"A RANDOMIZED CONTROL STUDY ON THE USE OF CHEWING GUM VERSUS STANDARD POST-OPERATIVE CARE FOLLOWING CAESAREAN DELIVERY FOR EARLY RECOVERY OF BOWEL ACTIVITY."

A Dissertation submitted by

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In partial fulfilment of the requirements for the award of degree of

MASTER OF SURGERY

In OBSTETRICS AND GYNAECOLOGY

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ABBREVATIONS

SL. No	ABBREVATION	EXPANSION
1	ANS	Autonomic nervous system
2	ENS	Enteric nervous system
3	BER	Basic electrical rhythm
4	MMC	Migrating motor complexes
5	CS	Caesarean sections
6	POI	Postoperative ileus
7	VIP	Vasoactive intestinal polypeptide
8	NO	Nitric oxide
9	CCK	Cholecystokinin
10	VBAC	Vaginal birth after caesarean
11	ART	Assisted reproductive technology
12	IVF	Invitro fertilization
13	ICSI	Intra cytoplasmic sperm injection
14	OS	Ogilvie's syndrome
15	GI	Gastrointestinal
16	ERAS	Enhanced Recovery After Surgery

17	**I-FEED**	Intake, Feeling Nauseous, Emesis, Physical Exam, and Duration of Symptoms
18	**PONV**	Postoperative nausea and vomiting
19	**POGI**	Postoperative GI Intolerance
20	**POGD**	Postoperative GI Dysfunction
21	**IM**	Intestinal motility
22	**CRF**	Corticotropin-releasing factor
23	**RCT**	Randomised control trial
24	**LSCS**	Lower segment caesarean section

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INTRODUCTION

Childbirth is the most stressful, exhilarating and fulfilling moment in a mother's life. Each labour experience is unique and calls for a celebration. The delivery procedure is addressed as vaginal delivery and caesarean sections. Caesarean sections (CS) can be planned or done in an emergency. Caesarean sections generally have increased maternal surgical risks for the current and subsequent pregnancies compared to spontaneous vaginal delivery. The restoration of gut motility after surgery may be one of the postoperative problems.

Early oral intake, early mobilization, and a postoperative feeling of well-being are all aided by the early restoration of bowel motility. Generally following an abdominal surgery small intestine activity returns to normal function in few hours, gastric activity returns in 24-48hrs and colon activity will return by 48-72 hours[1].

Some degree of adynamic ileus follows every laparotomy and also follows after caesarean deliveries. Postoperative ileus (POI) is primarily caused by a complex pathophysiology that is not fully understood. It can result in considerable patient morbidity and is frequently a reason for consulting gastroenterologists. POI is generally described as a temporary reduction in normal gastrointestinal movement following surgery, typically lasting 3-5 days. It is marked by symptoms such as abdominal swelling, absence of bowel sounds, and no passage of gas or stool. Factors exacerbating POI include postoperative pain, nausea, vomiting, delayed resumption of oral intake, and extended hospital stays. The overall incidence of POI for all operative procedures in the abdomen is 9.2%[2].

For prevention, surgical goal strives to minimize bowel manipulation, avoid excess IV fluids or profound hypovolemia and limit surgery length. After surgery gum chewing enhanced early bowel function recovery.

Chewing gum has recently become recognized as a novel, convenient, easily accessible, and of less cost to reduce postoperative ileus (POI). It works by stimulating intestinal movement through the cephalic-vagal reflex and by enhancing gastrointestinal hormone secretion responsible for bowel motility. This leads to the early restoration of bowel sounds, the passage of gas, and the return of appetite[3]. Therefore, we have undertaken the study to assess the effectiveness of chewing gum in promoting bowel motility following caesarean delivery.

AIMS AND OBJECTIVES OF STUDY

PRIMARY OBJECTIVE OF THE STUDY:

To know whether chewing gum enhances the early gut motility with respect to the time taken for

i. The first bowel sound to appear
ii. The first passage of flatus
iii. The first passage of stools

THE SECONDARY OBJECTIVE

1. Post-operative complications like vomiting, discontinuation,
2. The sense of well-being
3. Time for ambulation
4. To note any gut-related complications like paralytic ileus, sub-acute obstruction etc.,
5. To know the effectiveness of chewing gum

ANATOMY OF THE ALIMENTARY CANAL[4]

Esophagus:

It emerges from the diaphragm at the level of the tenth thoracic vertebrae, located to the left and a thumb's width below the sternum. On its surface are the gastric nerves (vagi) of the left and right. The peritoneum, which extends as the upper portion of the greater omentum to the left and as the lesser omentum to the right, invests it. It goes via the cardiac orifice and into the stomach.

Stomach:

It is a muscular bag made up of the fundus, body and pyloric antrum. The portion that protrudes upward and makes contact with the diaphragm above the level of the cardiac orifice is known as the fundus. The body reaches the level of the incisura angularis from the fundus. The pyloric antrum narrows towards the pylorus as it extends from the incisura angularis level.The stomach is composed of two muscle coats: an inner circular coat and an outer longitudinal coat, with an oblique muscle coat situated in between. With the exception of a tiny area posteriorly, the stomach is completely covered by the peritoneum.

Duodenum:

It is divided into four parts: the first, which is 2 inches long and peritonealized, runs upward and to the right; the second, which is 3 inches long and runs downward in the shape of a “C” with the duodenum's third part, which contains the head of the pancreas; the superior mesenteric artery crosses the third part anteriorly; the fourth, which turns left and crosses the aorta, lies on the left psoas muscle and the left lumbar sympathetic chain; it breaks free from the peritoneum and leads to the duodeno-jejunal flexure.

Jejunum and Ileum:

In tandem, they have a length of roughly six meters. The ileum makes up the bottom three fifths and the jejunum the upper two fifths. The ileum occupies the pelvis and mid-abdomen, while the jejunum, which is thicker than the ileum, occupies the upper portion of the infra-colic compartment. The mucosa is divided into what are known as Kerkring valves. The jejunum's absorptive surface is increased by these and the villi. The villi are sparse, club-shaped projections in the ileum and finger-like projections in the jejunum.

Caecum:

The appendix is attached to the infero-medial aspect of the large intestine's blind proximal pouch. At the base of the appendix, the three longitudinal muscle coats converge (as taenia). The ascending colon: Stretching from the ileocecal junction to the right colic (hepatic) flexure, it is approximately 6 inches long. It rests on the extraperitoneal fascia, which is fixed and connected to the iliac fascia. In certain places, fat pouches along the colon protrude as appendices called epiploicae.

Transverse colon:

It runs from the hepatic to the splenic flexure and is roughly eighteen inches long. It is in contact with the anterior abdominal wall and is fairly mobile. The greater omentum hangs down from its lower convexity.

Descending colon:

The sigmoid colon is a peritonealized structure that extends from the pelvic brim to the rectum and descending colon measures approximately 12 inches in length. It is retroperitoneal and begins at the splenic flexure and ends at the pelvic brim. The apex of the sigmoid mesocolon is

located on an inverted "V" at the bifurcation of the common iliac artery, over the sacroiliac joint at the pelvic brim.

Rectum:

The term "rectum," which implies "straight," is not accurate. The rectum starts when the sigmoid mesentery ends. Beginning at the level of the third piece of the coccyx, the three taenia of the colon—taenia libera, taenia omentalis, and taenia mesocolica—combine to form a complete outer layer of longitudinal muscle that travels through the pelvic floor and into the anal canal behind the perineal body.

Blood Supply

The stomach is supplied by the right gastric artery, which branches from the common hepatic artery, and the left gastric artery, which branches from the coeliac artery. The gastro-duodenal artery, which supplies blood to the stomach, splits into the left and right gastroepiploic arteries along the greater curvature. The left gastroepiploic artery is a branch of the splenic artery. The cardiac end of the stomach is supplied by the 5-7 short gastric branches of the splenic artery. With the exception of the absence of the gastroduodenal vein, the stomach's venous drainage follows the arteries. They seep into the gateway framework.

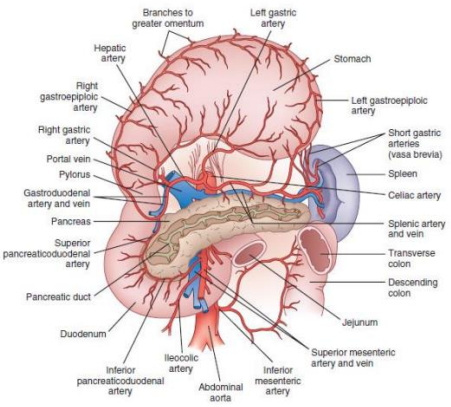

Fig No. 1: Blood supply to the stomach and duodenum

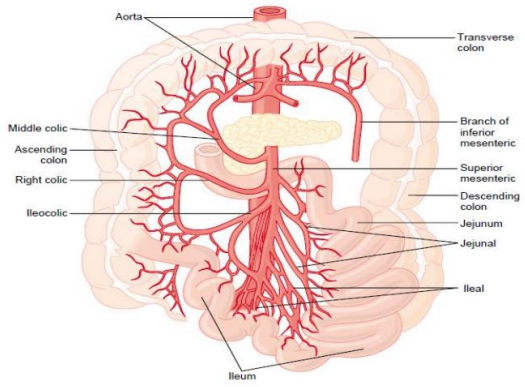

Fig No.2: Arterial blood supply to the intestines through the mesenteric web.

Nervous system[5]

The gastrointestinal system is supplied by

1. Extrinsic nervous system- Autonomic control

2. Enteric nervous system (ENS) - Plexuses

Extrinsic nervous system- Autonomic control[6]

Parasympathetic Innervation.

There are cranial and sacral divisions within the parasympathetic supply. The vagus nerves contain nearly all of the cranial parasympathetic nerve fibers, with the exception of those that supply the mouth and pharyngeal regions of the alimentary tract. The esophagus, stomach, and pancreas receive substantial innervation from these fibers, whereas the intestines receive only a small amount of innervation through the first half of the large intestine[5,6]

The pelvic nerves carry the sacral parasympathetics from the second, third, and fourth sacral segments of the spinal cord to the distal half of the large intestine and ultimately to the anus. Compared to the other intestinal areas, the sigmoidal, rectal, and anal regions have a

significantly higher supply of parasympathetic fibers. These fibers are specifically used to carry out the reflexes involved in defecation. The myenteric and submucosal plexuses are home to the majority of the gastrointestinal parasympathetic system's postganglionic neurons. The entire enteric nervous system becomes more active when these parasympathetic nerves are stimulated.

Sympathetic Innervation.

The spinal cords T-5 and L-2 segments are the starting points for the sympathetic fibres that supply the gastrointestinal tract. After exiting the spinal cord, the preganglionic fibres that innervate the gut enter the sympathetic chains that are lateral to the spinal column. Many of these fibres then continue through the chains to reach the mesenteric and celiac ganglia, which are examples of outlying ganglia. All regions of the gut are subsequently reached by the postganglionic fibres via postganglionic sympathetic nerves. Small amounts of epinephrine are also secreted by the sympathetic nerve endings, but norepinephrine is the main hormone.

The gastrointestinal tract's activity is generally inhibited by sympathetic nervous system stimulation, which has several effects that are opposite to those of the parasympathetic nervous system[7,8].

It exerts its effects in two ways:

1. slightly through the direct inhibition of intestinal tract smooth muscle (apart from mucosal muscle, which it excites) caused by secreted norepinephrine, and

2. mostly through norepinephrine's inhibitory action on all of the enteric nervous system's neurons

Afferent Sensory Nerve Fibers

Innervating the gut are numerous afferent sensory nerve fibres. The cell bodies of some of them are located in the spinal cord's dorsal root ganglia, while others are found in the enteric nervous system itself.

The presence of particular chemicals in the gut, excessive distention of the gut, or irritation of the gut mucosa can all activate these sensory nerves.

Then, excitation or, depending on the situation, inhibition of intestinal movements or secretion can result from signals passing through the fibres.

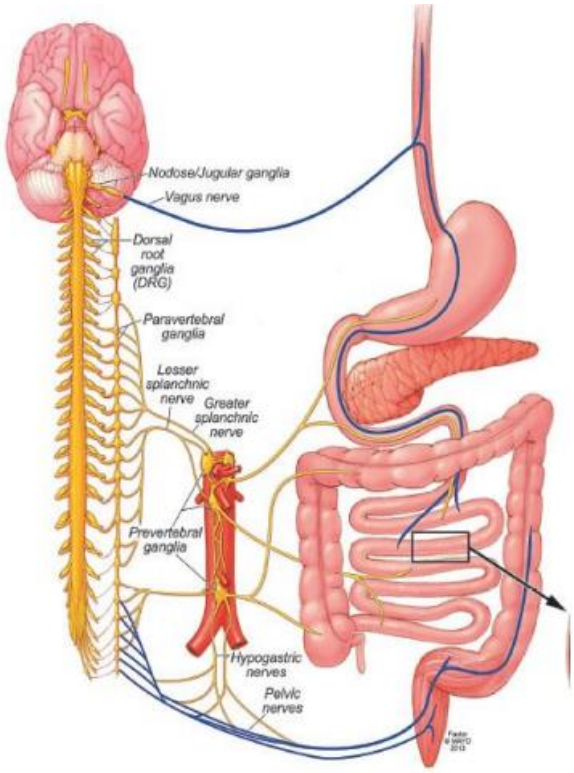

Fig no.3 : The autonomic nervous systems. Sections of the autonomic nervous system (ANS), displaying the organ innervation of the sympathetic (yellow) and parasympathetic craniosacral (blue) systems.

Enteric nervous system (ENS)-

Plexuses The enteric nervous system is a unique nervous system found in the gastrointestinal tract. It is fully contained within the stomach wall, starting in the esophagus and going all the way to the anus. Approximately 100 million neurons make up this enteric system, which is nearly the same amount as neurons in the entire spinal cord. The highly developed ENS plays a crucial role in regulating the secretion and movements of the gut.

The myenteric plexus, also called the Auerbach's plexus, is an outer plexus located between the circular and longitudinal muscle layers. It is one of the two plexuses that make up the enteric nervous system. (2) The submucosal plexus, also called Meissner's plexus, is situated in the submucosa.The submucosal plexus primarily regulates local blood flow and gastrointestinal secretion, while the myenteric plexus primarily regulates gastrointestinal movements. The myenteric and submucosal plexuses are connected to the extrinsic sympathetic and parasympathetic fibers7. The parasympathetic and sympathetic nervous systems can stimulate the enteric nervous system to either greatly enhance or inhibit gastrointestinal functions, even though it can function independently of these extrinsic nerves.

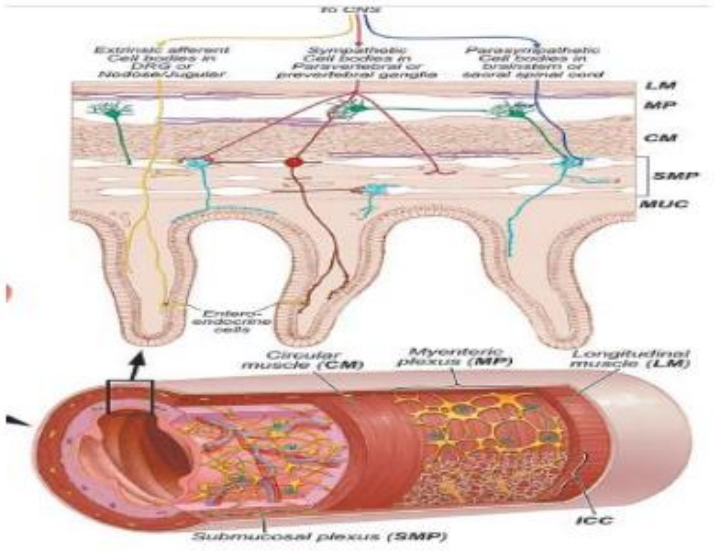

Fig No. 4: Cutaway/cross-sectional diagram of the small intestine's wall displaying the ENS's submucosal and myenteric plexuses

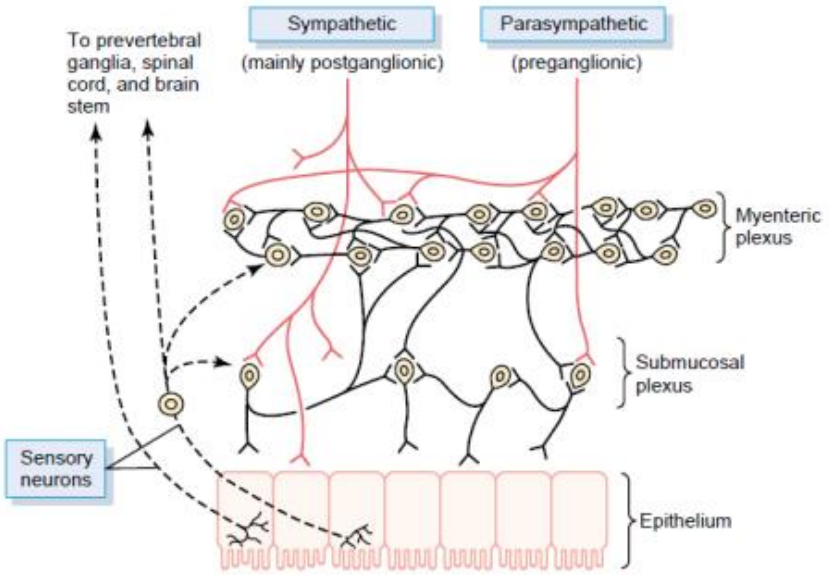

Fig No 5: Control of the gut wall by the nervous systems: the myenteric and submucosal plexuses are shown, and the sympathetic and parasympathetic nervous systems regulate them. kinds of neurotransmitters that enteric neurons secrete[8]

Most common

(1) acetylcholine and

(2) norepinephrine.

The others are substance-P, cholecystokinin, leu-enkephalin, metenkephalin, somatostatin, adenosine triphosphate, serotonin, dopamine, and cholecystokinin. Most often, acetylcholine stimulates the gastrointestinal tract. Gastrointestinal activity is nearly always inhibited by norepinephrine. This also applies to adrenal medullae-secreted epinephrine, which enters the circulation and primarily travels through the blood to the gastrointestinal tract. The other transmitters mentioned earlier are a combination of agents that are both excitatory and inhibitory

GENERAL PATTERNS OF MOTILITY[9]

1. PERISTALSIS
2. SEGMENTATION & MIXING
3. BASIC ELECTRICAL ACTIVITY & REGULATION OF MOTILITY
4. MIGRATING MOTOR COMPLEX (MMR)

PERISTALSIS

Peristalsis is a reflex response that happens in every section of the gastrointestinal tract, from the oesophagus to the rectum, in response to the lumen's contents stretching the gut wall. The stretch starts an area of relaxation in front of the stimulus and a circular contraction behind it. After that, the contraction wave travels from the oral to the caudal direction, pushing the lumen's contents forward at speeds ranging from 2 to 25 cm/s. The gut's autonomic input can either increase or decrease peristalsis, but it doesn't depend on extrinsic innervation to occur.

In fact, removing and replacing an intestinal segment in its original location does not impede the passage of its contents; rather, obstruction occurs only when the segment is turned around before being sewn back into place. A great illustration of the enteric nervous system's coordinated activity is peristalsis. Serotonin is released by local stretch, and this action stimulates sensory neurons that in turn activate the myenteric plexus. Smooth muscle contraction behind the bolus is caused by cholinergic neurons traveling retrogradely through this plexus, activating neurons that release substance P and acetylcholine. In parallel, neurons secreting nitric oxide (NO) and vasoactive intestinal polypeptide (VIP) are activated by cholinergic neurons traveling anterogradely, causing the relaxation to occur prior to the stimulus.

SEGMENTATION & MIXING

The enteric nervous system stimulates a peristalsis-related motility pattern when food is present, but its purpose is to slow the passage of intestinal contents down the length of the intestinal tract to give time for absorption and digestion. Segmentation is the name of this motility pattern, which allows for sufficient blending of the digestive juices and the intestinal contents, or chyme. A bowel segments contract at both ends, and then the segment's center contracts again to push the chyme both forward and backward. Therefore, in contrast to peristalsis, the chime regularly moves backward during segmentation. As long as there are nutrients in the lumen that can still be absorbed, this mixing pattern will continue. It is likely the result of the bowel's programmed activity, which is controlled by the enteric nervous system. It can happen without the help of the central nervous system, though the latter can influence it.[10,11,12].

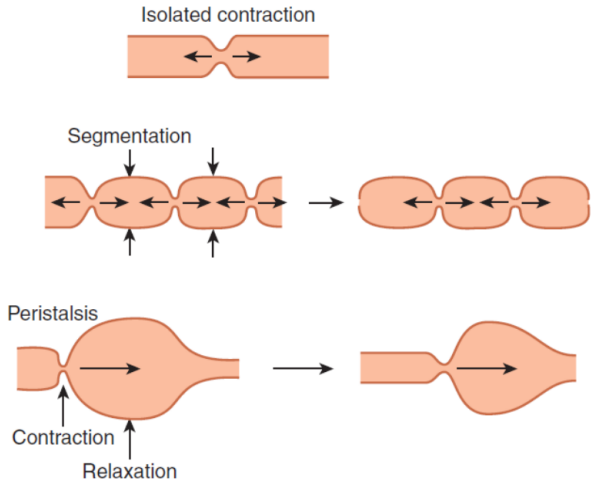

Fig no.6 Patterns of gastrointestinal motility and propulsion.

