

A Dissertation on  
**A PROSPECTIVE, RANDOMIZED, BLINDED, COMPARATIVE  
STUDY ON THE EFFECT OF “LIBERAL VS. RESTRICTIVE”  
FLUID PROTOCOL ON POST-OPERATIVE NAUSEA  
VOMITING AND DISCHARGE CRITERIA IN PATIENTS  
UNDERGOING PUERPERAL STERILIZATION UNDER GA AS  
DAY CARE SURGERY**

Submitted to  
**THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY**

In partial fulfillment of the requirements

For the award of the degree

**M.D. (BRANCH – X)  
ANAESTHESIOLOGY**



**GOVERNMENT STANLEY MEDICAL COLLEGE & HOSPITAL  
THE TAMILNADU DR. M.G.R MEDICAL UNIVERSITY  
CHENNAI, TAMILNADU**

**MAY 2018**

## **DECLARATION BY THE CANDIDATE**

I, **DR.K.AISHWARYA**, solemnly declare that the dissertation, titled “**A PROSPECTIVE, RANDOMIZED, BLINDED, COMPARATIVE STUDY ON THE EFFECT OF “LIBERAL VS. RESTRICTIVE” FLUID PROTOCOL ON POST-OPERATIVE NAUSEA VOMITING AND DISCHARGE CRITERIA IN PATIENTS UNDERGOING PUERPERAL STERILIZATION UNDER GA AS DAY CARE SURGERY**”, is a bonafide work done by me during the period of **MARCH 2017 TO JULY 2017** at Government Stanley Medical College and Hospital, Chennai under the expert guidance of **Dr. NAHEED AZHAR, M.D.,D.A.,D.N.B** Professor, Department Of Anaesthesiology, Government Stanley Medical College, Chennai.

This thesis is submitted to The Tamil Nadu Dr. M.G.R. Medical University in partial fulfillment of the rules and regulations for the M.D. Degree examinations in Anaesthesiology to be held in May 2018.

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## LIST OF ABBREVIATIONS

|          |                                             |
|----------|---------------------------------------------|
| PONV     | Postoperative Nausea and Vomiting           |
| VAS      | Visual Analogue Scale                       |
| PADSS    | Post Anaesthetic Discharge Scoring System   |
| TUG TEST | Timed Up and Go test                        |
| CIVE     | Compensatory Intravascular Volume Expansion |
| GDT      | Goal Directed Therapy                       |
| ODM      | Oesophageal Doppler Monitoring              |
| SGL      | Subglycocalyceal Layer                      |
| TBW      | Total Body water                            |
| ICF      | Intra Cellular fluid                        |
| ECF      | Extra Cellular fluid                        |
| ISF      | Interstitial Fluid                          |
| IV       | Intravenous                                 |

# CHAPTER 1

## INTRODUCTION

Fluid therapy plays an important role in achieving optimal outcomes after surgery and it continues to be one of the most controversial aspects of perioperative care<sup>1</sup>. The aims of perioperative fluid administration are to avoid dehydration, to maintain an effective circulating volume, and to prevent inadequate tissue perfusion during a period when the patient is unable to achieve these goals through normal oral fluid intake<sup>2</sup>. Knowledge of the effects of different fluids has increased in recent years, and the choice of fluid in a variety of clinical situations can now be rationally guided by an understanding of the physicochemical and biological properties of the various fluids available. However, there are only few useful clinical outcome data to guide this decision. Deciding how much fluid to give has historically been more controversial than choosing which fluid to give<sup>3</sup>.

The data about peri-operative fluid on outcomes, from major surgery are contradictory, with some studies reporting fluid restriction to reduce length of postoperative ileus and decrease postoperative complications<sup>4</sup>. Other investigators report benefits (primarily reduced length of postoperative ileus and reduced hospital stay) of individualized, goal-directed fluid administration<sup>5</sup>. Data from randomized, clinical trials consistently indicate that 1–2 L IV fluid (predominantly crystalloid)

improves outcomes such as dizziness, nausea and vomiting after minor surgery .The lack of procedure-specific evidence based guidelines for perioperative fluid management results in large variations of administered fluid regimens in daily practice.

Adverse outcomes such as nausea, vomiting, thirst, drowsiness, and dizziness can create great discomfort in ambulatory patients. Postoperative nausea and vomiting (PONV) is a common complication after ambulatory surgery. PONV can lead to high levels of patient distress and dissatisfaction<sup>6</sup>. It is a limiting factor in the early discharge of ambulatory surgery patients and also a leading cause for unanticipated hospital admission <sup>7</sup>. Current approaches for the prevention and treatment of PONV remain limited, and >25% of patients continue to experience PONV within 24 h of surgery<sup>8</sup> .Among high risk patients, the incidence of PONV is as frequent as 80%<sup>9</sup>. Although some advocate prophylactic antiemetic therapy for high risk patients, with rescue antiemetic treatment for episodes of PONV, the optimal approach remains unclear<sup>10</sup> .There remains a need to develop cost effective, ideally non pharmacologic strategies to decrease the incidence of PONV.

Intravascular volume deficits may be a factor in PONV and perioperative administration of IV fluids may reduce the incidence of adverse outcomes in outpatient surgery<sup>11</sup>. Perioperative administration of a

sufficient volume of IV fluids to correct this deficit may effectively prevent PONV .The combined intraoperative anesthetic and surgical losses that are often inadequately replaced, results in hypovolemia with reduced blood flow to the gut. Gut ischemia, if not corrected, is associated with excessive release of serotonin. Thus, fluid supplementation reduces the incidence of PONV, most probably, by improving the mesenteric perfusion and preventing gut ischemia and the resultant serotonin release. However, studies of perioperative fluid administration have used differing methodologies and have drawn conflicting conclusions<sup>12</sup> . Therefore, the potential efficacy of IV fluid therapy in reducing PONV remains to be convincingly demonstrated.

Hence a study was planned to examine the hypothesis that the administration of large volume IV fluids to patients undergoing ambulatory surgery would reduce the incidence and/or severity of PONV and other adverse outcomes postoperatively.

We propose to test this hypothesis in a common surgery that is conducted extensively across the country which would benefit if the patient will achieve discharge criteria at the earliest.



## **CHAPTER 2**

### **AIM OF THE STUDY**

The aim of this randomized study was to compare the effect of Liberal and Restrictive fluid protocol on post-operative nausea vomiting and discharge criteria in patients undergoing puerperal sterilization under GA as day care surgery.

#### **Primary Objectives**

1. Incidence and severity of Post-operative nausea and vomiting.
2. Incidence and severity of Pain.

#### **Secondary Objectives**

1. Discharge criteria
2. Patient well-being as assessed by thirst, headache, dizziness, drowsiness and fatigue
3. Post-operative Ileus.
4. Post-operative Exercise capacity and mobilization.

## **CHAPTER 3**

### **FLUID PHYSIOLOGY**

#### **FLUID COMPARTMENTS<sup>13,14</sup>**

Water constitutes about 60% of total body weight in the average adult, varying with age, gender, and body composition. Adipose tissue contains little water compared with other tissues, leading to marked variability in total body water (TBW) proportion between lean (75%) and obese (45%) individuals and between adult males and females. TBW is divided between anatomic and functional fluid compartments within the body, with the major division between intracellular fluid (ICF) and extracellular fluid (ECF). The extracellular fluid can be subdivided into the following compartments:

#### **Interstitial fluid (ISF)**

Lymphatic fluid and protein poor fluid occupying cell spaces.

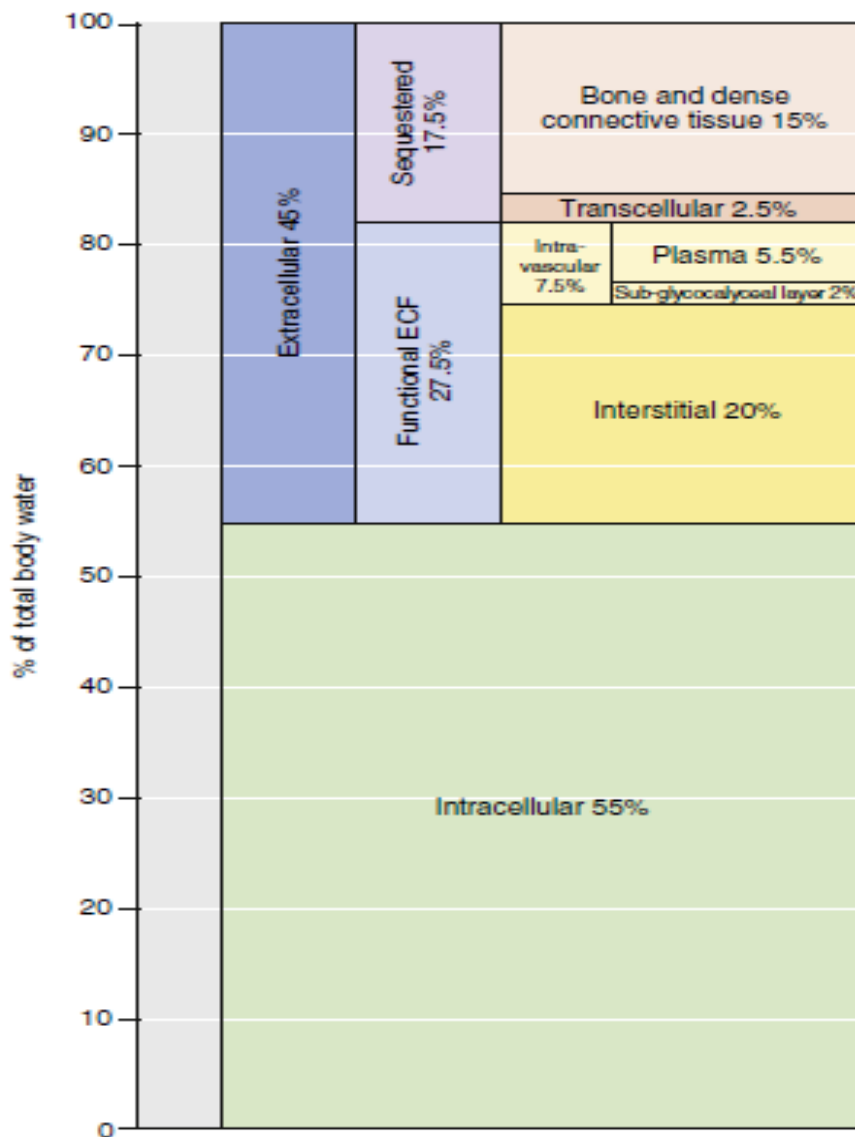
#### **Intravascular fluid**

Plasma volume, including a proportion contained within the subglycocalyx

## Transcellular fluid

Includes gastrointestinal (GI) tract fluid, bile, urine, cerebrospinal fluid, aqueous humor, joint fluid, and pleural, peritoneal, and pericardial fluid.

**Figure 1 : Distribution of total body water**



# PHYSICOCHEMICAL LAWS GOVERNING FLUID AND ELECTROLYTE MOVEMENT

The movement of water and solutes is governed by a variety of physicochemical and biologic processes.

## Diffusion

Diffusion is the process by which solute particles fill the available solvent volume by moving from areas of high to low concentration according to Fick's law of diffusion:

$$J = -DA(\Delta c/\Delta x)$$

where  $J$  is the net rate of diffusion,  $D$  is the diffusion coefficient,  $A$  is the cross-sectional area available for diffusion, and  $\Delta c/\Delta x$  is the concentration (chemical) gradient. Diffusion also may be driven by the tendency of charged solutes to move down electrical gradients.

## Osmosis

If a semi-permeable membrane separates pure water from water in which solute is dissolved, water molecules will diffuse across the membrane

from region of lower solute concentration into the region of higher solute concentration.

Osmotic pressure in an ideal solution is affected by temperature and volume.

$$P = nRT/V$$

where **P** is the osmotic pressure, **n** is the number of particles, **R** is the gas constant, **T** the absolute temperature and **V** the volume. The total osmotic pressure of plasma is approximately 5545 mm Hg.

### **Osmolality**

Osmolality may be used to describe solutions containing many different types of particles and is the number of osmoles (each containing  $6.023 \times 10^{23}$  of any type of particle present) present in 1 kg of solvent. Normal body osmolality is 285 to 290 mOsm/kg. The largest contribution to plasma osmolality is made by sodium and its related anions chloride and bicarbonate. It can be calculated by:

$$\text{Serum osmolality} = [ (2 \times \text{Na}) + (\text{glucose} \div 18) + (\text{BUN} \div 2.8) ]$$

where Na is the serum sodium concentration (mEq/L), glucose is the serum glucose concentration (mg/dL), BUN is the blood urea nitrogen concentration (mg/dL), and the  $(2 \times \text{Na})$  component reflects both Na and its associated anions (predominantly  $\text{Cl}^-$  and  $\text{HCO}_3^-$ )

**Osmolarity** is the number of osmoles of solute per liter of solution

### **Tonicity**

Tonicity is important in determining in vivo distribution of fluids across a cell membrane.

### **Oncotic Pressure**

Oncotic pressure is the component of total osmotic pressure due to the colloid - that is, large-molecular-weight particles, predominantly proteins (albumin, globulins, fibrinogen). Of the total plasma osmotic pressure of 5545 mm Hg, 25 to 28 mm Hg is due to plasma oncotic pressure. As the most abundant plasma protein, albumin is responsible for 65% to 75% of plasma oncotic pressure.

## **Crystalloid Versus Colloid Intravascular Volume Effects**

Infused crystalloid has been thought to distribute evenly throughout the extracellular compartments as a result of capillary filtration, leaving approximately one fourth or one fifth of the original volume within the circulating blood volume, whereas colloids were presumed to initially remain largely within the intravascular volume.

Crystalloids initially distribute throughout the plasma and the subglycocalyceal layer (SGL) volumes. Context sensitivity is responsible for the observation that clearance of crystalloid from its central compartment (the intravascular volume) is slower under anesthesia than in awake subjects<sup>15</sup>.

The importance of the endothelial glycocalyx is highlighted by studies showing that its degradation significantly impairs endothelial barrier function<sup>16</sup>. Maintenance of glycocalyx integrity is therefore gaining interest as a therapeutic target in perioperative fluid management.

To rationally prescribe fluid replacement, it is important to identify which compartment is depleted: specific losses should be replaced with the appropriate fluid.

## **CHAPTER 4**

### **FLUID PHARMACOLOGY**

In 1861, Thomas Graham classified substances as crystalloids or colloids based on their ability to diffuse through a parchment membrane.

IV fluids are broadly be classified into colloid and crystalloid solutions. They vary in their physical, chemical, and physiological properties.

#### **CRYSTALLOIDS**

Solutions of inorganic ions and organic molecules dissolved in water are referred to as crystalloids. The main solute is either glucose or sodium chloride and the solutions may be isotonic, hypotonic, or hypertonic with respect to plasma. Potassium, calcium, and lactate may be added to more closely replicate the ionic makeup of plasma. Crystalloids with an ionic composition close to that of plasma is referred as “balanced” or “physiological.”



## **ISOTONIC SALINE<sup>17</sup>**

One of the most commonly used crystalloid fluids is 0.9% sodium chloride. It has different names, including normal saline, physiologic saline, and isotonic saline.

### **FEATURES**

Its osmolarity (308) is slightly higher than that of plasma, although the osmolality (285 mOsm/kg) is very similar to that of plasma.

Infusions of 0.9% NaCl cause interstitial edema more than crystalloid fluids<sup>18</sup> due to the higher sodium load from 0.9% NaCl, which increases the “tonicity” of the interstitial fluid and promotes sodium retention by suppressing the renin-angiotensin-aldosterone axis<sup>19</sup>. Decreases in renal perfusion is also observed as a result of chloride-mediated renal vasoconstriction.

It also leads to an increase in ECF volume, dilutional decrease in hematocrit and albumin, increase in Cl<sup>-</sup> and K<sup>+</sup> concentrations, and decrease in HCO<sub>3</sub><sup>-</sup>. The excess salt and water load may take multiple days for even a healthy subject to excrete.

Large-volume infusions of 0.9% NaCL produce a metabolic acidosis. The saline-induced metabolic acidosis is hyperchloremic acidosis and is caused by the high concentration of chloride in 0.9% saline relative to plasma (154 versus 103 mEq/L).

The compelling indications are

- Situations in which increased plasma Na<sup>+</sup> may be beneficial, such as in the presence of cerebral edema.
- Preexisting Na<sup>+</sup> or Cl<sup>-</sup> total body depletion, such as gastric outlet obstruction.

### **Ringer's Fluids** <sup>20</sup>

Sydney Ringer, a British physician studied the contraction of isolated frog hearts and he introduced the sodium chloride solution in 1880 which contained calcium and potassium to promote cardiac contraction and cell viability .This solution is known as Ringer's injection and is 0.9% NaCL with added potassium and ionized calcium.

### **Ringer's Lactate**

In the early 1930's, an American pediatrician, Alexis Hartmann added sodium lactate to Ringer's solution to provide a buffer for the treatment of

metabolic acidosis . This solution was initially called as Hartmann's solution, and is now known as Ringer's lactate solution. The sodium concentration in Ringer's lactate is reduced to compensate for the sodium released from sodium lactate, and the chloride concentration is reduced to compensate for the negatively-charged lactate molecule; both changes result in an electrically neutral salt solution. The reduction in anionic content is compensated for by the addition of stable organic anionic buffers such as lactate, gluconate, or acetate. The osmolality of balanced solutions (265 mOsm/kg) is slightly lower than that of plasma, and they are therefore mildly hypotonic.

After administration, the buffer is metabolized to produce  $\text{HCO}_3^-$  in equimolar quantities by entry into the citric acid cycle.

### **Ringer's Acetate**

Because of concerns that large-volume infusions of Ringer's lactate solution could increase plasma lactate levels in patients with impaired lactate clearance the lactate buffer was replaced by acetate to create Ringer's acetate solution.

## **Advantage and Disadvantages**

The principal advantage of Ringer's lactate and Ringer's acetate over isotonic saline is the lack of a significant effect on acid-base balance.

The principal disadvantage of Ringer's solutions is the calcium content; i.e., the ionized calcium in Ringer's solutions can bind to the citrated anticoagulant in stored RBCs and promote clot formation.

Concerns that large doses of d-lactate may be associated with encephalopathy<sup>21</sup> and cardiac toxicity in patients with renal failure<sup>22</sup> have not been confirmed in humans.

Lactated solutions should be avoided in severe liver failure. Acetate is metabolized in muscle rather than liver, which makes Ringer's acetate a reasonable alternative to Ringer's lactate in patients with liver failure.

## **DEXTROSE SOLUTIONS**

Dextrose solutions have the following two main indications in the perioperative setting.

Isotonic glucose solution should be prescribed to treat simple dehydration and provide water replacement. The hypertonic glucose

solutions are given to provide glucose as a metabolic substrate in hypoglycemia or in combination with insulin therapy.

### Other Balanced Salt Solutions

Two of the crystalloid (i.e., Normosol and Plasma-Lyte) contain magnesium instead of calcium, and contain both acetate and gluconate buffers to achieve a pH of 7.4. These fluids are not as popular as isotonic saline or Ringer's lactate, but the absence of calcium makes them suitable as diluents for RBC transfusions, and Plasma-Lyte has shown less of a tendency to promote interstitial edema when compared with isotonic saline.

**Figure 2 : Comparison of Crystalloids**

| Fluid                | mEq/L           |                 |                |                  |                  |                                | pH  | Osmolality (mOsm/L) |
|----------------------|-----------------|-----------------|----------------|------------------|------------------|--------------------------------|-----|---------------------|
|                      | Na <sup>+</sup> | Cl <sup>-</sup> | K <sup>+</sup> | Ca <sup>++</sup> | Mg <sup>++</sup> | Buffers                        |     |                     |
| Plasma               | 140             | 103             | 4              | 5                | 2                | Bicarbonate (25)               | 7.4 | 290                 |
| 0.9% NaCl            | 154             | 154             | -              | -                | -                | -                              | 5.7 | 308                 |
| Lactated Ringer's    | 130             | 109             | 4              | 3                | -                | Lactate (28)                   | 6.4 | 273                 |
| Normosol             | 140             | 98              | 5              | -                | 3                | Acetate (27)<br>Gluconate (23) | 7.4 | 295                 |
| Plasma-Lyte          |                 |                 |                |                  |                  |                                |     |                     |
| Isolyte <sup>d</sup> |                 |                 |                |                  |                  |                                |     |                     |

## **COLLOIDS**

A colloid is a particulate solution with particles that do not dissolve completely. These solutions are also called suspensions. It is a saline solution with large solute molecules which do not pass readily from plasma to interstitial fluid. The retained molecules in a colloid create an osmotic force called the colloid osmotic pressure or oncotic pressure that holds water in the vascular compartment.

## **VOLUME EFFECTS**

Colloid is about 3 times more effective in expanding the plasma volume than the crystalloid. Crystalloid fluids reduce the plasma COP whereas Colloid fluids can preserve the normal COP ie 20 to 30 mm Hg.

## **CLASSIFICATION**

Colloid solutions used in clinical practice are divided into the semi-synthetic colloids (gelatins, dextrans, and hydroxyethyl starches (HES) and the naturally occurring human plasma derivatives (human albumin solutions, plasma protein fraction, fresh frozen plasma, and immunoglobulin solution).

The semi-synthetic colloids and the various preparations of plasma proteins in solution have a wide distribution of molecular sizes and are described as “polydisperse”. Human albumin solution contains more than 95% albumin with a uniform molecular size and is described as “monodisperse.”

## **PROPERTIES**

The semi-synthetic colloids are a heterogeneous group of products that vary in the magnitude and duration of Plasma Volume Expansion (PVE), effects on hemostasis, interaction with endothelial and inflammatory cells, adverse drug reactions, and cost.

The predominant effect of colloid solutions on blood rheology is to reduce blood viscosity by hemodilution, thus improving blood-flow. The higher-Molecular Weight (MW) dextrans and HES cause an increase in plasma viscosity, and the larger dextrans and gelatins also tend to cause red cell aggregation<sup>23</sup>.

All of the semi-synthetic colloids affect hemostasis. This occurs partly as a result of hemodilution of clotting factors and effects on components of the hemostatic mechanism. The gelatins appear to have the least effect on hemostasis. HES solutions have varying effects on

hemostasis that are dependent on the MW of the HES molecule.<sup>24</sup> The dextrans are associated with more significant hemostatic derangements

Dextran and HES molecules may also have specific anti-inflammatory effects<sup>25</sup>.

Anaphylaxis or anaphylactoid events have been described in association with all of the semi-synthetic colloids and albumin.



## CHAPTER 5

### PERI-OPERATIVE FLUID MANAGEMENT

#### **Reduced Fasting Duration – Enhanced Recovery After Surgery Guidelines**

These guidelines were developed for patients who undergo elective colorectal surgery and in whom a significant delay in gastric emptying is not suspected.

