistically insignificant for sub groups 1 & 2

Mean Arterial Pressure is not significantly varying among two groups for sub group 1

PI changes among two groups are statistically insignificant for sub groups 1 & 3

	WEIGHT ≥ 71									
	PRELOAD				COLOAD					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
BASE LINE	120.00	8.16	110	130	127.20	10.04	110	140	0.0387	S
1 MIN	107.23	12.58	90	128	113.20	12.59	94	138	0.1929	NS
2 MIN	101.23	13.01	90	126	109.00	9.17	92	128	0.0525	NS
3 MIN	94.15	10.66	82	118	108.90	10.27	92	126	0.0004	HS
4 MIN	96.77	9.58	82	112	108.50	13.18	90	140	0.0096	VS
5 MIN	100.15	6.50	80	104	104.65	13.14	86	140	0.2623	NS
6 MIN	98.77	9.71	80	112	104.45	12.62	90	140	0.1785	NS
7 MIN	103.08	10.12	78	112	104.45	14.02	82	140	0.7627	NS
8 MIN	108.77	5.45	94	118	106.60	8.76	94	130	0.4320	NS
9 MIN	104.46	8.91	80	114	110.85	8.60	100	138	0.0484	S
10 MIN	103.23	9.15	78	112	109.25	6.53	101	134	0.0347	S
11 MIN	106.62	3.69	102	112	108.35	7.44	104	138	0.4424	NS
12 MIN	106.31	6.26	98	114	107.55	9.16	98	142	0.6721	NS
13 MIN	105.00	5.34	98	115	110.00	8.31	98	136	0.0639	NS
14 MIN	107.77	7.73	92	118	108.05	9.29	98	134	0.9285	NS
15 MIN	106.77	6.25	94	118	108.90	11.21	98	138	0.5378	NS

TABLE 21

Table 21 shows systolic blood pressure variability for sub group 3. It is significant at 3 min, 4 min, 9 min, 10 min.

	WEIGHT 61 - 70									
	PRELOAD				COLOAD					
	MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
BASE LINE	82.88	8.55	65	104	86.72	7.81	74	102	0.1012	NS
1 MIN	79.27	9.85	60	98	79.72	7.60	66	94	0.8560	NS
2 MIN	74.50	10.10	56	92	73.76	7.69	58	84	0.7704	NS
3 MIN	69.92	7.89	58	84	72.72	9.27	58	90	0.2509	NS
4 MIN	68.27	6.87	58	78	70.60	8.16	58	88	0.2748	NS
5 MIN	67.77	5.76	58	80	72.24	8.91	58	86	0.0377	S
6 MIN	67.62	6.92	58	78	74.40	9.13	62	98	0.0043	VS
7 MIN	69.50	7.40	56	92	70.96	6.88	60	88	0.4697	NS
8 MIN	68.27	7.23	56	84	72.24	6.84	60	92	0.0495	S
9 MIN	68.46	5.65	58	78	72.80	4.76	64	84	0.0047	VS
10 MIN	68.81	6.36	54	84	71.52	5.45	62	82	0.1088	NS
11 MIN	69.54	6.41	61	84	71.60	6.31	57	80	0.2529	NS
12 MIN	71.08	5.11	62	82	73.92	7.59	59	90	0.1218	NS
13 MIN	71.92	6.06	62	84	74.12	9.08	59	102	0.3128	NS
14 MIN	71.15	5.30	59	82	73.20	9.05	59	94	0.3272	NS
15 MIN	72.88	5.29	64	84	75.88	9.34	64	94	0.1629	NS

TABLE 22

Table 22 shows that MAP changes among two groups are statistically significant at 5 min, 8 min and 9 min after induction for sub group 2.

	WEIGHT ≥ 71									
	PRELOAD				COLOAD					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
BASE LINE	83.46	6.62	69	94	87.80	6.83	72	98	0.0809	NS
1 MIN	77.38	10.36	58	90	78.75	6.43	68	94	0.6426	NS
2 MIN	70.54	11.55	55	92	75.20	5.25	64	88	0.1241	NS
3 MIN	68.38	7.77	56	78	71.20	6.16	62	86	0.2561	S
4 MIN	69.77	8.02	58	82	72.80	8.56	64	98	0.3166	NS
5 MIN	68.54	8.18	59	84	71.85	7.04	63	92	0.2245	NS
6 MIN	69.69	9.89	58	92	68.40	9.50	58	102	0.7097	NS
7 MIN	69.46	11.74	54	92	67.70	9.67	58	98	0.6418	NS
8 MIN	70.46	8.55	61	92	70.10	7.06	60	86	0.8956	NS
9 MIN	70.54	9.15	62	86	72.80	7.71	64	90	0.4500	NS
10 MIN	70.54	9.51	58	86	70.70	4.91	62	84	0.9492	S
11 MIN	68.54	10.23	56	90	72.30	7.37	62	92	0.2283	NS
12 MIN	70.15	10.40	58	94	73.10	8.27	64	98	0.3733	NS
13 MIN	69.54	9.57	58	90	73.10	7.66	64	94	0.2457	NS
14 MIN	71.08	8.40	59	86	72.60	6.45	68	92	0.5607	NS
15 MIN	72.46	8.75	61	86	73.35	8.14	64	94	0.7680	NS

TABLE 23

Table 23 shows MAP changes among two groups is statistically significant at 3 min, 10 min after induction for sub group 3.

	WEIGHT 61 - 70									
	PRELOAD				COLOAD					
	MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
BASE LINE	5.58	2.51	1.4	13	6.74	2.92	1.4	12.8	0.1325	NS
1 MIN	5.30	2.78	1.4	14.8	5.99	2.77	1.2	12.4	0.3771	NS
2 MIN	5.05	2.37	1.4	10.4	5.80	2.97	1.2	12.2	0.3184	NS
3 MIN	4.70	2.37	1.4	10.4	5.50	2.84	0.8	12.4	0.2796	NS
4 MIN	4.45	2.58	1	11.4	5.34	2.80	0.8	12.4	0.2449	NS
5 MIN	4.57	2.63	1	11.8	5.46	2.65	1.2	12.5	0.2294	NS
6 MIN	4.56	2.69	1	11.8	5.67	2.53	1.6	12.5	0.1343	VS
7 MIN	4.50	2.67	1.2	11.4	5.48	2.48	1.2	12.2	0.1811	NS
8 MIN	4.94	2.53	0.8	10.8	5.00	1.74	1.4	8.2	0.9150	NS
9 MIN	5.08	2.73	1.2	12.4	5.25	1.61	0.8	7.6	0.7873	VS
10 MIN	5.12	2.59	1	12.4	5.70	2.14	0.8	11.1	0.3880	NS
11 MIN	5.26	2.36	2.1	12.4	5.75	1.95	0.8	9.3	0.4194	NS
12 MIN	5.26	2.48	1.8	12.8	5.34	2.06	0.6	9.2	0.8980	NS
13 MIN	5.05	2.46	1.8	12.8	5.50	2.15	0.7	10.4	0.4938	NS
14 MIN	4.93	2.29	1.8	11.4	5.64	2.15	0.4	9.2	0.2597	NS
15 MIN	4.94	2.23	2	11.4	5.85	2.27	0.4	9.3	0.1559	NS

TABLE 24

Table 24 shows that PI changes among two groups are very significant at 6 min and 9 min after induction for sub group 2.

DISCUSSION

Spinal anaesthesia is the preferred mode of anaesthesia for patients undergoing caesarean section. It has several advantages avoidance of multiple drugs that can cross the placenta and cause fetal complications, avoiding maternal airway manipulation, doesn't affect the consciousness of the mother which helps in maternal satisfaction of experiencing childbirth.

But spinal anaesthesia in pregnancy has got certain complications such as difficulty in identifying the subarachnoid space and reaching a higher spinal level due to anatomical changes of the spine, increased sensitivity to local anaesthetic agents and most importantly, certain physiological complications like hypotension.

Hypotension after spinal anaesthesia can lead to certain complications like nausea, vomiting, and bradycardia in the mother and sustained hypotension can lead to fetal hypoxia and fetal compromise. This hypotension is due to vasodilation due to sympathetic blockade post spinal anaesthesia and it is exaggerated by the gravid uterus causing aortocaval compression.

Many studies have previously advocated the use of intravascular fluids to maintain the intravascular volume by filling the extra space caused by vasodilation of peripheral vessels. The timing and type of fluid used affect maintaining the intravascular volume thereby preventing hypotension.

Colloids maintain the intravascular volume for a longer time compared to crystalloids but have gotten certain complications like anaphylaxis and acute renal failure. So, colloids are avoided in pregnant undergoing caesarean section.

In our institute, a crystalloid, ringer lactate is the most common fluid used perioperatively in patients undergoing caesarean section. Traditionally, preloading is practised as a preventive measure of hypotension, but, recently, studies have proven

that co loading of fluid immediately after administering spinal anaesthesia is also effective in the prevention of hypotension.

The present study aimed at comparing the effect of timing of administration of ringer lactate – preloading or coloading on the hemodynamic changes in pregnant undergoing lower segment caesarean section under spinal anaesthesia.

ADVANTAGES OF THE STUDY:

In the present study, the results indicate that variables like the mean age of the patient, mean weight of the patient, the volume of spinal anaesthetic and the level achieved are comparable in both the preloading and coloading group with no statistically significant difference (P >0.05) so that, the hemodynamic parameters can be compared without confounding.

Also in the present study, other confounding factors such as oxytocin, and exteriorisation of the uterus can cause hypotension and heart rate changes by comparing the hemodynamics in both groups till the baby extraction. Further, indications of caesarean section in a major proportion of the cases included are G2P1L1 with 1 previous caesarean section and caesarean delivery on maternal request to allow adequate time for preloading.

MEAN HEART RATE:

In this study, the baseline means heart rate is 87 ± 12.9 bpm in the preloading group and 84 ± 12.2 bpm in the coloading group which is statistically insignificant with a p-value of 0.1954.

The trend of change in heart rate is statistically significant within the groups in both preload and coload groups with an increase in mean heart rate after spinal anaesthesia compared to baseline which might be a reflex to the hypotension.

In preload group, the difference in heart rate between the subjects is statistically significant in all preset time intervals starting from 2 minutes post-induction and it became highly significant from the 11th minute post-induction of spinal anaesthesia. In co load group, the heart rate difference between the subjects is significant only between 5 to 10 minutes post spinal induction. However, there is no statistically significant difference in the trend of heart rate changes between the two groups. This is in contrast to a previous study done by Mandal M et al in 2016 which showed that the heart rate change is statistically significant at 12 minutes, 14 minutes, and 16 minutes post spinal induction(26).

In this study, subgroup analysis showed the trend of heart rate changes and mean heart rate is not significant based on the parity of the patient in both groups. Mean heart rate changes are significantly different among the two groups at 3, 4, and 5 minutes after induction in patients who received 2ml of 0.5% bupivacaine with the heart rate being higher in preload group than co load group. However, there is no significant change in heart rate trend among the two groups in patients who received >2ml of 0.5% bupivacaine. There are no previous studies to compare these outcomes of the present study.

SYSTOLIC BLOOD PRESSURE:

In both groups, the baseline systolic blood pressure has no statistically significant difference. The difference in SBP is significant at 3 min, 4 min, 7 min, 10 min and 13 min post spinal anaesthesia induction between the two groups with blood pressure readings of preload group lesser than the coload group. Results of the previous study done by Sameer H Pamar et al (27) have shown that a fall in systolic blood pressure is significant in the first 60 minutes after spinal anaesthesia and the

SBP values at 3 min, 5 min and 10 min are significantly low in preload group than coload group.