BASIC ELECTRICAL ACTIVITY & REGULATION OF MOTILITY[12,13].

The myenteric plexus, also called the Auerbach's plexus, is an outer plexus located between the circular and longitudinal muscle layers. It is one of the two plexuses that make up the enteric nervous system. (2) The submucosal plexus, also called Meissner's plexus, is situated in the submucosa. This fundamental electrical rhythm (BER) is initiated by the interstitial cells of Cajal, stellate mesenchymal pacemaker cells with smooth muscle-like properties that send long multiply branched processes into the intestinal smooth muscle. These cells are located in the outer circular muscle layer near the myenteric plexus in the stomach and small intestine, and at the submucosal border of the circular muscle layer in the colon. There is a decreasing gradient in pacemaker frequency in the stomach and small intestine, and similar to the heart, the pacemaker with the highest frequency typically.

While muscle tension is increased by spike potentials superimposed on the most depolarizing portions of the BER waves, muscle contraction is rarely caused by the BER itself. Every spike has a depolarizing part caused by Ca 2+ influx and a repolarizing part caused by K + efflux. The BER is impacted by numerous neurotransmitters and polypeptides. For instance, acetylcholine causes the smooth muscle to become more tense and produce more spikes, but adrenaline causes the opposite effects. In the stomach, the BER occurs at a rate of roughly 4/min. In the duodenum, it is roughly 12/min, and in the distal ileum, it is about 8/min.

The BER rate increases in the colon from roughly 2/min at the cecum to roughly 6/min at the sigmoid. Coordination of peristaltic and other motor activity, including rhythmic segmentation, is the role of the BER; contractions are only possible during the depolarizing phase of waves. For example, following a vagotomy or stomach wall transection, the stomach's peristalsis becomes erratic and disordered.

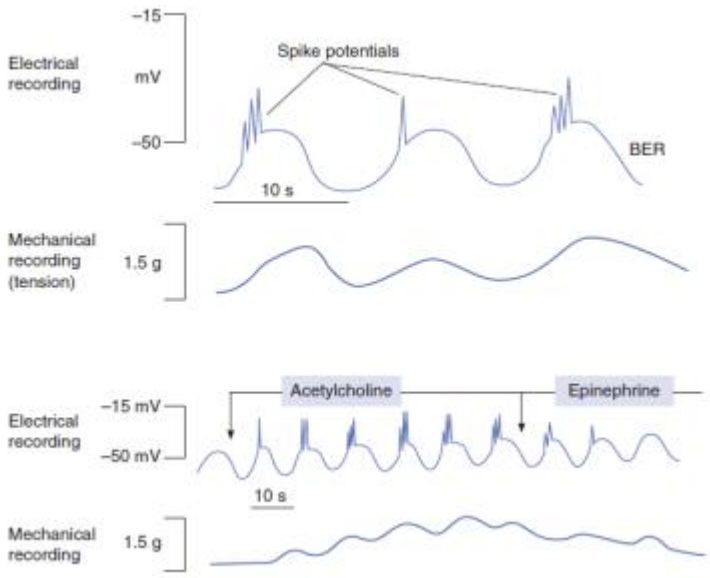

Fig No.7 Basic electrical rhythm (BER) of smooth muscle in the gastrointestinal tract. Top: Muscle contraction and its relationship to morphology. Bottom: Acetylcholine's stimulatory action and adrenaline's inhibitory action.

MIGRATING MOTOR COMPLEX

Fasting alters the electrical and motor activity pattern in gastrointestinal smooth muscle, causing cycles of motor activity to move from the stomach to the distal ileum in between periods of digestion. A period of quiescence (phase I), followed by erratic electrical and mechanical activity (phase II), and a burst of regular activity (phase III) mark the beginning, middle, and end of each cycle, or migrating motor complex (MMC). Motilin is what triggers the MMCs. When the MMC is in the contractile phases, the circulating level of this hormone rises at intervals of roughly 100 minutes during the inter digestive state.

The contractions occur at intervals of roughly 100 minutes and migrate aborally at a rate of about 5 cm/min. With every MMC, there is an increase in pancreatic secretion, bile flow, and gastric secretion. They probably do this to help make room for the next meal by removing

luminal contents from the stomach and small intestine. On the other hand, following a meal, motilin secretion is inhibited (food consumption inhibits motilin release through as-yet-unidentified mechanisms), and the MMC is eliminated until digestion and absorption are finished. During this period, peristalsis, the other types of BER, and spike potentials reappear. Due to its ability to bind to motilin receptors, the antibiotic erythromycin and its derivatives may be useful in treating patients whose gastrointestinal motility is reduced[11,12].

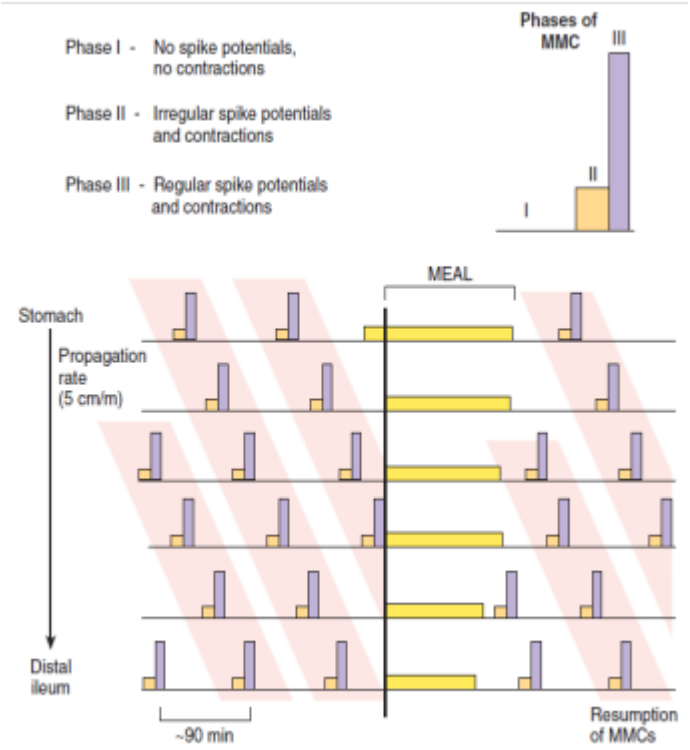

Fig No.8: Motor complexes that migrate (MMCs). Observe that during fasting, the complexes descend the gastrointestinal tract at a consistent pace, that a meal completely inhibits them, and that they resume 90–120 minutes after the meal.

SEGMENT-SPECIFIC PATTERNS OF MOTILITY

Food is held in the stomach and then released into the duodenum at a steady, regulated rate after being combined with mucus, acid, and pepsin.

GASTRIC MOTILITY & EMPTYING

Receptive relaxation is the process by which the fundus and upper part of the body relax and allow food to pass into the stomach with little to no increase in pressure. Next, in the lower body, peristalsis starts, blending and pulverizing the food and allowing tiny, semiliquid pieces to pass through the pylorus and into the duodenum.

The pharynx and oesophagus move, which is partly vagally mediated and initiates receptive relaxation. Relaxation is also a result of intrinsic reflexes stretching the wall of the stomach. Soon after, the gastric BER starts to control peristalstic waves, which move in the direction of the pylorus. Occasionally referred to as antral systole, the distal stomach contraction brought on by each wave can endure for up to ten seconds. Three to four waves occur each minute.

The antrum, pylorus, and upper duodenum appear to work together to regulate gastric emptying. The antrum contracts first, and then the duodenum and pyloric area contract in turn. Solid masses are prevented from entering the duodenum by partial contraction, which causes them to be mixed and crushed in the antrum prior to the advancing gastric contents. A small amount of the more liquid stomach contents are squirted into the small intestine at a time. Normally, the pyloric segment's contraction lasts a little bit longer than the duodenum, so regurgitation from the duodenum does not happen. The prevention of regurgitation may also be due to the stimulating action of cholecystokinin (CCK) and secretin on the pyloric sphincter.

REGULATION OF GASTRIC MOTILITY & EMPTYING

The kind of food consumed affects how quickly the stomach empties into the duodenum. Food high in carbohydrates quickly exits the stomach. Food high in protein exits the body more slowly, and the slowest emptying occurs after a high-fat meal. The osmotic pressure of the substance entering the duodenum affects the rate of emptying as well. "Duodenal osmoreceptors" detect the hyperosmolality of the duodenal contents and cause a decrease in gastric emptying, which is most likely neurological in origin[12,13,14].

Gastric motility and the secretion of pepsin and acid are inhibited by fats, carbohydrates, and acid in the duodenum through neuronal and hormonal mechanisms. Peptide YY is most likely the messenger in question. Additionally, CCK has been linked to inhibiting stomach emptying.

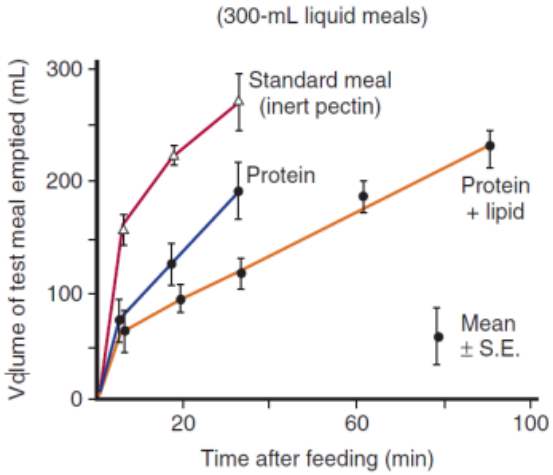

Fig No. 9 : Impact of fat and protein on how quickly the human stomach empties. Patients received meals in 300 mL of liquid.

SMALL INTESTINE

Pancreatic juice, bile, and mucosal cell secretions are combined with the intestinal contents in the small intestine.

INTESTINAL MOTILITY

During a fast, the MMCs that move through the intestine at regular intervals are replaced by peristaltic and other contractions that are managed by the BER. The proximal jejunum in the small intestine averages 12 BER cycles per minute, whereas the distal ileum only averages 8 cycles per minute. Peristalstic waves, segmentation contractions, and tonic contractions are the three different forms of smooth muscle contractions. The chyme, or contents of the intestines, is propelled toward the large intestines by peristalsis. Chyme is moved back and forth and becomes more exposed to the mucosal surface during segmentation contractions. Focused increases in Ca2+ influx cause these contractions, and waves of elevated Ca2+ concentration radiate outward from each focus.

Tonic contractions are comparatively long contractions that effectively divide the intestine into separate sections. It should be noted that the small intestine's transit time is actually longer when the body is fed than when it is fasted due to the last two types of contractions slowing it down. This promotes absorption by allowing the chyme to remain in contact with the enterocytes for longer.

COLON

The leftovers from meals that cannot be absorbed or digested are stored in the colon. Similar to that, this segment's motility is slowed to aid the colon's absorption of water, Na+, and other minerals. By removing about 90% of the fluid, it converts the 1000–2000 mL of isotonic chyme that passes through the ileum each day into about 200–250 mL of semisolid feces.

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MOTILITY OF THE COLON[14]

The ilea caecal valve, which closes off the reflex of colonic contents, especially sterile ileum, connects the colon to the ileum. Increases in colonic pressure squeeze the ileocecal valve shut, while increases in ileal pressure open it because the ileocecal valve is located in the portion of the ileum that projects slightly into the cecum. Normally, it is closed. It opens momentarily each time a peristaltic wave approaches, allowing some ileal chyme to spurt into the cecum. The ilea caecal valve opens more readily and more chyme passes through it as food exits the stomach (gastroileal reflex). Presumably, this is a vaso-vagal reflex.

Segmentation contractions and peristaltic waves, which resemble those in the small intestine, are among the movements of the colon. By exposing more of the colon's contents to the mucosa, segmentation contractions mix the contents and promote absorption. The contents are propelled toward the rectum by peristalsis waves, though weak antiperistalsis is occasionally observed. The mass action contraction, which happens roughly ten times a day and involves the simultaneous contraction of the smooth muscle over sizable confluent areas, is the third type of contraction that is unique to the colon. Materials are moved from one area of the colon to another by these contractions. Additionally, they transfer material into the rectum, and the defecation reflex is triggered by rectal distention.

The abundance of commensal bacteria within the comparatively. The colon's BER is responsible for coordinating its movements. Unlike the wave in the small intestine, this wave's frequency increases along the colon, reaching the sigmoid at 6/min from the ilea-cecal valve at about 2/min.

THE SMALL INTESTINE & COLON- Transient time

In approximately 4 hours, the initial part of a test meal usually reaches the cecum, and in 8 or 9 hours, the entire undigested food reaches the colon. Typically, the first meal remnants go through the colon's first third in six hours, second third in nine, and sigmoid colon, the colon's terminal portion, in twelve hours.The sigmoid colon's transit time to the anus is noticeably slower. Seventy percent of the small colored beads fed with a meal are recovered in the stool within 72 hours on average, but recovery takes longer than a week. By tracking the progress of a tiny pill containing sensors and a tiny radio transmitter, it is possible to observe transit time, pressure variations, and pH changes in the gastrointestinal tract.

DEFECATION

Reflex contractions of the rectum's musculature and the urge to void are triggered when it is distended with feces. The internal (involuntary) anal sphincter receives an excitatory sympathetic nerve supply, but an inhibitory parasympathetic nerve supply. When the rectum dilates, this sphincter loosensThe pudendal nerve provides the skeletal muscle known as the external anal sphincter with its nerve supply. Moderate rectum distention increases the force of the sphincter's contraction, which is maintained in a state of tonic contraction.

When rectal pressure rises to roughly 18 mm Hg, the urge to urinate first manifests itself. The external and internal sphincters relax and the contents of the rectum reflexively escape when the pressure reaches 55 mm Hg. Because of this, reflex rectum evacuation can happen even when there is a spinal injury. One can strain to start voluntary defecation before the pressure that relaxes the external anal sphincter is reached. Defecation is inhibited by the contraction of the puborectalis muscle and the normal angle of 90 degrees between the anus and the rectum. The pelvic floor descends 1-3 cm, the puborectalis muscle relaxes, and the abdominal muscles contract when straining14,15. It reduces the anorectal angle to 15 degrees or less. Defecation happens when this is paired with the external anal sphincter relaxing.

Therefore, defecation is a spinal reflex that can be deliberately avoided by maintaining the external sphincter's contraction and by tightening the abdominal muscles.

Food-induced distention of the stomach triggers the rectum's contractions and oftentimes the urge to urinate. The reaction is known as the gastrocolic reflex, and gastrin's effect on the colon may amplify it. Children are expected to urinate after meals due to the response. Adults' habits and cultural norms have a significant influence on when they defecate[16].

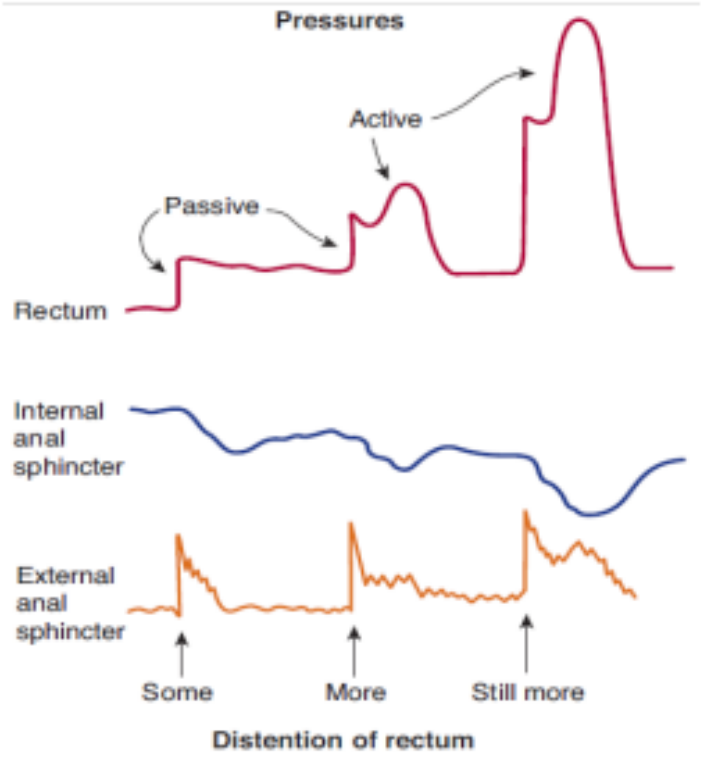

FIG NO. 10 : Responses to distention of the rectum by pressures less than 55 mm Hg

CESAREAN SECTION

A cesarean delivery is characterized by either hysterotomy and a laparotomy performed on the fetus. Removal of the fetus from the abdominal cavity in cases of uterine rupture or abdominal pregnancy is not covered by this definition. Hysterotomy—a postmortem or perimortem caesarean delivery—is rarely done on a woman who has recently passed away or whose death is anticipated shortly.

RATES: Reasons for persistently elevated caesarean rates include the following:

1. Nulliparas, who are more likely to give birth by caesarean section, account for a higher proportion of births as fewer women are having children.

2. The average age of mothers is increasing, and older women—particularly older nulliparas—are more likely to give birth by caesarean section.

3. Intermittent fetal heart rate auscultation is linked to a lower caesarean delivery rate than the widespread use of electronic fetal monitoring.

4. Most breech fetuses are now delivered by caesarean.

5. Operative vaginal deliveries have become less common.

6. Obesity, which is a caesarean delivery risk, has reached epidemic proportions.

7. Women with preeclampsia are more likely to have caesarean deliveries than to have labor inductions; the rates of both procedures have decreased.

From a peak of 28% in 1996 to 13.3% in 2018, the vaginal birth after caesarean (VBAC) rate has declined (Martin, 2019). The percentage of VBACs varies greatly between nations, ranging from 9.6 to 52.2%.[17].

8. Assisted reproductive technology(ART) is more widely used and is linked with greater cesarean delivery rates (Luke, 2019).

Nakeisha A. Lodge-Tulloch conducted a recent study on the relationship between CS and ART, and it included: 34 of the 1,750 studies that were found through the search met the requirements for inclusion. Invitro fertilization/ Intra cytoplasmic sperm injection(IVF/ICSI) pregnancies were linked, with a 95% confidence interval, to a 1.90-fold increase in the odds of a cesarean section compared to spontaneous conceptions. IVF/ICSI pregnancies were linked, when stratified by indication, to 1.91-fold higher odds of elective C-sections and 1.38-fold higher odds of emergent C-sections (95% CI 1.09, 1.75).[18]

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COMPLICATION FOLLOWING CESAREAN SECTION

1. The most common complication is massive bleeding, reported in 7% of cases[19].

2. Injury to the urinary tract, bowel, and large vessels[20].

3. Following a cesarean section, rates of abdominal pain ranged from 4% to 42%, according to two systematic reviews.[21,22].

4. Bowel obstruction, such as paralytic ileus and Ogilvie's syndrome (OS), was reported in 0.05 to 0.2%23 of cases[24].

5. Percentage of incisional hernias that heal after several cesarean sections[25].

6. Placenta praevia and uterine rupture are uncommon but serious complications that have increased in recent years, possibly as a result of a rise in the rate of cesarean sections.[26,27].

POSTOPERATIVE ILEUS

The term "postoperative ileus" (POI) refers to the impairment of gastrointestinal (GI) motility following abdominal or other surgery. It is typified by the delayed passage of flatus and defecation, the accumulation of gas and fluids in the bowel, and abdominal distention.[28,29,30].

In order to more accurately characterize the clinical manifestations of the GI Disorder, the American Society for Enhanced Recovery After Surgery (ERAS) and Perioperative Joint Consensus explored in 2018 doing away with the conventional definition of POI in favor of a more functional definition and scoring system of POGD31. As a result, three categories of postoperative GI functional impairment were defined by the Intake, Feeling Nauseous, Emesis, Physical Exam, and Duration of Symptoms (I-FEED) scoring system. The term "postoperative ileus" (POI) refers to the impairment of gastrointestinal (GI) motility following abdominal or other surgery. It is typified by the delayed passage of flatus and defecation, the accumulation of gas and fluids in the bowel, and abdominal distention.[31].

- Normal (I-FEED score 0–2): patients are able to eat without experiencing bloating symptoms; however, during the first 24–48 hours following surgery, they may experience postoperative nausea and vomiting (PONV).

- Postoperative GI Intolerance (POGI) (I-FEED score 3–5): 48 hours following surgery, these patients experience bloating, nausea, and small-volume emesis with or without bowel movements (stools or flatus). Nonetheless, the majority of them are able to handle oral fluids, so an NGT is not necessary.