1. Patients should be allowed to eat solid foods until 12 midnight and clear liquids until 2 to 3 hours before surgery or until they leave for the hospital.<sup>26,27</sup>
2. Patients should be encouraged to drink a suitable carbohydrate rich drink, upto 800 ml at bedtime the night before surgery and 400 ml until 2 to 3 hours before surgery or until they leave for the hospital.<sup>26,27</sup>

Studies<sup>28</sup> have shown that passive regurgitation and pulmonary aspiration occurs during anaesthesia when the gastric volume is more than 200 ml. Many recent studies have reported a preoperative mean gastric

fluid volume in the range of 10 to 30 ml , with 120 ml rarely exceeded in spite of intake of clear fluids.<sup>29</sup>

The Cochrane review<sup>30</sup> has recommended that ideally patients should come to surgery in a metabolically fed state, rather than starving and ketotic. A carbohydrate load given preoperatively may lead to reduced insulin resistance, decreased stress response to surgery, earlier return of bowel function and shortened length of stay. There is little evidence that carbohydrate loading results in improvement of other surgical outcomes<sup>31</sup>

The current guideline of solid intake of 6 hours is based on the estimated physiologic gastric emptying time for healthy patients. An ultrasonographic study by Soreide et al.<sup>32</sup> showed that 4 hours of fasting was required to guarantee complete emptying of solid particles after a light breakfast.

In summary, the evidence that favours reducing fasting times appears to be sufficient and is supported by numerous Worldwide guidelines. Reducing the fasting time to 2 hours for clear fluids and 6 hours for solids does not increase the risk of regurgitation or pulmonary complications in patients who are otherwise healthy.<sup>33</sup>

## **APPROACHES TO FLUID MANAGEMENT**

During peri-operative period, the fasting duration and subsequent trauma of surgery induces a range of neurohumoral and inflammatory changes, termed the stress response which can have a significant impact on fluid distribution.

Fluid requirement is a dynamic situation with great interindividual variability. This vary depending on patient factors, including weight and co-morbidity, and on surgical factors, such as the magnitude and site of surgery. Different fluid requirements are have been successfully used during the peri-operative period.

In “low-risk” minor surgery, fluid strategies may influence the incidence of relatively minor morbidity such as nausea and vomiting, whereas in major surgery the focus is on the potential for fluid administration to affect major postoperative morbidity and mortality.

IV fluid quantities may be given in two main ways :

1. By estimating the requirements based on patient weight, the phase of surgery, and nature of losses to estimate the required dose.

2. By direct measurement of an individual's physiologic variables, and administering fluid in sufficient quantities to achieve an improvement in these physiologic variables, so-called "Goal-directed therapy".

### **Traditional Fluid Management ( HOLLIDAY SEGAR FORMULA)**

This is based on historical estimates of fluid requirements during fasting (e.g., using the "4-2-1" calculation) and during episodes of excess loss, such as when body cavities are open or bleeding occurs. In preparing for elective surgery, oral clear fluid intake should continue until 2 hours preoperatively and longer fasting discouraged. The use of preoperative bowel preparation should be restricted to carefully selected cases, and in these cases an infusion of 1 to 2 L of balanced crystalloid with K<sup>+</sup> supplementation should be given in the preoperative period.

### **Maintenance Requirements for Water, Sodium and Potassium**

Sufficient water is required to balance gastrointestinal losses of 100–200 ml/day, insensible losses of 500–1000 ml/day (half of which is respiratory and half cutaneous); urinary losses of 1000 ml/day. The predicted daily maintenance fluid requirements for healthy, 70-kg adults is 2500 ml/day of a solution with a [Na<sup>+</sup>] of 30 mEq/l and a [K<sup>+</sup>] of 15–20 mEq/l.

**Table 1 : HOLLIDAY SEGAR FORMULA**

| <b>Weight (kg)</b> | <b>ml/kg/h</b> | <b>ml/kg/day</b> |
|--------------------|----------------|------------------|
| 1–10               | 4              | 100              |
| 11–20              | 2              | 50               |
| > 21               | 1              | 20               |

### **Surgical Fluid Requirements**

- Minimal tissue trauma (ex. herniorrhaphy) : 2-4 ml/kg/hr
- Moderate tissue trauma (ex. Cholecystectomy ): 4-8 ml/kg/hr
- Severe tissue trauma (ex. bowel resection) : 10 – 15 ml/kg/hr

### **Compensatory Intravascular Volume Expansion**

Vasodilation caused by anesthetics affects both the venous and arterial systems and may reduce cardiac preload and afterload. Cardiac output also may be decreased by the negative inotropic effect of anesthetic drugs. Therefore, fluid must be administered to expand the blood volume to compensate for venodilation. Compensatory Intravascular Volume Expansion (CIVE) with 5 to 7 ml/kg of balanced salt solution must occur prior to, or simultaneous with, the onset of anesthesia.

## **Bleeding**

Bleeding leads to direct loss of intravascular volume. Crystalloid being used to replace blood loss in a 3:1 ratio to account for crystalloid movement into the extravascular compartment<sup>34</sup>

## **Insensible losses**

The opening of anatomic compartments leads to evaporative fluid loss from mucosal surfaces, although estimating the extent of this loss may be difficult. Lamke et al<sup>35</sup> experimentally evaluated the insensible perspiration and proposed that it was highly overestimated. The authors calculated that baseline evaporation was approximately 0.5 ml/Kg/h in the awake adult and that it could increase to 1 mL/Kg/h at the most, during large abdominal surgery.

## **Inflammation-related redistribution**

Major surgery induces an inflammatory response that favors redistribution of fluid from the intravascular to the extracellular compartment.

## **A classic third space**

It was never localized and only “quantified” with one specific method using certain conditions regarding sampling and equilibration times, implying serious concerns and weaknesses. All other methods using various tracers, multiple sampling techniques, longer equilibration times, or analysis of kinetics contradict the existence of a fluid-consuming third space. Chappel D et. al.<sup>36</sup> concluded that a classic third space per se quantitatively does not exist. It is currently not more than an ill-defined compartment thought to reflect an otherwise unexplainable perioperative fluid shift.

An extension of the milliliter-per-kilogram approach to fluid administration has been to examine whether higher (e.g., 12 to 18 ml/kg/hr of intraoperative crystalloid) or lower (5 to 7 ml/kg/hr) fluid doses in the immediate peri-operative phase are associated with benefit after major surgery. Unfortunately, this work has been hampered by widely varying definitions of “restrictive/ conservative,” “standard,” and “liberal,” differing fluid types (colloids/crystalloids) examined, and different time courses over which the fluid strategy is applied. A common theme is that when fluid is given based on a milliliter-per-kilogram protocol and on clinical assessment rather than to target defined physiologic endpoints, the administration of more than 3500 to 5000 ml of crystalloid solution in the immediate

perioperative period is associated with increased postoperative morbidity. This may be reflected in increased weight gain, cardiopulmonary dysfunction, impaired wound healing, delayed GI function, and increased hospital length of stay .One study gives apparently conflicting results<sup>37</sup> although this may be partly accounted for by methodological differences with the other studies here.

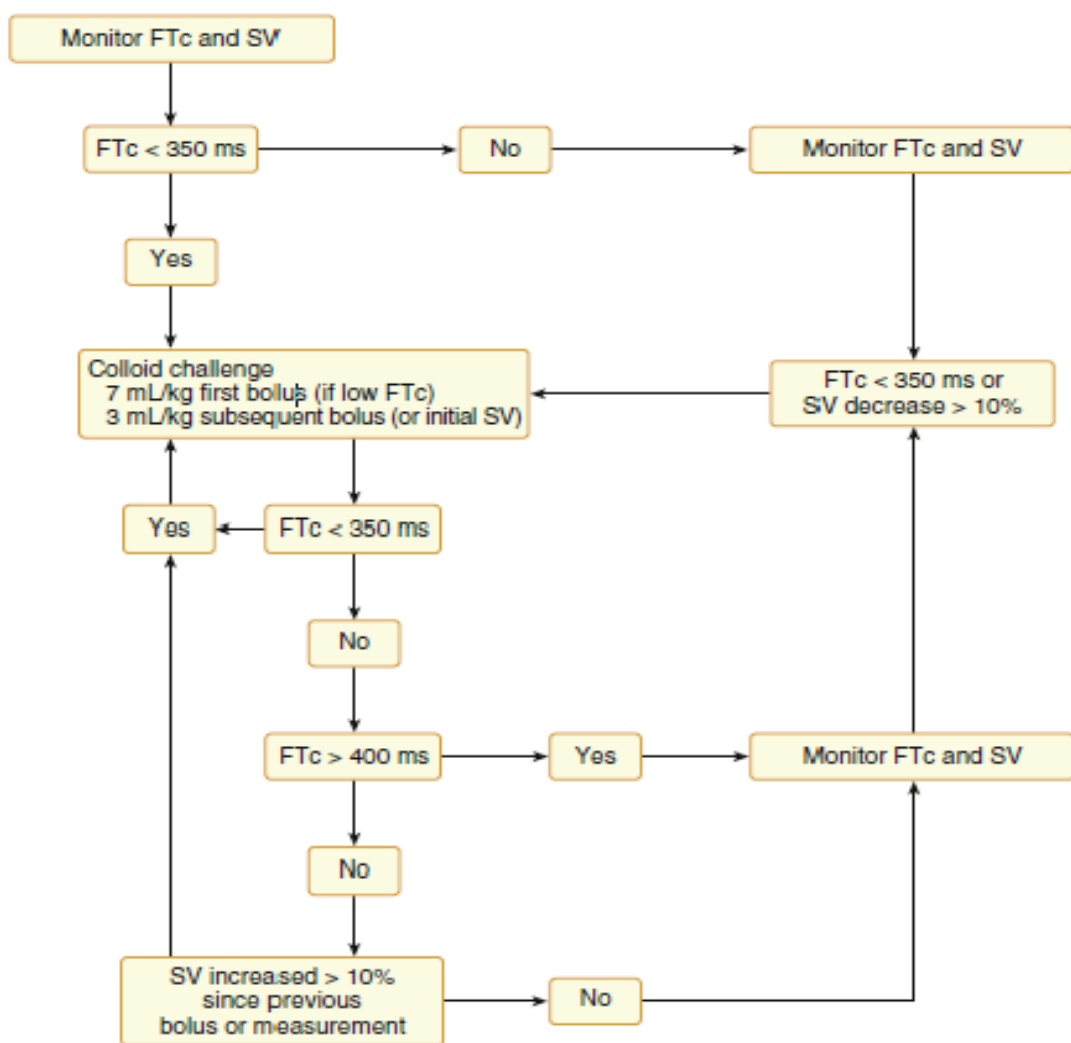
### **Modern Fluid Management<sup>38</sup>**

The modern approach to fluid management is based on the concept of goal-directed therapy (GDT), in which it is believed that interventions should be performed specifically to affect a meaningful clinical variable. It is based on measuring key physiologic variables related to cardiac output or global O<sub>2</sub> delivery and administering fluids to manipulate these variables toward levels associated with improved tissue perfusion and clinical outcome. The reality is that fluids can be harmful, and should only be given when they are expected to produce some benefit. Optimization of stroke volume using appropriate fluid management is the desired goal of perioperative fluid therapy.



Newer monitoring tools like Oesophageal Doppler Monitoring and optimization off Respiratory Variation are being increasingly recommended to guide fluid therapy.

**Figure 3 : Protocol for ODM-based intraoperative goal-directed fluid therapy.**



FTc, Heart rate-corrected descending aorta flow time; SV, stroke volume.

## **CHAPTER 6**

### **PERIOPERATIVE FLUID ASSESSMENT<sup>39</sup>**

Accurate assessments of intravascular fluid status are an essential part of perioperative care since it is a key variable influencing cardiac output (preload), and therefore tissue O<sub>2</sub> delivery.

#### **Assessment of Fluid Status by Physical Examination**

Obvious hypovolemia may manifest with tachycardia, reduced pulse pressure, hypotension, and increased capillary refill time. Examination of neck veins and passive leg raising test can yield useful information. The passive leg raising test (PLR) delivers a reversible endogenous fluid challenge by increasing venous return resulting from elevating the legs to 45 degrees in a supine patient and evaluating its effect on blood pressure and heart rate.

#### **Invasive Pressure Monitoring**

##### **Central Venous Pressure (CVP)**

CVP is a reasonable surrogate for the corresponding right atrial pressures. Single point estimates of CVP are of limited clinical value unless they are low (<5 mm Hg) and confirm an existing suspicion for

hypovolemia. Trends of CVP and their correspondence to clinical evidence of organ function and perfusion help to create a more meaningful picture of fluid needs and euvolemia.

### **Pulmonary Artery Catheters (PACs) and Pulmonary Artery Occlusion (Wedge) Pressures**

Pulmonary artery catheterization is an attractive option to measure both right and left heart and pulmonary artery pressures. Use of PACs has fallen over the last ten years due to higher complication rates, frequent misinterpretation of PAC data, and relative success with CVP-based methods for resuscitation in septic shock.

### **Cardiorespiratory Interactions and Dynamic Analysis of Fluid Status**

Cardiac output and blood pressure interact with the respiratory system in a predictable manner. Indices of intravascular fluid and preload assessment derived from positive pressure ventilator-induced arterial blood pressure changes include systolic pressure variability, the respiratory systolic variation test, stroke volume variability, and respiratory changes in arterial pulse pressure. Transthoracic echo offers a noninvasive and portable means of assessing fluid status.

## CHAPTER 7

### LIBERAL VS RESTRICTIVE FLUID PROTOCOL

Fluid management in the perioperative period has been extensively studied but, despite that, “the right amount” still remains uncertain. Over the last few decades, these circumstances lead to two “styles” of fluid management: the “**LIBERAL**” AND “**RESTRICTED**” fluid administration.

A standardized quantitative definition of the “liberal” and “restricted” fluid administration still remain uncertain. There are only heterogeneous examples in the literature.

**Table 2 : Liberal and Restricted fluid administration**

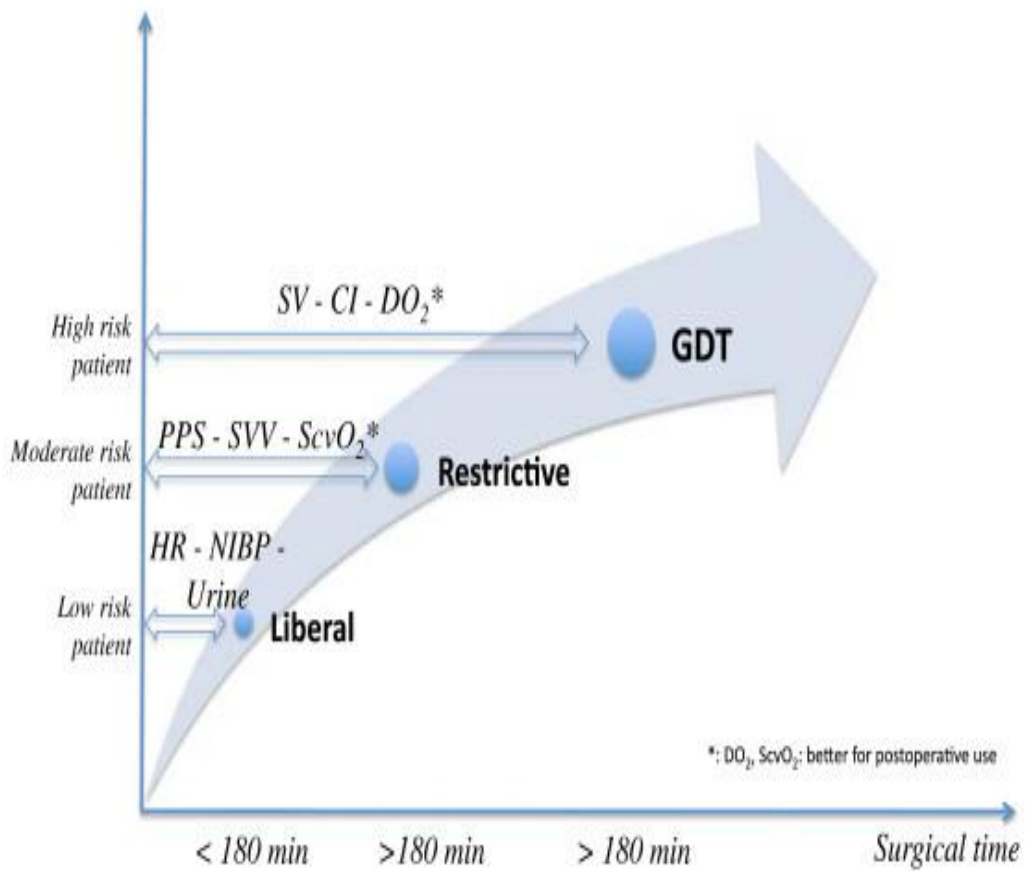
|                                                | <b>Liberal</b>                | <b>Restricted</b>              |
|------------------------------------------------|-------------------------------|--------------------------------|
| <b>Holte et al.<sup>40</sup></b>               | 30 ml/Kg/h                    | 10 ml/Kg/h                     |
| <b>Holte et al.<sup>41</sup></b>               | 18 ml/Kg/h RL + 7 ml/Kg/h HES | 5-7 ml/Kg/h RL + 7 ml/Kg/h HES |
| <b>Abraham-Nordling M. et al.<sup>42</sup></b> | 5 ml/Kg/h RL + 2 ml Gluc 2.5% | 2 ml/Kg/h Gluc 2.5%            |
| <b>Lobo S. et al.<sup>43</sup></b>             | 12 ml/Kg/h RL                 | 5 ml/Kg/h RL                   |

Chappell discussion about the type and duration of surgery<sup>36</sup> stated that a differentiation has to be made between major and minor operations as well as abdominal versus non-abdominal. In high risk surgical patients undergoing an intermediate to major risk surgery, evidence suggests the application of goal directed therapy (GDT), in which fluid administration is targeted on hemodynamic parameters (i.e. stroke volume) with the aim to maximize the oxygen delivery<sup>44</sup>. This approach should be the best thing to do, but there are limitations like invasiveness and the poor accuracy and precision of the non-invasive devices. In moderate to high risk patients undergo major surgery expected to last more than 180 minutes, a Goal Directed fluid Therapy (GDT) could reduce complications. Finally, several studies suggest that in low-risk patients undergoing minor to intermediate risk surgery and surgery in ambulatory setting, liberal strategy (non-restrictive) may be preferable. It reduces some postoperative complications such as nausea, vomiting, drowsiness, dizziness and length of stay<sup>45, 46</sup>.

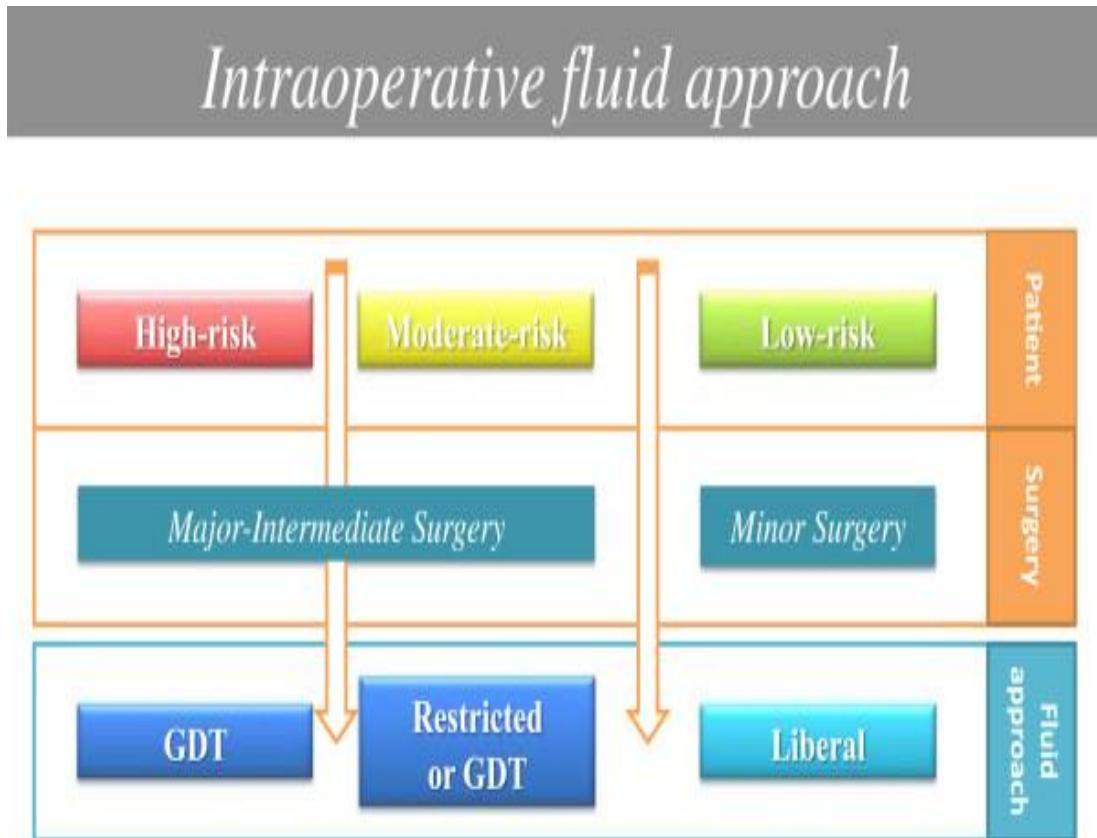
Current evidence suggests that liberal fluid is a good idea where major trauma and fluid shifting are unlikely, but more careful fluid management may be beneficial in more stressful operations.

Figure 4 : Hemodynamic monitoring on the basis of patient risk, surgical type and time.