In the present study, subgroup analysis showed there is a significant difference in the trend of SBP changes among two groups at 4, 6, and 10mins post induction in primipara, with the values being higher in co load group, which implies that patients of preload group experienced more hypotension than co load at the particular point of time. The difference is not statistically significant in co load group. In patients who received 2 ml of 0.5% bupivacaine, the SBP is significantly different among the two groups at 3, 4, 5, and 6mins post induction and the value is higher in co load group. In the subgroup that received a volume of >2 ml, the difference is not significant. A thorough literature review showed there are no previous studies available in this aspect to be compared with the current study.

MEAN ARTERIAL PRESSURE:

In the present study, a fall in mean arterial pressure of more than 20% from baseline is taken as a measure of hypotension. The difference in MAP between the two groups is statistically significant at 4 min, 6 min, 9 min, 11 min and 12 mins and the values are lower in preload group compared to the coload group. However, the percentage of subjects experiencing hypotension is higher in both groups. 65.4% of patients in preload group and 63.6% of patients in the coload group had hypotension post spinal anaesthesia induction, the difference of which is statistically not significant.

The results of the present study are in line with the study done by Jacob et al(4) which concluded in his study that when used alone, crystalloid has a high incidence of hypotension, regardless of the timing of its administration. However, in contrast to the results of the present study, a study conducted by Sidharth Kumar B

Pamar et al (28) has shown that the incidence of hypotension is lesser with 13.3% and 10% respectively in preloading and coloading groups.

In this study, subgroup analysis showed MAP trends are significantly different among pre and co-load groups at 4, 5, 12, 14, and 15mins post induction in primipara with MAP higher in the coload group which means at any given time, patients who received preload had more hypertension. But, in multipara, there is no significant difference in MAP trend. In patients who were given 2ml 0.5% bupivacaine, MAP changes are significant only at 5 mins post induction and in other subgroups, the difference is significant at 5, 11, 12, and 13 mins after induction with patients who received coload having more hypotension.

EPHEDRINE REQUIREMENT:

In this study, the Mean dose of ephedrine in preload group is 4.4 ± 5.3 mg and it is 1.9 ± 3 mg in the coload group, the difference of which is very significant statistically. In preloaded patients, ephedrine boluses were required in 47% to maintain MAP and in coloaded patients, it was required in 31% of the patients. The results are similar to that of a study conducted by Artawan IM et al (19) which showed the decreased requirement of ephedrine in the coload group.

In the present study, the sub group analysis has concluded that the ephedrine requirement is higher in multipara and in patients who received >2ml of a spinal drug in both preload and co load groups.

PERFUSION INDEX:

In the present study, the baseline perfusion index is statistically comparable with 6.29 ± 2.87 and 6.81 ± 2.99 in preload and coload groups respectively with p-value>0.01. Toyama et al (29) did a study on perfusion index as an indicator in predicting hypotension following spinal anaesthesia. In their study, baseline PI is

measured and correlated to SBP and MAP values measured at pre-set intervals after induction of spinal anaesthesia and they have concluded that the incidence of hypotension is less in patients with baseline PI < 3.5. The findings of our study can be considered to be in line with the findings of Toyama et al as the incidence of hypotension was higher in both groups as the baseline PI is > 3.5.

There is no statistically significant difference in the trend of PI between the two groups in the current study. A thorough literature search showed no previous studies supporting or contradicting this finding. So, further studies are needed to find the changes in the trend of PI about the timing of fluid administration which in turn can predict hypotension.

Sub-group analysis showed no significant trend changes in perfusion index based on parity of the patient and volume of spinal drug given.

CONCLUSION

The present study concludes that

- When used alone, the incidence of post spinal hypotension is high with Ringer Lactate irrespective of the timing of administration of fluid.

- When required, vasopressors should be used to prevent and treat hypotension.

- Ephedrine requirement is less in coloaded patients when compared to preloaded patients.

- The current study is inconclusive on the effect of the timing of fluid administration on a trend of perfusion index, a predictor of hypotension. So further studies are required to establish this finding.

SUMMARY

- Post spinal hypotension is the most common complication after spinal anaesthesia in pregnant women undergoing lower segment caesarean section. It affects both mother and foetus. In our study entitled "THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD ON HEMODYNAMICS IN PATIENTS UNDERGOING CESAREAN SECTION UNDER SPINAL ANAESTHESIA: A ONE YEAR RANDOMISED CLINICAL TRIAL" we conducted a study on pregnant women aged between 18-35years belonging to ASA I-II undergoing lower segment caesarean segment to observe the effect of crystalloid preload and coload on hemodynamics after spinal anaesthesia. Written informed consent were taken from the patients and ethical committee clearance was acquired. Patients were randomly allocated into two groups with 55 patients each in two groups.

- **Group A**: The participants receive 15ml/kg of lactated ringer 20 minutes prior to the induction of spinal anaesthesia – **Preload with crystalloid (N = 55)**
- **Group B**: The participants receive 15ml /kg of lactated ringer after induction of spinal anaesthesia within 15minutes- **co load with crystalloid (N = 55)**

- In both the groups, the demographic variables were comparable and were statistically insignificant.
- Incidence of hypotension is high in both groups but it is more in preload group. However, the difference in incidence is statistically insignificant.
- Ephedrine requirement is high in preload group compared to coload group and the difference is statistically significant.

- Variation in Perfusion index trend is statistically insignificant among two groups and the mean baseline perfusion index in both groups is > 3.5.

LIMITATIONS OF THE STUDY AND FUTURE SCOPES:

This is a single centre study with small sample size. Study was done only in ASA I and II. Hence the results cannot be generalized.

Future studies can focus on trend of variation of perfusion index with timing of fluid administration and its correlation with mean arterial pressure.

BIBLIOGRAPHY

1. N. J. McDonnell, M. J. Paech, N. A. Muchatuta, S. Hillyard, and E. A. Nathan, "A randomised double-blind trial of phenylephrine and metaraminol infusions for prevention of hypotension during spinal and combined spinal-epidural anaesthesia for elective caesarean section," *Anaesthesia*, vol. 72, no. 5, pp. 609–617, 2017.
2. Hofhuizen C, Lemson J, Snoeck M, Scheffer GJ. Spinal anesthesia-induced hypotension is caused by a decrease in stroke volume in elderly patients. Local Reg Anesth. 2019 Mar 4;12:19-26.
3. Ngan Kee, Warwick D Prevention of maternal hypotension after regional anaesthesia for caesarean section, Current Opinion in Anaesthesiology: June 2010 – Volume 23 – Issue 3 – p 304-309
4. Jacob JJ, Williams A, Verghese M, Afzal L. Crystalloid preload versus crystalloid coload for patients undergoing cesarean section under spinal anesthesia. J Obstet Anaesth Crit Care 2012;2:10-5
5. Ferré F, Martin C, Bosch L, Kurrek M, Lairez O, Minville V. Control of Spinal Anesthesia-Induced Hypotension in Adults. Local Reg Anesth. 2020;13:39-46.
6. Shnider SM, Lorimier AA, Asling JH, Morishima HO. Vasopressors in obstetrics I I: Fetal hazards of methoxamine administration during obstetric spinal anesthesia. Am J Obstet Gynecol 1970;106:680-6.
7. Oh, Jung-Won Hwang, In-Ae Song, Mi-Hyun Kim, Jung-Hee Ryu, Hee-Pyoung Park, et al. Influence of the timing of administration of crystalloid on maternal hypotension during spinal anesthesia for cesarean delivery: preload versus coload. BMC Anesthesiology 2014; 14:36.

8. Mitra J K, Roy J, Bhattacharyya P, Yunus M, Lyngdoh N M. Changing trends in the management of hypotension following spinal anesthesia in cesarean section. J Postgrad Med 2013;59:121-6
9. Rout CC, Rocke DA, Levin J, Gouws E, Reddy D: A reevaluation of the role of crystalloid preload in the prevention of hypotension associated with spinal anesthesia for elective cesarean section. Anesthesiology 1993, 79(2):262–269.
10. Jackson R, Reid JA, Thorburn J: Volume preloading is not essential to prevent spinal-induced hypotension at caesarean section. Br J Anaesth 1995, 75(3):262–265
11. Ueyama H, He YL, Tanigami H, Mashimo T, Yoshiya I: Effects of crystalloid and colloid preload on blood volume in the patient undergoing spinal anesthesia for elective Cesarean section. Anesthesiology 1999, 91(6):1571–1576.
12. Bajwa SJ, Kulshrestha A, Jindal R. Co-loading or pre-loading for prevention of hypotension after spinal anaesthesia! a therapeutic dilemma. *Anesth Essays Res*. 2013;7(2):155-159.
13. Mojica JL, Melendez HJ, Bautista LE. The timing of intravenous crystalloid administration andincidence of cardiovascular side effects during spinal anesthesia: The results from a 61andomized controlledtrial. Anesth Analg. 2002;94:432–7.
14. Dyer RA, Farina Z, Joubert IA, Du Toit P, Meyer M, Torr G, et al. Crystalloid pre-load versus rapid crystalloid administration after induction of spinal anaesthesia (coload) for elective caesarean section.Anaesth Intensive Care. 2004;32:351–7.
15. Locktich G. Clinical biochemistry of pregnancy. *Crit Rev Clin Lab Sci*. 1997;34:6.

16. Betrán AP, Ye J, Moller A-B, Zhang J, Gülmezoglu AM, Torloni MR (2016) The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates: 1990-2014. PloS ONE 11 (2): e0148343.
17. Yeoh SB, Sng BL, Sia ATH. Anaesthesia for lower-segment caesarean section: Changing perspectives. Indian J Anaesth 2010;54:409-14.
18. R, Bandyopadhyay KH, Afzal M, Mishra AK, Paul A. Labor epidural analgesia: Past, present and future. Indian J Pain 2014;28:71-81.
19. Artawan IM, Sarim BY, Sagita S, Etty Dedi MA. Comparison the effect of preloading and coloading with crystalloid fluidon the incidence of hypotension after spinal anesthesia in cesarean section. Bali J Anaesthesiol 2020;4:3-7.
20. Siddik – Sayyid SM, Nasr VG, Taha SK, Zbeide RA, Shehade JM, Al Alami AA, Mokadem FH, Abdallah FW, Baraka AS, Aouad MT. A randomized trial comparing colloid preload to coload during spinal anaesthesia for elective cesarean delivery. Anesth Analg. 2009 Oct; 109(4) : 1219 – 24.
21. Ngan Kee WD, Khaw KS, Ng FF. Prevention of hypotension during spinal anaesthesia for cesarean delivery: an effective technique using combination phenylephrine infusion and crystalloid cohydration. Anesthesiology. 2005 Oct; 103(4):744 – 50.
22. Ni HF, Liu HY, Zhang J, Peng K, Ji FH. Crystalloid Coload Reduced the Incidence of Hypotension in Spinal Anesthesia for Cesarean Delivery, When Compared to Crystalloid Preload: A Meta-Analysis. Biomed Res Int. 2017;2017:3462529.
23. Parul Jain, Deepali Valecha. Comparative evaluation of preloading and coloading of crystalloids to prevent spinal induced hypotension in caesarean section. International Journal of Contemporary Medical Research 2017;4 (2):411-414.]

24. Banerjee, A., Stocche, R.M., Angle, P. *et al*. Preload or coload for spinal anesthesia for elective Cesarean delivery: a meta-analysis. *Can J Anesth/J Can Anesth* **57,** 24–31 (2010).