- Postoperative GI Dysfunction (POGD): the most severe degree of GI impairment (I-FEED score > 6). Large-volume bilious emesis, nausea resistant to antiemetics, tympany, and painful abdominal distention are among the symptoms that patients experience.

The exact mechanisms underlying the onset, course, and severity of POI and POGD are still unknown. However, a number of potential pathogenic mechanisms have been well-described. These include its relationship to sympathetic neural reflexes in the spinal intestine, sympathetic hyperactivity, opioid use, inflammatory mediators, abnormal electrolyte levels, and exacerbation by surgical or anesthetic techniques (e.g., tissue manipulation and surgical incision size).[32,33,34,35.]

Additionally, it has been discovered that demographic traits like male sex, advancing age, and previous abdominal surgeries are all linked to POI.[36.]
It can be categorized as primary or secondary based on whether it occurred in the presence of a known precipitating factor or not. It is also known as type 1 intestinal failure. This typically happens following surgery when there are no mechanical issues that could interfere with the digestive tract's regular synchronized motor activity[9]. Wound infections, intra-abdominal collections, anastomotic leaks, and other sources of sepsis are among the most frequent causes of secondary POI. According to certain research, following surgery, intestinal motility (IM) should fully return to normal in two to three days[37.]

It is regarded as an expected and typical reaction to laparotomies and other surgeries. Though acknowledged as unavoidable, POI has never been demonstrated to have any beneficial effects, and extended POI is linked to several unfavourable outcomes.

Postoperative ileus can lead to various complications such as delayed recovery and mobilization, delayed absorption of nutrients and drugs by the GI tract, increased risk of PONV, longer hospital stays, higher hospitalization costs, decreased patient satisfaction due to pain and discomfort, and an increased risk of developing other complications, especially nosocomial infections and pulmonary complications, because of prolonged hospitalization.

CLINICAL COURSE

POI is the period of time after surgery that passes before flatus or stool passes and sufficient oral intake is maintained for a full day. While laparoscopy can take less than two days, the typical range for conventional procedures is two to four daysWithin 24 hours, the small intestine heals, the stomach heals in 24 to 48 hours, and the colon heals in 48 to 72 hours. In POI, the colon is often the rate-limiting factor. Primary POI (Uncomplicated) resolves in a predictable manner.

Secondary, prolonged, complicated POI is defined as any POI that lasts longer than seven days. The definition is identical to that of primary POI, with the exception that an operative complication like an abscess or peritonitis causes it to occur. Less than 10% of all abdominal operations result in secondary POI, but in hemicolectomy cases, that percentage rises to 25%.

PATHOPHYSIOLOGY

The intricate interaction of the enteric and central nervous systems, along with hormonal and local factors that directly affect the intestinal smooth muscle, maintains the motility of the gut[37,38].

The primary cause of POI is incision on the peritoneal cavity and manipulating the intestine. Ileus has two phases, each with its own unique physiological mechanisms. First phase: short-lived, neurogenically mediated, involving spinal reflexes activated from the initial abdominal

incision until shortly after surgery. The second stage, which is persistent inflammation, starts during surgery and lasts for an erratic amount of time following it. Clinical management is more relevant to the second phase.[39,40,41]

EARLY NEUROGENIC PHASE

Intestinal motility is neurogenically mediated through sympathetic pathways, and is momentarily stopped by skin incisions. Presynaptic noradrenergic beta receptors are activated by anesthesia and the surgical incision. Adrenergic agonists only partially block the prolonged inhibition of motility caused by mechanical handling of the intestine. This inhibition is due to high-threshold supraspinal pathways that activate particular CNS nuclei, such as the nucleus tractus solitarii and the paraventricular and supraoptic nuclei of the hypothalamus.

This pathway most likely involves a significant role for corticotropin-releasing factor (CRF), whose release activates neurons in the hypothalamic supraoptic nucleus, which transmits information to the spinal cord and sympathetic preganglionic neurons. These neurons then release noradrenaline, which inhibits the motility of the entire gastrointestinal tract. Apart from the adrenergic inhibitory pathway, strong stimulation of splanchnic afferents initiates a vagally mediated pathway that connects to neurons in the intestinal wall that contain vasoactive intestinal peptide (VIP) and inhibitory nitric oxide (NO). Once the incision is closed, the neural pathways, different nociceptors, and mechanoreceptors stimulated during abdominal surgery stop activating.

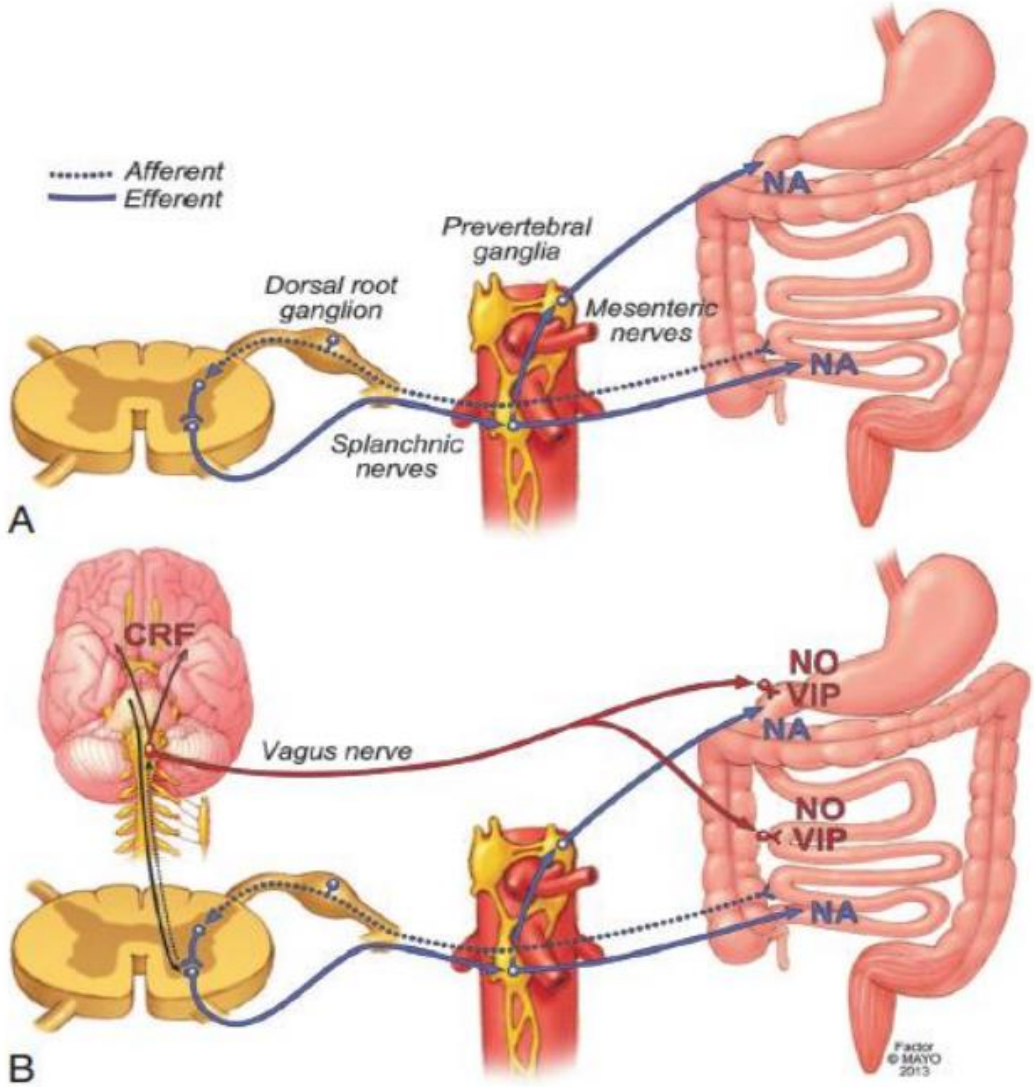

Fig No.11: **Diagrammatic representation of two brain pathways that are activated following abdominal surgery. (A) A straightforward laparotomy causes spinal afferents to synapse in the spinal cord, where they trigger a prevertebral adrenergic neuron-based inhibitory pathway that momentarily halts intestinal motility. (B) Additional pathways are activated by intestinal manipulation.Afferent signals travel to the brainstem, where they cause an increase in autonomic output to the sympathetic preganglionic neurons in the thoracic cord's intermediolateral column. These neurons are responsible for the release of noradrenaline (NA).**

LATE INFLAMMATORY PHASE

Activation of macrophages and other inflammatory cells in the muscularis externa occurs when the viscera is manipulated during surgery. Pro-inflammatory cytokines and chemokines are then released as a result, mediating inflammation and drawing in additional cells. Ileus is caused by a variety of mediators that inhibit smooth muscle motility, especially prostaglandins and nitric oxide.[42].

Studies on rats have provided evidence in favor of this theory, showing that different levels of penetration resulted in different levels of cytokine release43. Multiple local mediators and hormones are implicated in this effect rather than a single cause, but research has shown that nitric oxide (NO) is the primary inhibitory noradrenergic noncholinergic neurotransmitter of the GI tract, which may cause POI.[44].

The significance of the kinetically active mediators NO and prostaglandins in the presentation of inflammatory ileus has been validated through the application of both genetic and pharmacologic (selective inhibitors) techniques.[45,46].

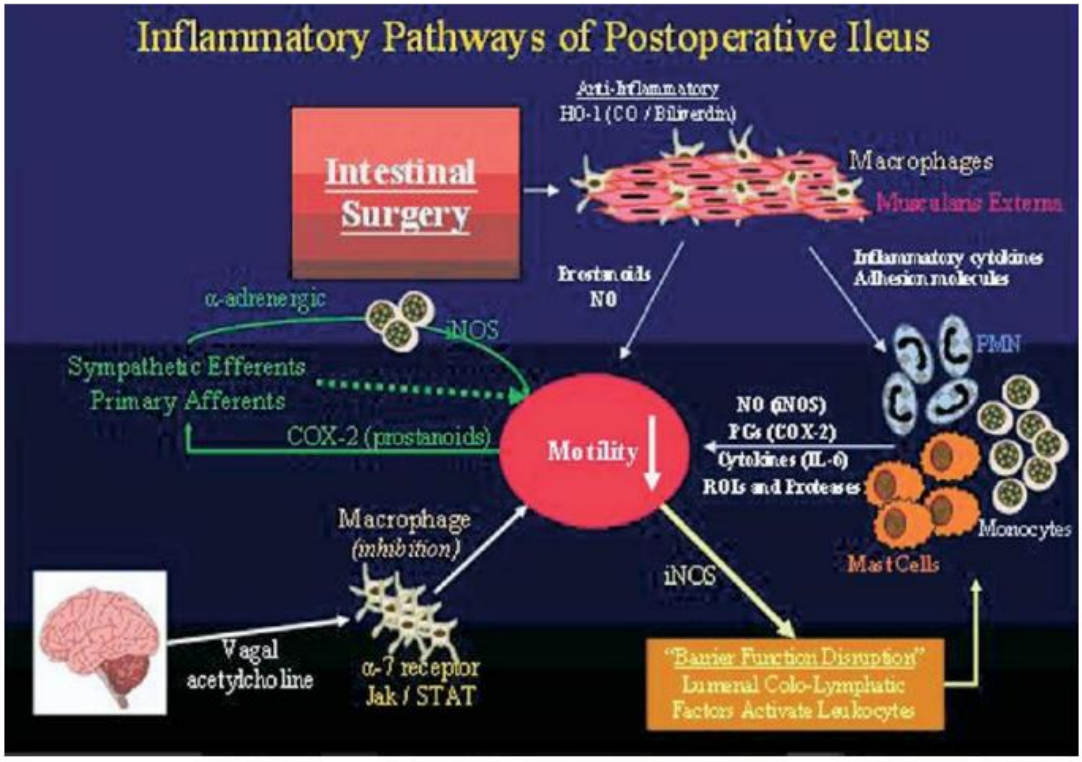

Fig No.12: Inflammatory Pathways of Postoperative Ileus

PHARMACOLOGIC MECHANISMS

Anesthesia: While the method of administration can greatly affect the length of POI, all anesthetic agents have an inhibitory effect on intestinal motility. Proactively using short-acting agents (like propofol) instead of long-acting ones (like bupivacaine) can speed up the restoration of gastrointestinal function. Furthermore, an alternative to IV anesthesia may be short-acting inhalational medications. In abdominal operations, mid-thoracic (T6-T8) catheter placement is commonly used as an adjuvant to general anesthesia to produce sympathetic blockade and administer epidural analgesia. This procedure significantly lowers the incidence and severity of post-operative pain.

Epidural analgesia reduces postoperative hormone resistance and simultaneously blocks the

release of stress hormones if it is started before the procedure. opiates Both endogenous and exogenous opioids play a major role in the development of POI. The CNS's μ receptors primarily regulate analgesia in the brain and spinal cord, out of the three main classes of opiate receptors (μ,κ,δ) found in the GI tract and central nervous system. The coordinated modulation of peristalsis and sphincteric activity is facilitated by endogenous opioids that are released from neurons located within the submucosal and myenteric plexuses of the intestinal tract. Intestinal motility is delayed when μ receptors are activated because this inhibits cholinergic neurons' ability to release acetylcholine. Exogenous opioids have an overall motility-inhibiting effect by raising the tone of the proximal duodenum and the stomach antral. Morphine has a biphasic effect on the small intestine. It stimulates MMC activity first, then causes atony, which slows down intestinal transit and impedes propulsion. Morphine slows transit by increasing the tone and amplitude of non-propagating contractions in the colon, which lessens propulsive activity. Opioids generally slow transit by suppressing intestinal contraction and motility, which lowers propulsive activity. Opioids generally have the effect of suppressing intestinal motility.

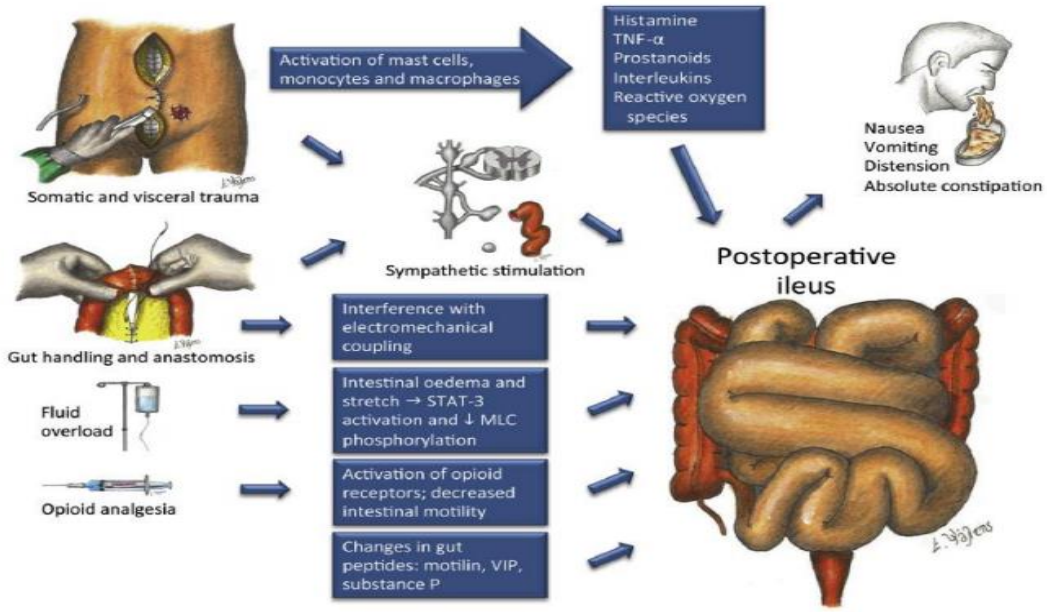

Fig No 13: Diagrammatic representation of the pathophysiological mechanisms of postoperative ileus that have been proposed. Myosin light chain, or MLC STAT stands for signal transducer and transcription activator. VIP stands for vasoactive intestinal polypeptide; TNF is the tumor necrosis factor.

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CLINICAL FEATURES

Ileus symptoms include abdominal pain, abdominal distension, inability to tolerate solid food, and constipation; vomiting and nausea are also possible.

A physical examination reveals reduced bowel sounds and distension in the abdomen. Mild to severe symptoms can be experienced; some patients can return to their regular activities in one or two days, while others need more time for close observation, pain management, and hydration.

Early postoperative Ileus does not need a diagnostic assessment. The small intestine is seen to be air-filled on abdominal plain films, frequently with air-fluid levels at different locations that raise the possibility of bowel obstruction. Frequently, distention reaches the stomach and colon. A computed tomography scan of the abdomen can verify the absence of obstruction or pinpoint the source of a mechanical obstruction. Extended post-operative infection (POI) lasts longer than seven days and is linked to both total opioid dosage and perioperative blood loss. If abdominal pain, vomiting, and radiologic evidence consistent with small bowel obstruction are present within 30 days of surgery following resolution of POI and return of normal bowel function, then postoperative bowel obstruction is diagnosed. CT can detect additional complications and differentiate POI from early postoperative small bowel obstruction.

TREATMENT

PREVENTION

Preoperative Nutrition.

It has been demonstrated that preoperative enteral carbohydrate loading increases muscle mass while lowering preoperative patient anxiety and discomfort, postoperative insulin resistance, and postoperative nausea and vomiting. It is advised to carbohydrate load with solid food six hours or up to two hours prior to surgery, respectively, using a liquid carbohydrate solution. This shortens hospital stay and improves recovery.

Reducing the Stress Response.

Nutritional support prior to and during surgery, epidural anesthesia, appropriate analgesia (including nonopioid pain management with NSAIDs and acetaminophen), and the use of ERPs all help to lessen the stress response to surgery, which has been linked to prolonged post-operative inflammation (POI), delayed wound healing, weariness, wound infections, and prolonged immune function suppression.

Mechanical Bowel Preparation.

A systematic review conducted with and without mechanical bowel preparation found no statistical evidence of its benefit with respect to anastomotic leak rate, reoperation, surgical site infection, or mortality.

Prophylaxis of Postoperative Nausea and Vomiting (PONV).

Pain is not always as stressful as PONV. Anesthesia, opioids, major surgery, and female gender are risk factors. For those who are at risk, prophylactic treatment for PONV can be administered with dexamethasone sodium phosphate at induction or a serotonin receptor antagonist at closure. Combined with prophylactic treatment, general anesthesia with propofol and remifentanil can lessen symptoms.

Risk Factors for Postoperative Nausea Vomiting (PONV)

- Female gender
- History of motion sickness General anesthesia
- Long-acting agents
- Volatile agents (nitrous oxide)
- Major abdominal surgery

- Blood loss
- Long duration
- Non-smoker status
- Opioids
- Previous history of PONV

Intraoperative Nature of Surgery.

When compared to open surgery, minimally invasive surgery has fewer incisions, lower total analgesic doses, less pain and inflammation, a quicker recovery of gastrointestinal function, a shorter hospital stay, and a lower cost. For instance, laparoscopy during colorectal surgery results in less abdominal pain, catabolism, and inflammation than open surgery.

Anesthesia.

By obstructing afferent neural transmission from reaching the central nervous system and preventing afferent activation of the sympathetic nervous system, regional anesthesia largely prevents the neuroendocrine stress response to surgery; its use preserves immune function while lowering the need for opiates.For open colorectal surgery and laparoscopy if a patient has a serious respiratory condition, epidural anesthesia and analgesia are advised; they have also been demonstrated to improve colonic blood flow and the recovery of GI function.

Hemodynamic Management.

Overhydration during the perioperative period is associated with an increased risk of morbidity, according to several large trials. Extended hospital stays and prolonged POI are associated with fluid excess, which can lead to bowel edema and pulmonary compromise. Goal-directed therapy, or fluid management by perioperative optimization of hemodynamic function, has been demonstrated to enhance patient outcome by optimizing cardiac stroke volume through small

fluid challenges. By employing goal-directed therapy to prevent fluid overload, postoperative complications can be minimized and a swift functional GI recovery can be facilitated.

Postoperative

Nasogastric Tubes, Drains, and Catheters.

Abdominal drains and NG tubes are frequently used, but they don't help patients and instead increase morbidity from GI and infectious diseases; avoiding them can hasten recovery from POI. Urinary catheters ought to be taken out 24–48 hours after surgery.

Gum Chewing and Laxative Use

It has been observed that sham feeding increases the motility of the human stomach, duodenum, and rectosigmoid. The peptide hormone gastrin, the neuropeptide neurotensin, and pancreatic polypeptide41 were found to have higher serum concentrations when sham feeding was applied, according to the researchers' findings. Furthermore, duodenal alkaline secretion was also increased by sham feeding. Chewing gum is regarded as a form of sham feeding since it simulates eating. The physiologic mechanism behind chewing gum is thought to be the activation of the cephalic-vagal pathway, which stimulates intestinal myoelectric activity to counteract the activation of the gastrointestinal μ opioid receptors. This results in an enhanced recovery of bowel motility. Bowel motility is stimulated both neurologically and humorally as a result of this reaction.