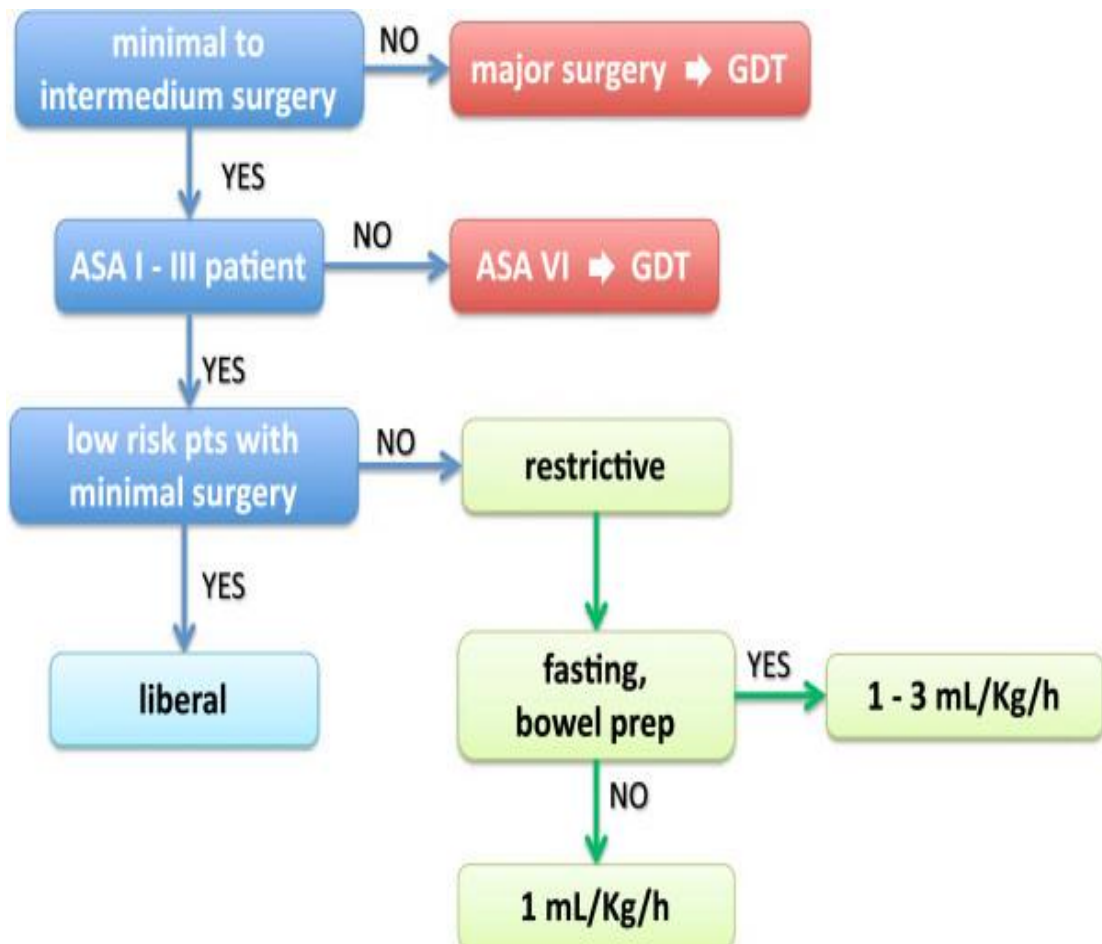
Patient risk, monitoring, fluid goal and surgical time



**Figure 5 : Intra-operative Fluid approach**



**Figure 6 : Perioperative fluid therapy**





## **CHAPTER 8**

### **REVIEW OF LITERATURE**

#### **Suntheralingham Yogendran, M.D.( 1995) et al <sup>11</sup>**

This study investigated the impact of peri-operative fluid status on adverse clinical outcomes in ambulatory surgery. Two hundred ambulatory surgical patients were prospectively randomized into two groups to receive high (20 mL /kg) or low (2 mL /kg) infusions of isotonic electrolyte solution over 30 min preoperatively. A standardized balanced anesthetic was used. A minimal amount of fluid was given during the intraoperative and postoperative periods. Adverse outcomes were assessed by an investigator blinded to the fluid treatment group at 30 and 60 min after surgery, at discharge, and the first postoperative day. The incidence of thirst, drowsiness, and dizziness was significantly lower in the high-infusion group at all intervals. Perioperative hydration of 20 mL/kg for patients undergoing general anesthesia for short ambulatory surgery was recommended in this study.

#### **Ali S.Z et al (2003) et al <sup>47</sup>**

This prospective, double-blinded, randomized controlled study was carried out in eighty patients attending for laparoscopic cholecystectomy or

gynaecological surgery. They were randomly allocated to receive 2 ml/kg (conservative) or 15 ml/kg (supplemental) Hartmann's solution intravenously, shortly before induction of anaesthesia. During surgery, fluid management was identical in both groups. During the first post-operative 24 h, post-operative nausea and vomiting occurred in 73% of patients in the conservative fluid group and 23% in the supplemental fluid group . It was concluded that supplemental pre-operative fluid is an inexpensive and safe therapy for reducing post-operative nausea and vomiting.

**Maharaj C.H. et al ( 2005)<sup>48</sup>**

A Randomized study was conducted on eighty patients undergoing gynecologic laparoscopy. Patients received either large (2 ml/kg per hour fasting) or small (3 ml/kg) volume infusions of compound sodium lactate solution over 20 min preoperatively. A standardized balanced anesthetic was used. The incidence and severity of PONV and pain, and need for supplemental antiemetic and analgesic therapy, were assessed by a blinded investigator at 0.5, 1, and 4 h postoperatively, and on the first and third postoperative days. The incidence and severity of PONV were significantly reduced in the large volume infusion group (59%) compared to small volume infusion group (87%). Postoperative pain scores and supplemental analgesia were also decreased in large volume infusion group. The study

concluded that preoperative correction of intravascular volume deficits effectively reduced PONV and postoperative pain in high risk patients presenting for ambulatory surgery.

**Chaudhary et al (2008)<sup>49</sup>**

This prospective randomized clinical trial was conducted on 60 female patients undergoing elective open cholecystectomy. Patients were randomly allocated to three equal groups A, B and C. All patients received pre-operative fluid supplementation. Group A patients received 2 ml/kg Ringer lactate iv (intravenously) and served as control, Group B patients received 12 ml/kg Ringer lactate iv whereas Group C patients received 12 ml/kg of 4.5 per cent hydroxyethylstarch (Hetastarch) iv. All patients received intra-operative fluid replacement by Ringer's lactate (6 ml/kg/h). An independent blinded observer assessed PONV during first 24 h following surgery using visual analogue scale (VAS). VAS scores in Groups B and C patients were less than that of Group A patients and became significantly different at 4 h post-operatively. The VAS scores of Groups B and C patients were comparable throughout. Rescue antiemetic was required in 90% of patients as compared to 50 and 55 per cent patients in Group B and Group C, respectively. Pre-operative intravenous fluid

supplementation using crystalloids and colloids resulted in significantly decreased incidence of PONV.

**Adanir Tayfun et al (2008)<sup>50</sup>**

This study evaluated the effect of preoperative and intraoperative hydration (the necessary amount of fluid preoperatively to cover the fluid deficit) on PONV. The patients were randomly assigned to one of two groups, each having 104 patients. Group 1 received intraoperative volume replacement and Group-II received preoperative volume replacement. Postoperative antiemetic efficacy was assessed by the ratio of the patients that require an antiemetic over the whole group. The PONV was significantly less detected in Group 2 (48%) than Group 1 (64%). The study concluded that PONV was reduced when the fluid deficit was replaced preoperatively.

**Ahmed Turkistani et al (2009)<sup>51</sup>**

This study was carried out on 80 patients who underwent Laparoscopic cholecystectomy. The patients were divided into four groups (each 20 patients), to receive preloading of intravenous fluid, as follows: Group 1 received 10 ml/kg of low-MW tetrastarch in saline, group 2 received 10 ml/kg medium-MW pentastarch in saline, group 3 had 10 ml/kg

of high-MW heta-starch in saline and group 4 received 10 ml/kg Ringer lactate and this was considered as the control group. All patients received the standard anesthetic technique. Postoperatively, the need for antiemetics and/or analgesics was recorded and the incidence of PONV was recorded at two and 24 hours. The highest incidence of PONV was in group 3 (75% of the patients) compared to the other three groups and the need for antiemetic therapy was highest in group 3 (70%), followed by group 2 (60%), and then group 1(35%), and the least one was in the control group (25%). It was concluded that Preoperative fluid supplementation with LR, in a dose of 10 ml/kg, produced a lower incidence of PONV compared to colloid solutions. Tetrastarch could be a good alternative to LR, for prevention of PONV, due to its long lasting effect, up to 24 hours, postoperatively.

**Gaurav Chauhan et al ( 2013)<sup>52</sup>**

This prospective, randomized, double blinded study was conducted in 200 patients in the age group 20-40 years undergoing ambulatory gynaecological laparoscopic surgery. They were randomized into two equal groups. Intra-operatively, Group I received 10 ml/kg Compound Sodium Lactate and Group II received 30 ml/kg Compound Sodium Lactate. In the first 4 h after anaesthesia, the incidence of nausea and vomiting in Group I was 66% as compared to 40% in Group II. Anti-emetic use was less in the

group II (13%) as compared to Group I(20%). This study concluded that intravenous hydration is a safe and effective means of preventing PONV and ensuring patient satisfaction at the time of discharge.

**Selcuk Yavuz et al (2014)<sup>53</sup>**

This study investigated the effects of preoperative intravenous hydration on postoperative nausea and vomiting in high APFEL scored patients undergoing laparoscopic cholecystectomy surgery. It was performed in 50 female patients who had APFEL score 3-4. The patients were divided into 2 groups. Group 1 had 15 ml/kg of Ringer Lactate and Group 2 received 2ml/kg Of Ringer lactate .In group 1 , the nausea VAS score was lower. When the total number of patients who had nausea and vomiting, more patients suffered nausea in Group II. Hence the study stated that Preoperative hydration may be effective in high APFEL scored patients to prevent postoperative nausea.

**Chohedri et al (2006)<sup>54</sup>**

This prospective randomized double-blind study was carried out in two hundred ambulatory surgical patients. They were randomly assigned into two groups. Before induction of anesthesia Group A received 20 ml/kg of 0.9% sodium chloride and Group B received 2 ml/kg of 0.9% sodium

chloride over 30 minutes. A standard general anesthetic technique was used. The following adverse postoperative outcomes like nausea, vomiting, dizziness, and thirst were assessed at 30 and 60 minutes postoperatively and at discharge. The incidence of postoperative vomiting and thirst was significantly decreased in group A compared to group B ( $p = 0.014$  and  $p = 0.029$ , respectively). There was no difference in the incidence of nausea and dizziness between the two groups. This study concluded that preoperative high dose hydration can efficiently decrease the incidence of postoperative thirst and vomiting within the first 60 minutes in ambulatory surgeries .

**Apfel CC et al(2012)**<sup>55</sup> performed a literature search using CENTRAL, MEDLINE, EMBASE, CINAHL, and Web of Science. They included prospective randomized controlled trials that reported PONV event rates in patients receiving supplemental i.v. crystalloids or a conservative fluid regimen after elective surgery under general anaesthesia. Studies were evaluated and the following results were given. Compared with conservative fluids, i.v. crystalloids reduced the risk of early postoperative nausea ( $P=0.003$ ), late nausea ( $P=0.004$ ), and overall nausea ( $P=0.02$ ). I.V. crystalloids did not reduce the risk of early postoperative vomiting ( $P=0.16$ ) or late post-operative vomiting ( $P=0.09$ ) but reduced overall vomiting ( $P=0.004$ ). I.V. crystalloids did not reduce the risk of early PONV ( $P=0.16$ )

but reduced the risk of late PONV ( $P < 0.001$ ) and overall PONV ( $P = 0.003$ ). I.V. crystalloids reduced the need for antiemetic rescue treatment ( $P < 0.001$ ). It concluded that supplemental i.v. crystalloids were associated with a lower incidence of several PONV outcomes.

**Holte K et al(2004)**<sup>56</sup> compared intraoperative administration of 40 mL/kg with 15 mL/kg LR in 48 patients undergoing laparoscopic cholecystectomy. He concluded that intraoperative administration of 40 mL/kg compared with 15 mL/kg LR improves postoperative organ functions and recovery and shortens hospital stay. Nausea, general well-being, thirst, dizziness, drowsiness, fatigue, and balance function were also significantly improved, as well as significantly more patients fulfilled discharge criteria and were discharged on the day of surgery with the high-volume fluid substitution.

**Brandstrup et. al (2003)**<sup>57</sup> compared a liberal vs. restrictive fluid strategy in 172 patients undergoing colorectal surgery. The liberal patients received 500 ml of 6% HAES and 500 ml NS loading, followed by NS at 7 mL/kg/h for one hour, then 5 mL/kg/hr for two hours, then 3 mL/kg/hr afterwards, with 500 ml blood loss replaced by NS, 500-1500 ml EBL replaced with 6% HAES, and over 1500 ml replaced with blood components. The restrictive group, by contrast, received only 500 ml of



D5W (minus whatever oral intake occurred during fasting) and volume to volume blood loss with 6% HAES up to 1500 ml EBL. Total IV fluids average 5.4 L for the liberal group and 2.7 L for the restrictive group. The restrictive regimen appeared to reduce the incidence of major and minor complications (ex. anastomotic leakage, pulmonary edema, pneumonia, and wound infection). More specifically, the numbers of both cardiopulmonary (7% versus 24%,  $P = 0.007$ ) and tissue-healing complications (16% versus 31%,  $P = 0.04$ ) were significantly reduced. No patients died in the restricted group compared with 4 deaths in the standard group (0% versus 4.7%,  $P = 0.12$ ). Despite a perioperative decrease in urine output, acute renal failure did not occur in any patient. However, Brandstrup's data was confounded by the introduction of colloids, as colloids were predominantly given to the restrictive group and the liberal group received  $> 5$  L crystalloids.

**Nisanevich et. al(2005)<sup>58</sup>**

Nisanevich et al. randomized 152 patients undergoing various abdominal procedures to receive intra-operatively either liberal (10 ml/kg bolus followed by 12 ml/kg/hr) vs. restrictive (4 ml/kg/hr) amount of lactated ringers solution. The number of patients with complications was lower in the RPG ( $P = 0.046$ ). They found decreased postoperative

morbidity (including improved GI recovery and a shortened hospital stay), under a protocol-based, more restrictive fluid therapy (1.2 L vs. 3.7 L).

**McCaul et al(2003)**<sup>59</sup> compared iv fluid loading with and without supplementary dextrose for the prevention of postoperative nausea and vomiting (PONV). 120 ASA I female patients undergoing elective gynecological laparoscopy were randomized to one of three groups, and received either: (a) CSL 1.5 ml/kg per hour fasting duration; (b) CSL, 1.5 mL/kg per hour fasting duration with 0.5 g/kg dextrose added in 50% formulation (CSL/dextrose); or (c) no iv fluid (control). The CSL/dextrose group reported increased PONV episodes, pain and thirst compared to control. They concluded that administration of dextrose is associated with nausea, increased opioid requirement and late thirst after elective gynecological laparoscopy and iv fluids did not decrease PONV.

**Holte K et al(2007)**<sup>41</sup> investigated the effects of two regimens of intraoperative fluids with physiological recovery as the primary outcome measure after fast-track colonic surgery. 32 ASA I-III patients undergoing elective colonic surgery were randomized to 'restrictive'(median 1640 ml, range 935-2250 ml) (Group 1) or 'liberal' (median 5050 ml, range 3563-8050 ml) (Group 2) perioperative fluid administration. A 'restrictive' fluid

regimen led to a transient improvement in pulmonary function and postoperative hypoxemia but no other differences in all-over physiological recovery compared with a 'liberal' (corrected) fluid regimen after fast-track colonic surgery.

**Abraham Nordling M et al(2012)**<sup>42</sup> trial was conducted to examine whether an extremely restricted perioperative fluid protocol would reduce hospital stay beyond the existing fast-track hospital time of 7 days after surgery. Seventy-nine patients were randomized to restricted and 82 to standard fluid therapy. Patients in the restricted group received a median of 3050 ml fluid on the day of surgery compared with 5775 ml in the standard group ( $P < 0.001$ ). The proportion of patients with complications was significantly lower in the restricted group (31 of 79 versus 47 of 82;  $P = 0.027$ )

## **CHAPTER 9**

### **MATERIALS AND METHODS**

This was a prospective randomized study done on patients undergoing puerperal sterilization under GA as day care procedure in Government RSRM Lying-in Hospital, Chennai.

After obtaining the approval of the Institutional Ethical Committee, a randomized, prospective study was conducted on 102 patients over a period of six months.

#### **INCLUSION CRITERIA**

ASA PS 1 and 2 patients aged between 18 and 40 years undergoing puerperal sterilization under GA as day care procedure.

#### **EXCLUSION CRITERIA**

1. BMI > 30
2. Smokers
3. History of Motion Sickness
4. Unstable haemodynamics
5. Systemic Illness involving renal, cardiac, GIT and nervous system
6. Diseases complicating pregnancy

## **GROUPS**

- Group R (Restrictive Fluid Protocol) patients received 2 ml /kg of Ringer Lactate.
- Group L (Liberal Fluid Protocol) patients received 15 ml/kg of Ringer Lactate.

## **MONITORING**

ECG, ANIBP, SaO<sub>2</sub>, ETCO<sub>2</sub>, Temperature

## **METHODOLOGY**

After ethical committee approval and written consent, ASA PS 1 and 2 patients aged between 18 and 40 years, undergoing puerperal sterilization under GA as day care procedure and meeting inclusion criteria were drafted into the study. The exclusion criteria were BMI > 30, Smokers, History of Motion Sickness, Unstable haemodynamics, Systemic Illness involving renal, cardiac, GIT and nervous system and Diseases complicating pregnancy.

## **SAMPLE SIZE AND RANDOMIZATION**

Based on the previous study<sup>48</sup> with a statistical power of 95% and an alpha error of 0.05, the sample size was calculated to be 102. Patients were randomized into 2 groups of 51 each by computer generated randomization from website [www.randomizer.org](http://www.randomizer.org) generated by a biostatistician not directly involved in the study.

Once patients were co-opted for the study, they were assessed preoperatively by an anaesthesiologist and relevant investigations were ordered in keeping with the institution protocols. The patients were familiarized with the use of VAS scale. In the premedication room, IV line was established and standard monitors applied included ECG, ANIBP, SaO<sub>2</sub>, ETCO<sub>2</sub> and temperature using a L&T Star 60 monitor.

An anaesthesiologist opened the randomization cover and based on the group allocation, administered the prescribed fluid intervention. Group R (Restrictive fluid protocol) patients received 2ml/kg of Ringer Lactate over 20 minutes. Group L (Liberal fluid protocol) patients received 15 ml/kg of Ringer Lactate in a similar manner. This anaesthesiologist no longer participated in the study.

In the OT, a different anaesthesiologist blinded to the preloading recorded the baseline haemodynamic parameters and re-oriented the patient to the use of VAS scale. Preoxygenation was done with 100% oxygen. General anaesthesia was induced with Inj. Glycopyrrolate 0.2 mg, Inj. Midazolam 0.02 mg/kg, Inj. Pentazocine lactate 0.5 mg/kg and Inj. Ketamine hydrochloride 1.5 mg/kg given intravenously. Oxygen was administered with a facemask and ventilation was assisted as necessary. After assessing adequate depth of anaesthesia, surgery was started, and anaesthesia was supplemented as necessary, with boluses of Inj. Ketamine 0.5 mg/kg. Intra-operative fluid was administered in the form of Ringer Lactate at 2ml/kg/hour. After completion of surgery, the wound was infiltrated with 0.5% Bupivacaine 5 ml. Intra-operatively, haemodynamics and any adverse events during the course of surgery were noted.

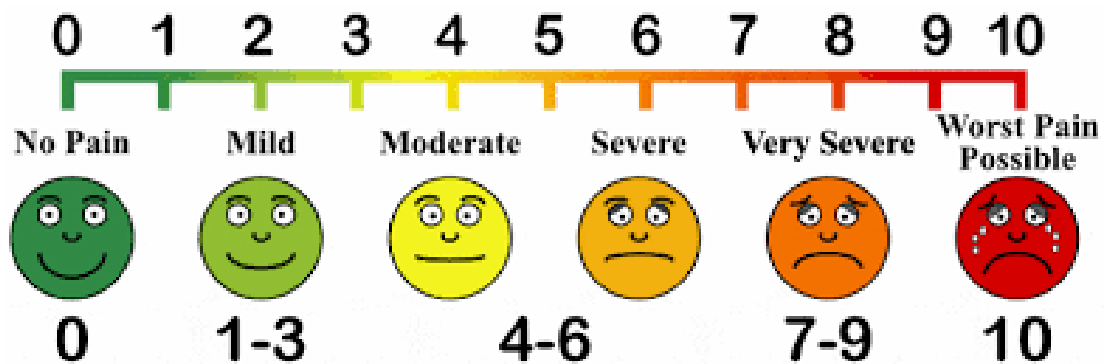
Post-operatively, patient received Oxygen by Hudson mask at 4 L/min for 4 hours. Ringer lactate was administered at 2 ml/kg/hour for 6 hours and then discontinued. If the patient felt comfortable she was allowed to take water orally. The quantity and frequency were determined by the patient's needs. If patient developed vomiting, Inj. Ondansetron 4 mg was administered as rescue anti-emetic. If vomiting continued, oral water was

discontinued and Ringer Lactate started at 2 ml/kg /hour. Subsequent assessment was made at 12 hour and 24 hours.

## DATA CAPTURE AND INTERPRETATION

Post-operatively patient was assessed at 2, 6, 12 and 24 hours by an anaesthesiologist who has not participated in the study. Pain was assessed using the VAS scale. When VAS score was more than 5, or patient demanded, rescue analgesic was administered in the form of Inj. Tramadol 50 mg slow IV.

**Figure 7 : VAS Scale For Pain**



Nausea, when solicited during assessment by the research personnel, is defined as the urge to vomit. It is scored with a four-point numerical scale from 0 to 3, with 0 - no nausea, 1 - mild nausea, 2 - moderate nausea, and 3 - severe nausea. Incidence of PONV from 0-2 hours post-operatively is labeled as 'early PONV' and that after two hours is



labeled as ‘late PONV’. Inj.Ondansetron 4 mg IV is used as a rescue antiemetic.

**Table 3 : 4 POINT PONV SCALE**

| <b>4 POINT PONV SCALE</b> |                 |
|---------------------------|-----------------|
| 0                         | NO Nausea       |
| 1                         | MILD Nausea     |
| 2                         | MODERATE Nausea |
| 3                         | SEVERE Nausea   |

Post-operative Ileus was recorded by a history of passing flatus, auscultation of bowel sounds and defecation.

Post-operative ambulation and exercise capacity was tested at 12 and 24 hours by the validated TUG test (timed Up and Go test). It consists of patient being seated on the bed, getting off it, walking 3 meters turning walking back to the bed and seating themselves on the bed. The time taken will be recorded.

General Well Being of the patient was recorded by asking for symptoms of Thirst, Dizziness, Headache, Drowsiness and Fatigue.

Presence of symptoms is indicated by 1 point and the absence by 0 point. A score of  $\leq 2$  is considered as good general condition.

Discharge criteria is assessed using the Post Anaesthetic Discharge Scoring System. Out of a total score of 10, a score of  $\geq 8$  is considered fit for discharge.

**Table 4 : Post Anaesthetic Discharge Scoring System**

| <b>PADSS SCALE</b>       |                              |                              |                             |
|--------------------------|------------------------------|------------------------------|-----------------------------|
|                          | 2                            | 1                            | 0                           |
| Vital signs              | Within 20 % of baseline      | 20 - 40%                     | >40%                        |
| Activity & Mental status | Oriented X 3 and steady gait | Oriented X 3 or steady gait  | Neither                     |
| Pain, PONV               | Minimal                      | Moderate, received treatment | Severe, Receiving treatment |
| Surgical Bleeding        | Minimal                      | Moderate                     | Severe                      |
| Intake/ Output           | PO fluid and voided          | PO fluids or Voided          | Neither                     |

## **CHAPTER 10**

### **OBSERVATION AND ANALYSIS**

The information gathered from the selected cases were noted in the master chart. The collected data were analyzed with IBM.SPSS Statistics software 23.0 Version. To describe about the data, descriptive statistics, frequency analysis, percentage analysis were used for the categorical variables and the mean and standard deviation were used for continuous variables. To find the significant difference between the bivariate samples in Independent groups the Unpaired sample t-test was used. To find the significance in categorical data Chi-Square test and Fisher's exact test was used. In all the above statistical tools the probability value of  $<0.05$  is considered as significant.

This study was designed to compare the effect of “liberal vs. restrictive” fluid protocol on post-operative nausea vomiting and discharge criteria in patients undergoing puerperal sterilization under GA as day care surgery 102 patients were selected and randomized.