25. Geta K: The Effect of Preloading and Co-Loading in the Prevention of Hypotension among Mothers Who Underwent Cesarean Delivery under Spinal Anesthesia: A Prospective Cohort Study. Sys Rev Pharm 2022; 13(2):213 – 218

26. Mandal M, Chattopadhyay S, Bagchi T, Chakrabarti S. Comparison of crystalloid and colloid preload on maternal hemodynamics in elective caesarean section under spinal anaesthesia. Int J Res Med Sci 2016;4:2428-35.

27.Sameer H Pamar, Bipin M Patel, Ravi kumar M Pamar et al. crystalloid preload versus crystalloid coload for the prevention of hypotension during spinal anaesthesia. Ind J Anesth Analg 2020; 7(1 – part 1): 106 – 113.

28. Siddharthkumar B. Parmar, Abdul Nasir A. Sheikh, Priyanka Sunil Shalu. A comparative study of preloading versus coloading of crystalloid to prevent spinal anaesthesia induced hypotension. JOER 2012; 1(5): 746 – 53.

29. Toyama S, Kakumoto, Morioka M et al. Perfusion Index deriver from a pulse oximeter can predict the incidence of hypotension during spinal anaesthesia for caesarean delivery. Br J Anaesth 2013; 111(2): 235 – 41.

ANNEXURE 1

INFORMED CONSENT

Mr. /Mrs. /Miss. _____ we are requesting you to enroll you in the study titled **"**COMPARING THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD ON HEMODYNAMICS IN PATIENTS UNDERGOING CESAREAN SECTION UNDER SPINAL ANAESTHESIA: A ONE YEAR RANDOMISED CLINICAL TRIAL conducted by REG NO: BA0120002 Post Graduate in M.D. Anesthesiology under the guidance of Dr._____ Department of Anesthesiology, J.N. Medical College, Belagavi under KAHER, Belagavi.

Respected Sir/Madam, we request you to participate in our study as you are eligible for it. During the study you will be asked some questions regarding your medical history and you are supposed to answer to the best of your knowledge.

Your participation in this research is voluntary. Your decision whether or not to participate in the study will not affect your relationship with J.N.Medical College. If you decide to participate you are free to withdraw at any time.

Purpose of the study: The study finds out the ideal time for giving crystalloid for decreasing the incidence of post spinal hypotension in patients undergoing cesarean section

Procedure Involved: If you agree to enroll in my study, I will ask your present, past and family history. Then you will be clinically examined in detail. You will be allotted into one of the two groups randomly using computer generated software. Group A will undergo crystalloid preloading and Group B undergo crystalloid coloading.

Voluntary Participation/Withdrawal: Taking part in the study is voluntary. You may choose not to enroll yourself in this study. Your decision will not change any health care services offered to you or your ward at K.L.E. S Hospital & MRC.

Risks:

There is no risk involved in this study.

Benefits: To know the ideal time of giving intravenous fluids to prevent post soinal hypotension.

Privacy and Confidentiality:

The only people to know that you are as research subject are you and members of the research team. No information provided by you during the research will be disclosed to other without your written permission except:

1. In emergency to protect your rights and welfare.
2. If required by law.

Authorization to Publish Results:

When the results of the research are published or discussed, in a conference, no information will be displayed that would disclose your identity. Any information that is obtained in connection with this study and that can be identified with your identity remaining confidential.

Financial Incentives for participation:

No financial incentives are being offered to enrolled patients. It is purely being done with the idea of research and all the cost of the study will be borne by the investigator.

Compensation:

In the event of injury related to the study, treatment will be made available through KLES Hospital and MRC, Belagavi. There is no compensation or payment for such medical treatment by law. If you get injured you may contact REG NO: BA0120002 at Department of Anesthesiology, J.N. Medical College or by Ph. No: 9492751715.

Questions:

In case you have any questions related to the study, in future or in case of study related injury or illness, you can contact REG NO: BA0120002**,** Department of Anesthesiology, J.N. Medical College, Belagavi. **Dr. _____**Dept. Of Anesthesiology, J.N. Medical College, Belagavi. Ph. No:9886375154.

If you have any queries about your rights as a study subject, you may call Dr. **Harsha Hegde**, Chairperson, J.N. Medical College Institutional Ethical Committee for Human Subjects Research & scientist D, ICMR, National institute of traditional medicine, Phone number-9480422500, J.N. Medical College, Belagavi.

INFORMED CONSENT FOR PARTICIPATION IN RESEARCH TRIAL

"COMPARING THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD ON HEMODYNAMICS IN PATIENTS UNDERGOING CESAREAN SECTION UNDER SPINAL ANAESTHESIA: A ONE YEAR RANDOMISED CLINICAL TRIAL

Mr./Ms./Mrs. _____ voluntarily agree for the participation of as a subject of study. By signing this consent form I am not giving up any of my legal rights, I may withdraw from the study anytime. I am signing the consent form after having read or been read for me in vernacular language, including the risks and the benefits and having all my questions answered.

Subject Name : _____

Signature or the Left Thumb Print of Subject/Guardian: _____

Date:

Witness Name: _____ Signature: _____

Investigators Name: _____ Signature: _____

Date:

Place : _____.

ANNEXURE II

PROFORMA

"COMPARING THE EFFECT OF CRYSTALLOID PRELOAD AND CRYSTALLOID COLOAD ON INCIDENCE ON HEMODYNAMICS IN PATIENTS UNDERGOING CESAREAN SECTION UNDER SPINAL ANAESTHESIA: A ONE YEAR RANDOMISED CLINICAL TRIAL

Group allotted : IP number :

Name : Age :

Pre examination evaluation

Past History

- HTN ☐ DM ☐ IHD ☐ Arrhythmia ☐ Valvular heart diseases ☐

H/o previous surgery/(s) where post spinal hypotension difficulty was encountered. Yes No ☐ ☐

General physical examination

Weight (Kg) : Temperature (^{0}F) : Pallor :

Cyanosis : Pedal edema : Clubbing :

PR : BP : RR :

Systemic examination:

RS : CNS :

CVS : GIT :

Preoperative physical status ASA Grade I II

TIME	HEART RATE	SYSTOLIC BLOOD PRESSURE	DIASTOLIC BLOOD PRESSURE	MEAN ARTERIAL PRESSURE	PERFUSION INDEX
Baseline					
1 min					
2 min					
3 min					
4 min					
5 min					
6 min					
7 min					
8 min					
9 min					
10 min					
11 min					
12 min					
13 min					
14 min					
15 min					

- SIGNATURE OF THE ANAESTHESIOLOGIST: _____

- SIGNATURE OF THE WITTNESS - _____

  SIGNATURE OF THE PRINCIPAL INVESTIGATOR - _____

ANNEXURE III - PHOTOS

PHOTO 1: BUPIVACAINE HEAVY

PHOTO 2: RINGER LACTATE

ANNEXURE IV - KEY TO MASTER CHART

HR	-	HEART RATE
SBP	-	SYSTOLIC BLOOD PRESSURE
DBP	-	DIASTOLIC BLOOD PRESSURE
MAP	-	MEAN ARTERIAL PRESSURE

Heart Rate

SL No	age in years	gender	diagnosis	ASA status	weight	interspace	lume of dr	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
1	25	f	g2p1L1 with prev lscs	2	60	L3 - L4	2	100	76	76	82	82	84	84	81	8073	80	73	74	66	70	72	74
2	22	f	primi with CDMR	2	75	L3 - L4	2.2	70	66	54	56	56	58	64	68	68	72	64	60	62	64	64	62
3	32	f	g2p1L1 with prev lscs	2	60	L3 - L4	2.2	90	84	78	77	76	74	78	78	76	78	74	76	76	74	70	70
4	31	f	g2p1L1 with prev lscs	2	76	L3 - L4	2.2	90	84	78	77	76	74	78	74	78	74	78	78	74	74	70	74
5	27	f	g2p1L1 with prev lscs	2	76	L2 - L3	2.2	94	78	78	74	78	78	74	78	74	76	76	74	77	78	76	74
6	30	f	g2p1L1 with prev lscs	2	68	L2 - L3	2.2	78	78	85	100	84	64	60	80	84	84	76	84	80	80	76	74
7	32	f	g2p1L1 with prev lscs	2	68	L3 - L4	2.2	70	56	56	58	74	78	74	78	78	74	78	76	76	74	78	74
8	22	f	primi with CDMR	2	70	L3 - L4	2.2	70	74	58	64	68	64	56	68	64	70	70	72	68	74	78	70
9	23	f	g2p1L1 with prev lscs	2	64	L3 - L4	2.4	70	74	70	74	84	84	88	74	74	74	76	74	74	78	78	74
10	32	f	g2p1L1 with prev lscs	2	70	L2 - L3	2.2	70	74	58	64	68	64	56	68	64	70	72	70	68	74	78	74
11	19	f	primi with CDMR	2	60	L2 - L3	2.2	80	74	68	56	56	54	52	58	58	64	62	63	63	64	68	68
12	25	f	primi with CDMR	2	80	L3 - L4	2.2	104	108	108	110	104	98	96	96	84	84	86	86	94	94	86	94
13	26	f	primi with CDMR	2	60	L3 - L4	2.2	84	74	68	68	65	64	68	68	74	82	82	76	74	74	76	74
14	26	f	g2p1L1 with prev lscs	2	58	L2 - L3	2	74	76	78	74	78	76	74	74	78	76	74	78	76	74	79	80
15	24	f	g2p1L1 with prev lscs	2	64	L2 - L3	2	100	80	84	86	90	110	90	84	86	78	74	78	74	78	76	76
16	24	f	g2p1L1 with prev lscs	2	68	L2 - L3	2	100	80	84	84	86	90	110	90	84	86	86	78	74	78	74	76
17	29	f	primi with CDMR	2	75	L3 - L4	2.2	90	84	76	70	68	104	108	104	100	98	98	90	90	90	86	84
18	24	f	primi with CDMR	2	64	L3 - L4	2.2	100	80	84	84	86	86	90	110	90	84	86	78	74	78	74	78
19	24	f	g2p1L1 with prev lscs	2	68	L2 - L3	2.2	90	84	76	68	70	78	104	106	100	98	98	90	90	84	84	84
20	36	f	primi with precious pregnancy	2	68	L2 - L3	2.2	110	104	104	102	98	84	84	86	84	82	84	82	86	86	84	82
21	30	f	primi with CDMR	2	72	L3 - L4	2.2	80	84	82	82	84	84	82	84	84	82	78	78	84	84	82	82
22	29	f	primi with GDM under control	2	64	L3 - L4	2.2	90	94	58	54	54	56	58	57	58	64	65	65	64	65	70	68
23	23	f	primi with CDMR	2	70	L3 - L4	2.2	70	74	58	64	68	68	56	64	70	70	72	68	74	78	70	74
24	32	f	g2p1L1 with prev lscs	2	60	L3 - L4	2.2	70	66	54	56	58	64	68	68	72	64	60	62	64	64	62	60
25	26	f	g2p1L1 with prev lscs	2	72	L2 - L3	2	78	78	85	104	84	64	60	80	84	80	76	84	80	76	74	80
26	29	f	primi with CDMR	2	75	L2 - L3	2	90	84	76	84	84	82	86	72	78	74	76	74	84	84	86	84
27	23	f	primi with CDMR	2	60	L3 - L4	2.2	70	66	54	56	56	58	64	68	68	72	64	60	62	64	64	62
28	26	f	g2p1L1 with prev lscs	2	65	L3 - L4	2.2	94	96	80	84	84	92	84	92	86	86	84	84	84	86	86	84
29	29	f	g2p1L1 with prev lscs	2	80	L2 - L3	2.2	78	76	90	76	78	84	84	90	78	78	76	70	70	70	74	74
30	30	f	primi with controlled gest htn	2	70	L2 - L3	2.2	84	84	82	82	74	70	72	74	70	74	78	78	76	76	78	78
31	25	f	primi with CDMR	2	64	L3 - L4	2.4	74	78	84	90	84	82	82	84	84	78	78	74	78	74	78	78
32	22	f	primi with CDMR	2	60	L3 - L4	2.4	124	110	110	100	100	104	104	98	98	94	94	92	92	90	94	94
33	26	f	g2p1L1 with prev lscs	2	64	L3 - L4	2.2	94	94	102	104	94	90	92	92	94	92	90	90	88	94	92	92
34	37	f	primi with CDMR	2	71	L3 - L4	2.2	88	90	96	101	99	102	100	98	97	102	106	105	108	104	100	96
35	28	f	primi with CDMR	2	58	L3 - L4	2.4	94	92	93	98	96	101	100	95	90	93	95	89	96	98	90	86
36	28	f	g2p1L1 with prev lscs	2	64	L3 - L4	2.2	84	86	84	78	66	70	68	76	72	74	78	75	76	80	86	82
37	33	f	primi with CDMR	2	64	L3 - L4	2.2	82	86	80	76	75	78	74	72	76	68	70	66	78	84	86	84
38	29	f	g2p1L1 with prev lscs	2	64	L2 - L3	2.2	94	98	96	100	102	92	90	94	92	96	88	88	84	86	84	88
39	29	f	g2p1L1 with prev lscs	2	66	L2 - L3	2	100	108	106	110	110	110	112	108	102	115	110	104	102	98	96	92
40	20	f	primi with CDMR	2	64	L3 - L4	2.2	98	120	96	98	104	102	98	100	104	96	94	92	92	94	90	88
41	29	f	3P1A1D1 with precious pregnanc	2	54	L2 - L3	2.2	110	112	110	106	104	102	100	102	110	104	102	96	94	94	94	92
42	22	f	g2p1L1 with prev lscs	2	58	L3 - L4	2.2	100	110	96	98	104	102	98	100	104	102	98	92	100	90	92	92
43	33	f	primi with CDMR	2	64	L2 - L3	2.2	96	108	96	100	102	106	98	96	98	100	96	94	90	90	88	92
44	26	f	g2p1L1 with prev lscs	2	64	L2 - L3	2.2	90	84	78	77	76	74	74	78	74	76	76	74	77	78	76	74
45	23	f	g2p1L1 with prev lscs	2	58	L3 - L4	2.2	82	86	80	76	75	78	74	72	76	96	94	92	92	94	90	88
46	26	f	g2p1L1 with prev lscs	2	62	L3 - L4	2.2	94	94	102	104	94	90	92	84	84	78	78	74	78	74	78	78
47	22	f	primi with CDMR	2	71	L3 - L4	2.2	110	104	104	102	98	104	102	98	100	104	102	96	98	96	100	102
48	28	f	g2p1L1 with prev lscs	2	56	L3 - L4	2.4	70	74	58	64	68	68	56	76	68	70	66	78	84	86	84	88
49	33	f	primi with GDM under control	2	60	L3 - L4	2.2	70	66	54	56	56	58	64	57	58	64	65	65	64	65	70	68
50	19	f	primi with 40wks in latent labor	2	72	L3 - L4	2.2	104	108	108	110	104	98	96	96	84	88	88	84	86	84	88	86
51	32	f	g2p1L1 with prev lscs	2	62	L3 - L4	2.2	84	86	84	78	66	70	68	76	72	74	78	75	76	80	86	82
52	22	f	primi with GDM under control	2	56	L2 - L3	2	90	84	78	77	76	74	78	78	72	74	78	75	76	80	86	82
53	30	f	primi with breech	2	72	L3 - L4	2.2	84	74	68	68	65	64	68	68	74	76	76	74	77	78	76	74
54	21	f	primi with 35wks with pv leak	2	68	L3 - L4	2.2	78	78	85	100	84	64	60	80	84	74	78	75	76	80	86	82
55	28	f	G3P1L1A1 with CDMR	2	60	L2 - L3	2	100	108	106	110	110	112	112	96	98	100	96	94	90	90	88	92