Early Oral Intake and Nutrition.

Early enteral nutrition reduces the risk of infections, strengthens the intestinal barrier, lowers insulin resistance and hyperglycemia, encourages anastomotic healing, and maintains a positive nitrogen balance when compared to taking nothing by mouth.. Combined with forced early mobilization and epidural analgesia, early enteral nutrition greatly enhanced the absorption of nutrients following colorectal surgery.

Postoperative Pain Management.

The best analgesia following surgery is provided by opioid-sparing analgesia, which includes thoracic epidural analgesia. Transversus abdominis plane block, intrathecal analgesia, wound infiltration and infusion, systemic lidocaine infusion, and patient-controlled analgesia are additional efficient postoperative pain management techniques. Multimodal analgesia is frequently achieved with NSAIDs and acetaminophen; however, there have been reports of a higher risk of anastomotic leakage when COX-2 inhibitors are used.

Early Mobilization.

Early mobilization requires effective pain management, as ambulatory epidural analgesia has demonstrated. Ambulation increases muscle strength and improves tissue oxygenation and pulmonary function. It also lowers insulin resistance, the risk of pulmonary embolism, and muscle loss. Patients are instructed to walk out of their room five times on the day of surgery and spend six hours a day in a chair according to one regimen.

Preset Discharge Criteria.

Standardized discharge criteria are part of ERPs; patients need to be able to pass gas or stool, be able to tolerate solid food for three meals in a row, have sufficient analgesia with a low pain score on a visual analog scale, and feel ready to be discharged with sufficient social support. vomiting and nausea following surgery. Up to 80% of high-risk surgical patients and 30% of low-risk surgical patients experience PONV.Compared to the use of regional anesthesia, general anesthesia increases the risk of PONV9 by a factor of nine.The duration of ileus can be shortened in patients at high risk for PONV by reducing risk factors when feasible and treating them with prophylactic agents; low-risk patients are less likely to benefit from this strategy. For the prophylaxis of PONV, randomized trials have demonstrated the effectiveness of glucocorticoids, 5-HT3 antagonists, and droperidol alone or in combination. These treatments are routinely advised for high-risk individuals[44,45].

REVIEW OF LITERATURE

1. **Zeliha Elkan Kiyat , Hatice Kahyaoglu Sut (2022)[47],** The purpose of this study was to investigate how post-csection xylitol gum chewing affected bowel movements. The timing of the first bowel movements and the onset of hunger is the same for all the groups. The xylitol gum chewing group experienced the first flatus earlier than the control group, and the nonxylitol gum chewing group experienced the first defecation earlier. The groups that chewed gum with and without xylitol were released from the hospital before the control group. They came to the conclusion that chewing gum containing xylitol in the early postpartum period is an effective and convenient way to induce bowel movements sooner.

2. **Manisha & Nirmala Duhan (2020)**[48] conducted a prospective randomised controlled trial on 220 women and documented the time taken for the appearance of first bowel sounds and the passage of flatus and stool after caesarean delivery. The study concluded that chewing gum effectively enhances motility, decreases discomfort post-operatively, and reduces hospital stay.

3. **Senderila Abdulkareem Mutlag, Dalia Farouk & Dalia Youssef (2019)**[49]. Two hundred women having had a caesarean section under spinal anaesthesia were put under observation during the postpartum period. Hundred of them were given chewing gum, and the other 100 cases had no intervention. Time to regain intestinal sounds and time to first flatus in the gum-chewing group had a highly significant difference when compared with the control group. They concluded that chewing gum is advised post-operative to help early returning of GIT post CS.

4. **Edna Pereira Gomes Morais , Rachel Riera, Gustavo Jm Porfírio (2016)[50].** They evaluate the impact of chewing gum on improving postoperative recovery following a CS and reducing the length of postoperative ileus. The review's main finding was that the women who chewed gum experienced their first flatus seven hours sooner than the women in the "usual care" control group. Compared to the control group, the chewing-gum group experienced an ileus rate that was, on average, more than 60% lower. One of the review's secondary outcomes was that, in the intervention group, faeces were passed on average nine hours sooner. When comparing the intervention group to the control group, the intervention group's average hospital stay was shorter. Compared to the control group, the first intestinal sounds were audible earlier during the intervention.

5. **Nefise Nazlı Yenigul , Begum Aydogan Mathyk (2019)[51]** A randomized controlled trial was conducted to examine the effectiveness of chewing gum in promoting improved bowel function following cesarean sections. When comparing the gum group to the control group, they found that the first bowel movement time, first sensation of hunger, first flatus passage, and mean length of hospital stay were all significantly shorter in the gum group. Chewing gum improved the postoperative satisfaction scores for overall bowel function in the patients. Chewing gum frequently during the initial postoperative period encourages the return of bowel movements earlier, reduces hospital stays, and improves patient satisfaction with bowel function.

6. **Ahmed Altraigey , Mohamed Ellaithy (2018)[52],** investigated the impact of chewing gum on the recovery of bowel motility in 372 women who were randomly assigned to three groups, with 124 women in each group, following a planned caesarean delivery. During the day, the first group chewed sugar-free gum every two hours after recovering, at least for thirty minutes. Six hours after surgery, the second group was given

oral fluids, and the third group served as the control group. It was linked to noticeably shorter hospital stays and shorter times spent receiving parenteral therapy. In the nonchewing gum groups, postoperative ileus, vomiting, and abdominal distension were significantly more common. The use of gum was not associated with any side effects or paralytic ileus. They came to the conclusion that chewing gum within two hours of surgery is an easy, safe, and well-tolerated intervention that can accelerate intestinal healing and reduce hospital stay following scheduled caesarean deliveries.

7. **Zunjia Wen** , **Meifen Shen (2017)[53],** For a total of 1659 women, ten RCTs were included in our meta-analysis. Chewing gum significantly reduced the time to first flatus passage, first bowel sound, first bowel movement, and length of hospital stay, but not the time to first hunger pangs. Chewing on a gun can hasten the healing of intestinal function after a cesarean section at a low cost and without risk. Higher-quality, larger-scale RCTs are still required to fully comprehend the role of gum chewing in the recovery of intestinal function after a caesarean section.

8. **Semra Akköz Çevik**, **Mürüvvet Başer (2016)[54]**, 120 women in all were involved in the study; they were split into three groups of 40 for the gum, exercise, and control groups. Two hours after the cesarean, gum was given to the groups in the gum section. The women chewed gum for the first eight hours until experiencing flatulence, which occurred every two hours for fifteen minutes. For the first eight hours following the cesarean, the women in the exercise group began to move, though, and continued to do so for five minutes every two hours until they experienced flatulence. Women receiving standard hospital care and treatment made up the control group. Every hour, the abdominal sounds, flatulence, and defecation of all the women were assessed. Bowel functions began in all three groups simultaneously after caesarean delivery; no discernible differences existed between the groups. It was found that while there was no discernible difference between the three groups, the gum, exercise, and control groups were all

released earlier.

9. **Hagit Hochner , Sandi M Tenfelde (2015)[55],** conducted a meta-analysis and systemic review. The meta-analysis comprised five randomised control trials with a total of 846 participants, focusing on gum chewing as an intervention compared with a nongum chewing intervention. Gum chewing had a positive effect on the main effects of digestive system activation, such as bowel sound, gas passage, and defecation, when compared to the non-chewing group.

10. **Ebru Sahin, Fusun Terzioglu (2015)[56],** examined the impact of early mobilization, early oral hydration, and gum chewing on intestinal motility following Caesarean delivery. Using 23 factorial test levels, the women who had caesarean sections were split into eight groups based on whether they used gum chewing, early oral hydration, or early mobilization. The results indicated that the first group to receive all interventions had earlier bowel movements, earlier gas passages, and earlier intestinal sounds than the other groups ($p < .05$). According to hospital protocol, the patient could not be released from the hospital before 48 hours had passed following the caesarean delivery; as a result, interventions had no bearing on the patient's discharge date.

11. **KHI Abd-El-Maeboud, MI Ibrahim, (2015)[57]** research shows that chewing gum encourages the bowel to return to motility sooner following a cesarean section. 200 pregnant patients had elective caesarean sections (CS) performed while they were under general anesthesia. Women were randomly assigned to one of two groups: group B (107 women) received traditional management (oral intake of clear fluids allowed after passage of flatus and regular diet with the passage of bowel movement), while group A (93) received one stick of sugarless gum for 15 minutes every two hours following surgery. In group A, the average length of surgery was greater. Group A experienced a significantly shorter mean postoperative time interval from the time of surgery to the first hearing of

normal intestinal sound, the passage of flatus, defecation, and hospital discharge ($P < 0.001$). There was only one woman in group B who experienced severe ileus. Group A patients were all able to chew gum starting on the first day after surgery.

12. **O V Ajuzieogu , A Amucheazi, H A Ezike (2014)[58]** studied the efficacy of chewing gum on postoperative ileus following caesarean section in Enugu, South East Nigeria included one hundred and eiaghty women booked for elective caesarean section were randomized into gum-chewing group (n = 90) or control group (n = 90). They found that the groups were comparable in age, body mass index (BMI) and duration of surgery. The mean time to first bowel sounds, mean time to first flatus and mean time to defecation were significantly reduced in patients that chewed gum compared with controls. Patients were satisfied with gum chewing and no side-effect was recorded**.**

13. **Bordin Jakkaew [1], Kittipat Charoenkwan (2013)[59],** Fifty pregnant patients who had caesarean sections at Chiang Mai University hospital participated in the study. Following a cesarean section, the patients were divided into two groups at random. Together with the standard postoperative feeding protocol, patients in groups 1 (conventional) and 2 (gum chewing) were instructed to chew two pieces of sugar-free gum for 30 minutes each in the morning, noon, evening, and before bed until the first flatus. The gum-chewing group experienced a shorter median time to the first flatus. Additionally, the group that chewed gum showed a tendency to experience fewer abdominal cramps on days 1 and 2. There was no discernible difference between the groups in terms of other outcome measures related to the recovery of bowel function and complications related to ileus.

14. **Hasan Kafali , Candan Iltemir Duvan (2010)[60]** investigated how chewing gum affected the bowel's postoperative activity following a cesarean section. Randomization was used to assign women undergoing caesarean sections to one of two groups: those

chewing gum (n = 74) or those not chewing gum (n = 76). The study group's mean duration of bowel sounds was 5.9 hours, compared to 6.7 hours in the control group, indicating a significant difference in timing ($p < 0.01$). In the gum-chewing group, the first passage of flatus occurred 22.4 hours after surgery, whereas in the control group it happened 31 hours ($p < 0.001$). Although the gum-chewing group's total hospital stay (2.1 days) was less than the control group's (2.3 days), the difference was not statistically significant ($p > 0.05$). Both groups had comparable postoperative analgesic needs, but the gum-chewing group had less postoperative antiemetic needs than the control group ($p < 0.01$).

15. **Hongkai Shang** , **Yang Yang,(2010)[61],** Three hundred and eighty-eight caesarean delivery patients participated in this study and were randomized to either the gum-chewing or control groups. There were 9% fewer patients in group G (mean 12%) than in group C (mean 21%) who had mild ileus symptoms. Every difference ($p < 0.001$) between the two groups was extremely significant. Chewing gum was well tolerated and did not cause any issues. Chewing gum is a physiological, affordable, and practical way to aid in the recovery of bowel function. However, this might not help with defecation, lactation, or early hospital discharge.

MATERIALS AND METHODS

SOURCE OF DATA:

- All the patients attending the Labour ward of the Department of Obstetrics and Gynecology, BLDE (DU) Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapura and undergoing caesarean section.
- The patients will be informed about the study in all respects, and informed written consent will be obtained.

STUDY PERIOD:

September 2022 to April 2024

SAMPLE SIZE: 314

METHODOLODY:

All the pregnant women in the age group of 18-40 years with > 28 weeks of gestational age admitted to the labour ward, undergoing elective/emergency caesarean section and agreeing to give written and informed consent will be included in the study. A detailed history and examination will be conducted. The duration of the surgery and any significant intraoperative findings shall be recorded. Pre-operative electrolytes will be performed to exclude electrolyte imbalance (Na, K, Ca, M).

Women undergoing caesarean section between 8 AM to 6 PM will be equally divided into two groups.

Group A (Study group):157 post-operative patients will be given gum chewing only Group B (control group):157 post-operative patients who will follow standard post- operative protocol. In group A the participants are subjected to gum-chewing, which will be started within one hour following the operation after shifting to the post-operative ward. The participants in the study group will be asked to chew gum for a duration of 15-30mins, every second hour until the first bowel sounds are heard. Commercially available sugar-free gum (orbit) will be used for the study. The time of first-time passage of flatus and the passage of stools for the first time was recorded by asking the patient. The study group patients will be prohibited from chewing gum from 10:00 PM to 8:00 AM. A visual analogue scoring system will analyze the sense of well-being.

Fig No 14 : Sugar free chewing gum.

In group B, the standard protocol of post-operative care, the participants are allowed orally after

hearing the first bowel sound. Bowel sounds are checked every 30 mins till they appear, and time is recorded. Then the time taken for passage of the first flatus and stool is recorded after allowing the patient orally.

INCLUSION CRITERIA

1. Maternal age from 18 – 40 years
2. Primigravida or multigravida of >28 weeks of gestational age undergoing elective/ emergency caesarean section under spinal anesthesia from 8 AM - 6 PM.

EXCLUSION CRITERIA

1. High-risk pregnancies like hypertensive disorders of pregnancy, gestational diabetes mellitus, Overt Diabetes Mellitus, Chronic Hypertension, prolonged labour, and obstructed labour.
2. History of gastrointestinal surgeries, chronic renal disease
3. Electrolyte imbalance
4. A Caesarean section was done under general anesthesia
5. History of laparotomy following caesarean section or vaginal delivery in a previous pregnancy or caesarean hysterectomy
6. Patients with intraoperative complications like postpartum haemorrhage leading to hysterectomy, bladder injury, bowel injury, bowel adhesions or prolonged operative time >2 hours.
7. Any conditions where the patient has to be kept nill by mouth for a longer duration for any reason.

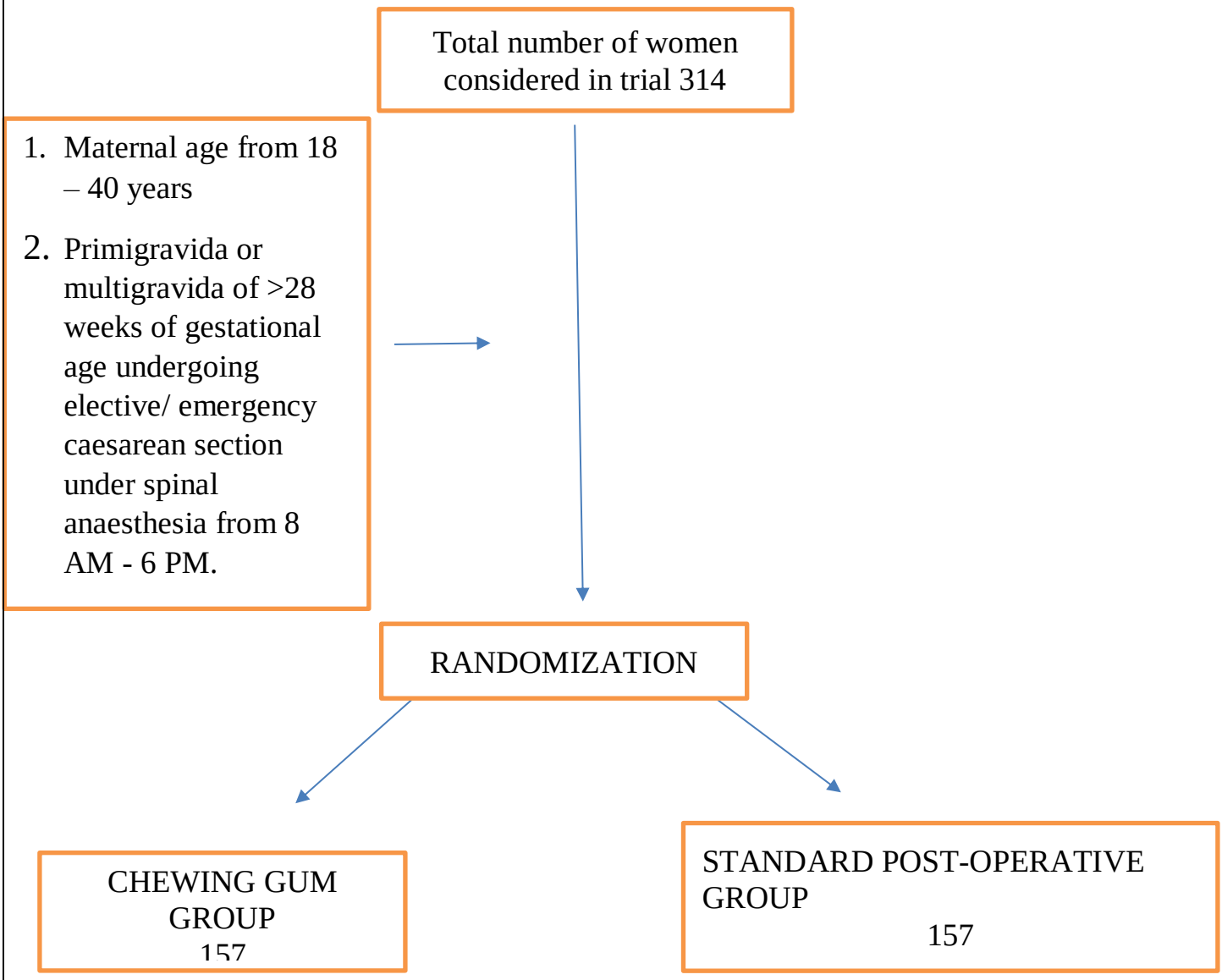
SAMPLE SIZE CALCULATION

- With Anticipated Proportion of Time of bowel sound appearance (4-6 hours) in gum chewing patients is 30 % and among controls is 13.63%[3]. The study would require a sample size of 157 per group. (i.e., a total sample size of 314 assuming equal group sizes), to achieve a power of 95% for detecting a difference in proportions between two groups at a two-sided p-value of 0.05.
- (Using Statulator software-- http://statulator.com/SampleSize/ss2P.html)
  - Formula used

- $n= (z_\alpha+z_\beta)^2\ 2\ p*q\ MD^2$
- Where Z= Z statistic at a level of significance
- MD= Anticipated difference between two proportions
  - P=Common Proportion
  - q= 100-p

RESULTS

A total of 314 women were considered into the trial. These 314 women were randomized into study group and Control group by computer generated randomized program.



STATISTICAL ANALYSIS

The data obtained will be entered into a Microsoft Excel sheet, and statistical analysis will be performed using a statistical package for the social sciences (Version 20).

Results will be presented as Mean±SD, counts and percentages and diagrams.
For normally distributed continuous variables between two groups will be compared using the independent t-test for not normally distributed variables, Mann Whitney U test will be used. Categorical variables between two groups will be compared using the Chi-square test.

$P<0.05$ will be considered statistically significant. All statistical tests will be performed.

OBSERVATON AND RESULTS

Majority of women belonged to 20-24 years age group i.e. seventy-eight (49.70%) in Group A and seventy-three (46.50%) in Group B.

Table 1: Comparison of age between case and control

AGE	Groups		Total	Chi square test	Significant value
	Cases	Controls			
< 20	9 5.70%	16 10.20%	25 8.00%	10.57	0.6*
20 - 24	78 49.70%	73 46.50%	151 48.10%		
25 - 29	56 35.70%	47 29.90%	103 32.80%		
30 - 34	9 5.70%	18 11.50%	27 8.60%		
35 - 39	5 3.20%	1 0.60%	6 1.90%		
40+	0 0.00%	2 1.30%	2 0.60%		
Total	**157** **100.00%**	**157** **100.00%**	**314** **100.00%**		
MEAN	**24.52**	**24.59**			

***Not significant**

This table shows the age distribution of the study subjects compared by Chi-Square test.