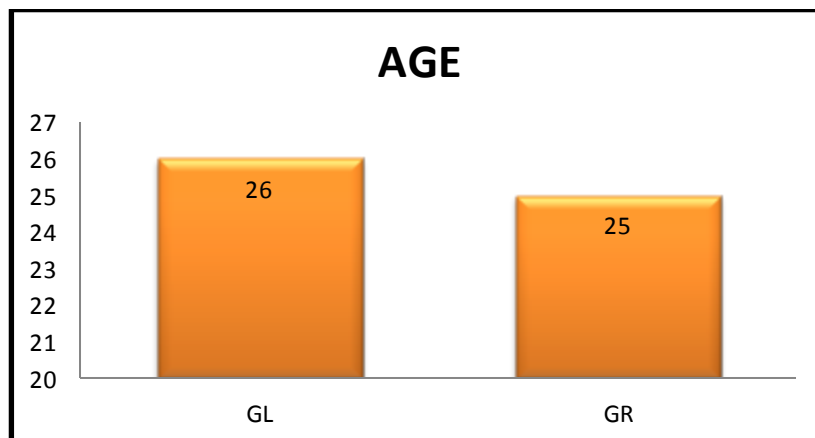
## DEMOGRAPHIC PROFILE

### AGE DISTRIBUTION

**Table 5 : Distribution of Age**

| AGE DISTRIBUTION |       |       |          |
|------------------|-------|-------|----------|
| Age(in years)    | GROUP | GL    | GROUP GR |
| Mean             |       | 25.94 | 25.47    |
| S.D              |       | 3.301 | 3.331    |
| 'p' value        |       | 0.475 |          |

**Figure 8 : Age Distribution**



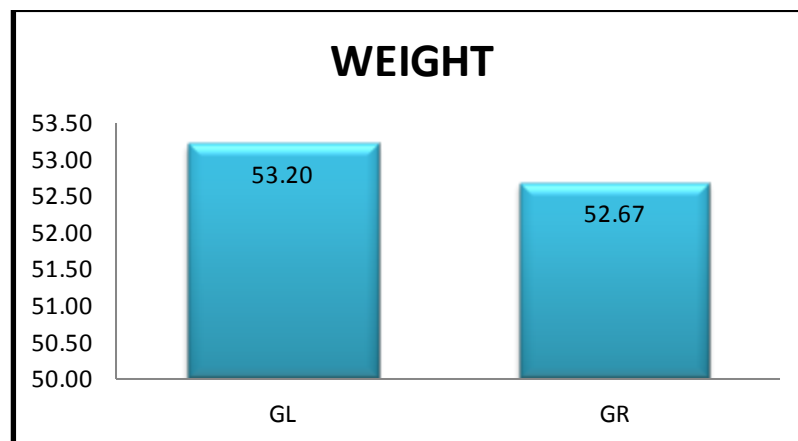
The mean age of patients in Group GL was 25.94. In GR Group, the mean age of patients was 25.47. The age group 'p' value is 0.475 which is statistically not significant.

## WEIGHT DISTRIBUTION

**Table 6 : Distribution of Weight**

| WEIGHT DISTRIBUTION |       |       |          |
|---------------------|-------|-------|----------|
| Weight(in kgs)      | GROUP | GL    | GROUP GR |
| Mean                |       | 53.20 | 52.67    |
| S.D                 |       | 8.355 | 7.536    |
| 'p' value           |       | 0.738 |          |

**Figure 9 : Comparison of Weight**



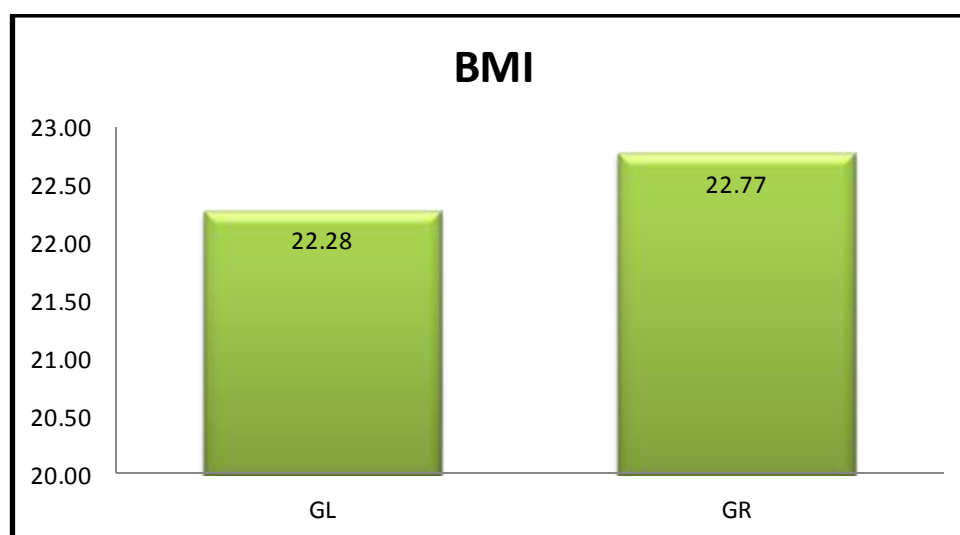
The mean weight of patients in Group GL was 53.20. In Group GR, the mean weight of patients was found to be 52.67. The 'p' value is 0.738 which is statistically not significant.

## BMI DISTRIBUTION

**Table 7 : Distribution of BMI**

| BMI DISTRIBUTION            |       |       |          |
|-----------------------------|-------|-------|----------|
| BMI (in kg/m <sup>2</sup> ) | GROUP | GL    | GROUP GR |
| Mean                        |       | 22.28 | 22.77    |
| S.D                         |       | 3.208 | 3.374    |
| 'p' value                   |       | 0.453 |          |

**Figure 10 : Comparison of BMI**



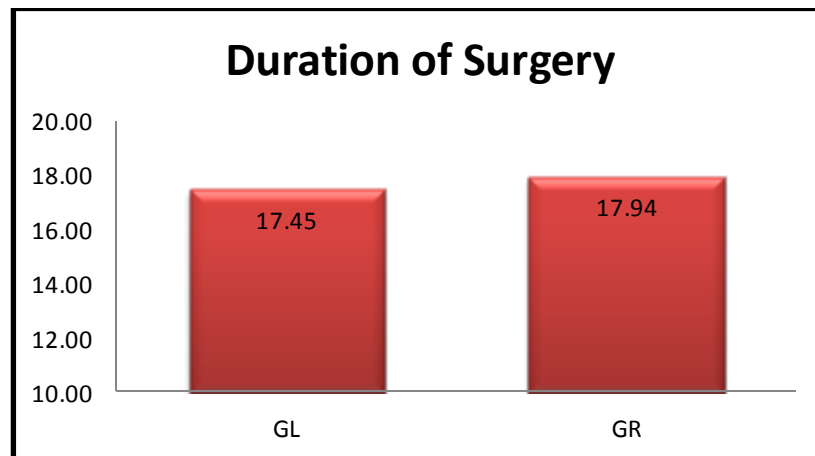
The mean BMI of patients in Group GL was 22.28. In Group GR, the mean BMI of patients was 22.77. The 'p' value is 0.453 which is statistically not significant.

## DURATION OF SURGERY

**Table 8 : Duration Of Surgery**

| DURATION OF SURGERY           |       |       |          |
|-------------------------------|-------|-------|----------|
| Duration of surgery (minutes) | GROUP | GL    | GROUP GR |
| Mean                          |       | 17.45 | 17.94    |
| S.D                           |       | 2.524 | 2.485    |
| 'p' value                     |       | 0.325 |          |

**Figure 11 : Duration Of Surgery**



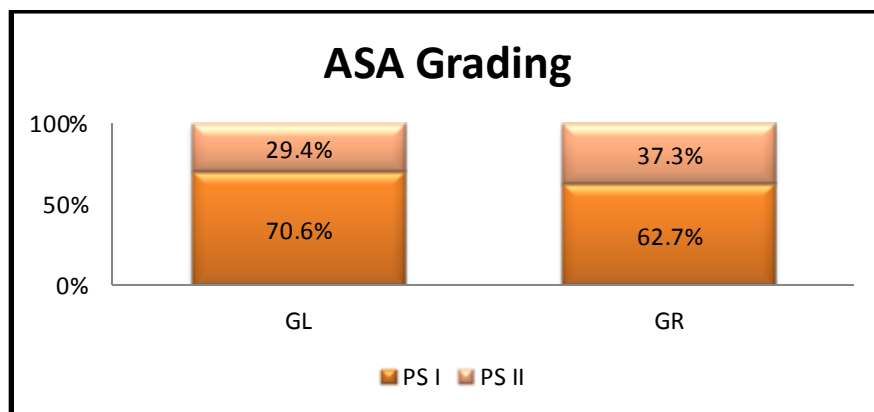
The mean duration of surgery in Group GL was 17.45 minutes. In Group GR, the mean duration of surgery was 17.94 minutes. The 'p' value is 0.325 which is statistically not significant.

## ASA DISTRIBUTION

**Table 9 : ASA Distribution**

| ASA DISTRIBUTION |                |      |                |      |
|------------------|----------------|------|----------------|------|
|                  | GROUP GL       |      | GROUP GR       |      |
|                  | No.of patients | %    | No.of patients | %    |
| <b>PS I</b>      | 36             | 70.6 | 32             | 62.7 |
| <b>PS II</b>     | 15             | 29.4 | 19             | 37.3 |
| <b>TOTAL</b>     | 51             | 100  | 51             | 100  |
| <b>'p' value</b> | 0.529          |      |                |      |

**Figure 12 : Comparison of ASA Distribution**



In Group GL, the no. of patients in PS I is 36 which is 70.6% and the no. of patients in PS II is 15 which is 29.4%. In Group GR, the no. of patients in PS I is 32 which is 62.7% and the no. of patients in PS II is 19 which is 37.3%. The 'p' value was found to be 0.529 which is statistically not significant.

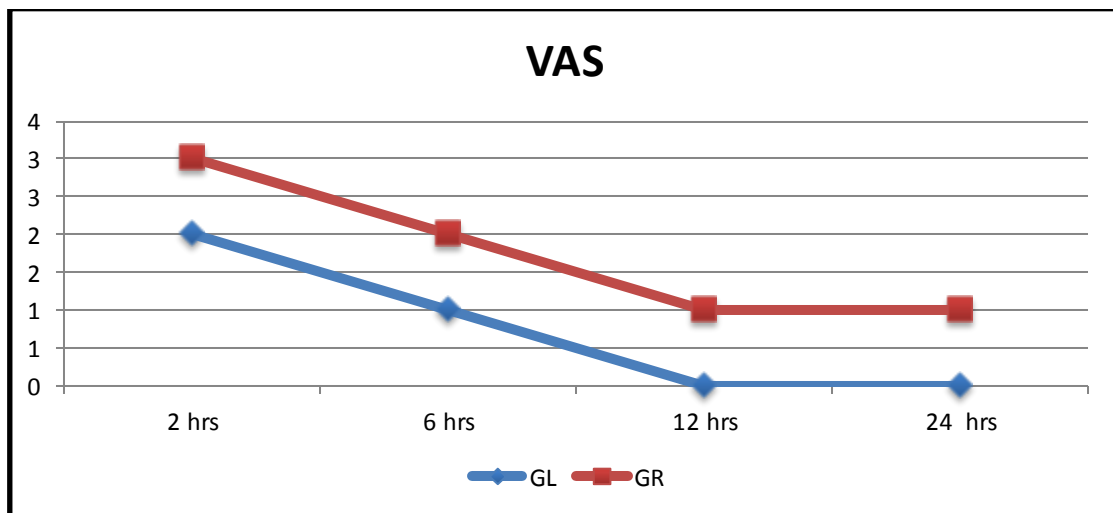


## COMPARISON OF VAS

**Table 10 : Comparison of VAS**

| COMPARISON OF VAS |          |       |          |       |           |
|-------------------|----------|-------|----------|-------|-----------|
|                   | GROUP GL |       | GROUP GR |       |           |
| VAS               | Mean     | SD    | Mean     | SD    | 'p' VALUE |
| <b>2 hours</b>    | 1.75     | 0.771 | 3.14     | 0.693 | 0.0005    |
| <b>6 hours</b>    | 1.08     | 0.688 | 2.31     | 0.735 | 0.0005    |
| <b>12 hours</b>   | 0.45     | 0.610 | 1.37     | 0.747 | 0.0005    |
| <b>24 hours</b>   | 0.20     | 0.401 | 0.71     | 0.576 | 0.0005    |

**Figure 13 : Comparison of VAS**



In GL group, the mean VAS score at 2 hours was 1.75. At 6 hours, the mean VAS score was 1.08. At 12 hours the mean VAS score was 0.45. At 24 hours the mean VAS score was 0.20.

In GR Group, the mean VAS score at 2 hours was 3.14. At 6 hours, the mean VAS score was 2.31. At 12 hours the mean VAS score was 1.37. At 24 hours the mean VAS score was 0.71.

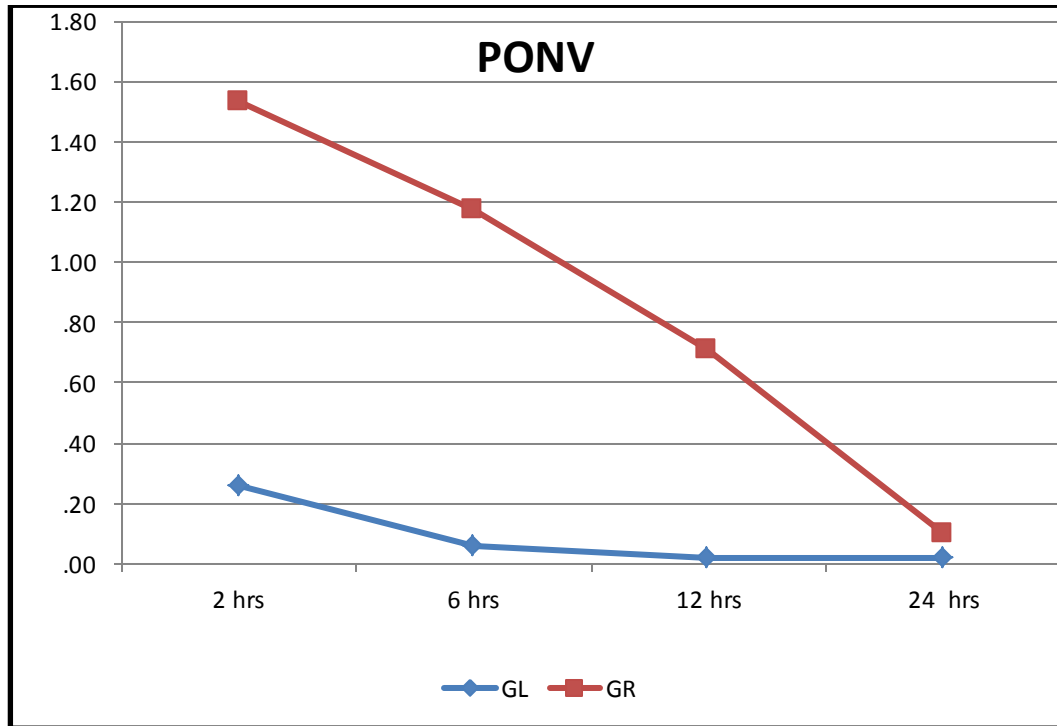
The 'p' value at 2, 6, 12, 24 hours was found to be 0.0005 respectively which is statistically significant.

## POSTOPERATIVE NAUSEA AND VOMITING

**Table 11 : Comparison of PONV**

| COMPARISON OF PONV |          |       |          |       |           |
|--------------------|----------|-------|----------|-------|-----------|
| PONV               | GROUP GL |       | GROUP GR |       | 'p' VALUE |
|                    | Mean     | SD    | Mean     | SD    |           |
| <b>2 hours</b>     | 0.25     | 0.440 | 1.53     | 0.612 | 0.0005    |
| <b>6 hours</b>     | 0.06     | 0.238 | 1.18     | 0.434 | 0.0005    |
| <b>12 hours</b>    | 0.02     | 0.140 | 0.71     | 0.460 | 0.0005    |
| <b>24 hours</b>    | 0.02     | 0.140 | 0.10     | 0.300 | 0.094     |

**Figure 14 : Comparison of PONV**



In GL group, the mean PONV score at 2 hours was 0.25. At 6 hours, the mean PONV score was 0.06. At 12 hours the mean PONV score was 0.02. At 24 hours the mean PONV score was 0.02.

In GR Group, the mean PONV score at 2 hours was 1.53. At 6 hours, the mean PONV score was 1.18. At 12 hours the mean PONV score was 0.71. At 24 hours the mean PONV score was 0.10.

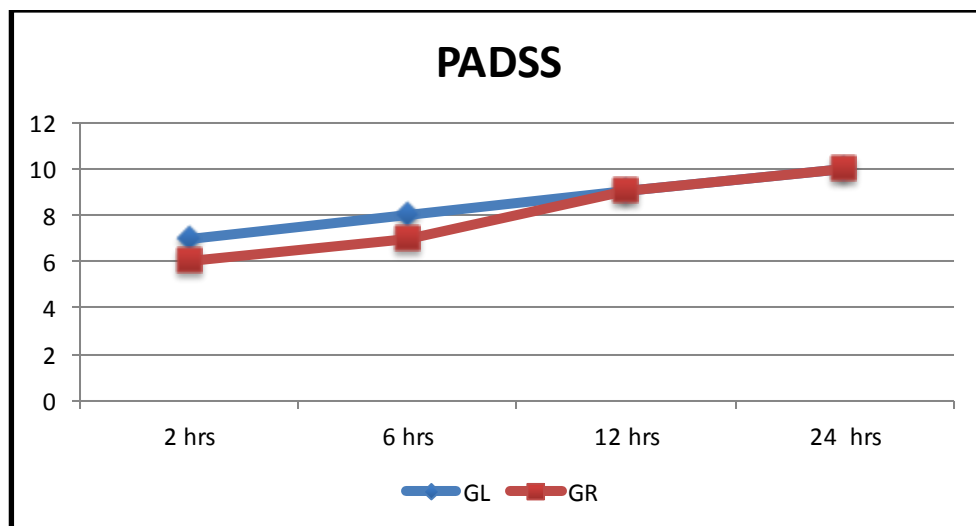
The 'p' value at 2, 6, 12 hours was found to be 0.0005 respectively which is statistically significant and at 24 hours the 'p' value is 0.094 which is statistically not significant.

## PADSS

**Table 12 : Comparison of PADSS**

| COMPARISON OF PADSS |          |       |          |       |           |
|---------------------|----------|-------|----------|-------|-----------|
|                     | GROUP GL |       | GROUP GR |       |           |
| PADSS               | Mean     | SD    | Mean     | SD    | 'p' VALUE |
| <b>2 hours</b>      | 6.96     | 0.599 | 6.18     | 0.478 | 0.0005    |
| <b>6 hours</b>      | 8.12     | 0.431 | 7.04     | 0.344 | 0.0005    |
| <b>12 hours</b>     | 9.24     | 0.619 | 8.76     | 0.790 | 0.0002    |
| <b>24 hours</b>     | 10.00    | 0.000 | 9.67     | 0.476 | 0.0005    |

**Figure 15 : Comparison of PADSS**



In GL Group, for Post Anaesthetic Discharge Scoring System, the mean score at 2 hours was 6.96. At 6 hours, the mean score was 8.12. At 12 hours the mean was 9.24. At 24 hours the mean was 10.00.

In GR Group, for Post Anaesthetic Discharge Scoring System, the mean score at 2 hours was 6.18. At 6 hours, the mean score was 7.04. At 12 hours the mean score was 8.76 . At 24 hours the mean score was 9.67.

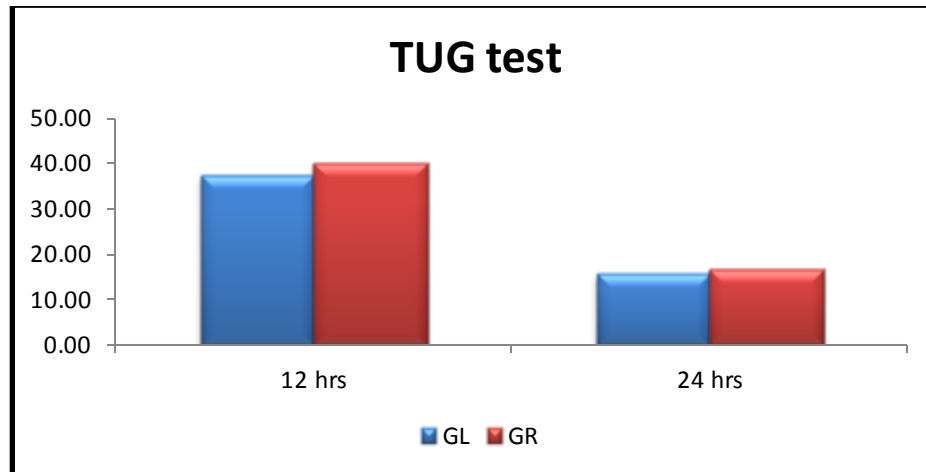
The ‘p’ value at 2,6,24 hours was found to be 0.0005 respectively and at 12 hours the ‘p’ value is 0.002 which is statistically significant.

## TUG TEST

**Table 13 : Comparison of TUG TEST**

| TUG TEST           |          |       |          |       |           |
|--------------------|----------|-------|----------|-------|-----------|
|                    | GROUP GL |       | GROUP GR |       |           |
| TUG TEST (seconds) | Mean     | SD    | Mean     | SD    | ‘p’ VALUE |
| 12 hours           | 37.51    | 8.561 | 40.16    | 8.900 | 0.129     |
| 24 hours           | 15.63    | 5.181 | 16.73    | 4.418 | 0.252     |

**Figure 16 : Comparison of TUG test**



In GL Group, at 12 hours the mean duration for tug test was 37.51 seconds. At 24 hours the mean duration was 15.63 seconds.

In GR Group, at 12 hours the mean duration for tug test was 40.16 seconds. At 24 hours the mean duration was 16.73 seconds.

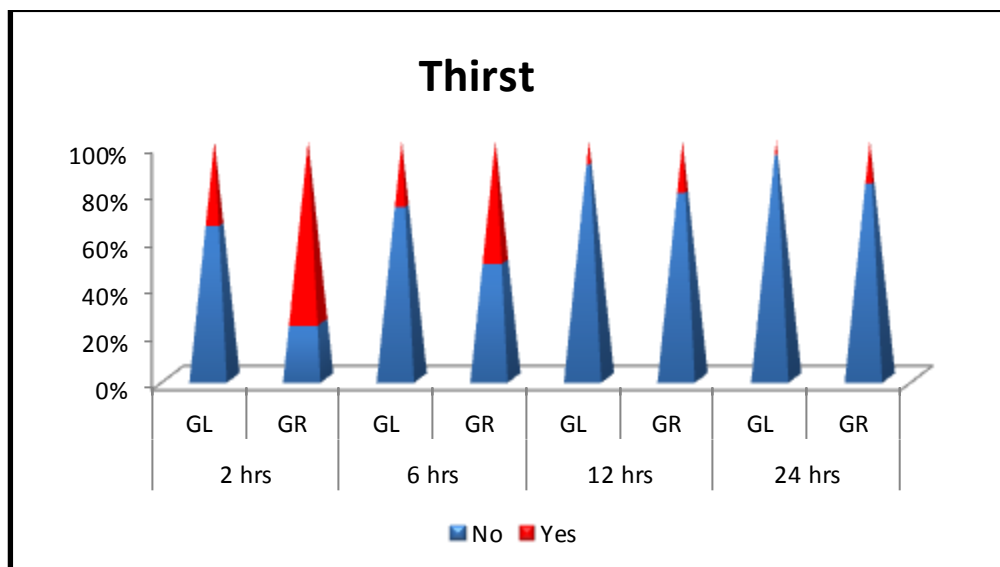
The 'p' value at 12 and 24 hours was found to be 0.129 and 0.252 which is statistically not significant.