SBP	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
	130	87	90	100	104	111	105	102	108	118	112	109	110	113	113	122
	110	110	90	90	100	100	110	112	118	104	104	110	98	104	110	110
	110	110	98	98	104	104	108	108	108	104	98	92	98	94	98	104
	130	112	90	92	100	104	94	110	110	110	108	108	110	112	110	110
	130	112	90	92	100	104	112	112	110	110	108	108	112	115	115	108
	110	94	93	94	96	100	98	94	94	100	100	110	110	114	112	110
	110	110	90	90	100	100	90	90	100	100	110	110	110	110	110	110
	110	106	104	104	96	94	108	108	86	88	94	98	98	104	104	108
	110	110	108	108	104	90	92	104	104	110	110	110	110	112	112	110
	110	104	104	106	96	94	108	86	88	108	94	98	98	104	104	108
	124	128	110	114	90	98	84	104	104	112	114	98	108	114	98	100
	110	110	114	98	98	80	80	78	104	104	78	104	98	104	104	110
	120	130	110	98	98	94	94	104	104	112	112	98	108	114	98	108
	130	112	112	96	98	104	104	108	108	104	104	98	98	94	98	98
	120	114	114	92	92	100	84	110	112	94	98	104	104	102	104	104
	110	114	114	90	90	100	84	110	112	94	98	112	98	104	104	102
	120	90	94	82	82	104	104	108	108	98	98	104	114	104	108	104
	110	114	114	90	90	100	84	110	112	94	98	112	98	104	102	102
	120	90	94	82	82	104	108	98	98	104	108	108	104	104	98	98
	140	120	114	104	104	84	90	104	104	92	86	104	104	102	102	104
	120	110	108	108	104	98	98	104	112	112	104	102	98	98	104	102
	110	110	86	94	86	104	104	78	86	98	98	98	104	96	104	104
	110	110	106	106	114	110	108	108	112	98	98	104	110	112	112	112
	110	110	90	90	100	100	110	112	118	118	104	104	110	98	104	110
	110	94	93	94	100	98	94	100	110	114	112	110	100	100	94	98
	120	90	94	82	82	104	104	108	108	98	98	104	114	104	108	104
	110	110	90	90	100	100	110	112	118	118	104	104	110	98	104	110
	130	130	90	90	100	100	104	104	106	104	104	108	108	110	110	108
	110	110	90	90	100	100	110	112	118	118	104	104	110	98	104	110
	130	130	90	90	100	100	104	104	106	104	104	108	108	110	110	108
	110	110	90	90	100	100	100	90	110	110	110	110	108	108	110	110
	110	100	100	98	104	104	110	94	94	98	108	102	104	110	104	102
	120	110	98	98	104	104	110	110	108	108	104	108	108	104	104	108
	140	140	130	130	134	134	128	128	134	134	128	128	124	128	128	128
	120	110	110	100	100	104	112	112	104	108	94	90	102	102	104	90
	130	124	119	104	106	102	108	106	110	104	100	102	104	103	114	110
	100	100	98	96	90	90	98	102	105	101	104	100	96	92	90	94
	120	116	114	110	106	107	105	112	110	118	106	104	108	112	108	116
	120	114	116	110	106	105	107	112	110	118	106	108	104	112	116	108
	124	130	126	115	113	108	110	98	80	110	112	112	116	120	118	116
	130	130	132	126	126	110	100	90	88	110	112	110	116	98	104	110
	122	120	118	110	105	105	90	90	100	110	112	110	110	112	118	118
	130	128	126	118	112	104	92	94	118	118	116	112	112	110	110	112
	120	120	120	118	112	104	104	92	88	110	110	112	104	106	108	110
	126	126	115	113	108	110	98	82	112	114	114	116	122	120	118	114
	110	94	93	94	96	100	98	94	94	80	110	112	112	98	98	104
	120	110	98	98	104	104	110	102	105	101	104	100	96	92	90	94
	130	124	119	104	106	102	108	106	100	110	112	110	110	112	118	118
	120	114	114	92	92	100	84	110	112	104	100	102	104	103	114	110
	124	130	126	115	113	108	110	98	80	88	100	102	104	103	114	110
	110	100	100	98	104	104	98	94	94	80	110	100	102	104	103	114
	130	128	126	118	112	104	92	94	94	80	110	112	112	98	92	94
	110	110	90	90	100	100	90	90	100	104	110	102	105	101	104	100
	124	130	126	115	113	108	110	98	88	110	112	110	116	98	104	110
	120	90	94	82	82	104	104	108	108	110	112	110	110	112	118	118
	110	100	100	98	104	104	110	94	104	100	102	104	103	114	110	110
	122	120	118	110	105	105	90	90	88	110	112	110	116	98	104	110

DBP	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
	70	42	50	55	60	64	64	52	62	73	72	67	70	70	70	76
	68	70	64	62	68	68	80	84	84	78	74	74	68	68	68	70
	70	70	68	68	80	72	68	68	64	62	60	64	64	54	68	64
	80	74	60	62	72	64	68	72	76	70	64	64	72	78	70	70
	80	74	60	62	67	84	84	64	78	78	72	72	70	67	66	64
	80	63	62	64	64	67	66	66	70	70	70	70	60	60	66	66
	70	70	60	60	70	60	60	60	70	70	78	78	70	80	80	80
	80	74	68	68	64	54	58	70	50	54	64	72	78	64	64	68
	70	70	68	68	64	60	62	68	68	78	78	70	80	72	72	74
	80	74	68	64	64	64	68	50	54	68	64	64	72	78	64	68
	80	84	68	68	62	60	60	58	58	64	68	68	72	84	60	60
	80	80	84	64	64	50	50	48	64	64	48	64	68	64	64	70
	70	80	70	64	64	62	62	62	64	72	72	68	72	84	60	60
	80	70	70	64	64	62	62	72	68	62	62	64	64	64	72	72
	70	74	84	64	64	60	64	64	72	64	68	72	68	62	64	62
	70	84	84	60	60	54	64	72	72	64	64	68	68	68	68	62
	70	60	64	60	60	62	62	64	64	62	62	64	68	64	60	60
	68	68	70	50	54	64	58	68	64	70	72	84	68	64	68	62
	70	60	64	60	60	64	68	62	62	64	60	60	64	62	64	68
	90	72	68	62	62	58	62	54	54	52	52	64	64	60	61	64
	70	70	68	68	68	72	64	68	72	72	68	62	60	62	68	64
	70	70	54	58	54	64	62	58	54	64	64	70	64	67	68	68
	80	84	74	74	84	80	84	78	72	68	68	64	70	70	68	72
	60	70	60	60	60	60	72	72	76	76	64	64	72	58	64	70
	80	63	62	64	67	66	66	70	72	62	64	66	74	66	66	66
	70	62	64	60	60	62	62	64	64	62	62	64	68	64	60	60
	60	70	62	62	64	64	78	74	74	78	69	64	72	70	68	70
	80	80	62	62	70	70	72	72	72	70	68	64	64	72	72	74
	70	70	60	60	70	60	60	60	60	60	62	70	60	60	70	70
	70	60	64	68	68	68	70	64	64	68	72	62	70	70	68	62
	70	70	64	64	68	68	70	70	68	68	64	72	72	70	70	70
	90	90	80	70	74	74	70	70	74	74	78	78	78	78	78	84
	80	72	72	60	60	64	72	72	64	60	64	60	60	60	62	60
	86	80	73	67	68	64	62	60	62	60	58	62	57	64	62	64
	50	52	52	54	50	48	52	56	60	58	58	62	60	50	54	62
	80	84	83	78	76	72	78	70	74	70	76	72	68	68	72	72
	84	80	83	74	76	78	72	74	70	76	72	70	72	68	68	72
	82	70	72	68	66	64	62	58	56	66	64	66	70	72	70	72
	90	88	78	72	70	66	60	62	62	68	66	68	70	64	62	68
	70	70	66	66	66	66	60	60	62	80	78	76	76	76	76	76
	76	76	74	66	68	62	62	60	70	72	70	68	68	68	68	70
	70	70	70	66	68	62	62	62	60	80	82	78	66	72	72	80
	70	70	72	70	68	62	66	58	64	66	66	70	72	74	70	72
	70	60	64	68	68	68	70	64	60	60	62	70	60	60	70	70
	90	90	80	70	74	74	70	70	74	70	76	72	68	68	72	72
	84	80	83	74	76	78	70	70	74	74	78	78	74	70	76	72
	68	68	70	50	54	64	58	68	62	80	78	76	76	76	70	72
	70	60	64	60	60	62	62	64	60	58	58	62	60	50	54	62
	84	80	83	74	76	78	72	74	62	60	58	62	57	64	62	64
	84	80	83	74	76	78	72	74	74	78	69	64	72	70	68	70
	70	70	60	60	70	60	60	60	58	64	66	66	70	72	74	70
	80	84	74	74	84	80	84	78	72	74	78	78	74	70	76	72
	82	70	72	68	66	64	62	56	60	58	58	62	60	50	54	62
	70	70	60	60	70	60	60	60	64	62	62	64	68	64	60	60
	50	52	52	54	50	48	52	56	60	60	64	60	60	60	62	60