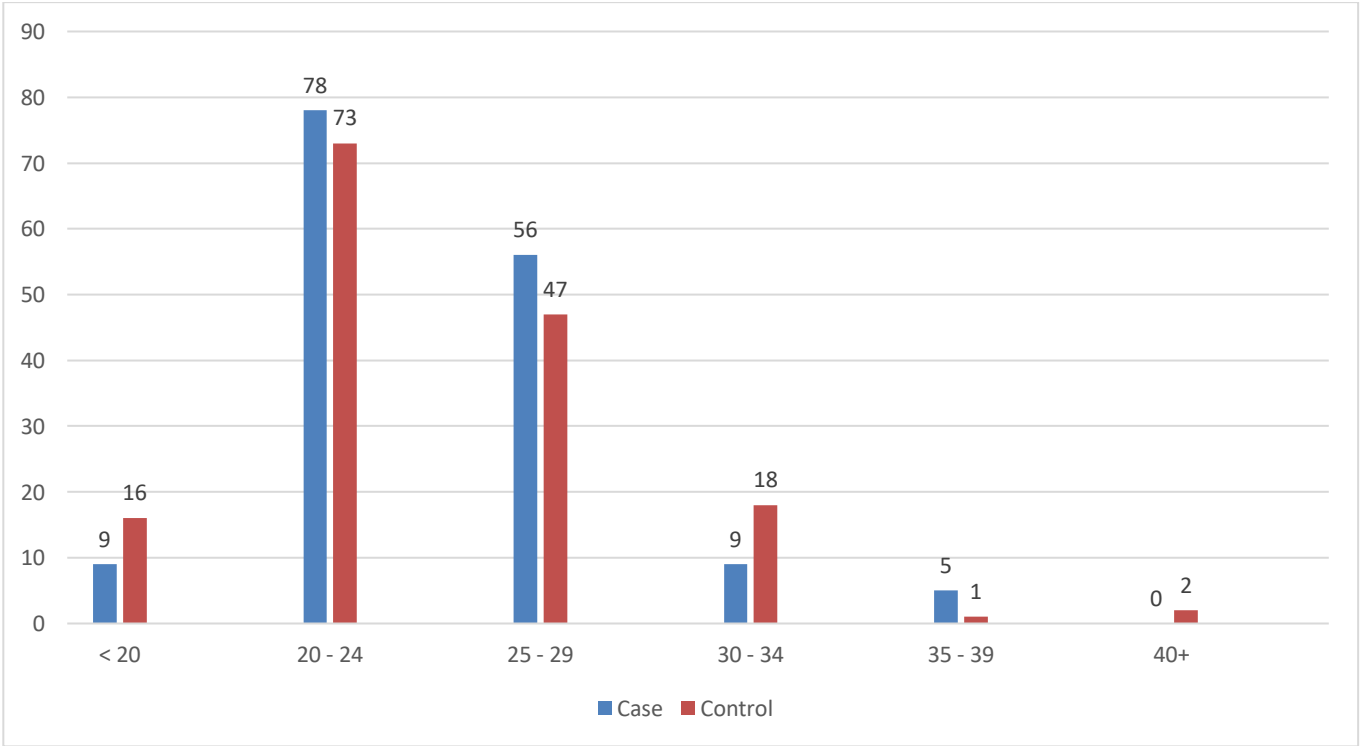
Among 157 women of group A ,9 women belonged to the age group of <20yrs which is 5.70%, 78 women belonged to 20-24yrs which is 49.70%, 56 women belonged to 25-29yrs which is

35.70% ,9 women belonged to 30-34yrs which is 35.70% and 5 women belonged to age group 35-39yrs which is 3.20%.

Among 157 women of the group B, 16 women belonged to the age group of <20yrs which is 10.20%, 73 belonged to 20-24yrs which is 46.50%, 47 women belonged to 25-29yrs which is 29.90%, 18 women belonged to 30-34yrs which is 11.50% and 1 women belonged to age group 35-39yrs which is 0.60%.

Mean age in Group A women was 24.52±3.93 years and 24.59±4.15 years in Group B. The age distribution between both groups shows p value 0.878 which is more than 0.05, thus implying there is no statistical significance.

Figure 1 : Bar diagram for comparison of age distribution between case and control

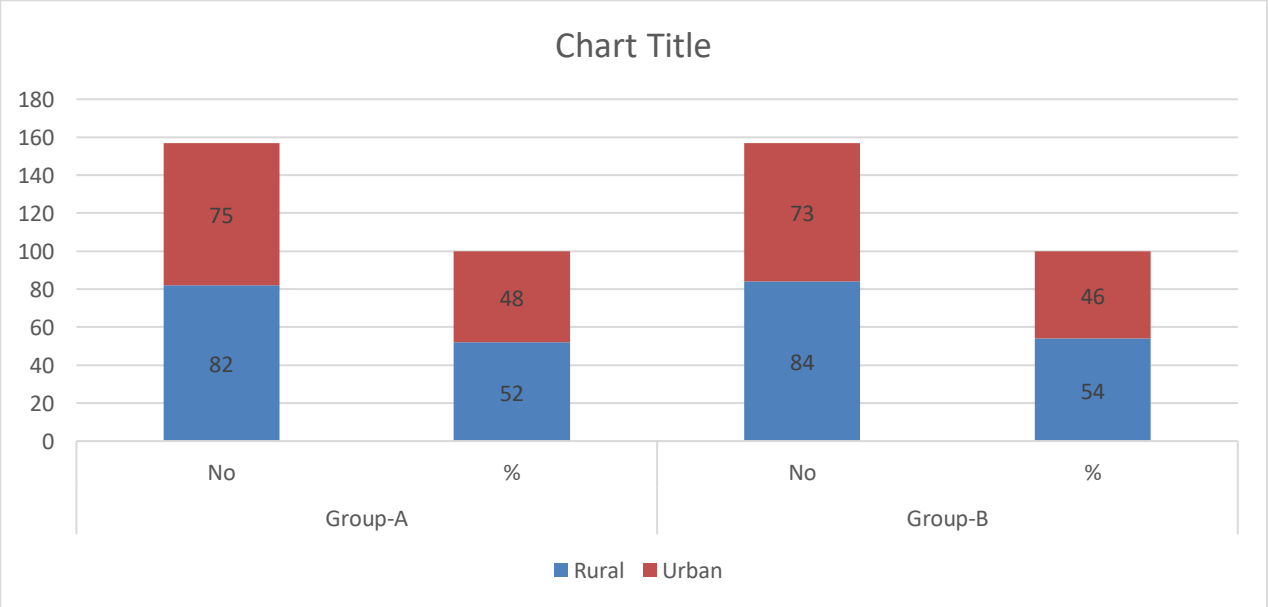


Majority of the women attending our institutional for delivery were from a rural population i.e. eight-two (52%) from group A and eight-four (54%) from group B with p value of 0.863.

Table 2: Comparison of locality between case and control

LOCALITY	Groups		Significant value
	Cases	Controls	
RURAL	82 52%	84 54%	**0.863**
URBAN	75 48%	73 46%	
Total	**157** **100.00%**	**157** **100.00%**	

Figure 2 : Bar diagram for comparison of locality between case and control

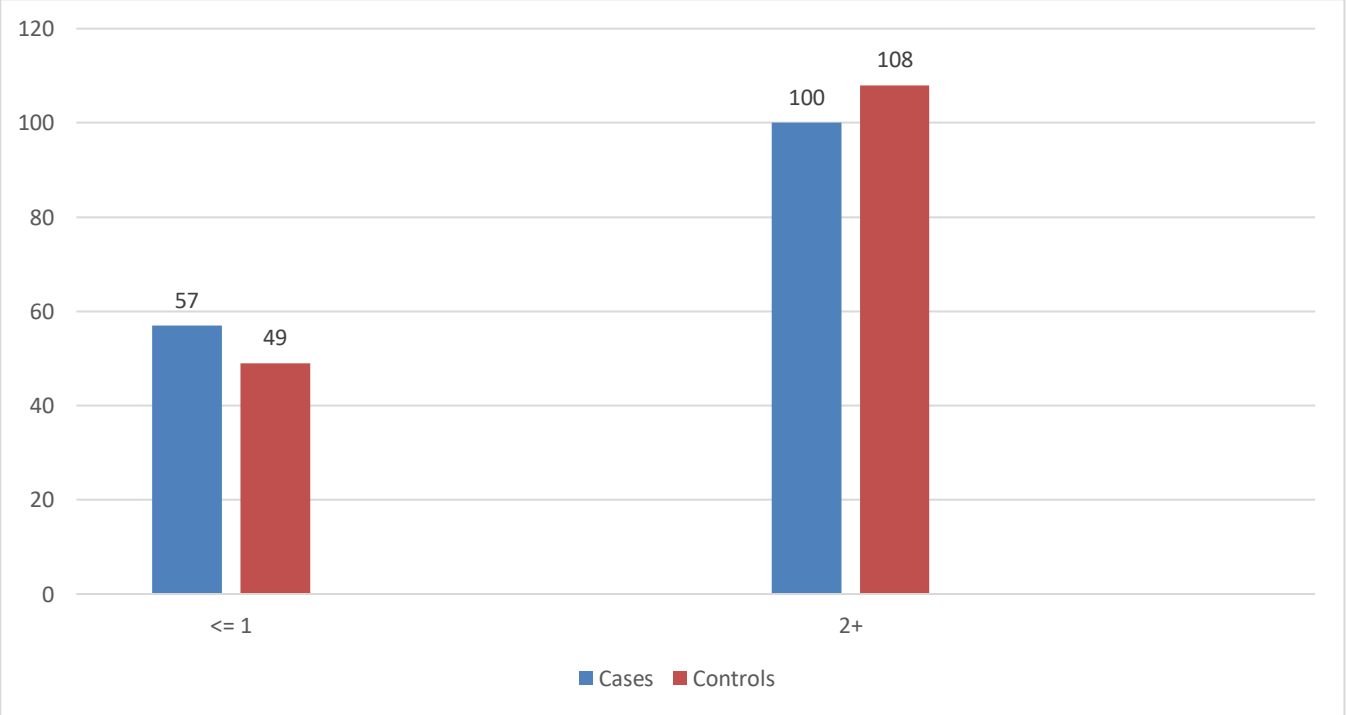


Fifty-seven (36%) in Group A and Fourty-nine (31%) in group B were primi gravida (p 0.321).

Table 3: Comparison of gravida between case and control

GRAVIDA	Groups		Total	Chi square test	Significant value
	Cases	Controls			
<= 1	57 36.30%	49 31.20%	106 33.80%	**0.911**	**0.34**
2+	100 63.70%	108 68.80%	208 66.20%		
Total	**157** **100.00%**	**157** **100.00%**	**314** **100.00%**		

Graphs 3: Bar diagram for comparison of gravid status between case and control



All of the women belong to term gestation where the mean gestational age is 38.92±1.43 in group A and 39.01±1.26 in group B with p value 0.588 as shown in table no4 below.

Table 4: Comparison of mean gestational age between case and control

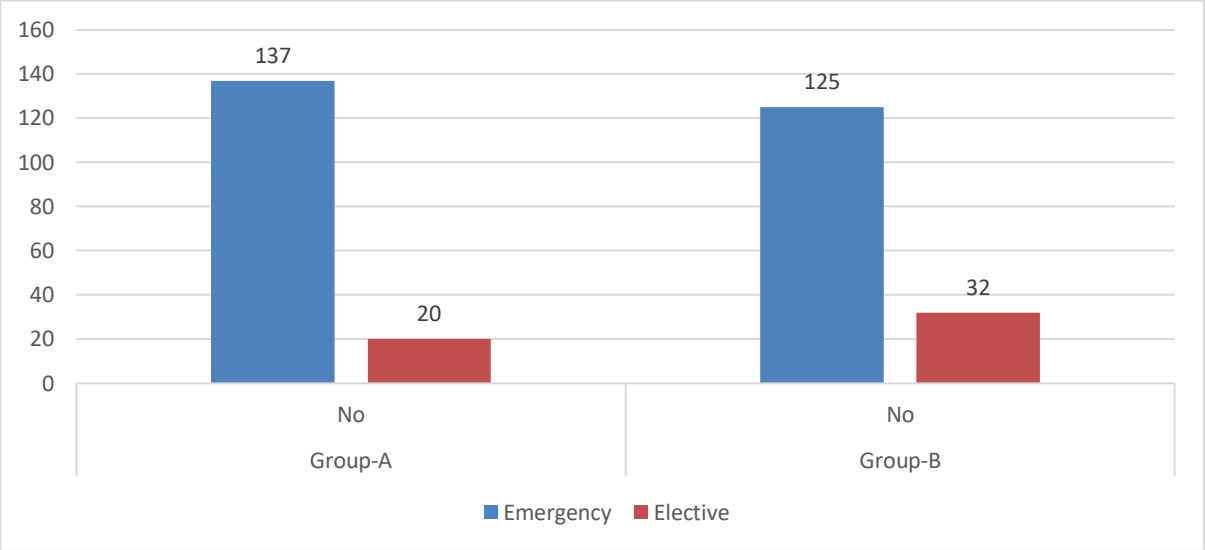
	Group-A		Group-B		P value
	Mean	Std. Deviation	Mean	Std. Deviation	
Gestational age	38.92	1.43	39.01	1.26	0.588

Total emergency LSCS performed were one thirty-seven (87%) in group A and one twenty-five (80%) in group B. The number of elective LSCS are fifty-two out of which twenty (13%) belong to group A and 32(20%) belong to group B (p0.06) as shown in the table 5 and Graph 4 below.

Table 5: Comparison of number of LSCS between case and control

LSCS	**Groups**		**Chi square test**	**Significant value**
	Cases	**Controls**		
EMERGENCY	137 87%	125 80%	**3.319**	**0.06**
ELECTIVE	20 13%	32 20%		
Total	**157** **100.00%**	**157** **100.00%**		

Graph 4 : Bar diagram for comparison of number of LSCS between case and control



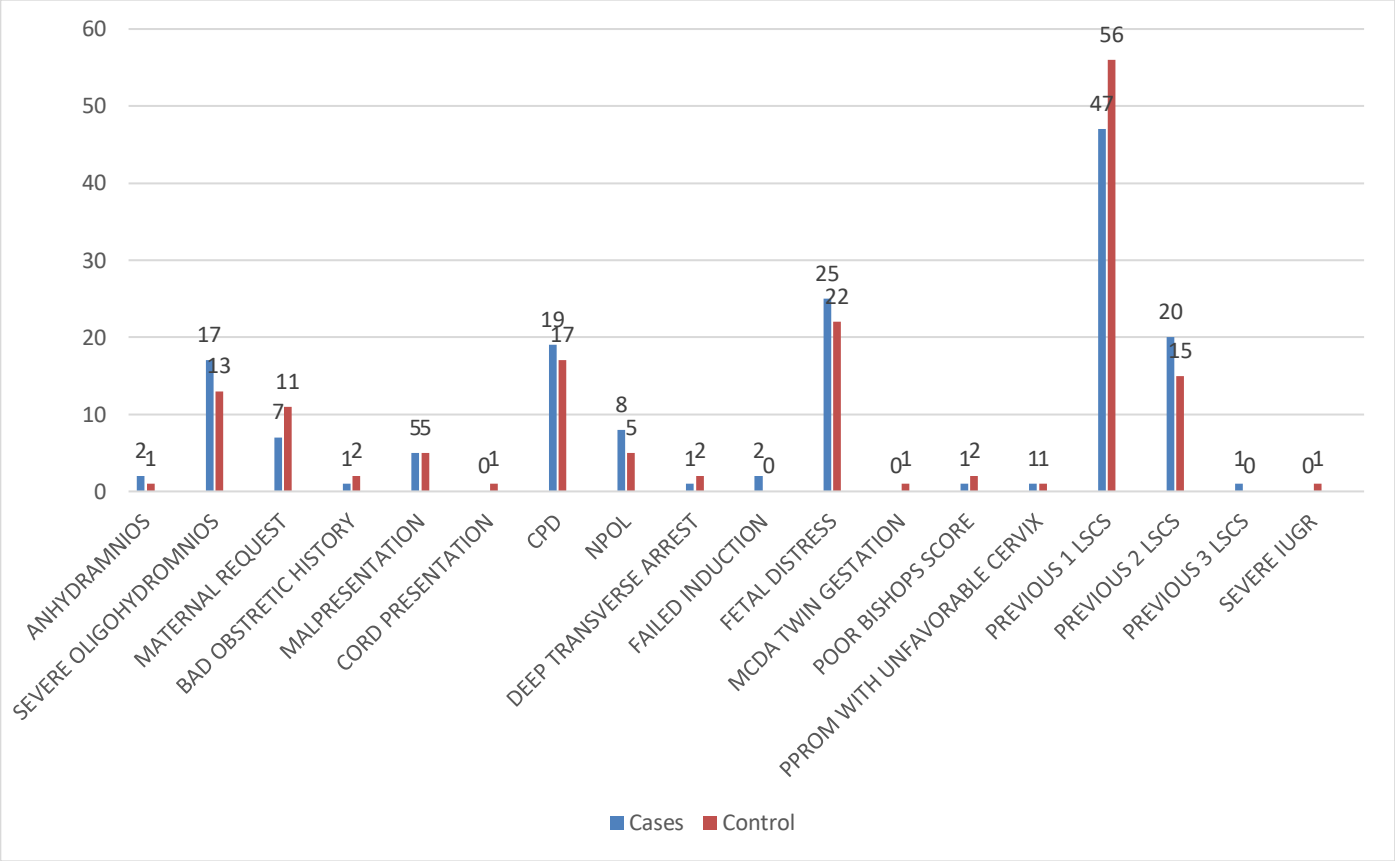
The below chart shows various indication for the CS. Of these CS most common indication was noted to be Previous LSCS. A total of sixty-eight (43%) and seventy-one (45%) in group A and group B respectively. Fetal distress being the second most common indication for CS i.e. twenty-five (16%) and twenty-four (15%) women in Group A and B, respectively.

Table 6: Comparison of indication of LSCS between case and control

INDICATION	Groups		Total	Chi square test	Significant value
	Cases	Controls			
ANHYDRAMNIOS	2 1.30%	1 0.60%	3 1.00%		
SEVERE OLIGOHYDROMNIOS	17 10.80%	13 8.30%	30 9.60%		
MATERNAL REQUEST	7 4.45%	11 7.00%	18 5.73%	**13.14**	**0.904**
BAD OBSTRETIC HISTORY	1 0.60%	2 1.30%	3 1.00%		

MALPRESENTATION	5 3.18%	5 3.18%	10 3.18%		
CORD PRESENTATION	0 0.00%	1 0.60%	1 0.30%		
CPD	19 12.10%	17 10.80%	36 11.50%		
NPOL	8 5.10%	5 3.20%	13 4.10%		
DEEP TRANSVERSE ARREST	1 0.60%	2 1.30%	3 1.00%		
FAILED INDUCTION	2 1.30%	0 0.00%	2 0.60%		
FETAL DISTRESS	25 15.90%	24 15.30%	49 15.60%		
MCDA TWIN GESTATION	0 0.00%	1 0.60%	1 0.30%		
POOR BISHOPS SCORE	1 0.60%	2 1.30%	3 1.00%		
PPROM WITH UNFAVORABLE CERVIX	1 0.60%	1 0.60%	2 0.60%		
PREVIOUS 1 LSCS	47 29.90%	56 35.60%	103 32.80%		
PREVIOUS 2 LSCS	20 12.70%	15 9.60%	35 11.10%		
PREVIOUS 3 LSCS	1 0.60%	0 0.00%	1 0.30%		
SEVERE IUGR	0 0.00%	1 0.60%	1 0.30%		
Total	**157** **100.00%**	**157** **100.00%**	**314** **100.00%**		

Graph 5 : Bar diagram for comparison of indication of LSCS between case and control



The duration of surgery among cases and control did not show any statistical difference (P=0.876). The mean duration of surgery among cases and control was 1.07 hours as shown in table no 7 below.

Table 7: Comparison of mean duration of surgery between case and control

	CASES		CONTROLS		P value
	Mean	Std. Deviation	Mean	Std. Deviation	

DURATION OF SURGERY	1.07	0.17	1.07	0.19	0.876

As per the inclusion criteria all the women were given spinal anaesthesia in both the groups and Pfannenstiel incision was used in both the groups. Adhesions were found in 20 (13%) women of cases and 18 (11.5%) women of control group (p = 0.696).

Number of chewing gums chewed by the participants of Group A (n = 157) showed that thirty-two (20.38%) women chewed only one chewing gum before appearance of bowel sound/flatus/feces and one hundred and four (66.24%) required two chewing gums. Nineteen (12.10%) women required 3 chewing gums and only 1 woman each required four and five chewing gums respectively.