## THIRST

**Table 14 : Comparison of Thirst**

| THIRST |     |          |            |          |            |           |
|--------|-----|----------|------------|----------|------------|-----------|
| Hours  |     | GROUP GL |            | GROUP GR |            | 'p' VALUE |
|        |     | Number   | Percentage | Number   | Percentage |           |
| 2      | Yes | 18       | 35.3%      | 39       | 76.5%      | 0.000     |
|        | No  | 33       | 64.7%      | 12       | 23.5%      |           |
| 6      | Yes | 14       | 27.5%      | 26       | 51.0%      | 0.015     |
|        | No  | 37       | 72.5%      | 25       | 49%        |           |
| 12     | Yes | 5        | 9.8%       | 11       | 21.6%      | 0.102     |
|        | No  | 46       | 90.2%      | 40       | 78.4%      |           |
| 24     | Yes | 3        | 5.9%       | 9        | 17.4%      | 0.122     |
|        | No  | 48       | 94.1%      | 42       | 82.4%      |           |

**Figure 17 : Comparison of Thirst**



At 2 hours, in Group GL, 18 patients( 35.3% ) had thirst while in Group GR , 39 patients had thirst ( 76.5%) . At 6 hours, in Group GL, 14 patients(27.5%) had thirst while in Group GR, 26 patients had thirst (51.0%). At 12 hours, in Group GL, 5 patients(9.8% ) had thirst while in Group GR, 11 patients had thirst ( 21.6%) . At 24 hours, in Group GL, 3 patients(5.9% ) had thirst while in Group GR, 9 patients had thirst (17.4%).

The ‘p’ value for thirst at 2 and 6 hours was found to be 0.000 and 0.015 respectively which is statistically significant. The ‘p’ value for thirst at 12 and 24 hours was found to be 0.102 and 0.122 respectively which is statistically not significant.

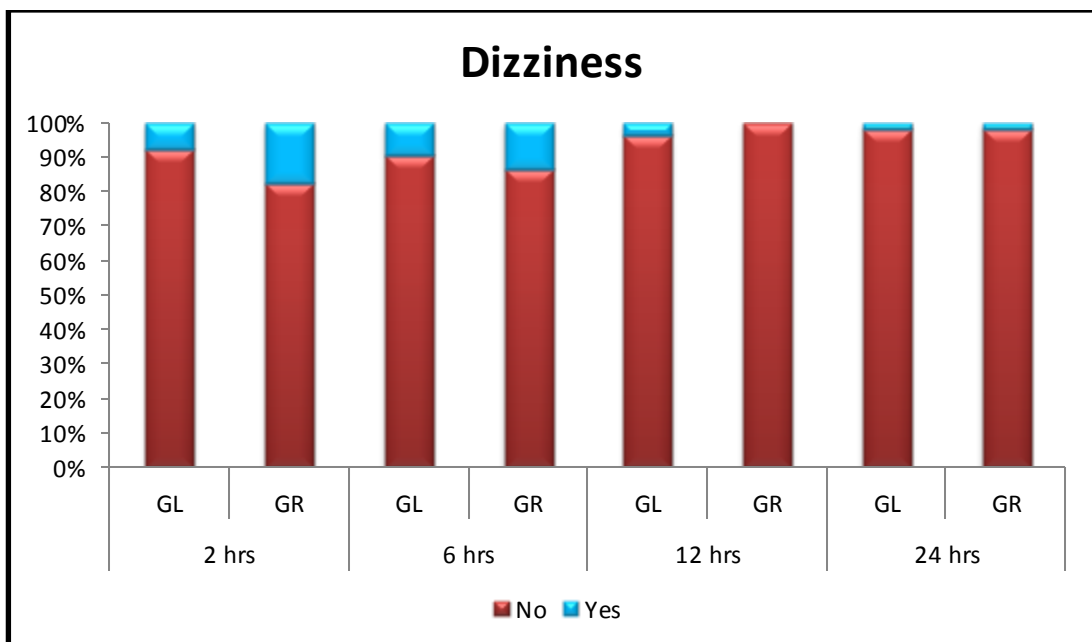


## DIZZINESS

**Table 15 : Comparison of Dizziness**

| DIZZINESS |     |          |            |          |            |           |
|-----------|-----|----------|------------|----------|------------|-----------|
| Hours     |     | GROUP GL |            | GROUP GR |            | 'p' VALUE |
|           |     | Number   | Percentage | Number   | Percentage |           |
| 2         | Yes | 4        | 7.8%       | 9        | 17.6%      | 0.234     |
|           | No  | 47       | 92.2%      | 42       | 82.4%      |           |
| 6         | Yes | 5        | 9.8%       | 7        | 11.8%      | 0.539     |
|           | No  | 46       | 90.2%      | 49       | 88.2%      |           |
| 12        | Yes | 2        | 3.9%       | 0        | 0%         | 0.495     |
|           | No  | 49       | 96.1%      | 51       | 100%       |           |
| 24        | Yes | 1        | 2%         | 1        | 2%         | 1.000     |
|           | No  | 50       | 98%        | 50       | 98%        |           |

**Figure 18 : Comparison of Dizziness**



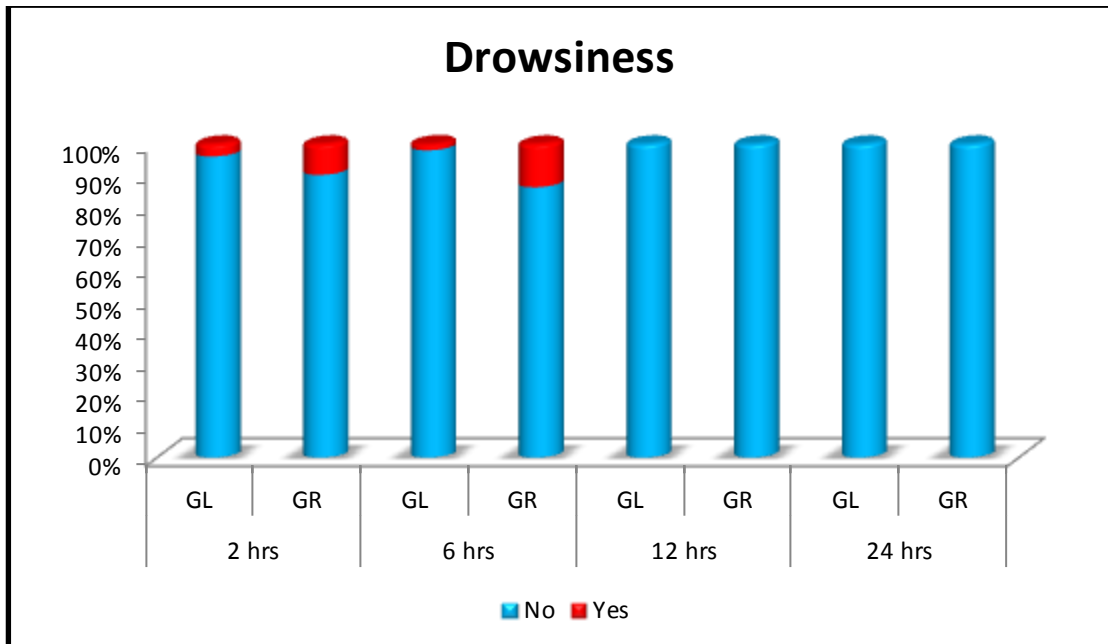
At 2 hours, in Group GL, 4 patients (7.8% ) had dizziness while in Group GR, 9 patients had dizziness ( 17.6%) . At 6 hours, in Group GL, 5 patients( 9.8% ) had dizziness while in Group GR, 7 patients had dizziness (11.8%) . At 12 hours, in Group GL, 2 patients (3.9%) had dizziness while in Group GR, none had dizziness ( 17.6%) . At 24 hours, in Group GL and GR, 1 patient each complained of dizziness (2%) . The ‘p’ value for dizziness at 2, 6, 12 and 24 hours was found to be 0.234 , 0.539, 0.495,1.000 respectively which is statistically not significant.

## DROWSINESS

**Table 16 : Comparison of Drowsiness**

| DROWSINESS |     |          |            |          |            |           |
|------------|-----|----------|------------|----------|------------|-----------|
| Hours      |     | GROUP GL |            | GROUP GR |            | 'p' VALUE |
|            |     | Number   | Percentage | Number   | Percentage |           |
| 2          | Yes | 2        | 3.9%       | 5        | 9.8%       | 0.436     |
|            | No  | 49       | 96.1%      | 46       | 90.2%      |           |
| 6          | Yes | 1        | 2.0%       | 7        | 13.7%      | 0.060     |
|            | No  | 50       | 98.0%      | 44       | 86.3%      |           |
| 12         | Yes | -        |            | -        | -          | -         |
|            | No  | 51       | 100%       | 51       | 100%       |           |
| 24         | Yes | -        |            | -        | -          | -         |
|            | No  | 51       | 100%       | 51       | 100%       |           |

**Figure 19 : Comparison of Drowsiness**



At 2 hours, in Group GL, 2 patients (3.9%) had drowsiness while in Group GR, 5 patients had drowsiness (9.8%) . At 6 hours, in Group GL, 1 patient (2.0%) had drowsiness while in Group GR, 7 patients had drowsiness (13.7%) . At 12 and 24 hours, none of the patient complained of drowsiness in both the groups

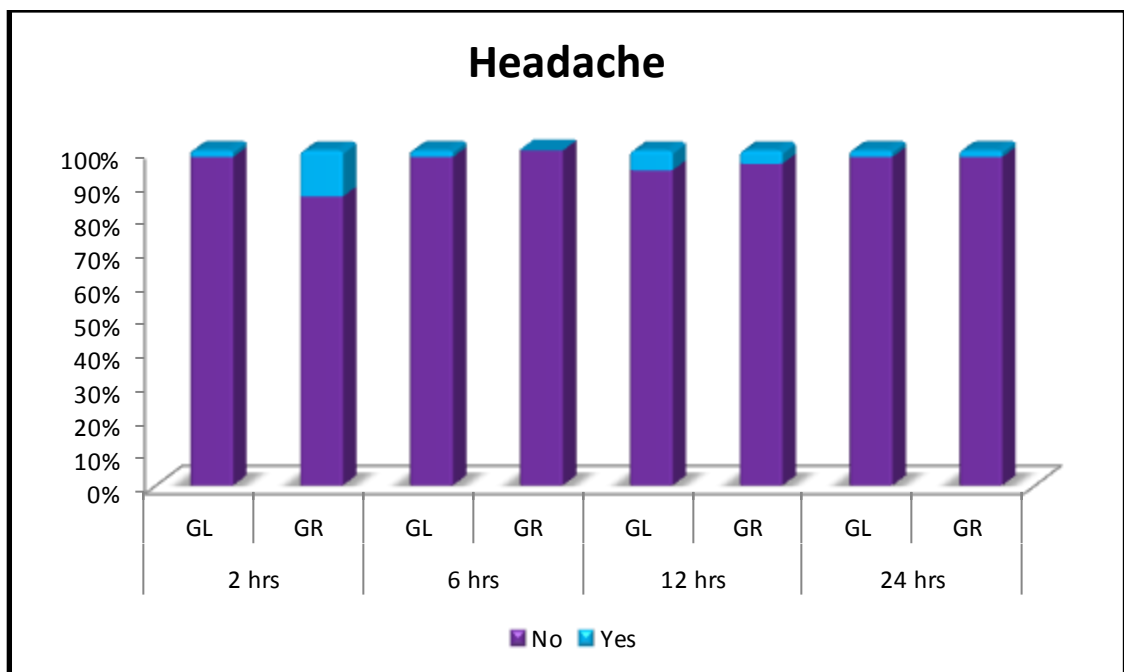
The 'p' value for drowsiness at 2 and 6 hours was found to be 0.436 , 0.060 respectively which is statistically not significant.

## HEADACHE

**Table 17 : Comparison of Headache**

| HEADACHE |     |          |            |          |            |           |
|----------|-----|----------|------------|----------|------------|-----------|
| Hours    |     | GROUP GL |            | GROUP GR |            | 'p' VALUE |
|          |     | Number   | Percentage | Number   | Percentage |           |
| 2        | Yes | 1        | 2%         | 7        | 13.7%      | 0.060     |
|          | No  | 50       | 98%        | 44       | 86.3%      |           |
| 6        | Yes | 1        | 2%         | 0        | 0%         | 1.000     |
|          | No  | 50       | 98%        | 51       | 100%       |           |
| 12       | Yes | 3        | 5.9%       | 2        | 3.9%       | 1.000     |
|          | No  | 48       | 94.1%      | 49       | 96.1%      |           |
| 24       | Yes | 1        | 2%         | 1        | 2%         | 1.000     |
|          | No  | 50       | 98%        | 50       | 98%        |           |

**Figure 20 : Comparison of Headache**



At 2 hours, in Group GL, 1 patient ( 2% ) had headache while in Group GR, 7 patients had headache ( 13.7% ) . At 6 hours, in Group GL, 1 patient( 2% ) had headache while in Group GR, none complained of headache. At 12 hours, in Group GL, 3 patients( 5.9% ) had headache while in Group GR, 2 patients had headache (3.9%) . At 24 hours, in Group GL and GR, 1 patient each complained of headache( 2% )

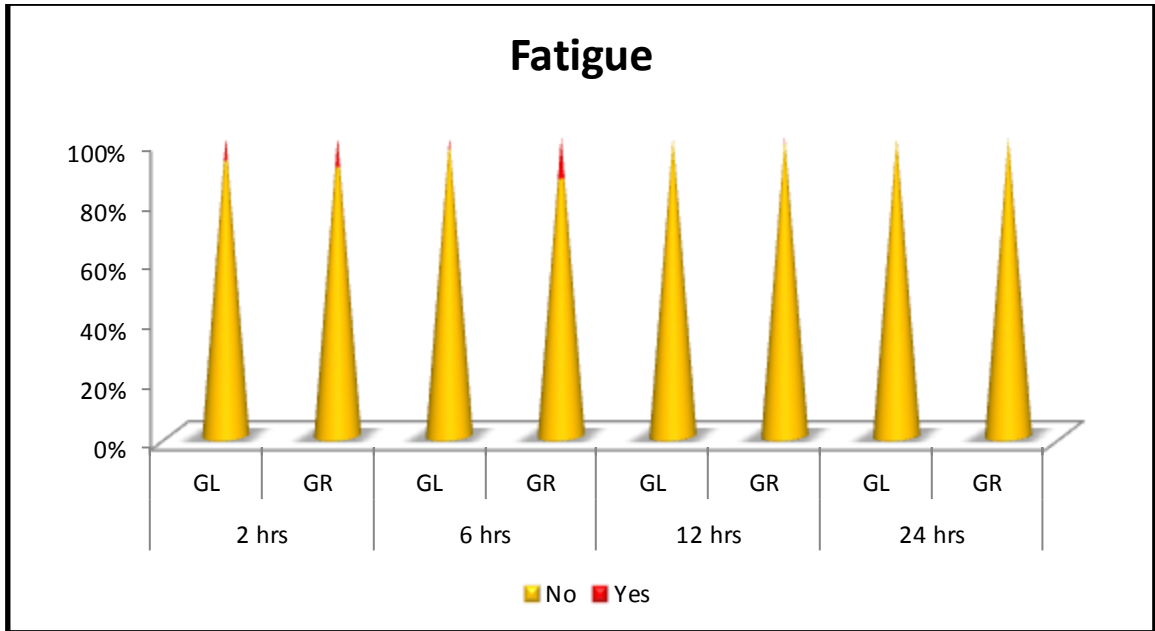
The ‘p’ value for headache at 2,6, 12 and 24 hours was found to be 0.060 , 1.000, 1.000,1.000 respectively which is statistically not significant.

## FATIGUE

**Table 18 : Comparison of Fatigue**

| Hours | FATIGUE |          |            |          |            | ‘p’ VALUE |
|-------|---------|----------|------------|----------|------------|-----------|
|       |         | GROUP GL |            | GROUP GR |            |           |
|       |         | Number   | Percentage | Number   | Percentage |           |
| 2     | Yes     | 4        | 7.8%       | 5        | 9.8%       | 1.000     |
|       | No      | 47       | 92.2%      | 46       | 90.2%      |           |
| 6     | Yes     | 2        | 3.9%       | 7        | 13.7%      | 0.160     |
|       | No      | 49       | 96.1%      | 44       | 86.3%      |           |
| 12    | Yes     | 0        | 0%         | 1        | 2%         | 1.000     |
|       | No      | 51       | 100%       | 50       | 98%        |           |
| 24    | Yes     | 0        | 0%         | 0        | 0%         | -         |
|       | No      | 51       | 100%       | 51       | 100%       |           |

**Figure 21 : Comparison of Fatigue**



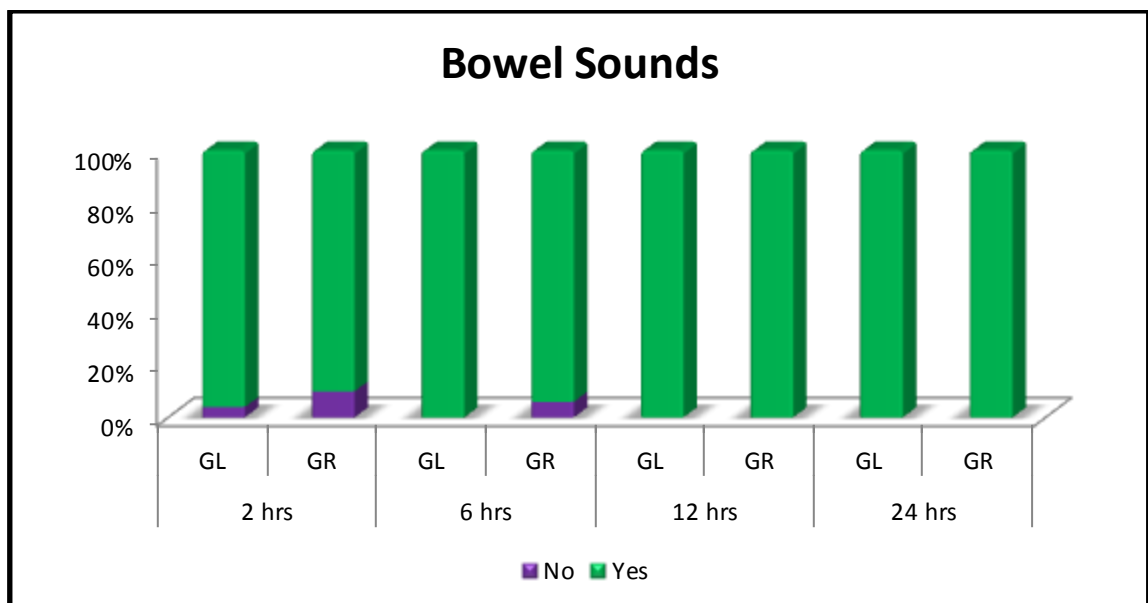
At 2 hours, in Group GL, 4 patients ( 7.8% ) complained of fatigue while in Group GR, 5 patients had fatigue ( 9.8% ) . At 6 hours, in Group GL, 2 patients (3.9% ) had fatigue while in Group GR, 7 patients complained of fatigue. At 12 hours, one patient from Group GR complained of fatigue. At 24 hours, none of the patients had fatigue in both the groups. The 'p' value at 2, 6, 12 hours was found to be 1.000,0.160, 1.000 respectively which is statistically not significant.

## BOWEL SOUND

**Table 19 – Bowel Sound**

| BOWEL SOUND |     |          |            |          |            |           |
|-------------|-----|----------|------------|----------|------------|-----------|
| Hours       |     | GROUP GL |            | GROUP GR |            | 'p' VALUE |
|             |     | Number   | Percentage | Number   | Percentage |           |
| 2           | Yes | 49       | 96.1%      | 46       | 90.2%      | 0.436     |
|             | No  | 2        | 3.9%       | 5        | 9.8%       |           |
| 6           | Yes | 51       | 100%       | 48       | 94.1%      | 0.243     |
|             | No  | 0        | 0%         | 3        | 5.9%       |           |
| 12          | Yes | 51       | 100%       | 51       | 100%       | -         |
|             | No  | 0        | 100%       | 0        | 100%       |           |
| 24          | Yes | 51       | 100%       | 51       | 100%       | -         |
|             | No  | 0        | 100%       | 0        | 100%       |           |

**Figure 22 : Bowel Sounds**



At 2 hours, bowel sound was present in 49 patients ( 96.1% ) in Group GL and 46 patients (90.2%) in Group GR. At 6 hours, bowel sound was present in 51 patients ( 100% ) in Group GL and 48 patients (94.1%) in Group GR. At 12 and 24 hours, bowel sound was present in all patients in both the groups.

The ‘p’ value at 2 and 6 hours was found to be 0.436, 0.243 respectively which is statistically not significant.