MAP	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
	84	57	61	70	68	80	68	69	72	88	78	81	80	84	84	91
	76	84	72	72	76	84	84	90	92	86	86	90	94	90	78	84
	84	84	78	78	88	90	78	76	78	74	68	68	66	64	68	68
	88	78	62	61	74	72	78	74	72	72	74	76	76	74	78	84
	94	86	84	72	82	84	92	92	76	74	77	67	84	74	74	68
	80	73	72	74	75	78	77	75	74	75	75	75	80	80	76	84
	84	80	56	58	62	64	62	60	68	68	70	74	74	78	74	78
	94	88	84	84	63	64	62	74	61	59	68	64	68	72	74	74
	84	84	90	84	78	63	64	72	72	78	84	84	82	84	82	84
	84	84	72	72	68	68	76	62	61	68	68	64	68	70	72	72
	84	90	72	74	58	59	62	61	61	70	72	74	68	74	62	64
	84	84	92	78	78	60	58	54	62	64	58	67	70	72	72	74
	90	94	87	72	72	68	68	72	70	74	84	72	72	80	76	76
	94	90	84	72	68	68	68	74	74	76	74	76	72	74	74	78
	94	90	92	71	64	68	59	72	70	62	64	74	78	74	72	72
	90	92	90	58	58	62	70	92	84	74	76	84	72	78	74	76
	84	58	60	61	60	68	68	72	72	64	64	62	68	68	64	64
	74	72	74	61	60	64	58	68	72	71	72	68	68	72	74	74
	84	60	62	58	58	64	64	62	60	62	64	64	68	62	59	72
	104	98	72	76	76	59	58	62	62	58	54	62	68	72	68	68
	94	88	84	78	78	74	74	72	78	84	82	78	72	72	86	82
	84	84	61	62	58	63	63	56	58	62	64	74	78	78	74	78
	84	86	82	78	78	80	78	72	78	72	72	68	72	84	82	80
	76	84	60	58	59	62	68	72	84	84	68	68	72	64	68	72
	80	73	72	74	74	68	68	74	72	74	80	84	76	84	84	86
	84	58	60	61	60	68	68	72	72	64	64	62	68	64	64	68
	80	73	72	74	74	68	68	74	72	74	80	84	76	84	84	86
	84	58	60	61	60	68	68	72	72	64	64	62	68	64	64	68
	76	84	61	60	64	68	72	72	68	87	84	72	74	71	68	84
	90	94	68	64	68	72	74	74	78	78	74	78	78	74	74	78
	69	69	55	56	65	60	60	56	65	65	64	64	63	63	69	69
	78	74	70	72	70	74	78	68	70	68	68	72	74	78	76	74
	84	82	70	68	64	68	70	74	74	72	74	74	72	74	72	74
	98	98	94	94	88	84	84	88	84	84	86	86	84	84	88	84
	84	78	78	64	64	62	78	72	70	71	74	68	68	68	64	71
	82	79	74	72	70	65	66	63	61	62	60	61	63	65	66	70
	65	63	64	63	60	58	60	63	65	62	64	62	60	58	59	61
	70	67	68	68	72	71	68	74	68	70	69	67	70	68	68	69
	70	67	68	68	72	71	69	74	68	72	74	70	69	67	70	68
	76	76	74	74	72	68	64	61	56	64	62	66	66	70	70	72
	84	80	78	78	78	70	66	61	56	68	64	64	68	66	66	64
	74	72	70	70	72	72	66	66	64	64	62	62	62	64	66	66
	78	76	76	72	68	60	56	56	66	66	64	66	66	64	64	66
	76	76	74	72	68	64	62	58	56	62	64	64	68	70	72	68
	65	63	64	63	60	58	60	63	61	62	60	61	63	65	66	70
	82	70	68	64	68	70	74	74	72	74	68	68	68	64	71	70
	69	69	55	56	65	60	60	56	65	68	68	70	74	74	78	74
	84	84	90	84	78	63	64	72	72	70	69	67	70	68	68	69
	82	79	74	72	70	65	66	63	65	62	64	62	60	58	66	70
	84	80	56	58	62	64	62	60	68	64	62	62	62	64	66	66
	84	84	61	62	58	63	63	56	58	56	62	64	64	68	70	72
	84	90	72	74	58	59	62	61	61	62	64	62	60	58	59	61
	80	73	72	74	75	78	77	75	74	74	76	74	76	72	74	74
	84	78	78	64	64	62	78	72	70	64	64	62	68	68	64	64
	84	80	56	58	62	64	62	60	68	84	80	56	58	62	64	62
	94	90	92	71	64	68	59	72	72	64	64	62	68	68	64	64
	84	84	90	84	78	63	64	72	62	58	54	62	68	72	68	68

PI	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
	8.4	3.1	4.8	12	9.2	11.8	7.8	5.3	8.4	9.8	9.8	10.2	11.5	10.2	12	12
	5.8	6.4	5.4	2.8	3	4.8	4.8	7.2	4.8	5.4	5.4	5.8	5.8	6.4	5.2	5.7
	8.4	7.8	6.4	6.4	5.8	5.8	3	3	4.8	4.8	3.6	3.8	4.6	4.8	5.2	5.2
	5.4	3.8	2.7	3.6	4.2	4.2	5.4	5.4	6.2	3.8	4.2	4.8	3.6	4.2	4.4	4.4
	5.4	3.6	2.7	2.7	4	4.2	4.2	5.4	5.4	6.2	3.8	4.2	4.8	3.6	4.2	4.4
	4.1	5	3.4	3.4	4	4.1	3.8	3.8	4	5	5	4.6	4.8	4.1	3.8	4.1
	7	7.8	8	7.8	7.6	8.4	8.4	8.6	8.4	8.8	8.6	8.6	7.8	7.8	7.6	7.6
	1.4	2.8	1.4	2	1	1.4	2.8	1.2	0.8	1.2	3.8	3	2.8	3.2	3	2.1
	7	7.8	8	7.8	8.4	8.4	8.4	8.6	8.8	8.6	8.6	7.8	6.8	7.6	7.8	7.6
	6.4	6.8	5.8	5.4	5.4	5.8	3.4	3.4	2.8	1.4	2.8	3.4	3.4	3.8	2.8	2.8
	8.4	7.8	4.8	5	6.2	3.8	4.2	5.8	5.8	4.8	4.2	4.5	4.5	5.6	5.4	5.8
	1.4	1.4	0.8	2.2	1.4	0.8	1.2	1.2	1.1	1.4	0.8	0.8	2.4	2.4	3	3
	8.4	7.8	6.4	6.4	5.8	6.4	7.2	7.2	8.4	7.2	7.2	7.7	7.7	7.6	7.6	7.4
	6.4	5.4	5.4	4.7	4.7	5.2	5.2	5.7	5.4	5.8	5.4	4.7	4.6	4.8	4.4	4.4
	6.4	6.2	6.8	5.7	4.8	3.2	3.2	3.6	3.2	3.4	3.2	4.8	4.7	4.4	4.2	4.2
	4.8	4.8	5.4	3.7	2.7	2.8	2.8	3.2	4.8	4	4.5	3.8	4	4.9	5	5.2
	8.4	6.8	6.4	6.4	6.2	7.2	7.8	7.4	5.8	6.2	6.4	6.4	7.2	6.4	6.8	6.2
	4.8	4.8	5.4	3.7	2.7	2.8	2.8	3.2	4.8	4.8	4.4	4.2	3.1	3.2	3.2	3.6
	5.8	5.4	3.6	3.2	3.8	4.2	4.2	4.8	5.2	5.4	5.8	5.6	5.2	4.8	4.8	5
	5.4	3.8	3.4	1.4	1.2	1	1	1.4	1	1.2	1	2.8	3.2	2.8	3.4	3.4
	10.2	9.8	8.4	8.4	7.8	7.2	8.4	8.4	7.2	7.4	7.1	8.4	8.2	8.6	8.2	8.4
	3.2	1.4	1.8	2	2.2	2	1.4	1.2	2.3	2.4	2.4	3.2	2.2	1.8	2.4	2.6
	6.4	6.2	6.8	5.4	5.4	6	5.8	5.4	6.8	5.8	5.4	6.2	6.4	6.4	6.2	6.4
	5.8	6.4	6.2	7.2	6.8	5.8	6.4	7	6.8	5.4	5.8	6.2	7.4	6.4	6	6.4
	4.2	4.1	5	3.4	3.8	4	4.1	3.8	4	4.6	5	5	4.8	4.1	3.8	4.1
	8.4	6.8	7.2	5.4	3.8	3.8	4.2	4.2	5.7	6.4	6.4	4.8	7.2	4.8	5.2	5.2
	5.8	6.4	5.4	2.2	3.8	3.2	4.8	4.6	3.2	2.8	4.6	5.4	5.4	6.2	6.4	5.8
	8.4	6.8	7.2	5.4	3.8	3.8	4.2	4.2	5.7	6.4	6.4	4.8	7.2	4.8	5.2	5.2
	5.8	6.4	5.4	2.2	3.8	3.2	4.8	4.6	3.2	2.8	4.6	5.4	5.4	6.2	6.4	5.8
	13	14.8	10.4	10.4	11.4	11.8	11.8	11.4	10.8	12.4	12.4	12.4	12.8	12.8	11.4	11.4
	5.4	5.4	3.4	3.6	5.4	5	4.8	3.4	4	4	4.8	5.4	6	5.4	5	5.5
	6.8	4.2	4.2	3.8	3.5	4.2	4.8	4.2	5.8	6.2	5.4	5.4	5.2	5.2	5.4	5.1
	8.4	8.2	8.2	8.4	7.8	7.4	7.8	7.4	8.4	8.2	8.2	8.4	8.8	8.4	8.4	8.2
	13.4	13.4	10.8	10.8	10.4	11.8	11.8	11.4	11.4	10.8	10.8	11.4	11.4	11.8	11.8	11.4
	5.5	2.4	2.4	3.5	3.5	4.2	2.4	2.4	4.8	4.8	2.8	5.4	5.8	5.8	4.2	4.8
	2.2	2	2	2.1	2	2.2	2.4	2.2	2.1	2	2.2	2.3	2.4	2.2	2.1	2.3
	1.6	1.6	1.4	1.4	1.2	1.4	1.5	1.3	1.4	1.6	1.3	1.4	1.2	1.2	1.3	1.4
	1.8	1.9	2	2.1	1.8	1.9	1.9	1.8	2.1	2	2	2.1	1.8	1.9	1.8	2
	1.8	2	1.9	2.1	1.8	1.8	1.9	1.9	2.1	2	2	2.1	1.9	1.9	1.8	2
	4.2	4.6	5	4.8	3.6	3.8	4.2	4.2	4.8	5.6	5.6	5.4	5.7	4.8	4.8	4.5
	5.4	5.4	5.6	4.8	4.8	4.4	4.6	4.2	4.2	4.8	5.4	5.4	5.3	4.6	4.6	4.4
	7.8	7.4	7.5	7.5	7.4	7.2	7.4	7.4	7.2	7.6	7.8	7.8	7.4	7.8	7.4	7.4
	12	8	8.4	8.2	8.4	8.2	7.8	8	8.2	7.8	7.8	7.6	7.4	7.4	7.8	7.6
	5.4	5.4	3.4	3.6	5.4	5	4.8	3.4	4	4	4.8	5.4	6	5.4	5	5.5
	8.4	6.8	6.4	6.4	6.2	7.2	7.8	7.4	5.8	6.2	6.4	6.4	7.2	6.4	6.8	6.2
	6.8	4.2	4.2	3.8	3.5	4.2	4.8	4.2	5.8	6.4	6.4	4.8	7.2	4.8	5.2	5.2
	13	14.8	10.4	10.4	11.4	11.8	11.8	11.4	10.8	10.8	11.4	11.4	11.8	11.8	11.4	10.6
	5.8	6.4	6.2	7.2	6.8	5.8	6.4	7	6.8	6.2	5.4	5.4	5.2	5.2	5.4	5.1
	8.4	7.8	6.4	6.4	5.8	6.4	7.2	7.2	8.4	7.6	7.8	7.8	7.4	7.8	7.4	7.4
	3.2	1.4	1.8	2	2.2	2	1.4	1.2	2.3	2	2.2	2.3	2.4	2.2	2.1	2.3
	5.4	5.4	5.6	4.8	4.8	4.4	4.6	4.2	4.2	4.8	2.8	5.4	5.8	5.8	4.2	4.8
	10.2	9.8	8.4	8.4	7.8	7.2	8.4	8	8.2	7.8	7.8	7.6	7.4	7.4	7.8	7.6
	1.8	1.9	2	2.1	1.8	1.9	1.9	1.8	2.1	2	2.2	2.3	2.4	2.2	2.1	2.3
	5.8	6.4	5.4	2.2	3.8	3.2	4.8	4.6	3.2	4	4.8	5.4	6	5.4	5	5.5
	5.8	6.4	5.4	2.2	3.8	3.2	4.8	4.6	3.2	4	4.8	5.4	6	5.4	5	5.5
	4.8	4.8	5.4	3.7	2.7	2.8	2.8	3.2	4.8	5.6	5.6	5.4	5.7	4.8	4.8	5.2
	8.4	7.8	6.4	6.4	5.8	5.8	3	3	4.8	4.8	5.6	5.4	5.7	4.8	4.8	4.5