Table 8: Number of chewing gums required among cases with previous LSCS

	NUMBER OF CHEWING GUM	**1**	**2**	**3**	**4**	**5**
INDICATION	**PREVIOUS 1 LSCS**	4	38	5	0	0
	PREVIOUS 2 LSCS	0	7	11	0	1
	PREVIOUS 3 LSCS	0	0	1	0	0

As shown in table no 8 out of forty-seven women with previous 1 LSCS thirty-eight (80%) women required 2 chewing gums. Among nineteen women with previous 2 LSCS seven (36.84%) required 2 chewing gums and eleven (57.89%) required 3 chewing gums as shown in

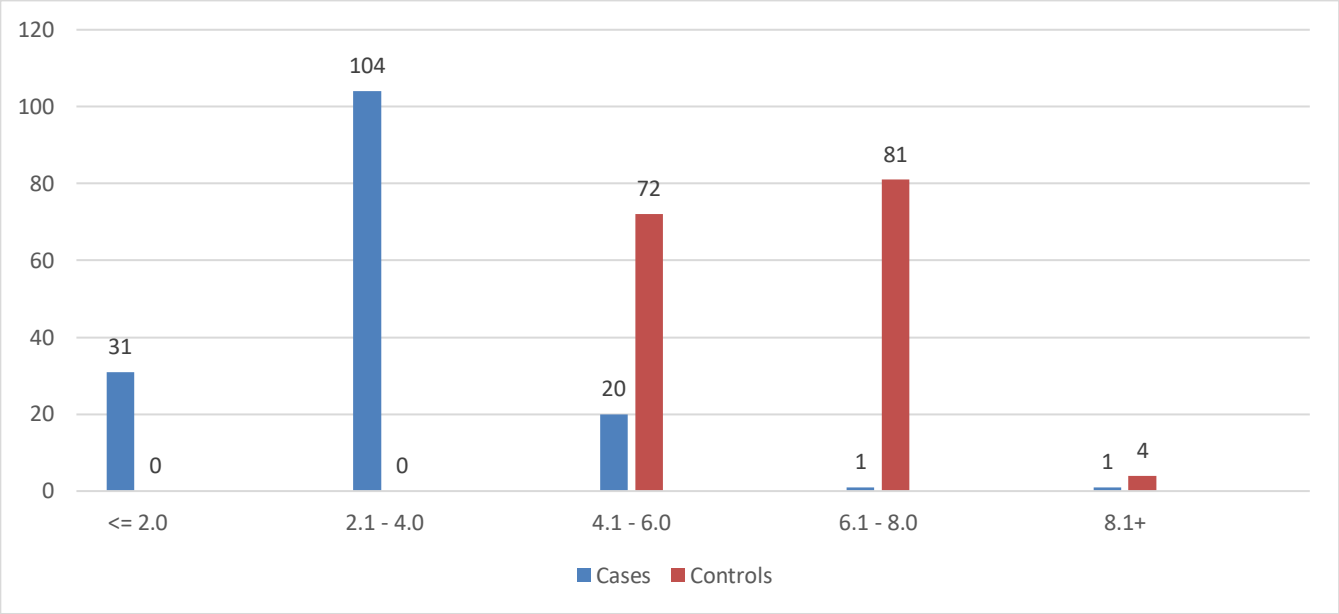
table 8.

Table 9: Comparison of time of bowel sound appearance (hours) among cases and controls

BOWEL SOUND	Groups		Total	Chi square test	Significant value
	Cases	Controls			
<= 2.0	31 19.70%	0 0.00%	31 9.90%	**244.24**	**0.0001***
2.1 - 4.0	104 66.20%	0 0.00%	104 33.10%		
4.1 - 6.0	20 12.70%	72 45.90%	92 29.30%		
6.1 - 8.0	1 0.60%	81 51.60%	82 26.10%		
8.1+	1 0.60%	4 2.50%	5 1.60%		
Total	**157 100.00%**	**157 100.00%**	**314 100.00%**		
MEAN	**3.39**	**6.91**			

*Statistically significant

Graph 6 : Bar diagram for comparison of time of appearance of bowel sounds among case and control



The time taken for the bowel sounds to appear in less than 2 hours was seen in thirty-one (19.70%) women of case group. While majority of the women (66.20%) among the case group bowel sounds appeared at 2-4 hours. While among the control group in seventy-two women (45.90%) bowel sounds appeared in 4-6 hrs and in eighty-one (51.60%) women bowel sounds appeared in 6-8 hours. Mean time taken for the appearance of bowel sounds among case and control was 3.39 hours and 6.91 hours respectively with significant difference (p=0.0001) as demonstrated in table 9 and graph 6 above.

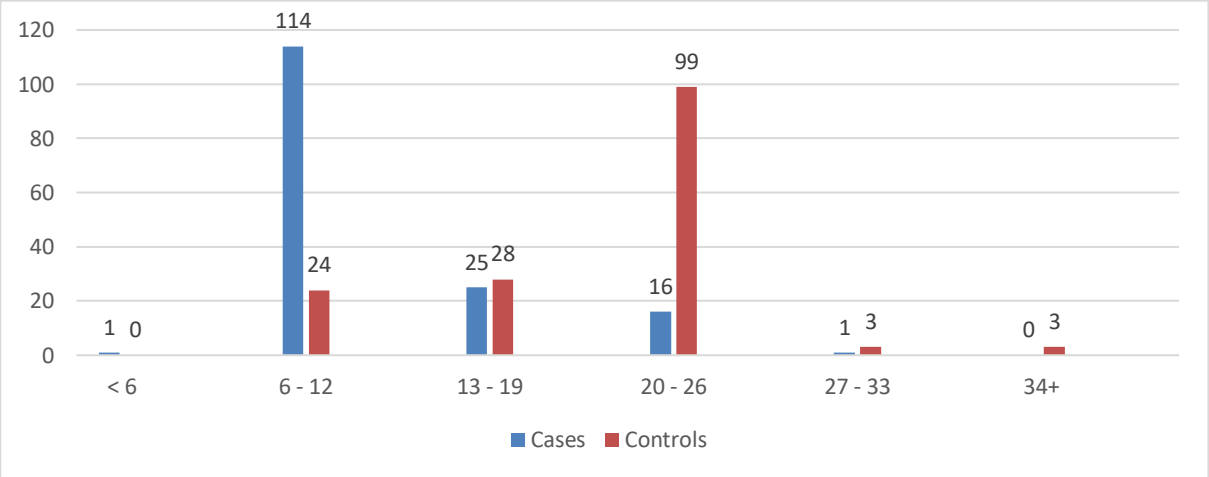
Table 10: Comparison of time of passage of flatus (hours) among cases and controls.

1ST FLATUS	Groups		Total	Chi square test	Significant value
	Cases	Controls			
< 6	1 0.60%	0 0.00%	1 0.30%	**123.77**	**0.0001***
6 - 12	114 72.60%	24 15.30%	138 43.90%		
13 - 19	25	28	53		

	15.90%	17.80%	16.90%		
20 - 26	16 10.20%	99 63.10%	115 36.60%		
27 - 33	1 0.60%	3 1.90%	4 1.30%		
34+	0 0.00%	3 1.90%	3 1.00%		
Total	**157 100.00%**	**157 100.00%**	**314 100.00%**		
MEAN	**12.74**	**20.51**			

*Statistically significant

Graph 7 : Bar diagram for comparison of time of appearance of 1st flatus among case and control



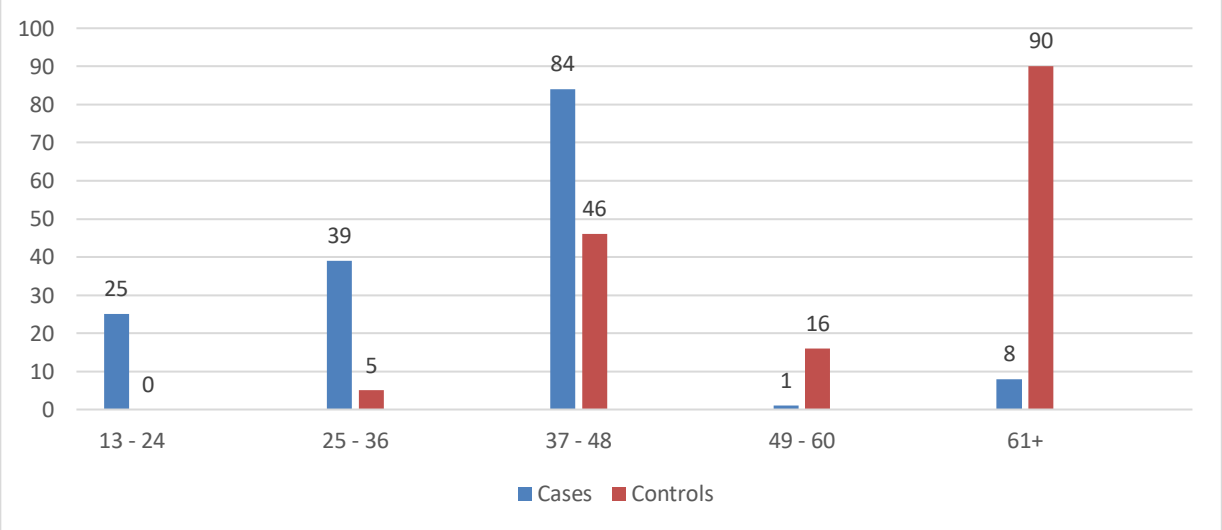
Among case group in majority of the women 1st flatus appeared in 6-12 hours following surgery and 20-26 hours in control group. Mean time taken for the appearance of 1st flatus among case and control were 12.74hours and 20.51 hours respectively with a significant difference (p=0.0001)

Table 11: Comparison of time taken for first stools (hours) among cases and controls.

1 ST	Groups	Total	Chi square	Significant value

STOOLS	Cases	Controls		test	
13 - 24	25 15.90%	0 0.00%	25 8.00%	144.22	0.0001*
25 - 36	39 24.80%	5 3.20%	44 14.00%		
37 - 48	84 53.50%	46 29.30%	130 41.40%		
49 - 60	1 0.60%	16 10.20%	17 5.40%		
61+	8 5.10%	90 57.30%	98 31.20%		
Total	**157** **100.00%**	**157** **100.00%**	**314** **100.00%**		
MEAN	**41.59**	**64.03**			

Graph 8 : Bar diagram for comparison of time taken for 1st stools among case and control



Among case group in majority of the women time taken for stools following surgery was 37-48 hours and 60+ hours in control group. Mean time taken for stools following surgery among case and control were 41.59 hours and 64.03 hours respectively with a significant difference (p=0.0001)

Table 12: Comparison of time taken for mobilization (hours) among case and controls.

MOBILIZATION	Groups		Total	Chi square test	Significant value
	Cases	Controls			
<= 6	45 28.70%	2 1.30%	47 15.00%	62.88	0.0001*
7 - 12	105 66.90%	120 76.40%	225 71.70%		
13 - 18	4 2.50%	30 19.10%	34 10.80%		
19 - 24	2 1.30%	4 2.50%	6 1.90%		
25 - 30	1 0.60%	0 0.00%	1 0.30%		
31+	0 0.00%	1 0.60%	1 0.30%		
Total	**157 100.00%**	**157 100.00%**	**314 100.00%**		
MEAN	**9.35**	**12.95**			

Mean duration of time taken for mobilization following surgery among cases and control were 9 hours and 12 hours respectively with a statistically significant difference (p=0.0001)

Graph 9 : Bar diagram for comparison of time taken for mobilization among case and control

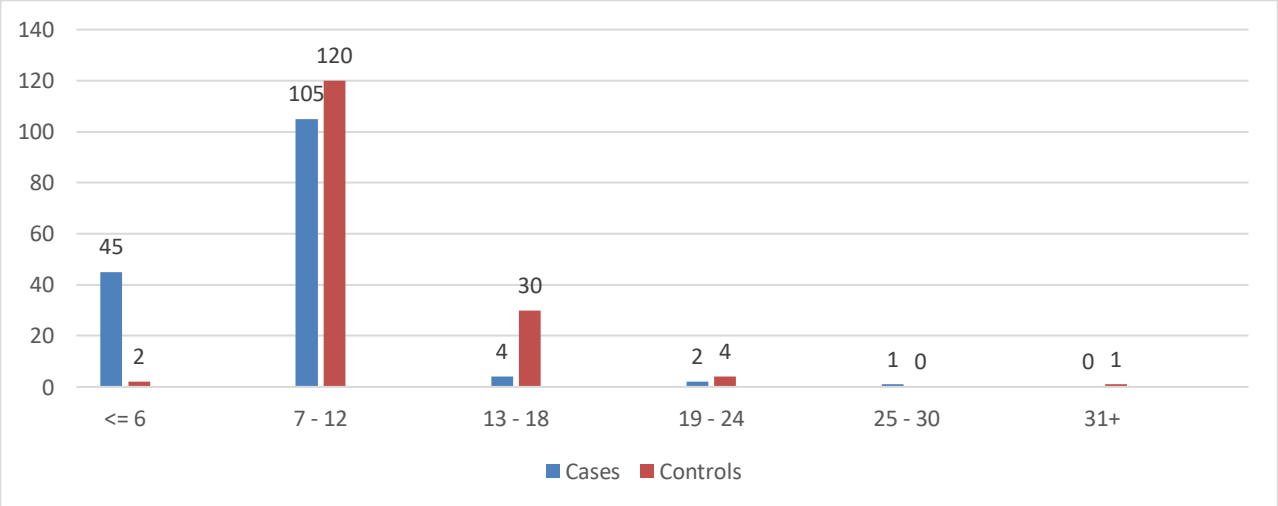


Table 13: Comparison of time taken for catheter removal (hours) among case and controls.

CATHETER REMOVAL	Groups		Total	Chi square test	Significant value
	Cases	Controls			
<= 12	23	0	23	**114.641**	**0.0001***
	14.60%	0.00%	7.30%		
13 - 24	90	37	127		
	57.30%	23.60%	40.40%		
25 - 36	32	24	56		
	20.40%	15.30%	17.80%		
37 - 48	7	85	92		
	4.50%	54.10%	29.30%		
61+	5	11	16		
	3.20%	7.00%	5.10%		
Total	**157**	**157**	**314**		
	100.00%	**100.00%**	**100.00%**		
MEAN	**12.97**	**42.05**			

***Statistically significant**

Mean duration of time taken for catheter removal following surgery among cases and control were 12.97 hours and 42.05 hours respectively with a statistically significant difference (p=0.0001).

Graph 10 : Bar diagram for comparison of time taken for catheter removal among case and control

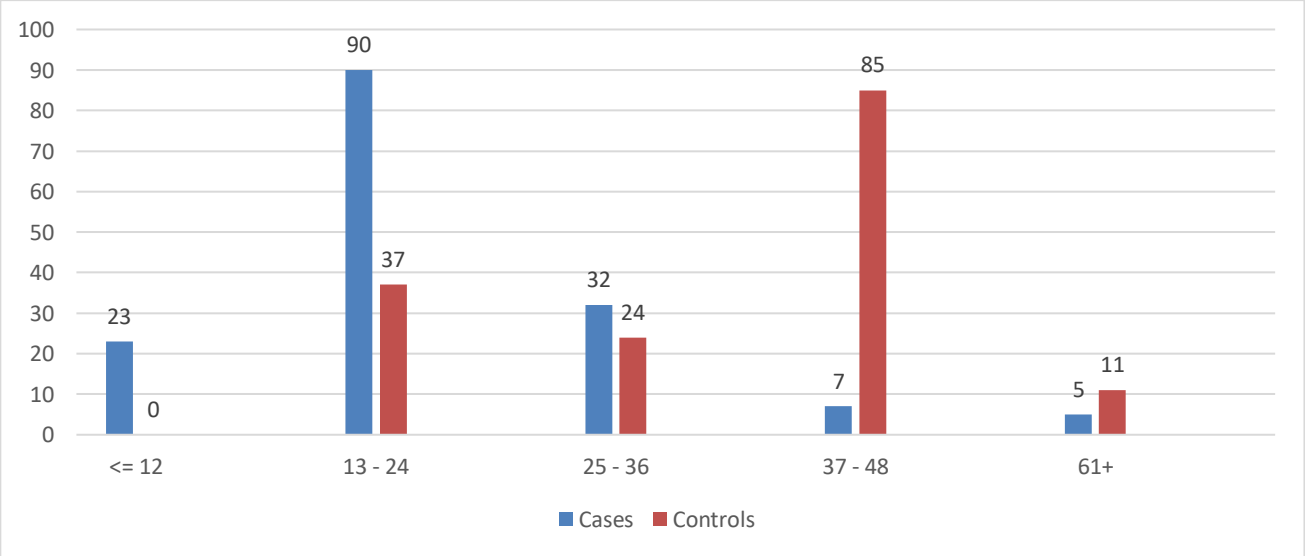
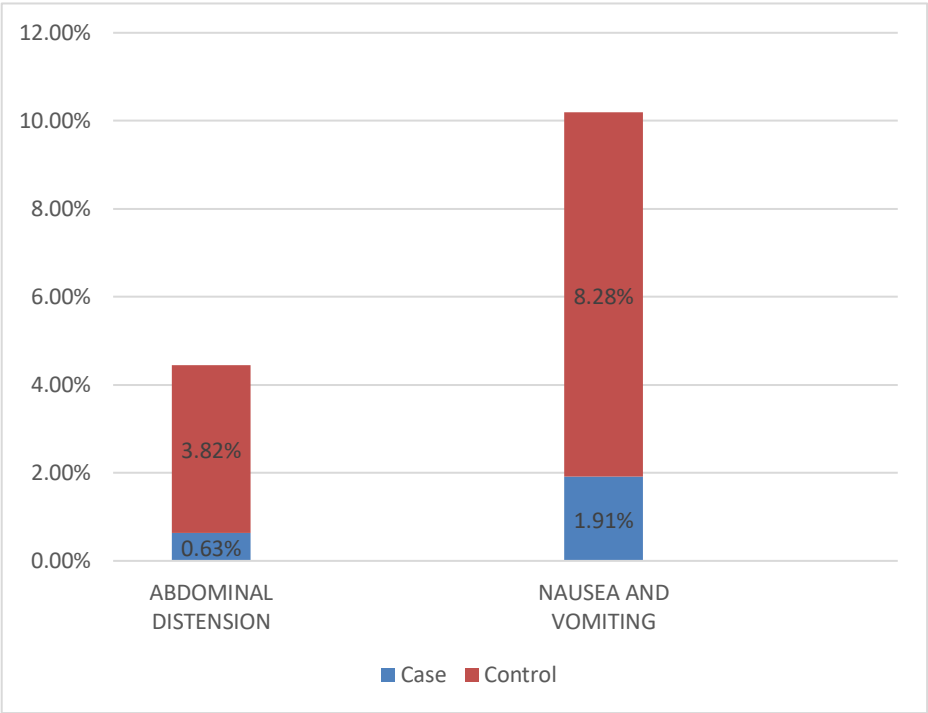


Table 14: Association of post-operative complications among case and control.

POSTOPERATIVE COMPLICATION	Groups		Total	Chi square test	Significant value
	Cases	Controls			
ABDOMINAL DISTENSION	1 0.63%	6 3.82%	7 2.22%	12.773	0.12
NAUSEA AND VOMITING	3 1.91%	13 8.28%	16 5.09%		
NILL	153 97.50%	138 87.90%	291 92.70%		
Total	**157** **100.00%**	**157** **100.00%**	**314** **100.00%**		

Post-operative complication such as abdominal distension was noted in one woman in case and six women in control group, while nausea and vomiting was seen in three women in case and thirteen women in control group with p=0.12.

Graph 11 : Bar diagram for comparison of post-operative complication among case and control



DISCUSSION

This study was conducted to observe the effectiveness of gum chewing when compared to the standard postoperative protocols among women who underwent cesarean section. Among 314 samples collected, statistical evaluation was done to analyze each factor and to understand the effectiveness of gum chewing for early recovery of bowel activity.

In our study, we included 314 pregnant women who are undergoing LSCS after meeting the inclusion criteria at Shri B.M. Patil's Medical College, Hospital and Research Centre. Among them 157 were taken under gum chewing group and 157 were taken under standard postoperative group.

The study findings revealed that there was no statistically significant difference between both groups as compared to their general characteristics, age groups, parity, occupation, LSCS/ previous abdominal surgery, type of caesarean section, indication of caesarean section and type of anesthesia, these findings were comparable to the other studies reported in the literature.

AGE:

In our study age comparison had no statistical significance among both groups.
Similar results were noted in other studies. Like Manish Nirmala Duhan, a prospective randomized control trial mean age in Group A women was 24.86[+ or -]3.89 years and 25.28[+ or -] 3.34 years in Group B[48]. Similarly, A randomised study by Senderila Abdulkareem, Dalia (2019), Egypt mean age in Group A women was 23.62±3.55 years and 22.82±4.31years in Group B[49]. Also study done by OV Ajuzieogu et al. mean age in Group A women was 25.0 ± 6.4 years and 25.5 ± 6.0 years in Group B[58]

Table 15: Comparison of age group among different studies

STUDIES	GROUP 1 (MEAN AGE) years	GROUP 2 (MEAN AGE) years
Manisha et al.[48]	24.86±3.89	25.28±3.34
Senderila Abdulkareem Mutlag et al.[49]	23.62±3.55	22.82±4.31
OV Ajuzieogu et al.[58]	25.0 ± 6.4	25.5 ± 6.0
Our study	24.52±3.93	24.59±4.15

Time of appearance of bowel sounds

The time of appearance of bowel sounds depends on the duration of the procedure, the impact of the anaesthesia, the handling of the gut, the presence of intraperitoneal adhesions during the procedure, and blood loss during surgery, as well as any prior abdominal or caesarean section history.

The mean time of first appearance of bowel sounds in this study was (3.39 hours) in study group as compared to control group (6.91 hours) and the difference was statistically significant (p = 0.0001).