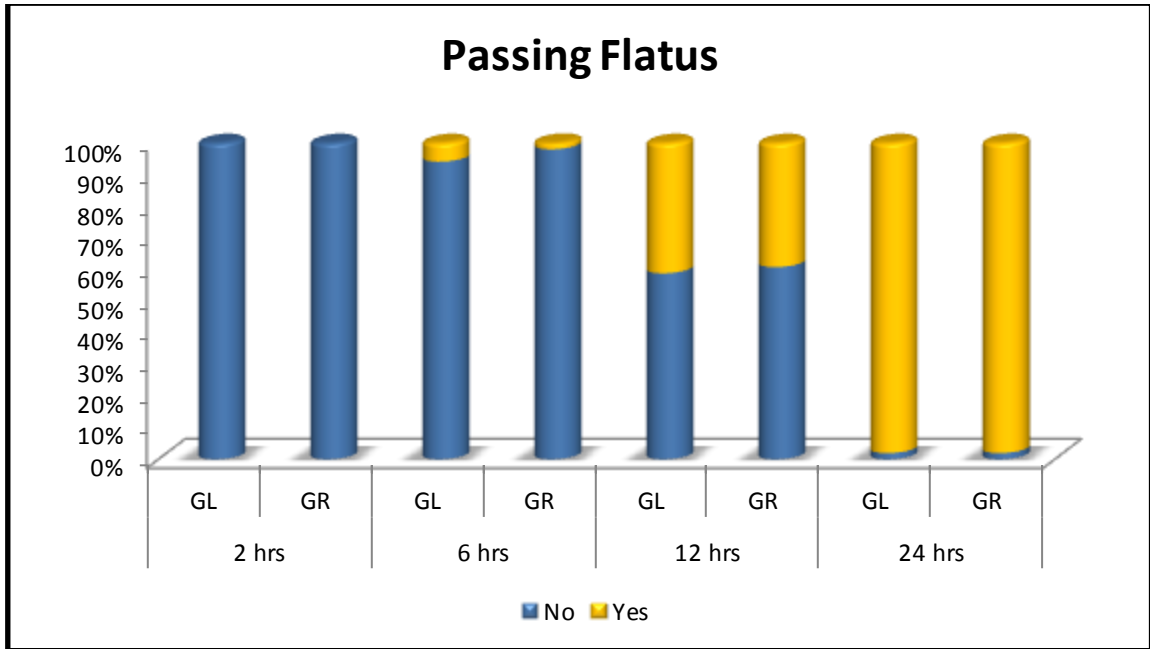
## PASSING FLATUS

**Table 20 : Passing flatus**

| PASSING FLATUS |     |                    |          |                    |           |       |
|----------------|-----|--------------------|----------|--------------------|-----------|-------|
| Hours          |     | GROUP GL           | GROUP GR |                    | 'p' VALUE |       |
|                |     | Number of patients | %        | Number of patients | %         |       |
| 2              | Yes | 0                  | 0        | 0                  | 0         | -     |
|                | No  | 51                 | 100      | 51                 | 100       |       |
| 6              | Yes | 3                  | 5.9      | 1                  | 2         | 0.617 |
|                | No  | 48                 | 94.1     | 50                 | 98        |       |
| 12             | Yes | 21                 | 41.2     | 20                 | 39.2      | 0.840 |
|                | No  | 30                 | 58.8     | 31                 | 60.8      |       |
| 24             | Yes | 50                 | 98       | 50                 | 98        | 1.000 |
|                | No  | 1                  | 2        | 1                  | 2         |       |



**Figure 23 : Passing flatus**



At 2 hours, none of the patients passed flatus in both the groups. At 6 hours, 3 patients (5.9%) in group GL and 1 patient (2%) from Group GR passed flatus. At 12 hours, 21 patients(41.2%) in group GL and 20 patients(39.2%) in group GR passed flatus. At 24 hours, 50 patients (98%) and 50 patients (98%) in group GR passed flatus.

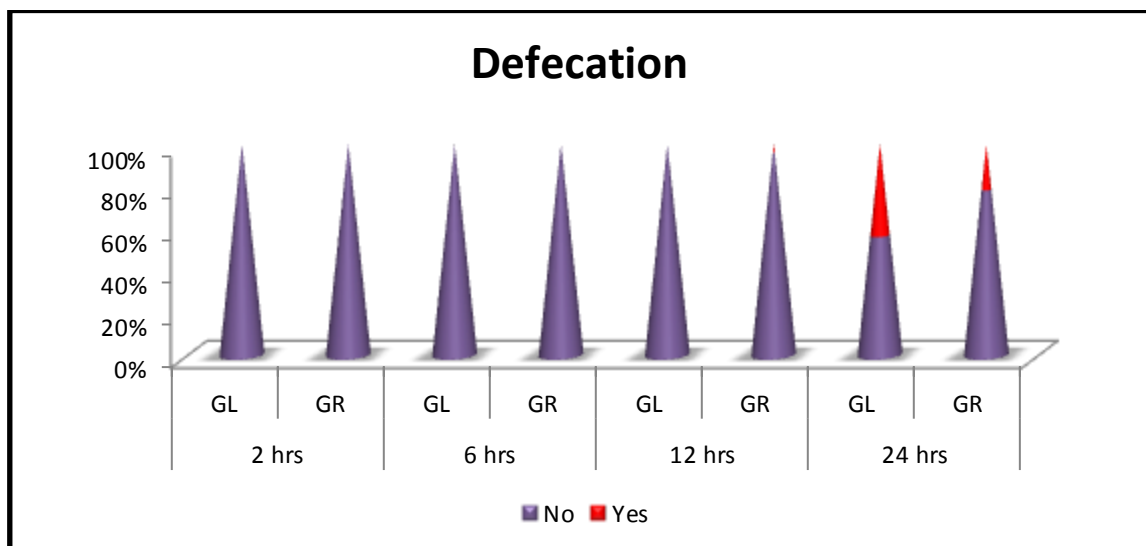
The 'p' value at 6 ,12 and 24 hours was found to be 0.617,0.840,1.000 respectively which is statistically not significant.

## DEFECATION

**Table 21 : Defecation**

| DEFECATION |     |                    |          |                    |           |       |
|------------|-----|--------------------|----------|--------------------|-----------|-------|
| Hours      |     | GROUP GL           | GROUP GR |                    | 'p' VALUE |       |
|            |     | Number of patients | %        | Number of patients | %         |       |
| 2          | Yes | 0                  | 0        | 0                  | 0         | -     |
|            | No  | 51                 | 100      | 51                 | 100       |       |
| 6          | Yes | 0                  | 0        | 0                  | 0         | -     |
|            | No  | 51                 | 100      | 51                 | 100       |       |
| 12         | Yes | 0                  | 0        | 2                  | 3.9       | 0.495 |
|            | No  | 51                 | 100      | 49                 | 96.1      |       |
| 24         | Yes | 22                 | 43.1%    | 11                 | 21.6      | 0.200 |
|            | No  | 29                 | 56.9%    | 40                 | 78.4      |       |

**Figure 24 : Defecation**



At 2 hours and 6 hours, none of the patients defecated in both the groups. At 12 hours, only 2 patients in group GR( 3.9%) defecated.. At 24 hours, 22 patients in group GL (43.1%) and 11 patients in group GR (21.6%) defecated. The 'p' value at 12 and 24 hours was found to be 0.495,0.200 respectively which is statistically not significant.

## **CHAPTER 11**

### **DISCUSSION**

Modern multivariable studies, meta-analysis and systemic reviews have greatly increased our knowledge about the risk factors of PONV. Consensus is emerging that antiemetic prophylaxis is neither cost effective nor free from side effects. Multimodal management of PONV obviates the need of antiemetic prophylaxis and its associated side effects and therefore the importance of adequate hydration of patients has been stressed on.

Adverse outcomes such as nausea, vomiting, thirst, drowsiness, and dizziness can create great distress in ambulatory patients. Nausea delays oral intake and worsens the general well-being of patients. Retching because of nausea may increase pain and cause discomfort after minor abdominal surgery, such as laparoscopic procedures. Dizziness can precipitate nausea, vomiting, and restlessness and can delay ambulation. Postoperative drowsiness is potentially dangerous to patients if they cannot protect their airways. It also delays recovery and discharge. These adverse outcomes delay early discharge and home readiness, thus increasing the workload of the nursing staff.

Crystalloid fluid administration may be a simple, inexpensive, non pharmacological therapy that could reduce these symptoms, avoiding drug-related side-effects. The current evidence suggests that liberal fluid is a good idea where major trauma and fluid shifting are unlikely, but more careful fluid management may be beneficial in more stressful operation.

This prospective, double-blinded, randomized, comparative study is conducted in a common surgery that is conducted extensively across the country which would benefit if the patient will achieve discharge criteria at the earliest. Govt. RSRM Lying in Hospital is situated in the heart of North Chennai. Everyday around 8 to 10 cases of puerperal sterilization are being conducted. Patients posted for puerperal sterilization were selected in our study from this enormous pool of cases.

As PONV is affected by so many variables, we tried to ensure maximum standardization in our study. In this way, those patients with BMI >30 (Obesity), Smokers, History of Motion Sickness, Unstable haemodynamics, Systemic Illness involving renal, cardiac, GIT and nervous system., Diseases complicating pregnancy were excluded from the study.

On analyzing the demographic profile, the distribution of age and Body Mass Index in both the groups were comparable. The ASA

distribution and the mean duration of surgeries were also comparable and there was no significant difference between the two groups.

Intraoperatively, vital parameters were monitored and compared. There was no statistically significant difference observed in terms of Heart rate, Systolic Blood pressure, Diastolic Blood pressure, Mean Arterial Pressure and SpO<sub>2</sub> between the two groups.

### **Effects on PONV**

**Yogendran.S et al<sup>11</sup>** in 1995 compared the effects of high (20 ml/kg) and low (2 ml/kg) infusion of isotonic electrolyte solution preoperatively on adverse outcomes in ambulatory surgery. They reported a decrease in the incidence of PONV. In our study, the mean PONV scores at 2,6,12 hours in Group GL were lesser ( $0.25\pm 0.44$ ,  $0.06\pm 0.238$ ,  $0.02\pm 0.140$ ) when compared with Group GR ( $1.53\pm 0.612$ ,  $1.18\pm 0.434$ ,  $0.71\pm 0.460$ ). There was a significant difference between the two groups. At 24 hours, the mean PONV score (GL  $0.02\pm 0.14$ ; GR  $0.10\pm 0.300$ ) in both the groups was comparable and no difference was observed. Hence our study agrees with the above study that liberal fluid improves patient outcomes in short procedures.

**Ali S et al.**<sup>47</sup> in 2003 have reported that a supplemental preoperative I.V. fluid therapy with 15 ml.kg<sup>-1</sup> significantly reduced the incidence of PONV . PONV occurred in 73% in conservative fluid group and 23% in the supplemental group. Our study results correlate with the above study.

**Maharaj.C et al**<sup>48</sup> in 2005 conducted a randomized study in eighty patients undergoing gynaecological laparoscopy who received either large (2 ml/kg/hour fasting) or small(3 ml/kg) preoperatively. The study concluded that preoperative correction of intravascular volume deficits effectively reduced PONV in high risk patients presenting for ambulatory surgery. The result is similar to our study but those at high risk for PONV are excluded from our study.

**Chaudhary et al**<sup>49</sup> in 2008 compared the effects of 2 ml/kg Ringer lactate iv (Group A) , 12 ml/kg Ringer lactate iv (Group B) and 12 ml/kg of 4.5 per cent hydroxyethylstarch (Hetastarch) iv. They concluded that Pre-operative intravenous fluid supplementation using crystalloids and colloids resulted in significantly decreased incidence of PONV. In our study also we found similar results. However, in our study colloid was not used .

**Adanir Tayfun et al (2008)**<sup>50</sup> studied the effect of preoperative and intraoperative hydration on PONV. Group I received intraoperative volume

replacement and Group-II received preoperative volume replacement .The PONV was significantly less detected in Group II (48%) than Group I (64%). The study concluded that PONV was reduced when the fluid deficit was replaced preoperatively. Our study correlates with his study that the incidence of PONV was decreased in those who received liberal( 15 ml/kg) fluid pre-operatively. However, in our study intra-operative fluid administration is similar in both the groups. Their argument is explained by the fact that if the fluid deficit is covered 2 h prior to the operation, the crystalloid fluids diffuse outside of the blood vessels into tissues and this allows the fluid to restore the deficit at the cellular level which may affect both the peripheral (mucosal hypoperfusion of gastrointestinal tract) and central (probably the hydration of CTZ cells) mechanisms of PONV. Our study did not evaluate this component.

**Ahmed Turkistani et al (2009)<sup>51</sup>** divided the patients into four groups (each 20 patients), to receive preloading of intravenous fluid, as follows: Group 1 received 10 ml/kg of low-MW tetrastarch in saline, group 2 received 10 ml/kg medium-MW pentastarch in saline, group 3 had 10 ml/kg of high-MW heta-starch in saline and group 4 received 10 ml/kg Ringer lactate. It was concluded that Preoperative fluid supplementation with LR, in a dose of 10 ml/kg, produced a lower incidence of PONV



compared to colloid solutions. Tetrastarch could be a good alternative to LR, for prevention of PONV, due to its long lasting effect, up to 24 hours, postoperatively. In our study also we found that Ringer Lactate (15 ml/kg) infusion pre-operatively reduced the incidence of PONV at 2,6,12 hours.

**Gaurav Chauhan et al ( 2013)**<sup>52</sup> conducted a study in 200 patients in the age group 20-40 years undergoing ambulatory gynaecological laparoscopic surgery. This study concluded that intravenous hydration (30 ml/kg Compound Sodium Lactate) intra-operatively is a safe and effective means of preventing PONV. Our study results are similar to this study. The difference is amount of fluid administered is two times that of volume used in our study(15 ml/kg) and infusion was done intra-operatively.

**Selcuk Yavuz et al (2014)**<sup>53</sup> studied the effects of preoperative intravenous hydration ( 15 ml /kg RL vs. 2 ml/kg RL ) on postoperative nausea and vomiting in high APFEL scored patients undergoing laparoscopic cholecystectomy surgery. Hence the study stated that Preoperative hydration may be effective in high APFEL scored patients to prevent postoperative nausea. Our study results correlate with this study but those at high risk for PONV are excluded from our study.

**Chohedri et al (2006)**<sup>54</sup> This prospective randomized double-blind study was carried out in two hundred ambulatory surgical patients. This study concluded that preoperative high dose hydration can efficiently decrease the incidence of postoperative vomiting within the first 60 minutes in ambulatory surgeries . In our study we found that the incidence PONV is reduced at 2,6,12 hours

**Brandstrup et. al.**<sup>57</sup> compared a liberal vs. restrictive fluid strategy in 172 patients undergoing colorectal surgery. Total IV fluids average 5.4 L for the liberal group and 2.7 L for the restrictive group. The restrictive regimen appeared to reduce the incidence of major and minor complications (ex. anastomotic leakage, pulmonary edema, pneumonia, and wound infection). This is in contrast to our study and it once again confirms that type of surgery ( major vs. minor ) plays an important role in deciding the amount of fluid to be given.

**McCaul et al.**<sup>51</sup> found that large volume rehydration with a solution containing dextrose resulted in an increased requirement for opiate therapy in the PACU, compared with an equal volume of Ringer's lactate solution or no IV fluids. This increase in postoperative fentanyl requirement was likely caused by the presence of dextrose in the IV fluid, given that this did not occur with Ringer's lactate solution alone.

## **Effects on Pain**

In Group GL, the mean VAS scores at 2,6,12,24 hours ( $1.75\pm 0.771, 1.08\pm 0.688, 0.45\pm 0.610, 0.20\pm 0.401$ ) were lesser when compared with Group GR ( $3.14\pm 0.693, 2.31\pm 0.735, 1.37\pm 0.747, 0.71\pm 0.576$ ). There was a significant difference between the two groups. The p value is 0.0005 at all intervals. Our study results correlate with the following study.

**Maharaj C.H. et al ( 2005)<sup>48</sup>** conducted a randomized study in eighty patients undergoing gynaecological laparoscopy who received either large (2 ml/kg/hour fasting) or small(3 ml/kg) preoperatively. The incidence and severity of pain, and need for supplement analgesic therapy, were assessed by a blinded investigator at 0.5, 1, and 4 h postoperatively, and on the first and third postoperative days. Postoperative pain scores and supplemental analgesia were decreased in large volume infusion group. The study concluded that preoperative correction of intravascular volume deficits effectively reduced postoperative pain.

## **Effects on Discharge criteria**

Discharge criteria was assessed using the Post Anaesthetic Discharge Scoring System. Out of a total score of 10, a score of  $\geq 8$  was considered fit for discharge. Group GL achieved the score of 8 earlier (at 6 hours )

whereas patients in Group GR achieved it at 12 hours. The PADSS score was better in Group GL at all time intervals when compared with Group GR.

**Holte K et al**<sup>56</sup> in 2004 compared intraoperative administration of 40 ml/kg with 15 ml/kg LR in patients undergoing laparoscopic cholecystectomy. He concluded that intraoperative administration of 40 mL/kg compared with 15 mL/kg LR improves postoperative organ functions and recovery and shortens hospital stay

**Gaurav Chauhan et al ( 2013)**<sup>52</sup> concluded that intravenous hydration is a safe and effective means of preventing PONV and ensuring patient satisfaction at the time of discharge. The findings in our study agree with the above two studies.

## **EFFECTS ON GENERAL WELL-BEING**

General Well-being of the patients was recorded by asking the symptoms of thirst, headache, dizziness, drowsiness and fatigue.

### **THIRST**

In Group GL, at 2 hours , 18 patients (35.3%) had thirst and in Group GR 39 patients had thirst (76.5%). At 6 hours , in Group GL,

14 patients( 27.5%) had thirst and in group GR, 26 patients (51%) had a positive symptom which was statistically significant. No significant difference was achieved at 12 and 24 hours between the two groups.

**Yogendran .S et al<sup>11</sup>** in his study mentioned that the incidence of thirst was significantly lower in the high-infusion group (20 ml /Kg) hen compared with low infusion group (2 ml/kg)

**Chohedri et al<sup>54</sup>** showed in his study that preoperative high dose hydration can efficiently decrease the incidence of postoperative thirst and vomiting within the first 60 minutes in ambulatory surgeries

**Holte K et al<sup>56</sup>** found that the incidence of thirst was decreased post—operatively in those received 40 ml/kg Ringer Lactate.

There was no significant difference in the scores of headache, dizziness, drowsiness and fatigue at 2,6,12 and 24 hours between the two groups.

Post-operative Exercise capacity and mobilization was assessed by a validated TUG test at 12 and 24 hours. The mean duration of TUG test at 12 hours in both the groups were 37.51seconds with SD of 8.561 (Group GL) and 40.16 with SD of 8.900 (Group GR). The mean duration of TUG test at

24 hours in both the groups were was 15.63 with SD of 5.181 (Group GL) and 16.73 with SD of 4.418 (Group GR) which was not statistically significant.

At 12 and 24 hours, bowel sound was present in all patients in both the groups. At 2 hours, none of the patients passed flatus and defecated in both the groups At 24 hours, almost 98% in both the groups passed flatus, 22 patients in group GL ( 43.1%) and 11 patients in group GR ( 21.6%) defecated which was not statistically significant.

This is in accordance with **Holte Kathrine et al**<sup>40</sup> study in 2007 who compared the effects of “liberal”( (median 4250 ml, range 3150–5200 ml) versus “restrictive” (median 1740 ml, range 1100–2165 ml) intravascular fluid administration in knee arthroplasty on physiological recovery as the primary outcome variable. He found no differences in exercise capacity (TUG test), general well-being, headache, dizziness, drowsiness or fatigue either pre or postoperatively between the groups and also the length of postoperative ileus did not differ between the groups.

## **CHAPTER 12**

### **SUMMARY**

The incidence of Post-Operative Nausea and Vomiting (PONV) is significantly reduced in liberal fluid group when compared to restrictive fluid group .

The incidence of Pain is significantly reduced in liberal fluid group when compared to restrictive fluid group .

The patients who received liberal fluid achieved discharge criteria earlier than those who received restrictive fluid.

The incidence of thirst is significantly reduced in liberal fluid group when compared to restrictive fluid group.

No significant difference is found for headache, dizziness, drowsiness, fatigue, post-operative ileus, Post-operative Exercise capacity and mobilization between both the groups.

## **CHAPTER 13**

### **CONCLUSION**

The mean PONV Scores and VAS Pain Scores were lesser in those who received liberal fluid (15 ml/kg) preoperatively. These patients achieved discharge criteria earlier when compared with restrictive fluid group.

Preoperative hydration effectively reduced PONV in patients presenting for ambulatory surgery. Hence I conclude that liberal fluid therapy is an inexpensive and safe therapy for reducing post-operative nausea and vomiting.



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# PROFORMA

Name: Indication: STUDYNO:  
Age: Study Consent: IP NO:  
Weight: ASA: MASTER CHARTNO:  
Height:  
BMI:  
Airway:

---

**EXCLUSION CRITERIA:**  BMI > 30  Smokers  History of Motion Sickness  Unstable haemodynamics  Systemic Illness involving renal, cardiac, GIT and nervous system  Diseases complicating pregnancy

A  
M  
P  
L  
E

## ASSESSMENT

### MONITORS

ECG   
ANIBP   
SpO2   
ETCO2   
Temp

---

**IV ACCESS** Site: Size:

**PRELOADING FLUID:** RL VOLUME:

---

GA/ TIVA

Preoxygenation:

| IV. GLYCOPYROLLATE | IV. MIDAZOLAM<br>0.02mg/kg | IV. PENTAZOCINE<br>0.5 mg/kg |
|--------------------|----------------------------|------------------------------|
| IV.KETAMINE        | DOSE                       | TIME                         |
| Bolus 1.5 mg/kg    |                            |                              |
| Top up 0.5 mg/kg   |                            |                              |

|                                                       | TIME | PR | BP      | SaO2    | ETCO2    | IV Fluid |
|-------------------------------------------------------|------|----|---------|---------|----------|----------|
| Baseline                                              |      |    |         |         |          |          |
| 5                                                     |      |    |         |         |          |          |
| 10                                                    |      |    |         |         |          |          |
| 15                                                    |      |    |         |         |          |          |
| 20                                                    |      |    |         |         |          |          |
| 25                                                    |      |    |         |         |          |          |
| 30                                                    |      |    |         |         |          |          |
| 35                                                    |      |    |         |         |          |          |
| 40                                                    |      |    |         |         |          |          |
| 45                                                    |      |    |         |         |          |          |
| 50                                                    |      |    |         |         |          |          |
| 55                                                    |      |    |         |         |          |          |
| 60                                                    |      |    |         |         |          |          |
|                                                       |      |    |         |         |          |          |
|                                                       |      |    | 2 hours | 6 hours | 12 hours | 24 hours |
| Pain – VAS score                                      |      |    |         |         |          |          |
| Nausea/ Vomiting - 4 point scale                      |      |    |         |         |          |          |
| Ileus – Bowel sounds ( YES/NO)                        |      |    |         |         |          |          |
| Ileus – Passing Flatus ( YES/NO)                      |      |    |         |         |          |          |
| Ileus - Defecation ( YES/NO)                          |      |    |         |         |          |          |
| Exercise capacity and Mobilization – TUG test in secs |      |    |         |         |          |          |
| General well-being - Thirst<br>YES =1, NO =0          |      |    |         |         |          |          |
| General well-being – Dizziness<br>YES =1, NO =0       |      |    |         |         |          |          |
| General well-being – Headache<br>YES =1, NO =0        |      |    |         |         |          |          |
| General well-being – Drowsiness<br>YES =1, NO =0      |      |    |         |         |          |          |
| General well-being – Fatigue<br>YES =1, NO =0         |      |    |         |         |          |          |
| Discharge Criteria<br>PADSS                           |      |    |         |         |          |          |

INSTITUTIONAL ETHICAL COMMITTEE,  
STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : A Prospective , Randomised, Blinded, Controlled comparative study on the effect of "Liberal Vs Restrictive" fluid protocol on post operative nausea vomiting and discharge criteria in patients undergoing puerperal sterilization under GA"

Principal Investigator : Dr. K Aishwarya

Designation : PG, MD ( Anaesthesiology)


Department : Department of Anaesthesiology  
Government Stanley Medical College,  
Chennai-01

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 24.02.2017 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

  
MEMBER SECRETARY, 31/1/17.  
IEC, SMC, CHENNAI  
MEMBER SECRETARY  
ETHICAL COMMITTEE,  
STANLEY MEDICAL COLLEGE  
CHENNAI-600 001.

## CONSENT FORM

### ஒப்புதல் உறுதிமொழி அளிக்கும் படிவம்

ஆராய்ச்சியின் தலைப்பு :

குடும்பநல அறுவை சிகிச்சையின்போது இரத்த நாளங்களில் செலுத்தப்படும் மருத்துவநீரை பொதுவாக கொடுக்கப்படும் அளவுக்கும் அல்லது அதைவிட சிறிதளவு அதிகமாக கொடுப்பதன் மூலம் வாந்தி வரும் வாய்ப்புகள் மற்றும் அறுவை சிகிச்சைக்கு பின்னர் வீட்டுக்கு செல்லும் உடல்தகுதி பெறும் நேரத்தையும் ஒப்பிடும் ஆய்வு.