Heart Rate

SL No	age	gender	diagnosis	ASA status	weight	interspace	volume of drug	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
1	28	f	Primi with CDMR	2	64	L3 - L4	2.2	80	64	66	66	64	66	76	72	70	71	72	70	73	72	74	66
2	29	f	Primi with CDMR	2	76	L2 - L3	2.2	90	96	95	100	92	94	89	88	92	85	82	76	78	84	80	86
3	25	f	Primi with CDMR	2	76	L3 - L4	2.4	90	94	96	102	92	94	88	94	86	82	78	78	84	82	80	86
4	21	f	G2P1L1 with prev. LSCS	2	70	L3 - L4	2.2	82	80	84	62	62	62	78	82	88	90	96	123	119	111	111	118
5	35	f	primi with precious pregnancy	2	58	L3 - L4	2.2	84	82	74	70	70	74	68	64	64	68	64	68	70	74	68	68
6	33	f	primi with controlled hypothyroidism	2	72	L2 - L3	2.2	86	78	74	78	76	74	74	70	76	74	74	72	72	78	74	74
7	29	f	G2P1L1 with prev. LSCS	2	84	L2 - L3	2.2	74	70	76	74	76	70	84	86	90	78	74	74	76	70	74	76
8	28	f	G2P1L1 with prev. LSCS	2	64	L3 - L4	2.2	78	78	74	74	68	74	72	70	74	74	80	82	82	84	84	88
9	27	f	Primi with CDMR	2	60	L3 - L4	2.2	104	102	108	102	104	98	94	94	94	92	92	88	84	92	92	94
10	32	f	G2P1L1 with prev. LSCS	2	85	L3 - L4	2	94	94	90	92	94	94	90	92	92	98	94	92	92	94	90	90
11	24	f	G2P1L1 with prev. LSCS	2	60	L2 - L3	2	74	72	72	74	74	70	70	74	70	72	72	74	78	78	74	74
12	30	f	Primi with CDMR	2	70	L2 - L3	2	80	84	82	82	84	80	80	78	78	74	74	78	74	78	74	78
13	28	f	primi with GDM on MNT diet	2	82	L2 - L3	2	70	64	58	62	64	60	64	58	58	64	68	66	58	64	64	62
14	33	f	Primi with CDMR	2	60	L3 - L4	2.2	90	90	60	60	56	56	78	78	78	78	80	84	84	84	84	80
15	24	f	G2P1L1 with prev. LSCS	2	68	L3 - L4	2.2	80	84	84	80	82	84	86	84	82	80	78	84	82	86	84	84
16	24	f	Primi with CDMR	2	74	L3 - L4	2.2	74	86	104	102	98	84	86	74	78	84	84	83	78	76	84	88
17	28	f	Primi with CDMR	2	64	L2 - L3	2.2	90	92	94	86	84	88	90	78	84	84	86	84	88	78	76	84
18	26	f	G2P1L1 with prev. LSCS	2	64	L2 - L3	2.2	78	74	78	76	76	74	68	74	78	78	72	84	84	82	78	78
19	33	f	primi with precious pregnancy	2	64	L2 - L3	2.2	84	82	84	89	88	86	84	82	82	84	84	82	86	84	82	88
20	22	f	G2P1L1 with prev. LSCS	2	64	L3 - L4	2.2	74	76	84	86	90	90	92	88	84	84	86	84	82	80	82	84
21	25	f	G2P1L1 with prev. LSCS	2	74	L3 - L4	2.2	84	82	84	89	88	88	84	73	76	81	84	82	88	89	82	86
22	25	f	Primi with CDMR	2	62	L2 - L3	2	82	82	84	89	88	86	80	90	73	81	83	86	87	82	96	89
23	24	f	G2P1L1 with prev. LSCS	2	62	L2 - L3	2	70	64	68	60	62	54	58	52	54	56	60	64	64	62	64	64
24	23	f	G2P1L1 with prev. LSCS	2	74	L3 - L4	2.2	70	64	60	60	58	64	62	70	72	68	64	60	64	64	62	64
25	26	f	Primi with CDMR	2	58	L3 - L4	2.2	90	90	94	98	86	84	82	84	86	84	78	78	86	84	84	80
26	23	f	Primi with CDMR	2	74	L3 - L4	2.2	68	74	82	84	56	54	56	52	58	54	52	54	58	64	62	68
27	24	f	Primi with CDMR	2	68	L3 - L4	2.2	84	88	104	108	98	96	98	94	94	78	72	74	74	76	74	72
28	25	f	Primi with CDMR	2	70	L2 - L3	2	102	84	84	78	76	74	78	78	76	76	74	78	78	84	82	84
29	24	f	G2P1L1 with prev. LSCS	2	70	L2 - L3	2.2	100	84	84	78	76	78	70	76	70	70	74	72	70	84	78	76
30	24	f	G2P1L1 with prev. LSCS	2	80	L2 - L3	2.2	120	120	114	114	120	110	110	114	114	120	122	124	110	114	114	110
31	28	f	G2P1L1 with prev. LSCS	2	78	L2 - L3	2	100	100	100	94	92	92	94	92	92	90	94	94	92	90	90	94
32	30	f	G2P1L1 with prev. LSCS	2	64	L2 - L3	2	80	84	84	80	84	82	86	84	84	82	84	86	86	84	84	84
33	27	f	G2P1L1 with prev. LSCS	2	70	L3 - L4	2.2	86	102	104	98	98	94	86	86	94	84	85	84	94	90	90	84
34	25	f	G2P1L1 with prev. LSCS	2	58	L3 - L4	2.2	104	106	94	86	84	78	84	82	82	86	84	92	84	84	92	92
35	21	f	G2P1L1 with prev. LSCS	2	76	L3 - L4	2.2	80	64	66	66	64	66	76	72	70	71	72	70	73	72	74	66
36	28	f	G2P1L1 with prev. LSCS	2	76	L3 - L4	2.2	90	96	95	100	92	94	89	88	92	85	82	76	78	84	80	86
37	26	f	G2P1L1 with prev. LSCS	2	70	L2 - L3	2.2	82	80	84	62	62	62	78	82	88	90	96	123	119	111	111	118
38	24	f	G2P1L1 with prev. LSCS	2	58	L2 - L3	2	84	82	74	70	70	74	68	64	64	68	64	68	70	74	68	68
39	32	f	G3P1L1A1 with prev LSCS	2	72	L3 - L4	2.2	86	78	74	78	76	74	74	70	76	74	74	72	72	78	74	74
40	23	f	primi with non progress of labour	2	84	L3 - L4	2	74	70	76	74	76	70	84	86	90	78	74	74	76	70	74	76
41	28	f	primi with non progress of labour	2	64	L3 - L4	2.2	78	78	74	74	68	74	72	70	74	74	80	82	82	84	84	88
42	23	f	G2P1L1 with prev. LSCS	2	58	L3 - L4	2.2	104	106	94	86	84	78	84	82	82	86	84	92	84	84	92	92
43	26	f	G2P1L1 with prev. LSCS	2	70	L2 - L3	2.2	86	102	104	98	98	94	86	86	94	84	85	84	94	90	90	84
44	30	f	G2P1L1 with prev. LSCS	2	64	L3 - L4	2.2	80	84	84	86	82	82	82	84	84	86	86	82	82	84	82	82
45	26	f	G2P1L1 with prev. LSCS	2	78	L3 - L4	2.2	100	98	98	100	94	96	96	98	98	96	94	94	92	92	90	94
46	26	f	primi with FGR	2	80	L3 - L4	2.2	120	120	114	112	120	110	112	112	114	120	122	124	110	114	114	110
47	25	f	G2P1L1 with prev. LSCS	2	70	L2 - L3	2	102	84	84	78	76	74	78	78	76	76	74	78	78	84	82	84
48	28	f	Primi with CDMR	2	66	L2 - L3	2.2	88	104	108	98	96	98	94	94	78	72	76	76	74	76	72	74
49	34	f	G2P1L1 with prev. LSCS	2	74	L2 - L3	2.2	68	74	82	84	56	54	56	52	58	54	52	54	58	64	62	68
50	24	f	Primi with CDMR	2	74	L3 - L4	2.2	68	74	72	74	76	78	74	76	76	74	78	74	76	76	74	74
51	20	f	primi with oligo	2	58	L3 - L4	2.2	70	64	68	60	62	54	58	52	54	56	60	64	64	62	64	64
52	27	f	G2P1L1 with prev. LSCS	2	58	L3 - L4	2.2	70	64	68	60	62	64	64	62	60	66	64	64	66	62	62	60
53	23	f	G2P1L1 with prev. LSCS	2	68	L3 - L4	2.2	80	84	84	86	84	82	82	84	80	78	82	82	84	84	86	88
54	34	f	G2P1L1 with prev. LSCS	2	66	L2 - L3	2	80	82	84	84	82	80	80	78	78	76	78	76	74	78	78	76
55		f	G2P1L1 with prev. LSCS	2	66	L3 - L4	2.2	74	76	78	90	94	86	86	84	78	78	78	76	78	74	74	76