These findings were in accordance with other studies like a randomised control trial by Manish, Nirmala Duhan (2020), Rohtak India the mean time taken for appearance of bowel sound was 3.27 hrs in gum chewing group and 8.22 hrs in control group[47]. Similarly, a study done by Senderila Abdulkareem, Dalia (2019), Egypt mean time for appearance of bowel sounds was 11.8 hrs in gum chewing group and 16.96 hrs in control group[48]. Also, a study done by OV Ajuzieogu, (2014), Nigeria Mean time taken for bowel sounds took more time to appear. Time taken was 21.9hrs and 26.1 hrs in gum chewing and control group respectively[58].

Table 16: Comparison of time of appearance of bowel sounds among different studies

A randomised control trial by Manish, Nirmala Duhan (2020), Rohtak India[48]	**Group A was 3.27 hrs** **Group B was 8.22 hrs**
A randomised study by Senderila Abdulkareem, Dalia (2019), Egypt[49]	**Group A was 11.8 hrs** **Group B was 16.96 hrs**
A randomised controlled clinical trial by OV Ajuzieogu, (2014), Nigeria[58]	**Group A was 21.9 hrs** **Group B was 26.1 hrs**

Time of first passage of flatus

After surgery, the return of motility is typically first observed in small bowel in less than 24 hours than in the stomach between 24 and 48 hours and finally in the large bowel after more than 48 hours.

In this study time of first passage of flatus in study group i.e 12.74 hours while 20.51 hours in control group and this time was comparable with other studies.

A randomised control trial by Manish, Nirmala Duhan (2020), Rohtak India the meantime taken for appearance of flatus was 9.77 hrs in gum chewing group and 17.15 hrs in control group. Similarly, a study done by Senderila Abdulkareem, Dalia (2019), Egypt mean time for appearance of flatus following surgery was 13 hrs in gum chewing group and 27.55 hrs in

control group. Also, a study done by OV Ajuzieogu, (2014), Nigeria Mean time taken for flatus took more time to appear. Time taken was 24.8 hrs and 30.0 hrs in gum chewing and control group respectively.

Table 17: Comparison of time of passage of first flatus among different studies

A randomised control trial by Manish, Nirmala Duhan (2020), Rohtak India[48]	**Group A was 9.77 hrs** **Group B was 17.15 hrs**
A randomised study by Senderila Abdulkareem, Dalia (2019), Egypt[49]	**Group A was 13.00 hrs** **Group B was 27.55hrs**
A randomised controlled clinical trial by OV Ajuzieogu, (2014), Nigeria[58]	**Group A was 24.8 hrs** **Group B was 30.0 hrs**

Time of first passage of stools

Gum chewing results in early passage of stools after surgery because it is a type of sham feeding that stimulates motility of human stomach, duodenum and rectosigmoid.

In this study the time of first passage of stool after surgery in study group is 41.59 hours and 64.03 hours in control group which is comparable to studies reported in literature.

For example: A randomised control trial by Manish, Nirmala Duhan (2020), Rohtak India the meantime taken for passage of first stools was 18.79 hrs in gum chewing group and 39.12 hrs in control group. Similarly, a study done by Senderila Abdulkareem, Dalia (2019), Egypt mean time for passage of stools following surgery was 16 hrs in gum chewing group and 20 hrs in control group. Also, a study done by OV Ajuzieogu, (2014), Nigeria Mean time taken for passage of stools following surgery was 30.7 hrs and 40.0 hrs in gum chewing and control group respectively.

Table 18: Comparison of time of passage of first stools among different studies

A randomised control trial by Manish, Nirmala Duhan (2020), Rohtak India[48]	**Group A was 18.79 hrs** **Group B was 39.12 hrs**
A randomised study by Senderila Abdulkareem, Dalia (2019), Egypt[49]	**Group A was 16 hrs** **Group B was 20 hrs**
A randomised controlled clinical trial by OV Ajuzieogu, (2014), Nigeria[58]	**Group A was 30.7 hrs** **Group B was 40.0 hrs**

In our study we noted early oral intake has helped in early ambulation in the study group which is 9 hours while in a control group it is 12 hours. We have also observed that early mobilization has also helped in early catheter removal and a good sense of wellbeing in mothers who belonged to study group.

CONCLUSION

Study was done, so that a positive step can be taken toward diminishing problems in fields of timely and early prevention of ileus.

From the present study we can conclude that sham feeding hastens the return of gastrointestinal motility following caesarean section as it is substantiated by the significantly lesser time essential for the bowel sounds to appear, passage of flatus and stools. Among the previous caesarean section cases in whom the return of gut motility is delayed have also noted early return of GI motility on the use of chewing gum. Gum chewing is therefore advised as a standard postoperative strategy to encourage gastric motility in women who have had caesarean sections.

According to the study's implications, surgeons can advise postoperative patients for gum chewing as a way to relieve stress, improve relaxation and overall wellbeing, and also as a form of diversionary therapy that speeds up recovery and prevents complications and thereby give the client satisfied care at a reasonable cost.

Thus, we conclude that gum chewing following caesarean section is a potential method to promote recovery and reduce complications such as postoperative ileus (POI), a condition where the intestines temporarily shut down after surgery. The study suggests that chewing gum stimulate gastrointestinal motility, leading to earlier return of bowel function after surgery. A faster recovery of bowel function can result in shorter hospital stays, reduced discomfort, and earlier resumption of normal activities.

Although only a population of 314 women were included in the study, the statistical analysis strongly emphasizes that gum chewing had maximum patient benefit.

SUMMARY

The thesis explores the efficacy of chewing gum as a novel and cost-effective intervention to alleviate postoperative ileus. Chewing gum offers a simple and accessible approach to stimulate intestinal motility, thereby accelerating the recovery of gastrointestinal function following surgery.

Key findings suggest that chewing gum operates through multiple mechanisms, including the stimulation of intestinal motility via the cephalic-vagal reflex. Additionally, it enhances the production of gastrointestinal hormones associated with bowel motility, leading to early restoration of bowel sounds, passage of flatus, and the return of appetite.

This research underscores the potential of chewing gum as a non-invasive adjunct therapy for mitigating postoperative ileus, ultimately contributing to improved patient outcomes and reduced healthcare costs.

Our study is a randomized control study of the effectiveness of chewing gum on post-operative ileus among the patients who have undergone caesarean section at Shri B M PATIL Medical college and research hospital, Vijayapura.

A total of 314 patients who fulfilled the inclusion criteria were included. For study group chewing gum was given 1 hour following the surgery and were asked to chew for 15 mins and was repeated every 2nd hourly till the appearance of bowel sounds.

1. 314 who had undergone Cesarean section were included in the study. They were randomized into two groups based on the randomization table obtained from research randomizer.

2. Patients were evaluated with a detailed history and complete physical examination. All

routine investigations, intraoperative findings, bowel parameters were noted.

3. Mean age of patients in study group was 24.52±3.93 years and 24.59±4.15 years in Group B

4. In our study emergency cesarean sections were 127 and 132 and elective surgery 20 and 32 in group a and group B respectively.

5. In our study most common indication for caesarean section was noted to be previous LSCS with other associated obstetric indication. And the second most common indication was fetal distress.

6. Duration of surgery in both group A and group B had no statistical difference.

7. In our study we observed that the time taken for bowel sounds to appear in repeat cesarean section was delayed and gum chewing has hastened the GI motility.

8. We have also noted that Mean time taken for the appearance of bowel sounds among case and control was 3.39 hours and 6.91 hours respectively. Mean taken for the appearance of 1st flatus among case and control were 12.74 hours and 20.51 hours. And the meantime taken for stools following surgery among case and control were 41.59 hours and 64.03 hours respectively.

9. Thus, we have observed that gum chewing has also helped in early mobilization, early catheter removal and better sense of wellbeing when compared with control group.

BIBLIOGRAPHY

1. Ozlem A, Hulya O. Gum chewing and bowel function after Caesarean section under spinal anesthesia.
2. Li ZL, Zhao BC, Deng WT, Zhuang PP, Liu WF, Li C, Liu KX. Incidence and risk factors of postoperative ileus after hysterectomy for benign indications. International Journal of Colorectal Disease. 2020 Nov;35:2105-12.
3. Nimarta, Singh NV, Shruti, Gupta R. Effectiveness of chewing gum on bowel motility among the patients who have undergone abdominal surgery. Nursing & Midwifery Research Journal. 2013 Jul;9(3):108-17.
4. Last R.J Regional and Applied Anatomy .1973; 5th edition; 413 -466
5. Guyton and Hall Textbook of Medical Physiology. 2006; 11 the edition; 771-774
6. Adelson DW, Million M: Tracking the moveable feast: sonomicrometry and gastrointestinal motility. News Physiol Sci 19:27, 2004.
7. Daniel EE: Physiology and pathophysiology of the interstitial cell of Cajal: from bench to bedside. III. Interaction of interstitial cells of Cajal with neuromediators: an interim assessment. Am J Physiol Gastrointest Liver Physiol 281: G1329, 2001.
8. Hansen MB: The enteric nervous system II: gastrointestinal functions. Pharmacol Toxicol 92:249-57, 2003.
9. Barret , Barman et al Ganong‘s Review of Medical Physiology .2012; 24 the edition; 498-508.
10. Barrett KE: Gastrointestinal Physiology. McGraw-Hill, 2006.
11. Cohen S, Parkman HP: Heartburn—A serious symptom. N Engl J Med 1999;340:878.
12. Itoh Z: Motilin and clinical application. Peptides 1997;18:593.
13. Lembo A, Camilleri M: Chronic constipation. N Engl J Med 2003;349:1360.
14. Levitt MD, Bond JH: Volume, composition and source of intestinal gas. Gastroenterology 1970;59:921.
15. Mayer EA, Sun XP, Willenbucher RF: Contraction coupling in colonic smooth muscle. Annu Rev Physiol 1992;54:395
16. Mittal RK, Balaban DH: The esophagogastric junction. N Engl J Med 1997;336:924

16a Kumari N, Jain N, Dhar RS. Effect of a locally tailored clinical pathway tool on VBAC

outcomes in a private hospital in India. The Journal of Obstetrics and Gynecology of India. 2021 Jun;71:246-53.

17. Kumari N, Jain N, Dhar RS. Effect of a locally tailored clinical pathway tool on VBAC outcomes in a private hospital in India. The Journal of Obstetrics and Gynecology of India. 2021 Jun;71:246-53.
18. Lodge-Tulloch NA, Elias FT, Pudwell J, Gaudet L, Walker M, Smith GN, Velez MP. Caesarean section in pregnancies conceived by assisted reproductive technology: a systematic review and meta-analysis. BMC Pregnancy and Childbirth. 2021 Dec;21:1-3.
19. Holm C, Langhoff-Roos J, Petersen KB, Norgaard A, Diness BR. Severe postpartum haemorrhage and mode of delivery: a retrospective cohort study. BJOG: An International Journal of Obstetrics & Gynaecology. 2012 Apr;119(5):596-604.
20. Oliphant SS, Bochenska K, Tolge ME, Catov JM, Zyczynski HM. Maternal lower urinary tract injury at the time of Cesarean delivery. International urogynecology journal. 2014 Dec;25:1709-14
21. Weibel S, Neubert K, Jelting Y, Meissner W, Woeckel A, Roewer N, Kranke P. Incidence and severity of chronic pain after caesarean section. European journal of anaesthesiology. 2016 Nov 1;33(11):853-65.
22. Yimer H, Woldie H. Incidence and associated factors of chronic pain after caesarean section: a systematic review. Journal of Obstetrics and Gynaecology Canada. 2019 Jun 1;41(6):840-54.+
23. Andolf E, Thorsell M, Källén K. Cesarean delivery and risk for postoperative adhesions and intestinal obstruction: a nested case-control study of the Swedish Medical Birth Registry. American journal of obstetrics and gynecology. 2010 Oct 1;203(4):406-e1.
24. Kimberley J, Olda N, Yuen N, Umstad MP. An Obstetric Perspective on Functional Bowel Obstruction After Cesarean Section: A Case Series. J Clin Gynecol Obstet. 2016;5(1):53-7
25. Paulsen CB, Zetner D, Rosenberg J. Incisional hernia after cesarean section: A systematic review. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2020 Jan 1;244:128-33.
26. Al-Zirqi I, Stray-Pedersen B, Forsén L, Daltveit AK, Vangen S. Uterine rupture: trends over 40 years. BJOG: An International Journal of Obstetrics & Gynaecology. 2016 Apr;123(5):780-7.

27. Fitzpatrick KE, Kurinczuk JJ, Bhattacharya S, Quigley MA. Planned mode of delivery after previous cesarean section and short-term maternal and perinatal outcomes: A population-based record linkage cohort study in Scotland. PLoS medicine. 2019 Sep 24;16(9):e1002913.
28. Carroll J, Alavi K. Pathogenesis and management of postoperative ileus. Clin Colon Rectal Surg. 2009 Feb;22(1):47-50. doi: 10.1055/s-0029-1202886. PMID: 20119556; PMCID: PMC2780226.
29. Furness JB. The enteric nervous system and neurogastroenterology. Nat Rev Gastroenterol Hepatol 2012; 9:286-94.
30. Kalff JC, Carlos TM, Schraut WH, et al. Surgically induced leukocytic infiltrates within the rat intestinal muscularis mediate postoperative ileus. Gastroenterology 1999; 117:378-87.
31. Hedrick T. L., McEvoy M. D., Mythen M. M. G., Bergamaschi R., Gupta R., Holubar S. D., et al. (2018). American society for enhanced recovery and perioperative quality initiative joint consensus statement on postoperative gastrointestinal dysfunction within an enhanced recovery pathway for elective colorectal surgery. *Anesth. Analg.* 126, 1896–1907. 10.1213/ANE.0000000000002742 [PubMed] [CrossRef] [Google Scholar] [Ref list]
32. Lobo D. N., Bostock K. A., Neal K. R., Perkins A. C., Rowlands B. J., Allison S. P. (2002). Effect of salt and water balance on recovery of gastrointestinal function after elective colonic resection: a randomised controlled trial. *Lancet* 359, 1812–1818. 10.1016/S0140-6736(02)08711-1 [PubMed] [CrossRef] [Google Scholar] [Ref list]
33. Luckey A., Livingston E., Tache Y. (2003). Mechanisms and treatment of postoperative ileus. *Arch. Surg.* 138, 206–214. 10.1001/archsurg.138.2.206 [PubMed] [CrossRef] [Google Scholar] [Ref list]
34. Bauer A. J., Boeckxstaens G. E. (2004). Mechanisms of postoperative ileus. *Neurogastroenterol. Motil.* 16, 54–60. 10.1111/j.1743-3150.2004.00558.x [PubMed] [CrossRef] [Google Scholar]
35. Shah S. K., Uray K. S., Stewart R. H., Laine G. A., Cox C. S. (2011). Resuscitation-induced intestinal edema and related dysfunction: state of the science. *J. Surg. Res.* 166, 120–130. 10.1016/j.jss.2009.09.010 [PMC free article] [PubMed] [CrossRef] [Google Scholar]
36. A systematic review and meta-analysis of baseline risk factors for the development of postoperative ileus in patients undergoing gastrointestinal surgery. Lee MJ, Vaughan-Shaw P, Vimalachandran D. *Ann R Coll Surg Engl.* 2020;102:194–203. [PMC free article] [PubMed] [Google Scholar]

37. Postoperative ileus. Livingston EH, Passaro EP Jr. *Dig Dis Sci.* 1990;35:121–132. [PubMed] [Google Scholar] [Ref list]
38. Review of the pathophysiology and management of postoperative ileus. Mattei P, Rombeau JL. *World J Surg.* 2006;30:1382–1391. [PubMed] [Google Scholar]
39. Postoperative ileus: impact of pharmacological treatment, laparoscopic surgery and enhanced recovery pathways. Augestad KM, Delaney CP. *World J Gastroenterol.* 2010;16:2067–2074. [PMC free article] [PubMed] [Google Scholar]
40. Furness JB. The enteric nervous system and neurogastroenterology. Nat Rev Gastroenterol Hepatol 2012; 9:286-94.
41. Kalff JC, Carlos TM, Schraut WH, et al. Surgically induced leukocytic infiltrates within the rat intestinal muscularis mediate postoperative ileus. Gastroenterology 1999; 117:378-87.
42. Postoperative ileus: recent developments in pathophysiology and management. Bragg D, El-Sharkawy AM, Psaltis E, Maxwell-Armstrong CA, Lobo DN. *Clin Nutr.* 2015;34:367–376. [PubMed] [Google Scholar]
43. Surgical manipulation of the gut elicits an intestinal muscularis inflammatory response resulting in postsurgical ileus. Kalff JC, Schraut WH, Simmons RL, Bauer AJ. *Ann Surg.* 1998;228:652–663.
44. Nitric oxide as an inhibitory non-adrenergic non-cholinergic neurotransmitter. Bult H, Boeckxstaens GE, Pelckmans PA, Jordaens FH, Van Maercke YM, Herman AG. *Nature.* 1990;345:346–347.
45. Kalff JC, Carlos TM, Schraut WH, et al. Surgically induced leukocytic infiltrates within the rat intestinal muscularis mediate postoperative ileus. Gastroenterology 1999; 117:378-87.
46. Wei Ge et al 'Effect of chewing gum on the postoperative recovery of gastrointestinal function' Int J Clin Exp Med 2015;8(8):11936-11942.
47. Kiyat ZE, Sut HK. The Effect of Xylitol Gum Chewing After Cesarean on Bowel Functions: A Randomized Controlled Study. Journal of PeriAnesthesia Nursing. 2022 Dec 1;37(6):913-7.
48. Duhan N. Impact of gum chewing on recovery of bowel activity after caesarean section. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2020 Mar 1;9(3):1132-8.
49. Mutlag SA, Farouk D, Youssef D. The relation between gum chewing in early post-operative period and the return of gastro-intestinal function after cesarean section. Obstet Gynecol Int J.

2019;10:408-12.

50. Morais EP, Riera R, Porfírio GJ, Macedo CR, Vasconcelos VS, de Souza Pedrosa A, Torloni MR. Chewing gum for enhancing early recovery of bowel function after caesarean section. Cochrane Database of Systematic Reviews. 2016(10).
51. Yenigul NN, Aydogan Mathyk B, Aslan Cetin B, Yazici Yilmaz F, Ayhan I. Efficacy of chewing gum for improving bowel function after cesarean sections: a randomized controlled trial. The Journal of Maternal-Fetal & Neonatal Medicine. 2020 Jun 2;33(11):1840-5.
52. Altraigey A, Ellaithy M, Atia H, Abdelrehim W, Abbas AM, Asiri M. The effect of gum chewing on the return of bowel motility after planned cesarean delivery: a randomized controlled trial. The Journal of Maternal-Fetal & Neonatal Medicine. 2020 May 18;33(10):1670-7.
53. Wen Z, Shen M, Wu C, Ding J, Mei B. Chewing gum for intestinal function recovery after caesarean section: a systematic review and meta-analysis. BMC pregnancy and childbirth. 2017 Dec;17:1-9.
54. Çevik SA, Başer M. Effect of bed exercises and gum chewing on abdominal sounds, flatulence and early discharge in the early period after caesarean section. Journal of clinical nursing. 2016 May;25(9-10):1416-25.
55. Hochner H, Tenfelde SM, Abu Ahmad W, Liebergall-Wischnitzer M. Gum chewing and gastrointestinal function following caesarean delivery: a systematic review and meta-analysis. Journal of Clinical Nursing. 2015 Jul;24(13-14):1795-804.
56. LeGarde SP. Chewing Gum to Promote the Recovery of Gastrointestinal Motility After a Cesarean Section. 2017 NCUR. 2017 Apr 7.
57. Andersson T, Bjerså K, Falk K, Fagevik Olsén M. Effects of chewing gum against postoperative ileus after pancreaticoduodenectomy–a randomized controlled trial. BMC research notes. 2015 Dec;8:1-5.
58. Ajuzieogu OV, Amucheazi A, Ezike HA, Achi J, Abam DS. The efficacy of chewing gum on postoperative ileus following cesarean section in Enugu, South East Nigeria: A randomized controlled clinical trial. Nigerian journal of clinical practice. 2014 Nov 1;17(6):739-42.
59. Jakkaew B, Charoenkwan K. Effects of gum chewing on recovery of bowel function following cesarean section: a randomized controlled trial. Archives of gynecology and obstetrics. 2013 Aug;288:255-60.

60. Kafali H, Duvan Cİ, Gözdemir E, Simavli S, Onaran Y, Keskin E. Influence of gum chewing on postoperative bowel activity after cesarean section. Gynecologic and obstetric investigation. 2010 Nov 21;69(2):84-7.

61. Shang H, Yang Y, Tong X, Zhang L, Fang A, Hong L. Gum chewing slightly enhances early recovery from postoperative ileus after cesarean section: results of a prospective, randomized, controlled trial. American journal of perinatology. 2010 May;27(05):387-91.