இந்த ஆராய்ச்சியைப் பற்றி முழுவிவரங்களுக்கும் என் தாய் மொழியில் தரப்பட்டன. இந்த ஆய்வினை பற்றி முழுமையாக நான் புரிந்துக் கொண்டேன்.

இந்த ஆராய்ச்சியில் பங்கு பெறுபவர்களுக்கும், பங்கு பெறாதவர்களுக்கும் எந்தவித பாரபட்சம் இல்லாமல் மருத்துவ சிகிச்சை கிடைக்கும் என்பதை நான் அறிவேன்.

இந்த ஆராய்ச்சியின் முடிவுகள் மருத்துவம் சார்ந்த பத்திரிகைகளில் பிரசுரமாவதற்கு நான் எதிர்ப்பு தெரிவிக்கமாட்டேன்.

இந்த ஆராய்ச்சியில் என் சுய விருப்பப்படி முழுமனதுடன் ஒப்புதல் தருகிறேன்.

பங்கு பெறுபவரின் கையொப்பம் : \_\_\_\_\_

தேதி : \_\_\_\_\_

முகவரி :

ஆராய்ச்சியாளரின் கையொப்பம் : \_\_\_\_\_

தேதி : \_\_\_\_\_

# MASTER CHART - I

| S.NO | STUDY NO | STUDY DATE | NAME           | AGE | GENDER | IP NO. | WEIGHT | HEIGHT  | BMI   | ASA   | GROUP | DURATION OF SURGERY | PULSE RATE |       |        |        |        | SBP      |       |        |        |        | DBP      |       |        |        |        | MAP      |       |        |        |        |
|------|----------|------------|----------------|-----|--------|--------|--------|---------|-------|-------|-------|---------------------|------------|-------|--------|--------|--------|----------|-------|--------|--------|--------|----------|-------|--------|--------|--------|----------|-------|--------|--------|--------|
|      |          |            |                |     |        |        |        |         |       |       |       |                     | BASELINE   | 5 min | 10 min | 15 min | 20 min | BASELINE | 5 min | 10 min | 15 min | 20 min | BASELINE | 5 min | 10 min | 15 min | 20 min | BASELINE | 5 min | 10 min | 15 min | 20 min |
| 1    | 1        | 01/03/17   | Prnya          | 25  | F      | 16276  | 40 kgs | 150 cms | 17.77 | PS I  | GL    | 15 mins             | 58         | 90    | 93     | 108    | 101    | 119      | 147   | 138    | 137    | 136    | 72       | 100   | 96     | 94     | 83     | 87       | 115   | 110    | 108    | 100    |
| 2    | 1        | 05/03/17   | Hepzibah       | 25  | F      | 16525  | 52 kgs | 155 cms | 21.66 | PS I  | GR    | 20 mins             | 81         | 82    | 86     | 84     | 98     | 110      | 120   | 142    | 144    | 132    | 70       | 82    | 86     | 90     | 86     | 83       | 94    | 104    | 108    | 101    |
| 3    | 2        | 05/03/17   | Saranya        | 23  | F      | 16526  | 50 kgs | 154 cms | 21.09 | PS I  | GR    | 20 mins             | 84         | 86    | 88     | 86     | 86     | 122      | 126   | 132    | 134    | 136    | 82       | 84    | 86     | 82     | 86     | 95       | 98    | 101    | 99     | 103    |
| 4    | 3        | 05/03/17   | Lavanya        | 28  | F      | 16415  | 56 kgs | 152 cms | 24.24 | PS I  | GL    | 20 mins             | 89         | 91    | 108    | 107    | 106    | 124      | 132   | 142    | 144    | 142    | 76       | 84    | 86     | 88     | 84     | 92       | 100   | 104    | 106    | 103    |
| 5    | 1        | 07/03/17   | Tamilselvi     | 30  | F      | 16469  | 50 kgs | 154 cms | 22    | PS I  | GL    | 15 mins             | 91         | 94    | 108    | 110    | 109    | 131      | 134   | 142    | 144    | 151    | 86       | 88    | 86     | 88     | 84     | 101      | 103   | 104    | 106    | 106    |
| 6    | 2        | 07/03/17   | Varalakshmi    | 25  | F      | 16534  | 50 kgs | 158 cms | 20.8  | PS I  | GR    | 20 mins             | 86         | 88    | 92     | 94     | 104    | 128      | 138   | 142    | 139    | 138    | 86       | 76    | 86     | 78     | 84     | 100      | 96    | 104    | 98     | 102    |
| 7    | 1        | 08/03/17   | Bagyalakshmi   | 26  | F      | 16556  | 50 kgs | 159 cms | 20    | PS I  | GR    | 15 mins             | 104        | 110   | 108    | 106    | 104    | 148      | 152   | 134    | 132    | 128    | 86       | 88    | 76     | 78     | 82     | 106      | 109   | 95     | 96     | 97     |
| 8    | 2        | 08/03/17   | Dhivya         | 21  | F      | 16317  | 60 kgs | 152 cms | 26.66 | PS I  | GR    | 20 mins             | 115        | 98    | 96     | 94     | 92     | 136      | 128   | 124    | 131    | 128    | 84       | 76    | 82     | 83     | 76     | 101      | 93    | 96     | 99     | 93     |
| 9    | 3        | 08/03/17   | Prnya          | 23  | F      | 16574  | 50 kgs | 152 cms | 21    | PS I  | GL    | 20 mins             | 84         | 86    | 88     | 92     | 91     | 124      | 122   | 134    | 132    | 138    | 76       | 86    | 76     | 84     | 86     | 92       | 98    | 95     | 100    | 103    |
| 10   | 1        | 09/03/17   | Thasleema      | 24  | F      | 16638  | 60 kgs | 156 cms | 24.69 | PS I  | GL    | 20 mins             | 90         | 92    | 105    | 110    | 108    | 120      | 110   | 130    | 136    | 140    | 80       | 70    | 80     | 90     | 90     | 93       | 83    | 96     | 105    | 106    |
| 11   | 2        | 09/03/17   | Indumathi      | 22  | F      | 16636  | 50 kgs | 152 cms | 21.73 | PS I  | GL    | 20 mins             | 88         | 94    | 102    | 110    | 97     | 110      | 126   | 130    | 140    | 130    | 70       | 80    | 84     | 90     | 80     | 83       | 95    | 99     | 106    | 96     |
| 12   | 1        | 15/3/2017  | Nandhini       | 23  | F      | 16745  | 40 kgs | 156 cms | 18    | PS I  | GR    | 15 mins             | 68         | 81    | 99     | 98     | 96     | 130      | 143   | 156    | 152    | 152    | 80       | 82    | 94     | 86     | 82     | 96       | 102   | 114    | 108    | 105    |
| 13   | 1        | 16/3/2017  | Sathiyakala    | 32  | F      | 17041  | 62 kgs | 156 cms | 27.5  | PS I  | GL    | 15 mins             | 84         | 88    | 86     | 82     | 89     | 132      | 131   | 128    | 118    | 124    | 76       | 84    | 82     | 76     | 78     | 94       | 99    | 97     | 90     | 93     |
| 14   | 2        | 16/3/2017  | Fantha         | 27  | F      | 16946  | 35 kgs | 150 cms | 16    | PS I  | GL    | 20 mins             | 120        | 125   | 126    | 131    | 132    | 130      | 142   | 138    | 146    | 142    | 80       | 86    | 92     | 94     | 88     | 96       | 104   | 107    | 111    | 106    |
| 15   | 3        | 16/3/2017  | Mala           | 25  | F      | 17039  | 50 kgs | 154 cms | 22    | PS I  | GR    | 20 mins             | 77         | 81    | 82     | 88     | 90     | 120      | 128   | 134    | 132    | 136    | 70       | 84    | 76     | 84     | 86     | 83       | 84    | 95     | 100    | 102    |
| 16   | 1        | 17/3/2017  | Surya          | 24  | F      | 17019  | 55 kgs | 154 cms | 24.4  | PS I  | GR    | 15 mins             | 76         | 90    | 90     | 70     | 78     | 118      | 114   | 113    | 128    | 124    | 77       | 78    | 82     | 84     | 86     | 89       | 90    | 92     | 98     | 98     |
| 17   | 2        | 17/3/2017  | Nandhini       | 22  | F      | 16892  | 60 kgs | 158 cms | 24.09 | PS I  | GR    | 15 mins             | 83         | 73    | 70     | 82     | 80     | 126      | 124   | 164    | 160    | 145    | 82       | 74    | 102    | 95     | 97     | 96       | 84    | 115    | 117    | 109    |
| 18   | 3        | 17/3/2017  | Subradra Devi  | 30  | F      | 16962  | 50 kgs | 140 cms | 25.5  | PS I  | GR    | 20 mins             | 108        | 106   | 104    | 105    | 94     | 138      | 114   | 116    | 115    | 113    | 93       | 71    | 74     | 84     | 84     | 108      | 85    | 88     | 91     | 93     |
| 19   | 4        | 17/3/2017  | Tamil Elakya   | 23  | F      | 16897  | 58 kgs | 150 cms | 25.7  | PS I  | GR    | 15 mins             | 80         | 89    | 98     | 98     | 105    | 141      | 163   | 169    | 157    | 145    | 93       | 110   | 117    | 111    | 101    | 109      | 126   | 131    | 123    | 113    |
| 20   | 5        | 17/3/2017  | Saranya Devi   | 26  | F      | 16876  | 65 kgs | 160 cms | 25.3  | PS I  | GR    | 15 mins             | 84         | 71    | 78     | 81     | 80     | 110      | 115   | 106    | 110    | 112    | 69       | 68    | 69     | 80     | 89     | 83       | 84    | 79     | 94     | 96     |
| 21   | 6        | 17/3/2017  | Vijaya         | 28  | F      | 16767  | 55 kgs | 153 cms | 24.4  | PS I  | GL    | 15 mins             | 86         | 115   | 118    | 116    | 108    | 124      | 142   | 146    | 138    | 132    | 86       | 86    | 96     | 76     | 84     | 98       | 104   | 112    | 96     | 100    |
| 22   | 7        | 17/3/2017  | Latha          | 26  | F      | 16866  | 55 kgs | 152 cms | 24.3  | PS I  | GR    | 20 mins             | 81         | 89    | 86     | 94     | 88     | 126      | 132   | 131    | 134    | 136    | 78       | 84    | 78     | 82     | 79     | 94       | 100   | 95     | 99     | 98     |
| 23   | 8        | 17/3/2017  | Sheelarani     | 26  | F      | 16894  | 60 kgs | 153 cms | 26.6  | PS I  | GR    | 20 mins             | 81         | 98    | 96     | 84     | 88     | 132      | 146   | 142    | 132    | 138    | 84       | 92    | 94     | 86     | 88     | 100      | 110   | 110    | 101    | 104    |
| 24   | 1        | 19/3/2017  | Kanchana Angel | 28  | F      | 16963  | 65 kgs | 157 cms | 29    | PS I  | GR    | 20 mins             | 92         | 79    | 82     | 83     | 86     | 130      | 130   | 132    | 136    | 134    | 90       | 90    | 84     | 82     | 86     | 103      | 103   | 100    | 100    | 102    |
| 25   | 2        | 19/3/2017  | Lalitha        | 24  | F      | 16896  | 49 kgs | 146 cms | 23    | PS I  | GR    | 15 mins             | 83         | 86    | 87     | 77     | 85     | 133      | 136   | 142    | 144    | 137    | 89       | 88    | 92     | 102    | 103    | 103      | 104   | 108    | 116    | 114    |
| 26   | 3        | 19/3/2017  | Sivaranjani    | 24  | F      | 17072  | 49 kgs | 150 cms | 21.7  | PS I  | GR    | 20 mins             | 82         | 94    | 95     | 102    | 105    | 133      | 136   | 143    | 142    | 144    | 82       | 84    | 92     | 86     | 82     | 99       | 101   | 109    | 104    | 102    |
| 27   | 4        | 19/3/2017  | Meena          | 22  | F      | 16887  | 75 kgs | 162 cms | 29.2  | PS I  | GL    | 15 mins             | 82         | 84    | 93     | 91     | 102    | 107      | 131   | 139    | 138    | 134    | 74       | 93    | 96     | 92     | 89     | 85       | 105   | 110    | 107    | 104    |
| 28   | 1        | 20/3/2017  | Malathi        | 24  | F      | 17122  | 58 kgs | 164 cms | 21.64 | PS I  | GL    | 15 mins             | 76         | 95    | 107    | 110    | 111    | 129      | 135   | 150    | 145    | 143    | 72       | 90    | 107    | 93     | 89     | 91       | 105   | 121    | 110    | 107    |
| 29   | 2        | 20/3/2017  | Bagyalakshmi   | 24  | F      | 16878  | 54 kgs | 159 cms | 21.6  | PS I  | GL    | 15 mins             | 64         | 71    | 74     | 94     | 81     | 143      | 137   | 137    | 149    | 144    | 81       | 92    | 92     | 102    | 98     | 101      | 107   | 107    | 113    | 110    |
| 30   | 3        | 20/3/2017  | Regina         | 36  | F      | 17117  | 42 kgs | 154 cms | 17.7  | PS I  | GL    | 20 mins             | 102        | 105   | 108    | 113    | 114    | 132      | 145   | 154    | 136    | 144    | 90       | 101   | 106    | 98     | 98     | 104      | 116   | 122    | 111    | 110    |
| 31   | 4        | 20/3/2017  | Geetha         | 25  | F      | 17144  | 40 kgs | 150 cms | 17.7  | PS I  | GL    | 15 mins             | 84         | 93    | 108    | 113    | 118    | 126      | 136   | 151    | 145    | 141    | 84       | 97    | 105    | 100    | 98     | 96       | 106   | 118    | 114    | 110    |
| 32   | 1        | 21/3/2017  | Jancy Mary     | 25  | F      | 17163  | 65 kgs | 153 cms | 28.8  | PS I  | GL    | 15 mins             | 99         | 102   | 101    | 100    | 98     | 157      | 160   | 155    | 147    | 138    | 98       | 98    | 96     | 81     | 83     | 115      | 118   | 116    | 107    | 100    |
| 33   | 2        | 21/3/2017  | Akilandam      | 23  | F      | 16923  | 70 kgs | 154 cms | 29.7  | PS I  | GL    | 20 mins             | 74         | 81    | 78     | 88     | 89     | 111      | 118   | 140    | 146    | 134    | 67       | 82    | 100    | 101    | 92     | 78       | 90    | 111    | 113    | 101    |
| 34   | 3        | 21/3/2017  | Naganammal     | 31  | F      | 17038  | 50 kgs | 152 cms | 22.22 | PS I  | GL    | 20 mins             | 74         | 75    | 89     | 77     | 78     | 112      | 112   | 120    | 128    | 128    | 72       | 65    | 83     | 93     | 93     | 85       | 81    | 95     | 105    | 105    |
| 35   | 4        | 21/3/2017  | Poongodi       | 30  | F      | 16963  | 50 kgs | 158 cms | 20.08 | PS I  | GL    | 15 mins             | 90         | 81    | 78     | 70     | 77     | 110      | 94    | 120    | 134    | 131    | 72       | 66    | 84     | 94     | 95     | 85       | 75    | 96     | 107    | 107    |
| 36   | 1        | 23/3/2017  | Sowmya         | 24  | F      | 17333  | 60 kgs | 158 cms | 24.09 | PS I  | GL    | 15 mins             | 81         | 91    | 85     | 83     | 91     | 116      | 105   | 116    | 114    | 115    | 75       | 69    | 71     | 78     | 78     | 89       | 81    | 86     | 90     | 91     |
| 37   | 2        | 23/3/2017  | Usha           | 28  | F      | 17352  | 40 kgs | 156 cms | 16.46 | PS II | GL    | 15 mins             | 77         | 91    | 95     | 98     | 91     | 127      | 103   | 103    | 121    | 129    | 86       | 68    | 68     | 87     | 90     | 100      | 80    | 80     | 98     | 103    |
| 38   | 3        | 23/3/2017  | Saranya        | 29  | F      | 17405  | 50 kgs | 154 cms | 21.09 | PS I  | GL    | 20 mins             | 88         | 89    | 83     | 92     | 96     | 134      | 111   | 133    | 132    | 136    | 89       | 70    | 96     | 84     | 86     | 104      | 84    | 108    | 100    | 104    |
| 39   | 4        | 23/3/2017  | Shama          | 24  | F      | 17331  | 50 kgs | 152 cms | 21.64 | PS I  | GR    | 20 mins             | 133        | 108   | 114    | 104    | 106    | 135      | 105   | 131    | 140    | 135    | 91       | 59    | 94     | 93     | 81     | 106      | 74    | 106    | 109    | 99     |
| 40   | 5        | 23/3/2017  | Sunitha        | 26  | F      | 17248  | 50 kgs | 160 cms | 19.53 | PS I  | GR    | 20 mins             | 83         | 96    | 86     | 96     | 96     | 120      | 140   | 138    | 130    | 137    | 76       | 96    | 86     | 88     | 90     | 92       | 110   | 103    | 102    | 105    |
| 41   | 6        | 23/3/2017  | Durga          | 27  | F      | 17213  | 40 kgs | 152 cms | 17.39 | PS I  | GR    | 15 mins             | 83         | 90    | 110    | 111    | 113    | 120      | 159   | 132    | 128    | 134    | 86       | 106   | 93     | 90     | 92     | 98       | 120   | 106    | 101    | 106    |
| 42   | 7        | 23/3/2017  | Nisha          | 27  | F      | 17270  | 48 kgs | 149 cms | 21.62 | PS I  | GR    | 15 mins             | 80         | 96    | 100    | 100    | 104    | 119      | 156   | 155    | 142    | 142    | 89       | 108   | 103    | 96     | 96     | 96       | 126   | 121    | 113    | 113    |
| 43   | 1        | 26/3/2017  | Sathya         | 28  | F      | 17211  | 70 kgs | 163 cms | 26.41 | PS I  | GL    | 20 mins             | 76         | 81    | 80     | 84     | 86     | 116      | 144   | 142    | 144    | 146    | 79       | 104   | 97     | 98     | 101    | 88       | 116   | 110    | 113    | 116    |
| 44   | 2        | 26/3/2017  | Divya          | 20  | F      | 17398  | 45 kgs | 152 cms | 20    | PS I  | GL    | 20 mins             | 92         | 94    | 105    | 106    | 104    | 128      | 132   | 158    | 155    | 147    | 91       | 97    | 104    | 96     | 86     | 101      | 107   | 120    | 118    | 116    |
| 45   | 3        | 26/3/2017  | Devi           | 31  | F      | 17471  | 45 kgs | 150 cms | 20    | PS I  | GR    | 20 mins             | 92         | 96    | 97     | 96     | 95     | 133      | 122   | 120    | 134    | 136    | 94       | 83    | 86     | 88     | 92     | 107      | 96    | 97     | 103    | 106    |
| 46   | 4        | 26/3/2017  | Suganya        | 25  | F      | 17509  | 40 kgs | 152 cms | 17.31 | PS I  | GL    | 15 mins             | 97         | 100   | 102    | 108    | 106    | 130      | 125   | 135    | 138    | 140    | 89       | 90    | 98     | 98     | 99     | 108      | 102   | 108    | 111    |        |