SBP	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
	122	102	104	102	104	104	109	108	108	109	108	104	105	106	104	104
	140	134	122	126	124	120	119	121	114	118	108	104	106	118	121	126
	140	132	128	126	124	124	120	119	114	118	108	104	106	118	120	120
	120	110	114	109	109	110	113	118	102	105	100	110	110	110	91	97
	120	108	94	90	108	104	110	114	108	84	98	104	108	110	108	104
	130	110	104	104	94	94	90	104	104	108	108	108	98	98	102	102
	110	108	110	102	104	104	100	100	94	104	104	108	104	112	104	102
	110	110	90	90	94	94	98	104	104	104	108	108	104	104	108	108
	130	130	112	108	108	100	100	102	90	84	90	94	98	98	108	108
	140	110	110	98	98	96	98	98	98	108	104	104	106	108	108	100
	110	94	92	104	104	108	108	104	104	108	108	104	108	104	108	108
	120	110	110	108	104	104	108	108	104	106	106	108	102	104	108	108
	110	94	92	104	104	92	108	108	112	114	114	108	104	106	98	104
	140	140	130	130	130	140	140	140	138	138	138	130	140	140	130	130
	110	110	104	108	98	98	104	104	112	112	112	120	108	104	112	104
	130	110	102	92	94	86	108	94	108	112	108	112	108	102	101	98
	100	112	108	108	112	94	95	98	104	102	112	108	102	98	102	108
	110	108	104	98	94	108	108	102	112	102	104	106	104	112	110	110
	130	116	120	120	126	101	108	112	120	101	109	112	112	110	110	112
	120	108	98	104	86	94	104	108	108	104	102	104	108	112	112	108
	130	116	120	120	126	101	108	112	116	120	101	109	112	112	110	112
	130	120	120	118	112	116	126	116	101	104	108	112	116	109	112	110
	140	138	104	104	102	112	112	108	104	98	104	108	112	107	126	108
	140	138	120	124	140	140	140	140	130	138	134	138	142	136	134	138
	140	140	130	130	130	130	142	142	138	138	140	138	126	126	134	132
	124	124	104	110	114	90	98	82	98	104	108	104	112	108	98	100
	112	90	84	88	98	98	102	104	108	108	112	112	108	104	102	112
	124	124	104	110	114	90	98	82	98	104	108	104	112	108	98	100
	112	90	84	88	98	98	102	104	108	108	112	112	108	104	102	112
	140	104	104	108	104	110	110	96	98	104	106	106	110	114	112	112
	140	104	104	108	104	110	110	96	98	104	106	106	110	114	112	112
	130	100	100	100	110	110	90	90	100	100	110	110	108	110	108	120
	120	110	104	104	102	100	100	104	108	110	110	104	110	110	108	108
	110	110	104	104	108	104	104	110	110	108	104	110	112	112	108	104
	110	124	102	90	92	104	104	94	86	108	108	94	86	86	104	104
	130	130	108	108	96	104	94	102	108	110	112	98	104	124	108	108
	122	102	104	102	104	104	109	108	108	109	108	104	105	106	104	104
	140	134	122	126	124	120	119	121	114	118	108	104	106	118	121	126
	120	110	114	109	109	110	113	118	102	105	100	110	110	110	91	97
	120	108	94	90	108	104	110	114	108	84	98	104	108	110	108	104
	130	110	104	104	94	94	90	104	104	108	108	108	98	98	102	102
	110	108	110	102	104	104	100	100	94	104	104	108	104	112	104	102
	110	110	90	90	94	94	98	104	104	104	108	108	104	104	108	108
	130	130	108	108	96	104	94	102	108	110	112	98	104	124	108	108
	110	124	102	90	92	104	104	94	86	108	108	94	86	86	104	104
	110	110	104	104	108	108	104	104	110	110	108	104	110	112	112	108
	120	110	104	104	102	100	100	104	108	108	110	110	104	108	108	110
	130	100	100	108	110	110	90	90	102	102	110	108	108	106	106	104
	130	120	110	110	104	108	110	110	96	98	104	106	106	110	112	112
	112	90	84	88	98	98	102	104	108	108	112	112	108	104	102	112
	124	104	110	114	90	98	98	82	98	104	108	104	112	108	98	100
	124	110	110	108	108	106	104	108	108	110	112	108	98	106	106	100
	140	138	104	104	102	112	112	108	104	98	104	108	112	107	126	108
	120	104	104	102	102	98	106	108	104	104	102	98	104	104	106	106
	120	104	106	106	104	102	98	98	102	104	110	102	106	106	104	104
	110	98	98	104	104	108	108	104	106	106	102	102	98	102	102	98
	120	120	100	96	96	98	104	104	110	104	108	108	106	104	104	106

DBP	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
	90	56	56	57	56	52	65	64	64	65	70	52	53	58	56	54
	90	86	78	78	84	72	74	76	74	72	68	69	71	78	84	82
	90	84	82	86	82	84	78	78	84	76	78	78	84	84	86	84
	70	68	70	72	76	74	63	68	52	59	47	57	57	57	43	47
	80	70	64	54	72	64	70	84	70	54	60	64	68	70	68	60
	80	74	64	72	62	62	60	64	64	74	74	72	70	68	64	64
	70	68	70	58	64	60	54	62	58	62	64	62	60	72	68	64
	70	70	60	60	62	62	70	64	72	72	72	74	74	74	72	72
	80	80	72	70	70	60	60	62	60	54	60	64	70	70	70	70
	70	70	70	74	74	76	74	74	80	80	74	74	76	74	74	78
	70	68	62	68	68	72	72	64	64	68	68	64	68	64	72	72
	70	64	64	68	72	78	78	68	78	74	74	74	64	74	76	74
	70	62	60	64	61	64	68	68	72	72	68	71	64	60	64	62
	80	80	80	80	80	80	76	78	78	78	80	80	80	80	80	80
	70	70	64	68	64	64	68	64	64	64	84	84	68	64	74	68
	80	80	60	62	62	62	57	57	68	64	72	64	64	64	58	68
	80	74	68	68	72	62	62	70	68	62	74	68	80	74	64	64
	70	72	74	68	64	72	74	68	72	62	58	68	74	78	72	84
	80	70	80	76	74	58	60	66	80	58	66	68	70	66	70	70
	70	68	64	64	50	58	64	72	68	64	58	64	68	72	68	70
	80	70	80	76	76	58	60	66	68	80	58	66	66	70	66	70
	80	80	76	76	74	70	76	68	58	60	60	66	70	66	70	66
	80	74	80	62	68	72	58	58	62	62	72	68	64	69	84	74
	80	74	78	78	84	94	90	94	84	86	84	90	92	96	92	92
	80	80	84	68	78	80	84	76	78	78	80	84	82	82	78	80
	80	64	62	68	68	62	64	62	68	64	68	64	82	78	60	62
	72	62	62	64	62	64	64	64	62	58	84	82	78	64	68	62
	80	64	64	60	61	76	76	68	72	64	61	64	78	78	68	64
	80	64	64	60	61	76	76	68	72	64	61	64	78	78	68	64
	80	70	70	70	80	80	60	60	56	56	70	70	68	70	68	70
	70	64	60	60	62	64	64	64	68	70	70	60	70	70	68	68
	70	70	64	64	64	62	62	68	64	68	64	70	74	74	68	68
	80	84	60	60	58	64	64	60	62	62	57	64	58	58	60	60
	80	74	64	62	57	62	54	64	68	74	74	68	64	84	72	68
	90	56	56	57	56	52	65	64	64	65	70	52	53	58	56	54
	90	86	78	78	84	72	74	76	74	72	68	69	71	78	84	82
	70	68	70	72	76	74	63	68	52	59	47	57	57	57	43	47
	80	70	64	54	72	64	70	84	70	54	60	64	68	70	68	60
	80	74	64	72	62	62	60	64	64	74	74	72	70	68	64	64
	70	68	70	58	64	60	54	62	58	62	64	62	60	72	68	64
	70	70	60	60	62	62	70	64	72	72	74	74	74	74	72	72
	80	74	64	62	57	62	54	64	68	74	74	68	64	84	72	68
	80	84	60	60	58	64	64	60	62	62	57	64	58	58	60	60
	70	70	64	62	64	68	64	64	68	68	72	70	74	74	72	70
	70	64	60	60	62	64	64	64	64	68	70	70	60	70	68	68
	80	70	70	74	74	80	60	64	68	68	68	70	70	64	68	68
	80	64	64	60	61	76	76	68	72	64	61	64	78	78	68	64
	72	62	62	64	62	64	64	64	62	58	84	82	78	64	68	62
	80	64	62	68	68	62	64	62	68	64	68	64	82	78	60	62
	80	64	62	68	64	62	64	68	68	68	64	62	62	68	68	62
	80	74	80	62	68	72	58	58	62	62	72	68	64	69	84	74
	70	68	68	64	68	60	68	64	60	62	62	62	60	66	68	68
	80	66	62	64	64	62	60	60	64	64	68	60	64	64	62	60
	70	74	68	64	64	66	62	64	64	66	60	60	58	62	62	64
	70	70	74	60	62	64	62	62	60	58	58	64	64	58	60	60