| S.NO | STUDY NO. | STUDY DATE | NAME           | AGE | GENDER | IP NO. | WEIGHT | HEIGHT  | BMI   | ASA   | GROUP | DURATION OF SURGERY | PULSE RATE |       |        |        | SBP    |          |       |        | DBP    |        |          |       | MAP    |        |        |          |       |        |        |        |
|------|-----------|------------|----------------|-----|--------|--------|--------|---------|-------|-------|-------|---------------------|------------|-------|--------|--------|--------|----------|-------|--------|--------|--------|----------|-------|--------|--------|--------|----------|-------|--------|--------|--------|
|      |           |            |                |     |        |        |        |         |       |       |       |                     | BASELINE   | 5 min | 10 min | 15 min | 20 min | BASELINE | 5 min | 10 min | 15 min | 20 min | BASELINE | 5 min | 10 min | 15 min | 20 min | BASELINE | 5 min | 10 min | 15 min | 20 min |
| 51   | 2         | 31/3/2017  | Sowmya         | 24  | F      | 17561  | 50 kgs | 164 cms | 19.33 | PS I  | GL    | 20 mins             | 60         | 85    | 96     | 99     | 94     | 120      | 138   | 153    | 146    | 135    | 76       | 96    | 109    | 104    | 95     | 91       | 110   | 124    | 118    | 108    |
| 52   | 3         | 31/3/2017  | Nandhini       | 23  | F      | 17506  | 45 kgs | 156 cms | 20    | PS II | GL    | 20 mins             | 89         | 92    | 109    | 103    | 99     | 110      | 111   | 134    | 124    | 119    | 71       | 69    | 90     | 83     | 80     | 84       | 83    | 105    | 97     | 92     |
| 53   | 4         | 31/3/2017  | Aruna rani     | 31  | F      | 17032  | 55 kgs | 160 cms | 21.48 | PS II | GL    | 15 mins             | 92         | 94    | 107    | 105    | 110    | 118      | 120   | 124    | 140    | 145    | 72       | 82    | 90     | 90     | 93     | 84       | 93    | 99     | 101    | 106    |
| 54   | 5         | 31/3/2017  | Shamila        | 25  | F      | 17617  | 50 kgs | 158 cms | 20.08 | PS II | GL    | 20 mins             | 88         | 92    | 92     | 94     | 95     | 113      | 121   | 131    | 139    | 155    | 75       | 88    | 82     | 90     | 103    | 88       | 99    | 82     | 104    | 119    |
| 55   | 6         | 31/3/2016  | Abirami        | 21  | F      | 17605  | 48 kgs | 160 cms | 18.75 | PS I  | GR    | 15 mins             | 98         | 97    | 112    | 115    | 115    | 108      | 136   | 148    | 149    | 140    | 86       | 90    | 92     | 94     | 92     | 93       | 105   | 111    | 112    | 108    |
| 56   | 1         | 04-01-17   | Deepa          | 27  | F      | 979    | 50 kgs | 155 cms | 20.83 | PS I  | GR    | 20 mins             | 102        | 104   | 108    | 108    | 109    | 124      | 128   | 136    | 121    | 128    | 76       | 82    | 92     | 76     | 86     | 92       | 97    | 106    | 91     | 100    |
| 57   | 2         | 04-01-17   | Sudha          | 24  | F      | 1025   | 62 kgs | 170 cms | 21.43 | PS I  | GL    | 20 mins             | 91         | 109   | 119    | 109    | 108    | 121      | 132   | 142    | 137    | 136    | 78       | 86    | 104    | 94     | 84     | 92       | 101   | 114    | 106    | 101    |
| 58   | 3         | 04-01-17   | Vasanth        | 32  | F      | 1043   | 47 kgs | 146 cms | 22.06 | PS I  | GR    | 20 mins             | 89         | 109   | 105    | 95     | 96     | 130      | 144   | 154    | 157    | 148    | 83       | 95    | 116    | 108    | 98     | 99       | 111   | 128    | 124    | 114    |
| 59   | 4         | 04-01-17   | Sangeetha      | 23  | F      | 1104   | 50 kgs | 154 cms | 21.09 | PS II | GL    | 15 mins             | 86         | 119   | 112    | 88     | 86     | 124      | 101   | 116    | 112    | 118    | 78       | 65    | 77     | 71     | 64     | 90       | 77    | 90     | 85     | 82     |
| 60   | 5         | 04-01-17   | Prnya          | 23  | F      | 1344   | 52 kgs | 152 cms | 21.64 | PS II | GL    | 15 mins             | 89         | 105   | 70     | 74     | 78     | 115      | 123   | 107    | 118    | 132    | 72       | 89    | 72     | 85     | 74     | 86       | 89    | 72     | 85     | 93     |
| 61   | 1         | 04-03-17   | Shama          | 26  | F      | 1174   | 45 kgs | 150 cms | 20    | PS II | GL    | 20 mins             | 113        | 93    | 103    | 110    | 112    | 112      | 95    | 109    | 118    | 116    | 71       | 48    | 60     | 72     | 74     | 85       | 64    | 76     | 82     | 88     |
| 62   | 2         | 04-03-17   | Rani           | 27  | F      | 1172   | 40 kgs | 150 cms | 17.77 | PS II | GL    | 20 mins             | 84         | 88    | 102    | 101    | 98     | 118      | 108   | 98     | 102    | 104    | 78       | 86    | 64     | 92     | 86     | 91       | 93    | 75     | 95     | 92     |
| 63   | 3         | 04-03-17   | Suguna         | 24  | F      | 17686  | 60 kgs | 156 cms | 26.66 | PS II | GR    | 15 mins             | 92         | 98    | 106    | 104    | 99     | 100      | 110   | 136    | 139    | 128    | 66       | 70    | 90     | 92     | 86     | 75       | 83    | 105    | 106    | 100    |
| 64   | 4         | 04-03-17   | Karpagam       | 28  | F      | 17698  | 66 kgs | 150 cms | 29.33 | PS II | GR    | 15 mins             | 90         | 98    | 102    | 98     | 100    | 150      | 167   | 172    | 151    | 148    | 89       | 100   | 98     | 100    | 98     | 109      | 122   | 122    | 117    | 114    |
| 65   | 5         | 04-03-17   | Saranya        | 24  | F      | 17630  | 48 kgs | 155 cms | 20    | PS II | GR    | 20 mins             | 82         | 106   | 111    | 106    | 101    | 106      | 128   | 127    | 129    | 119    | 70       | 84    | 86     | 90     | 82     | 85       | 99    | 99     | 103    | 95     |
| 66   | 6         | 04-03-17   | Samsath        | 29  | F      | 17658  | 54 kgs | 152 cms | 23.37 | PS I  | GL    | 20 mins             | 85         | 100   | 97     | 92     | 96     | 124      | 135   | 135    | 135    | 129    | 72       | 89    | 91     | 90     | 84     | 88       | 102   | 103    | 102    | 99     |
| 67   | 7         | 04-03-17   | Esther         | 24  | F      | 17711  | 55 kgs | 151 cms | 24.44 | PS I  | GL    | 15 mins             | 88         | 94    | 96     | 92     | 94     | 140      | 148   | 149    | 156    | 141    | 76       | 84    | 71     | 77     | 76     | 97       | 105   | 101    | 107    | 98     |
| 68   | 1         | 04-07-17   | Maharani       | 28  | F      | 1231   | 55 kgs | 156 cms | 22.63 | PS I  | GL    | 15 mins             | 83         | 103   | 104    | 112    | 117    | 112      | 138   | 138    | 129    | 136    | 75       | 104   | 100    | 93     | 92     | 84       | 113   | 110    | 102    | 101    |
| 69   | 1         | 04-09-17   | Anganmai       | 24  | F      | 1394   | 45 kgs | 151 cms | 19.73 | PS I  | GR    | 15 mins             | 119        | 129   | 122    | 130    | 122    | 123      | 144   | 140    | 134    | 133    | 70       | 94    | 92     | 85     | 86     | 88       | 111   | 108    | 101    | 103    |
| 70   | 2         | 04-09-17   | Nasima Begum   | 21  | F      | 1379   | 50 kgs | 152 cms | 21.64 | PS I  | GR    | 20 mins             | 92         | 88    | 91     | 99     | 90     | 113      | 122   | 146    | 128    | 123    | 72       | 84    | 98     | 86     | 87     | 83       | 96    | 118    | 99     | 97     |
| 71   | 3         | 04-09-17   | Shahin Fathima | 34  | F      | 1413   | 65 kgs | 154 cms | 27.42 | PS II | GR    | 20 mins             | 116        | 129   | 118    | 99     | 96     | 125      | 114   | 126    | 136    | 125    | 78       | 74    | 85     | 92     | 84     | 94       | 87    | 99     | 107    | 97     |
| 72   | 1         | 04-11-17   | Dilrasi        | 26  | F      | 1476   | 62 kgs | 155 cms | 25.83 | PS II | GR    | 15 mins             | 101        | 127   | 136    | 124    | 119    | 127      | 162   | 163    | 148    | 142    | 86       | 104   | 103    | 91     | 90     | 100      | 123   | 123    | 113    | 107    |
| 73   | 1         | 04-12-17   | Vinitha        | 21  | F      | 1554   | 55 kgs | 152 cms | 23.8  | PS I  | GL    | 20 mins             | 91         | 102   | 92     | 110    | 101    | 139      | 120   | 145    | 135    | 151    | 83       | 61    | 89     | 79     | 85     | 102      | 81    | 108    | 98     | 107    |
| 74   | 2         | 04-12-17   | Mariyam Beevi  | 26  | F      | 1550   | 50 kgs | 148 cms | 22.83 | PS II | GL    | 20 mins             | 96         | 97    | 100    | 100    | 98     | 112      | 119   | 126    | 148    | 135    | 51       | 71    | 80     | 101    | 78     | 71       | 87    | 95     | 117    | 98     |
| 75   | 1         | 16/4/2017  | Deepa          | 35  | F      | 1701   | 65 kgs | 154 cms | 27.42 | PS II | GR    | 15 mins             | 84         | 88    | 93     | 82     | 81     | 114      | 90    | 101    | 105    | 114    | 73       | 58    | 62     | 65     | 61     | 87       | 69    | 76     | 78     | 79     |
| 76   | 2         | 16/4/2017  | Sumathy        | 23  | F      | 1621   | 60 kgs | 152 cms | 25.97 | PS I  | GL    | 15 mins             | 101        | 87    | 73     | 78     | 89     | 140      | 110   | 126    | 124    | 148    | 80       | 56    | 65     | 74     | 91     | 100      | 74    | 85     | 91     | 110    |
| 77   | 1         | 17/4/2017  | Soniya         | 26  | F      | 1695   | 52 kgs | 153 cms | 22.22 | PS I  | GR    | 20 mins             | 84         | 89    | 90     | 90     | 88     | 133      | 132   | 145    | 137    | 136    | 85       | 85    | 100    | 93     | 92     | 102      | 101   | 115    | 108    | 106    |
| 78   | 1         | 18/4/2017  | Manjula        | 28  | F      | 1728   | 60 kgs | 158 cms | 24.09 | PS I  | GL    | 15 mins             | 82         | 115   | 104    | 99     | 104    | 128      | 146   | 143    | 146    | 142    | 86       | 102   | 93     | 92     | 93     | 100      | 117   | 110    | 110    | 109    |
| 79   | 1         | 25/4/2017  | Yuganya        | 24  | F      | 1953   | 40 kgs | 164 cms | 14.92 | PS II | GR    | 15 mins             | 88         | 113   | 118    | 122    | 118    | 127      | 144   | 137    | 138    | 129    | 84       | 101   | 98     | 94     | 88     | 98       | 115   | 111    | 109    | 102    |
| 80   | 1         | 07-03-17   | Arokya Mari    | 32  | F      | 8066   | 52 kgs | 154 cms | 21.94 | PS I  | GL    | 15 mins             | 84         | 86    | 98     | 102    | 101    | 128      | 134   | 142    | 138    | 144    | 86       | 92    | 84     | 86     | 100    | 102      | 108   | 108    | 102    | 105    |
| 81   | 2         | 07-03-17   | Maheshwan      | 32  | F      | 8009   | 54 kgs | 152 cms | 23.37 | PS II | GR    | 20 mins             | 88         | 99    | 104    | 106    | 108    | 118      | 124   | 132    | 142    | 144    | 76       | 82    | 86     | 92     | 94     | 90       | 96    | 101    | 108    | 110    |
| 82   | 3         | 07-03-17   | Nandhini       | 28  | F      | 8124   | 52 kgs | 155 cms | 21.66 | PS I  | GL    | 20 mins             | 74         | 88    | 96     | 104    | 110    | 112      | 128   | 136    | 144    | 142    | 72       | 86    | 88     | 92     | 88     | 85       | 100   | 104    | 109    | 106    |
| 83   | 1         | 07-05-17   | Mariammal      | 25  | F      | 8300   | 52 kgs | 156 cms | 21.39 | PS II | GL    | 15 mins             | 88         | 101   | 110    | 112    | 108    | 124      | 136   | 138    | 142    | 144    | 82       | 88    | 92     | 86     | 88     | 96       | 104   | 107    | 104    | 106    |
| 84   | 2         | 07-05-17   | Rajeshwan      | 25  | F      | 8112   | 49 kgs | 154 cms | 20.67 | PS II | GR    | 20 mins             | 88         | 98    | 102    | 104    | 110    | 132      | 134   | 142    | 144    | 142    | 86       | 88    | 94     | 104    | 96     | 101      | 103   | 110    | 117    | 111    |
| 85   | 3         | 07-05-17   | Thirumathy     | 26  | F      | 8098   | 50 kgs | 156 cms | 20.57 | PS I  | GR    | 20 mins             | 76         | 84    | 89     | 101    | 110    | 114      | 126   | 138    | 142    | 144    | 78       | 82    | 84     | 86     | 94     | 90       | 94    | 102    | 104    | 110    |
| 86   | 1         | 07-06-17   | Shyamala       | 27  | F      | 8360   | 56 kgs | 148 cms | 25.57 | PS II | GL    | 15 mins             | 82         | 92    | 98     | 108    | 104    | 126      | 134   | 142    | 141    | 138    | 84       | 86    | 88     | 86     | 84     | 98       | 102   | 106    | 104    | 102    |
| 87   | 2         | 07-06-17   | Malini         | 21  | F      | 8296   | 55 kgs | 158 cms | 22.08 | PS I  | GL    | 20 mins             | 88         | 89    | 92     | 110    | 112    | 122      | 129   | 134    | 138    | 142    | 84       | 88    | 92     | 96     | 96     | 96       | 101   | 106    | 110    | 111    |
| 88   | 1         | 07-08-17   | Prema          | 23  | F      | 8390   | 40 kgs | 154 cms | 16.87 | PS II | GR    | 20 mins             | 111        | 115   | 116    | 118    | 112    | 135      | 132   | 130    | 144    | 142    | 83       | 85    | 86     | 88     | 86     | 100      | 101   | 101    | 115    | 104    |
| 89   | 2         | 07-08-17   | Kalpana        | 27  | F      | 8348   | 55 kgs | 164 cms | 20.52 | PS I  | GL    | 20 mins             | 99         | 115   | 112    | 116    | 118    | 115      | 116   | 130    | 136    | 134    | 78       | 74    | 93     | 86     | 82     | 88       | 86    | 103    | 102    | 99     |
| 90   | 1         | 07-10-17   | Manimegalai    | 29  | F      | 8527   | 65 kgs | 151 cms | 28.5  | PS I  | GL    | 15 mins             | 77         | 112   | 105    | 106    | 104    | 125      | 159   | 140    | 137    | 138    | 75       | 103   | 91     | 82     | 86     | 94       | 122   | 107    | 106    | 103    |
| 91   | 2         | 07-10-17   | Saina          | 26  | F      | 8424   | 50 kgs | 144 cms | 25.51 | PS I  | GR    | 15 mins             | 84         | 94    | 109    | 111    | 112    | 106      | 118   | 157    | 161    | 148    | 71       | 82    | 114    | 113    | 110    | 83       | 93    | 128    | 126    | 122    |
| 92   | 3         | 07-10-17   | Dhanalakshmi   | 29  | F      | 8315   | 57 kgs | 144 cms | 27.53 | PS I  | GR    | 20 mins             | 77         | 81    | 95     | 91     | 92     | 125      | 135   | 150    | 159    | 162    | 74       | 90    | 102    | 98     | 107    | 87       | 101   | 116    | 112    | 123    |
| 93   | 1         | 07-11-17   | Bharathy       | 24  | F      | 8472   | 40 kgs | 152 cms | 17.31 | PS I  | GR    | 20 mins             | 71         | 86    | 92     | 98     | 101    | 118      | 128   | 136    | 138    | 134    | 78       | 86    | 92     | 88     | 82     | 91       | 100   | 106    | 104    | 99     |
| 94   | 2         | 07-11-17   | Janarthana     | 25  | F      | 8290   | 57 kgs | 150 cms | 25.33 | PS II | GR    | 15 mins             | 82         | 88    | 92     | 96     | 102    | 131      | 134   | 138    | 141    | 142    | 76       | 86    | 88     | 89     | 88     | 94       | 102   | 104    | 106    | 106    |
| 95   | 3         | 07-11-17   | Jamilselvi     | 20  | F      | 8553   | 48 kgs | 155 cms | 20    | PS II | GR    | 20 mins             | 76         | 78    | 84     | 88     | 92     | 122      | 129   | 134    | 136    | 142    | 72       | 76    | 82     | 89     | 92     | 88       | 93    | 99     | 104    | 108    |
| 96   | 1         | 17/7/2017  | Uma            | 30  | F      | 8774   | 51 kgs | 150 cms | 22.66 | PS II | GR    | 15 mins             | 82         | 98    | 100    | 94     | 91     | 128      | 121   | 151    | 156    | 136    | 81       | 81    | 101    | 105    | 94     | 97       | 94    | 117    | 122    | 108    |
| 97   | 2         | 17/7/20    |                |     |        |        |        |         |       |       |       |                     |            |       |        |        |        |          |       |        |        |        |          |       |        |        |        |          |       |        |        |        |





| SN O | STUD Y NO. | STUDY DATE | NAME           | AGE | PAIN - VAS SCORE |    |     |     | 4 Point PONV SCALE |    |     |     | SOUNDS |     |     |     | ILEUS - BOWEL |    |     |     | ILEUS - PASSING FLATUS |    |     |     | ILEUS - DEFECTION |    |     |     | TUG TEST |    |     |     | GENERAL WELL-BEING - THIRST |    |     |     | GENERAL WELL-BEING - DIZZINESS |    |     |     | GENERAL WELL-BEING - HEADACHE |    |     |     | GENERAL WELL-BEING - DROWSINESS |    |     |     | GENERAL WELL-BEING - FATIGUE |    |   |    | DISCHARGE CRITERIA - PADSS |    |   |   |
|------|------------|------------|----------------|-----|------------------|----|-----|-----|--------------------|----|-----|-----|--------|-----|-----|-----|---------------|----|-----|-----|------------------------|----|-----|-----|-------------------|----|-----|-----|----------|----|-----|-----|-----------------------------|----|-----|-----|--------------------------------|----|-----|-----|-------------------------------|----|-----|-----|---------------------------------|----|-----|-----|------------------------------|----|---|----|----------------------------|----|---|---|
|      |            |            |                |     | 2h               | 6h | 12h | 24h | 2h                 | 6h | 12h | 24h | 2h     | 6h  | 12h | 24h | 2h            | 6h | 12h | 24h | 2h                     | 6h | 12h | 24h | 2h                | 6h | 12h | 24h | 2h       | 6h | 12h | 24h | 2h                          | 6h | 12h | 24h | 2h                             | 6h | 12h | 24h | 2h                            | 6h | 12h | 24h | 2h                              | 6h | 12h | 24h |                              |    |   |    |                            |    |   |   |
|      |            |            |                |     | 3                | 3  | 2   | 0   | 2                  | 2  | 1   | 0   | No     | No  | Yes | Yes | No            | No | Yes | Yes | No                     | No | Yes | Yes | No                | No | Yes | Yes | No       | No | Yes | Yes | 1                           | 1  | 0   | 0   | 1                              | 1  | 0   | 0   | 1                             | 1  | 0   | 0   | 1                               | 1  | 0   | 0   | 1                            | 1  | 0 | 0  | 1                          | 1  | 0 | 0 |
| 23   | 8          | 17/3/2017  | Sheelarami     | 26  | 3                | 3  | 2   | 0   | 2                  | 2  | 1   | 0   | No     | No  | Yes | Yes | No            | No | Yes | Yes | No                     | No | Yes | Yes | No                | No | Yes | Yes | 50       | 15 | 1   | 1   | 0                           | 0  | 1   | 1   | 0                              | 0  | 1   | 1   | 0                             | 0  | 1   | 1   | 0                               | 0  | 1   | 1   | 0                            | 0  | 6 | 6  | 10                         | 10 |   |   |
| 24   | 1          | 19/3/2017  | KanchanaAnagel | 28  | 3                | 2  | 1   | 0   | 1                  | 1  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | Yes | Yes | No                     | No | Yes | Yes | No                | No | Yes | Yes | 60       | 20 | 0   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 0   | 0   | 0                               | 0  | 0   | 0   | 7                            | 7  | 9 | 10 |                            |    |   |   |
| 25   | 2          | 19/3/2017  | Lalitha        | 24  | 3                | 2  | 1   | 0   | 1                  | 1  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | Yes | Yes | No                     | No | Yes | Yes | No                | No | Yes | Yes | 49       | 16 | 1   | 1   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 0   | 0   | 0                               | 0  | 7   | 7   | 10                           | 10 |   |    |                            |    |   |   |
| 26   | 3          | 19/3/2017  | Sivaramani     | 24  | 4                | 2  | 1   | 0   | 1                  | 1  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 48       | 12 | 1   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 0   | 0   | 7                               | 7  | 9   | 10  |                              |    |   |    |                            |    |   |   |
| 27   | 4          | 19/3/2017  | Mena           | 22  | 2                | 1  | 0   | 0   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 35       | 10 | 0   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 0   | 0   | 7                               | 8  | 10  | 10  |                              |    |   |    |                            |    |   |   |
| 28   | 1          | 20/3/2017  | Mulathi        | 24  | 1                | 0  | 0   | 0   | 1                  | 0  | 0   | 0   | No     | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 48       | 14 | 1   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 6   | 8   | 9                               | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 29   | 2          | 20/3/2017  | Bagyalakshmi   | 24  | 1                | 1  | 1   | 0   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | Yes | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 42       | 12 | 0   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 1   | 0   | 0                               | 0  | 7   | 9   | 10                           | 10 |   |    |                            |    |   |   |
| 30   | 3          | 20/3/2017  | Regina         | 36  | 1                | 1  | 0   | 0   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | Yes | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 36       | 14 | 0   | 0   | 0                           | 0  | 1   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 1   | 0   | 0                               | 0  | 6   | 8   | 10                           | 10 |   |    |                            |    |   |   |
| 31   | 4          | 20/3/2017  | Geetha         | 25  | 2                | 1  | 0   | 0   | 0                  | 0  | 0   | 0   | No     | Yes | Yes | Yes | No            | No | Yes | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 38       | 16 | 1   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 0   | 0   | 6                               | 9  | 10  | 10  |                              |    |   |    |                            |    |   |   |
| 32   | 1          | 21/3/2017  | Jancy Mary     | 25  | 1                | 1  | 0   | 0   | 1                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | Yes | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 29       | 14 | 1   | 1   | 0                           | 0  | 1   | 0   | 0                              | 0  | 1   | 0   | 0                             | 0  | 1   | 0   | 0                               | 0  | 7   | 8   | 8                            | 10 |   |    |                            |    |   |   |
| 33   | 2          | 21/3/2017  | Akilandam      | 23  | 2                | 1  | 0   | 0   | 1                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | Yes | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 48       | 10 | 1   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 7   | 8   | 9                               | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 34   | 3          | 21/3/2017  | Nagammal       | 31  | 2                | 1  | 0   | 0   | 1                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 35       | 10 | 1   | 1   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 6   | 7   | 8                               | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 35   | 4          | 21/3/2017  | Poongodi       | 30  | 1                | 0  | 0   | 0   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 40       | 12 | 0   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 7   | 8   | 8                               | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 36   | 1          | 23/3/2017  | Sowmiya        | 24  | 1                | 1  | 0   | 0   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 45       | 18 | 0   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 7   | 7   | 9                               | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 37   | 2          | 23/3/2017  | Usha           | 28  | 0                | 1  | 0   | 1   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 50       | 20 | 1   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 6   | 8   | 10                              | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 38   | 3          | 23/3/2017  | Saranya        | 29  | 2                | 1  | 1   | 0   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 48       | 18 | 0   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 6   | 8   | 10                              | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 39   | 4          | 23/3/2017  | Shaira         | 24  | 4                | 3  | 1   | 0   | 2                  | 1  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 42       | 18 | 1   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 6   | 7   | 9                               | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 40   | 5          | 23/3/2017  | Sunitha        | 26  | 3                | 2  | 1   | 0   | 1                  | 1  | 1   | 0   | No     | Yes | Yes | Yes | No            | No | Yes | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 45       | 16 | 1   | 1   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 6   | 6   | 8                               | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 41   | 6          | 23/3/2017  | Durga          | 27  | 3                | 2  | 1   | 1   | 2                  | 1  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 46       | 20 | 1   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 5   | 7   | 9                               | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 42   | 7          | 23/3/2017  | Nisha          | 27  | 3                | 2  | 1   | 1   | 1                  | 1  | 1   | 0   | Yes    | Yes | Yes | Yes | No            | No | Yes | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 54       | 22 | 1   | 1   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 6   | 7   | 9                               | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 43   | 1          | 26/3/2017  | Sahya          | 28  | 1                | 0  | 0   | 0   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 60       | 30 | 1   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 7                             | 8  | 10  | 10  |                                 |    |     |     |                              |    |   |    |                            |    |   |   |
| 44   | 2          | 26/3/2017  | Dwya           | 20  | 2                | 1  | 1   | 0   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 41       | 14 | 1   | 0   | 0                           | 1  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 7   | 8   | 10                              | 10 |     |     |                              |    |   |    |                            |    |   |   |
| 45   | 3          | 26/3/2017  | Devi           | 31  | 3                | 3  | 2   | 2   | 2                  | 1  | 1   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 48       | 15 | 1   | 1   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 1                             | 0  | 0   | 0   | 6                               | 7  | 8   | 10  |                              |    |   |    |                            |    |   |   |
| 46   | 4          | 26/3/2017  | Suganya        | 25  | 2                | 2  | 0   | 0   | 0                  | 0  | 0   | 0   | Yes    | Yes | Yes | Yes | No            | No | No  | Yes | No                     | No | No  | Yes | No                | No | No  | Yes | 52       | 19 | 0   | 0   | 0                           | 0  | 0   | 0   | 0                              | 0  | 0   | 0   | 0                             | 0  | 6   | 8   | 10                              | 10 |     |     |                              |    |   |    |                            |    |   |   |