MAP	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
	98	71	72	72	68	64	80	60	60	80	72	70	70	64	68	71
	88	84	74	70	75	78	72	76	70	69	66	65	68	71	75	79
	88	84	78	72	76	78	72	72	68	72	74	74	78	72	78	82
	84	84	72	80	72	84	80	76	74	76	65	75	75	75	59	64
	84	72	67	59	68	68	72	78	78	60	64	62	68	76	70	70
	90	84	76	76	64	68	62	64	70	70	68	68	68	64	68	70
	72	74	70	62	64	68	61	60	62	64	68	68	64	70	70	68
	74	74	62	62	64	64	68	68	72	72	74	72	72	74	72	74
	94	94	86	80	80	70	70	64	64	58	60	62	68	64	68	68
	84	78	78	64	68	68	72	74	70	70	74	78	74	74	70	70
	74	74	78	78	74	78	74	74	76	76	74	74	78	74	72	72
	84	84	78	78	74	74	72	70	72	74	78	74	76	72	68	68
	84	68	64	68	70	68	76	74	84	82	74	68	66	64	68	64
	104	102	98	94	98	96	94	88	90	90	94	92	94	96	90	90
	84	82	80	80	78	74	74	78	76	74	74	78	84	84	78	80
	94	86	80	72	74	63	64	64	82	84	78	84	84	86	78	74
	86	84	78	78	84	68	72	74	84	82	82	74	78	69	80	84
	84	92	84	86	78	84	98	88	92	84	78	80	78	84	92	94
	90	78	84	82	80	64	68	72	84	68	72	74	72	74	74	84
	90	74	78	62	58	58	62	68	68	64	64	68	72	74	74	72
	90	78	84	86	84	68	68	72	74	84	62	80	84	72	84	86
	90	86	80	90	88	86	92	84	72	76	76	80	82	80	84	94
	94	86	84	82	77	78	64	68	68	72	78	76	74	68	84	82
	94	94	88	84	98	92	102	98	86	90	84	92	98	94	92	94
	104	100	98	86	86	94	98	86	84	88	92	94	96	90	92	90
	88	72	72	68	76	72	68	58	72	74	68	72	74	78	68	64
	80	72	58	58	62	62	68	66	64	68	76	74	74	72	74	78
	102	74	76	70	72	84	82	70	70	72	68	68	72	74	72	78
	100	74	76	76	70	84	90	72	72	76	68	64	90	102	94	92
	96	80	78	69	80	80	58	58	64	64	70	78	74	78	74	80
	84	78	74	74	68	68	70	70	68	74	74	68	74	74	68	68
	84	82	80	80	78	74	74	78	76	74	74	78	84	84	78	80
	90	94	74	64	60	68	72	62	68	70	64	57	59	59	64	64
	92	88	76	72	64	68	62	62	64	71	70	74	72	82	80	78
	98	71	72	72	68	64	70	60	60	80	72	70	70	64	68	71
	88	84	74	70	75	78	72	76	70	69	66	65	68	71	75	79
	84	84	72	80	72	84	80	76	74	76	65	75	75	75	59	64
	84	72	67	59	68	68	72	78	78	60	64	62	68	76	70	70
	90	84	76	76	64	68	62	64	70	70	68	68	68	64	68	70
	72	74	70	62	64	68	61	60	62	64	68	68	64	70	70	68
	74	74	62	62	64	64	68	68	72	72	74	72	72	74	72	74
	92	88	76	72	64	68	62	62	64	71	70	74	72	52	80	78
	90	94	74	64	60	68	72	62	68	70	64	57	59	59	64	64
	84	82	80	80	78	74	74	78	76	74	74	78	84	84	78	80
	84	78	74	74	68	68	70	70	68	74	74	68	74	74	68	68
	96	80	78	69	80	80	58	58	64	64	70	78	74	78	74	80
	100	74	76	70	72	84	82	70	70	72	68	68	72	74	72	78
	80	72	58	58	62	62	68	66	64	68	76	74	74	72	74	78
	88	72	72	68	76	72	68	58	72	74	68	72	74	78	68	64
	88	72	72	68	64	68	62	68	66	64	68	62	64	66	68	68
	94	86	84	82	77	78	64	68	72	78	76	74	68	84	82	82
	84	70	72	68	68	62	68	64	68	66	64	68	68	66	66	68
	84	72	72	74	68	68	64	64	68	72	72	70	68	68	64	68
	74	66	68	68	64	68	68	64	68	66	62	62	60	64	64	64
	84	84	66	62	62	64	68	72	74	68	70	72	72	74	68	68

PI	baseline	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	11 min	12 min	13 min	14 min	15 min
	1.4	1.2	1.2	0.8	0.8	1.2	1.6	1.6	1.8	2.4	1.4	0.8	0.7	0.7	0.4	0.4
	1.4	1.5	1.3	1.4	1.5	1.5	1.2	1.4	1.4	1.5	1.7	1.6	1.4	1.2	1.4	1.5
	1.4	1.8	1.8	1.4	1.3	1.3	1.2	1.3	1.6	1.8	1.8	1.4	1.4	1.8	1.8	1.4
	8.4	8.4	12.2	12.4	12.4	12.5	12.5	12.2	4.8	3.8	11.1	9.3	0.6	1.8	2.3	9.3
	8.4	5.8	2.6	3.4	4.2	3.8	4.2	5.8	5.4	4.8	3.6	4.2	4.6	3.8	3.8	4.2
	3.8	3.4	2.8	2.4	2.4	3.6	2.8	2.4	2.8	3.4	3.8	3.4	4.2	4.5	2.8	3.2
	5.4	5.2	3.4	3.4	2.8	2.8	3.1	2.6	1.5	3.1	3.2	3.6	4.2	4.8	5.2	5.4
	3.4	3.4	2.8	2.8	2.4	2.4	2.8	3.4	3.4	3.8	3.8	3.8	3.4	3.4	3.8	3.8
	5.4	6.8	2.4	2.4	2.8	2.8	1.5	1.5	1.4	1.2	2.4	2.4	2.8	2.8	2.8	3
	10.8	10.4	10.4	8.2	8.2	8	8.4	8.4	8.2	8.2	8	7.8	8.2	8.4	8.4	8.4
	10.8	8.4	8.4	9.8	10.4	10.4	10.2	10.8	10.8	10.8	10.4	10.4	10.4	10.8	10.4	10.8
	8.4	8.2	8.2	7.8	7.8	7.4	7.4	7.2	7.2	7	7.2	7.2	7.4	7.2	7.2	7.8
	8.6	6.8	7.2	7.2	6.4	5.8	6.8	7.2	8.4	8.2	6.8	7.2	6.6	6.8	6.2	6.2
	7.8	7.4	8	7.9	7.4	6.8	7.2	9	8.4	8	8	8.2	7.2	6.8	7.2	9
	9.2	8.5	11.2	10.8	9.8	6.4	7.8	4.8	5.4	6.4	7.8	4.8	6.8	7.2	8.1	7.8
	8.2	7.8	5.4	3.2	4	4.2	3.6	4.8	5.2	5.4	5.2	5.2	5.8	5.2	4.8	5.6
	4.8	4.2	3.6	2.8	3.4	4.2	4.8	6.8	5.2	4.2	4.8	6.8	4.7	3.8	4.8	3.2
	11.2	10.8	7.2	7.4	6.8	10.2	8.4	7.8	6.4	6.8	7.2	4.8	7.2	5.4	6.2	6.8
	5.2	3	3.8	4.8	6.4	6.8	7.1	8.4	8.2	6.8	7.2	8.4	5.9	6.8	7.2	8.4
	11.4	8.6	8.6	7.4	6.8	6.8	7.2	6.4	5.8	6.2	4.7	6.2	5.8	6.8	6.7	6.8
	7.1	7.1	5.2	3.8	3.5	2.6	4.8	5.3	4.1	5.3	5.9	5.9	5	4.5	5.8	5.3
	7.1	7.1	5.2	3	3.5	2.6	3	2.1	3.1	4.4	5.3	5.7	5.9	5.9	5	4.5
	12.8	12.4	9.8	7.2	7.4	6.8	7.2	4.3	5.2	4.8	6.2	5.8	7.4	7.4	8.4	8.2
	6.4	6.4	5.4	5.8	5.8	5.8	6.4	6.4	6.8	6.8	6.4	6.8	6.4	6.2	5.8	5.8
	7.8	7.4	8	7.9	11	11.2	9.8	8.4	7.8	6.4	6.8	8.4	7.2	6.8	7.2	9
	8.4	4.8	4.2	5.4	6.2	6	6.4	6.2	7.8	7.4	5.8	6.2	6.4	6.8	5.8	7.2
	6.4	6.5	6.4	5.8	5.8	4	4.2	4.8	4.6	5.8	5.8	5	5.8	6.4	7	6.8
	6.4	6.5	6.4	5.8	5.8	4	4.2	4.8	4.6	5.8	5.8	5	5.8	6.4	7	6.8
	6.4	6.5	6.4	5.8	5.8	4	4.2	4.8	4.6	5.8	5.8	5	5.8	6.4	7	6.8
	5.6	5.6	8	8	5.4	8	8.8	8.8	7	7	6	6.2	5.2	5.8	6	6
	8.4	8.4	4.8	2.2	2.4	2.5	4	4	3.5	3.5	4	4	4.8	4.8	4.2	4.2
	9.2	8.4	8.5	8.4	9	8.4	7.8	6.4	6.8	7.4	8.4	8.2	9.2	10.4	9.2	8.8
	5.4	4.8	3.6	3.6	3.2	4.2	4.2	3.8	3.2	4.8	5.2	6.8	5.2	4.8	4.8	4.2
	6.8	5.4	5.8	5.8	5.3	5.4	6.2	6.4	6.4	6.2	6.8	7.2	6.4	6.9	6.8	7.2
	1.4	1.2	1.2	0.8	0.8	1.2	1.6	1.6	1.8	2.4	1.4	0.8	0.7	0.7	0.4	0.4
	1.4	1.5	1.3	1.4	1.5	1.5	1.2	1.4	1.4	1.5	1.7	1.6	1.4	1.2	1.4	1.5
	8.4	8.4	12.2	12.4	12.4	12.5	12.5	12.2	4.8	3.8	11.1	9.3	0.6	1.8	2.3	2.3
	8.4	5.8	2.6	3.4	4.2	3.8	4.2	5.8	5.4	4.8	3.6	4.2	4.6	3.8	3.8	4.2
	3.8	3.4	2.8	2.4	2.4	3.6	2.8	2.4	2.8	3.4	3.8	3.4	4.2	4.5	2.8	3.2
	5.4	5.2	3.4	3.4	2.8	2.8	3.1	2.6	1.5	3.1	3.2	3.6	4.2	4.8	5.2	5.4
	3.4	3.4	2.8	2.8	2.4	2.4	2.8	3.4	3.4	3.8	3.8	3.8	3.4	3.4	3.8	3.8
	5.4	4.8	3.6	3.6	3.2	4.2	4.2	3.8	3.2	4.8	5.2	6.8	5.2	4.8	4.8	4.2
	6.8	5.4	5.8	5.8	5.3	5.4	6.2	6.4	6.4	6.2	6.8	7.2	6.4	6.9	6.8	7.2
	8.4	4.8	3.6	3.6	3.2	4.2	3.8	3.2	4.8	5.2	6.8	5.2	4.8	5.2	4.8	4.8
	9.2	8.4	8.5	8.4	9	8.4	7.8	6.4	6.8	7.4	8.4	8.2	9.2	10.4	9.2	8.8
	8.4	8.4	6.8	6.8	5.9	6.2	6.2	6.4	6.8	6.8	7.2	7.2	6.8	6.8	6.4	6.2
	5.6	5.6	8	8	5.4	8	8.8	8.8	7	7	6	6.2	5.2	5.8	6	6
	6.4	6.5	6.4	5.8	5.8	4	4.2	4.8	4.6	5.8	5	5.8	6.4	7	6.8	6.8
	3.8	2.7	2.8	2.4	1.3	4.5	5.2	4.5	3.6	3.8	4.2	5.4	5.2	5.6	5.4	5.2
	8.4	4.8	4.2	5.4	6.2	6	6.4	6.2	7.8	7.4	5.8	6.2	6.4	6.8	5.8	7.2
	4.8	4.8	4.2	5.4	6.2	6	6.4	6.2	6.4	5.8	5.8	5.4	5.4	5.2	4.8	4.8
	12.4	12.8	9.8	7.2	7.4	6.8	7.2	4.3	5.2	4.8	6.2	5.8	7.4	7.4	8.4	8.2
	12.8	12.4	9.8	7.2	7.4	7.4	6.6	6.6	6.8	6.8	7.2	7.2	6.8	6.8	6.4	6.8
	8.4	7.6	7.6	7.2	7.2	7.4	7.8	7.8	7.6	7.6	7.4	7.4	7.2	7.2	7.8	7.6
	1.8	1.8	1.4	1.4	1.2	1.6	1.6	1.2	1.4	0.8	0.8	1.2	1.2	1.4	1.4	1.2
	2.8	2.8	4.6	5.4	5.4	5.6	5.6	5.8	5.4	4.8	4.8	5.8	5.6	5.4	5.4	5.4