ANNEXURES

BLDE (DEEMED TO BE UNIVERSITY)
SHRI BM.PATIL MEDICAL COLLEGE HOSPITAL ANDRESEARCHCENTER, VIJAYAPURA-586103

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

I, the undersigned,_____D/O W/O_____,_____years, ordinarily residentof _____do hereby state/declare that Dr BRUNDHA N of Shri. B. M. Patil Medical College Hospital and Research Centre have examined me thoroughly_____at_____ _____(place), and it has been explained to me in my own language about the study. Further, **Dr BRUNDHA N** informed me that he/she is conducting a dissertation/research titled **"A randomized control study on the use of chewing gum versus standard post-operative care following caesarean delivery for early recovery of bowel activity."** under the guidance of **Dr ARUNA M BIRADAR** requesting my participation in the study. The doctor has informed me that my participation in this study helped in the evaluation of the results of the study, which is a useful reference for the treatment of other similar cases in the near future.The Doctor has also informed me that information given by me, observations made/ photographs/ video graphs taken upon me by the investigator will be kept secret and not assessed by a person other than my legal heir except for academic purposes or me.

The Doctor did inform me that though my participation is purely voluntary, based on theinformation given by me, I can ask for any clarification during treatment/study related to diagnosis, the procedure of treatment, result of treatment or prognosis. At the same time, Ihave been informed that I can withdraw from my participation in this study at any time I wantor the investigator can terminate me from the course at any time but not the procedure oftreatment and follow-up unless I request to be discharged.

After understanding the nature of the dissertation or research, diagnosis made, and mode of treatment. I am givingconsent for the blood investigations and also for the follow-up.

I the undersigned Shri/Smt_____, under my fully conscious state of mind agree to participate in the said research/dissertation.

Signature of the patient:

Signature of Doctor:

Date:

Place:

SHRI BM. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE, VIJAYAPURA - 586103

PROFORMA

Name:	Age:	Ip no:
Case.no:		
Address:	Occupation:	
DOA:	Contact no: 1.	
D.O. Study:	☐ Study Group ☐ Control Group	

1. **Diagnosis on Admission:**

2. **History of present pregnancy:**

LMP:
EDD:
POG:

3. **Obstetric history:**

Married Life:
Obstetric Score: G P L A
Previous Deliveries:

4. **Past history:**

5. **Family history:**

6. **Personal history:**

Diet:
Appetite:
Sleep:

Bowel/ Bladder:
Habits:

7. **General physical examination:**

Built:
Height:
Weight:
BMI:
Pallor:
Icterus:
CVS:

RS:

8. Per abdomen:

Fundal Height:
Fundal Grip:
Pelvic Grips:

9. Per vaginal

10. Diagnosis:

11. Investigations:

Hb:
Platelet count:
Urine routine:
Pus cells:
Albumin:
Sugars:
Random Blood Sugar:
HIV
HBsAg
Serum electrolytes:
Na:
K:
Ca:
Mg:
Blood grouping and typing
BT and CT

12. Delivery details:

☐ Emergency ☐ Elective
Time:
Indication:
Type of Anesthesia:
Intra-operative Findings:
Duration of Surgery:

13. Neonatal Details:

Baby Cried Immediately after Birth: ☐ Yes ☐ No
Resuscitation Needed: ☐ Yes ☐ No
Sex:
Birth Weight:
Date and Time of Birth:

Apgar Score: ☐ 1Min: ☐ 5Min:

NICU Admissions: ☐ Yes ☐ No

14. <u>Study Parameters:</u>

Auscultation of Bowel Sounds: (Started 2 Hours post-surgery)

TIME (HOURS)	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**	**6.5**	**7**	**7.5**	**8**
BOWEL SOUNDS													

NBM Status:

Time taken for the first bowel sounds to appear:

Time of first passage of flatus:

Time of first passage of stools:

Time Interval of Oral Intake from Time of Surgery:

Mobilisation from Time of Surgery:

Time Interval of Removal of Catheter:

Complications: Nausea: Paralytic Ileus:
Vomiting: Sub-acute Obstruction
Others(specify):

Discontinuation/dislike:

15. **Control parameters:**

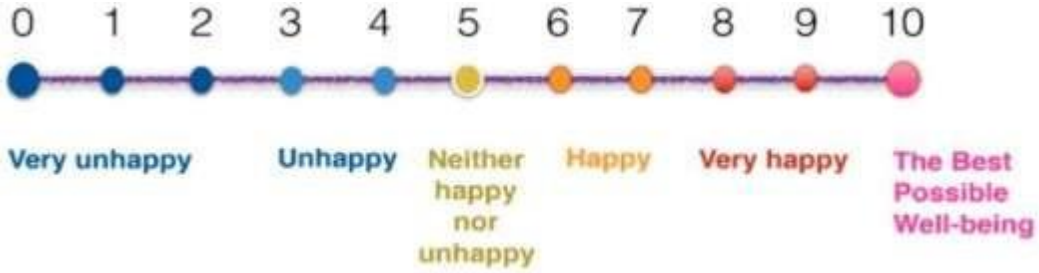
NBM Status:

Time Interval of Oral Intake from Time of Surgery:

Mobilisation from Time of Surgery:

Time Interval of Removal of Catheter:

16. **Sense of well-being:**



17. **Duration of Stay in Hospital:**
18. **Remarks:**

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21BMOBG02-brundha intro,docx	Brundha N

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BLDE
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The Constituent College
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 762/2022-23

30/8/2022

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on **Friday, 26th August, 2022 at 3.30 p.m. in the Department of Pharmacology** scrutinizes the Synopsis of Post Graduate Student of BLDE (DU)'s Shri B.M.Patil Medical College Hospital & Research Centre from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "A Randomized Control Study On Use of Chewing Gum Versus Standard Post-Operative Care Following Caesarean delivery In Early Recovery Of Bowel Activity".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: DR.BRUNDHA N

NAME OF THE GUIDE: Dr.Aruna Birdar, **Associate professor, Dept. of OBGY.**

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA

Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA

MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103, Karnataka

Following documents were placed before Ethical Committee for Scrutiny:

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document

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SL NO	LOCATLITY	AGE	GRAVIDA	GESTATIONAL AGE	INDICATION	CASES	DURATION OF SURGERY	NUMBER OF CHEWING GUM	BOWEL SOUND	1ST FLATUS	1 ST STOOLS	ORAL INTAKE	MOBILIZATION	CATHETER REMOVAL	SENSE OF WELL BEING	DURATION OF HOSPITAL STAY
1	R	18	1	39	CPD	CASES	1	2	2.5	7	20	5	24	36	10	5
2	R	25	1	41	SEVERE OLIGOHYDROMNIOS	CONTROL	1		4.5	10	48	4.5	24	36	5	7
3	R	23	1	38	MALPRESENTATION	CASES	1.5	1	2	6	30	4	24	36	10	4
4	U	26	4	39	PREVIOUS 2 LSCS	CONTROL	1		4.5	10	48	4.5	24	48	7	7
5	R	25	2	38	PREVIOUS 1 LSCS	CONTROL	1.5		6	12	48	6	24	36	7	10
6	R	21	3	38	PREVIOUS 2 LSCS	CONTROL	1.5		5	10	40	5	24	72	6	10
7	R	23	2	40	PREVIOUS 1 LSCS	CASES	1	1	2	8	36	5	30	36	10	5
8	R	22	1	40	NPOL	CASES	1.5	1	2	6	24	3	12	24	10	4
9	R	27	3	40	PREVIOUS 2 LSCS	CASES	1	3	6	12	36	6	16	36	8	7
10	R	19	1	41	CPD	CONTROL	1.5		6	10	48	6	12	24	8	7
11	U	20	2	38	MATERNAL REQUEST	CASES	1	2	2.5	4	24	2.5	12	24	10	4
12	U	23	3	41	SEVERE OLIGOHYDROMNIOS	CASES	1	2	2.5	8	48	2.5	12	24	10	5
13	R	26	1	38	FETAL DISTRESS	CASES	1	2	2.5	12	48	2.5	18	36	10	7
14	U	22	1	40	NPOL	CONTROL	1		6	12	48	6	18	36	7	7
15	R	22	3	37	PREVIOUS 1 LSCS	CASES	1	2	3	18	28	3	10	24	10	5
16	U	23	1	37	NPOL	CASES	1	2	2.5	6	16	2.5	12	36	10	4
17	U	32	1	40	FETAL DISTRESS	CONTROL	1.5		5	10	48	5	36	48	6	10
18	U	24	1	41	SEVERE OLIGOHYDROMNIOS	CASES	1	2	3	8	30	3	10	24	10	4
19	R	28	2	40	PREVIOUS 1 LSCS	CASES	1.5	2	4	12	24	4	10	36	10	5
20	R	22	2	38	PREVIOUS 1 LSCS	CONTROL	1		6	12	36	6	18	48	7	7
21	U	18	2	41	MATERNAL REQUEST	CONTROL	1		7	16	50	7	16	48	7	7
22	U	19	1	39	NPOL	CASES	1.5	2	2.5	6	20	2.5	10	36	10	5
23	U	26	2	40	CPD	CASES	1	2	3	8	40	3	12	36	10	4
24	R	28	2	37	SEVERE OLIGOHYDROMNIOS	CASES	1	1	2	8	18	2	10	36	10	4
25	R	20	2	40	FETAL DISTRESS	CASES	1.5	1	2	10	36	2	12	48	10	5
26	U	24	2	39	PREVIOUS 1 LSCS	CASES	1.5	2	4	10	48	4	12	48	10	5
27	R	18	1	40	FETAL DISTRESS	CASES	1.5	2	3.5	12	48	3.5	16	36	9	7
28	R	31	2	37	MATERNAL REQUEST	CONTROL	1		8	12	72	8	18	48	7	10
29	U	23	1	40	FETAL DISTRESS	CASES	1	1	2	6	20	2	10	30	10	7
30	U	24	4	40	PREVIOUS 1 LSCS	CONTROL	2		8	12	48	8	12	48	7	7
31	U	25	4	40	FAILED INDUCTION	CASES	1.5	1	2	8	36	2	10	36	10	5
32	U	21	1	41	MATERNAL REQUEST	CONTROL	1.5		8	12	48	8	12	48	6	7
33	R	27	2	39	PREVIOUS 1 LSCS	CASES	1.5	2	4	10	24	4	12	30	10	5
34	R	26	3	39	PREVIOUS 1 LSCS	CONTROL	1		8	10	38	8	12	36	7	9
35	R	22	1	41	CPD	CASES	1	2	3	8	18	3	10	24	10	4
36	U	26	1	41	MALPRESENTATION	CONTROL	1		8	16	40	8	12	36	8	7
37	R	25	2	40	CPD	CASES	1	2	2.5	6	18	2.5	10	30	10	4
38	R	23	3	38	PREVIOUS 2 LSCS	CASES	1	3	6	11	72	6	12	36	9	5
39	U	22	3	40	MALPRESENTATION	CONTROL	1		8	18	38	8	12	48	7	7
40	R	27	3	37	PREVIOUS 1 LSCS	CONTROL	1		6	14	40	6	12	48	7	7
41	R	35	3	39	PREVIOUS 2 LSCS	CASES	1	2	3	8	20	3	10	36	10	5
42	U	21	2	40	FETAL DISTRESS	CONTROL	1		7	18	46	7	12	48	7	7
43	U	30	1	41	CPD	CASES	1	2	2.5	8	18	2.5	10	36	10	4
44	R	25	1	37	FETAL DISTRESS	CASES	1	1	2	6	20	2	8	36	10	5
45	U	22	1	38	SEVERE OLIGOHYDROMNIOS	CONTROL	1		8	16	40	8	12	48	6	10
46	U	23	3	40	PREVIOUS 1 LSCS	CASES	1	2	3	6	20	3	10	72	10	7
47	R	22	3	40	PREVIOUS 1 LSCS	CONTROL	1		8	18	48	8	12	72	6	8
48	U	24	2	40	PREVIOUS 1 LSCS	CONTROL	1		6	15	34	6	10	48	6	7
49	U	20	2	38	PREVIOUS 1 LSCS	CONTROL	1		7	18	40	7	12	38	7	7
50	U	26	3	37	PREVIOUS 2 LSCS	CASES	1	2	4	10	48	4	8	36	10	5
51	U	32	4	38	PREVIOUS 2 LSCS	CONTROL	1.5		7	18	38	7	12	72	7	10
52	U	26	3	40	PREVIOUS 2 LSCS	CASES	1.5	2	4	12	48	4	10	36	8	7
53	R	26	2	39	SEVERE OLIGOHYDROMNIOS	CASES	1.5	2	3	8	20	3	10	36	8	7
54	U	28	1	41	SEVERE OLIGOHYDROMNIOS	CASES	1	2	3	12	22	3	8	36	10	5

55	U	29	6	40	SEVERE OLIGOHYDROMNIOS	CASES	1	2	2.5	10	18	2.5	8	36	10		5
56	U	18	2	39	DEEP TRANSVERSE ARREST	CONTROL	1		8	15	36	8	12	72	7		10
57	U	24	2	40	CPD	CONTROL	1		6	16	32	6	10	48	7		7
58	U	22	2	37	DEEP TRANSVERSE ARREST	CASES	1.5	1	2	8	18	2	6	72	9		8
59	U	29	3	41	FETAL DISTRESS	CASES	1	2	4	16	30	4	10	48	9		7
60	U	24	3	39	PREVIOUS 1 LSCS	CONTROL	1		8	20	38	8	12	72	7		7
61	U	23	2	38	PREVIOUS 1 LSCS	CASES	1	2	3	18	36	3	10	24	10		5
62	R	31	2	39	PREVIOUS 1 LSCS	CONTROL	1.5		6	22	48	6	12	48	8		7
63	R	24	3	38	PREVIOUS 2 LSCS	CASES	1	2	3.5	16	36	3.5	10	24	8		7
64	R	22	4	41	PREVIOUS 1 LSCS	CASES	1	2	3.5	12	30	3.5	10	36	10		4
65	U	18	2	37	PREVIOUS 1 LSCS	CONTROL	1.5		6.5	20	48	6.5	12	48	8		7
66	R	19	1	38	FETAL DISTRESS	CASES	1.5	2	3.5	10	30	3.5	10	24	10		7
67	U	24	1	39	FETAL DISTRESS	CASES	1.5	2	3	14	30	3	8	24	10		5
68	U	21	1	40	CPD	CASES	1	2	2.5	16	22	2.5	10	24	10		5
69	U	21	2	37	PREVIOUS 1 LSCS	CONTROL	1		6	20	72	6	12	48	7		7
70	R	31	2	40	CPD	CONTROL	1		6.5	24	72	6.5	14	48	7		7
71	R	21	1	38	CPD	CONTROL	1.5		7	20	50	7	12	48	8		8
72	U	28	2	39	PPROM WITH UNFAVORABLE CERVIX	CASES	1	2	3.5	18	36	3.5	10	24	10		5
73	U	23	1	40	FETAL DISTRESS	CASES	1.5	2	2.5	10	36	2.5	10	24	10		7
74	R	27	7	37	FETAL DISTRESS	CONTROL	1		8	24	72	8	14	48	7		12
75	U	22	4	37	PREVIOUS 1 LSCS	CASES	1	2	3.5	10	24	3.5	10	24	10		4
76	R	27	1	37	BREECH	CONTROL	1.5		8	20	50	8	16	48	7		7
77	U	25	4	40	FETAL DISTRESS	CASES	1.5	2	3.5	12	36	3.5	10	24	10		8
78	R	25	2	38	PREVIOUS 1 LSCS	CASES	1	2	4	18	36	4	10	24	10		5
79	U	23	1	38	MATERNAL REQUEST	CASES	1	2	3	10	36	3	10	24	10		4
80	R	20	1	38	CPD	CASES	1	2	3.5	18	48	3.5	10	24	10		4
81	U	25	3	39	PREVIOUS 2 LSCS	CONTROL	1.5		8	24	72	8	12	48	7		7
82	U	20	1	38	MATERNAL REQUEST	CONTROL	1		7	24	72	7	1	48	8		7
83	U	30	5	38	MATERNAL REQUEST	CONTROL	1.5		8	24	72	8	12	48	7		7
84	R	22	2	39	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	12	72	7		7
85	U	27	3	39	PREVIOUS 2 LSCS	CONTROL	1.5		10	24	56	10	16	48	7		5
86	U	26	1	39	MATERNAL REQUEST	CASES	1	2	2.5	14	48	2.5	10	24	10		4
87	R	28	4	37	PREVIOUS 3 LSCS	CASES	1.5	3	6	24	72	6	10	72	10		5
88	R	23	2	37	PREVIOUS 1 LSCS	CONTROL	1.5		8	36	72	8	12	48	7		7
89	U	24	1	38	CPD	CASES	1	3	5	24	52	5	10	48	9		5
90	R	19	2	40	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	16	48	6		7
91	R	23	1	40	CPD	CASES	1	2	4	20	48	4	12	24	10		5
92	R	25	2	40	PREVIOUS 1 LSCS	CONTROL	1		7	24	72	7	16	48	6		5
93	R	24	2	40	PREVIOUS 1 LSCS	CONTROL	1		6	24	72	6	16	48	6		5
94	R	27	2	40	FETAL DISTRESS	CONTROL	1		6	24	42	6	16	48	6		7
95	R	20	1	37	SEVERE OLIGOHYDROMNIOS	CASES	1	2	4	18	36	4	10	24	10		10
96	R	24	2	40	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	16	48	6		7
97	R	23	3	40	PREVIOUS 2 LSCS	CASES	1.5	3	6	16	48	3	10	72	8		7
98	U	25	2	40	PREVIOUS 1 LSCS	CASES	1	2	3.5	18	48	3.5	10	24	10		5
99	R	18	1	39	SEVERE IUGR	CONTROL	1		8	20	72	8	16	48	6		10
100	U	26	2	39	FETAL DISTRESS	CONTROL	1		8	24	72	8	16	48	6		10
101	R	23	3	41	FETAL DISTRESS	CASES	1.5	3	6	12	48	6	10	72	10		4
102	R	23	3	38	FETAL DISTRESS	CONTROL	1		6	24	60	6	12	48	6		7
103	R	32	1	37	NPOL	CASES	1	2	3.5	12	36	3.5	10	24	9		5
104	R	39	2	37	SEVERE OLIGOHYDROMNIOS	CASES	1	2	4	12	48	4	12	24	9		4
105	R	19	2	37	SEVERE OLIGOHYDROMNIOS	CONTROL	1		8	12	72	8	12	48	7		5
106	R	19	2	41	CPD	CASES	1	2	3	12	24	3	10	24	10		4
107	R	24	1	37	FETAL DISTRESS	CASES	1	2	4	12	24	4	12	24	10		4
108	U	23	2	39	PREVIOUS 1 LSCS	CASES	1	2	4	12	48	4	8	24	10		5
109	U	27	2	40	PREVIOUS 1 LSCS	CONTROL	1		6	24	72	6	12	48	7		5
110	U	24	2	39	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	12	48	7		5
111	U	23	2	38	SEVERE OLIGOHYDROMNIOS	CONTROL	1		6	24	72	6	12	48	7		5
112	U	20	2	40	FETAL DISTRESS	CASES	1	2	3	10	24	3	8	12	10		4
113	U	24	2	39	PREVIOUS 1 LSCS	CONTROL	1		7	24	72	7	12	24	8		5
114	R	20	1	41	SEVERE OLIGOHYDROMNIOS	CONTROL	1.5		6	12	48	6	12	24	7		7
115	R	25	3	41	FETAL DISTRESS	CONTROL	1		8	24	72	8	12	26	7		8
116	U	29	2	39	PREVIOUS 1 LSCS	CASES	1	2	4	12	36	4	10	12	10		4
117	U	34	2	38	PREVIOUS 1 LSCS	CONTROL	1.5		6	24	72	6	12	36	7		5

118	U	21	1	39	DEEP TRANSVERSE ARREST	CONTROL	1		8	36	72	8	12	72	6		7
119	U	24	1	39	CPD	CONTROL	1		8	24	48	8	12	36	7		5
120	R	25	1	38	NPOL	CASES	1	2	3	12	36	3	10	12	10		4
121	U	20	2	39	CPD	CASES	1	2	3.5	12	36	3.5	6	12	6		4
122	R	30	3	39	PREVIOUS 2 LSCS	CONTROL	1		10	24	72	10	12	48	7		7
123	R	20	1	41	CPD	CASES	1.5	2	3	24	36	3	8	12	10		4
124	R	24	2	39	NPOL	CONTROL	1		8	12	72	8	12	48	7		5
125	R	27	2	37	PREVIOUS 1 LSCS	CASES	1	2	3	24	48	3	10	12	10		4
126	R	20	1	40	FETAL DISTRESS	CASES	1	2	4	24	48	4	10	12	10		5
127	R	22	2	37	PREVIOUS 1 LSCS	CASES	1	3	4.5	24	48	4.5	10	12	10		5
128	R	18	2	40	CPD	CONTROL	1		8	24	72	8	12	48	7		5
129	U	23	5	38	PREVIOUS 2 LSCS	CONTROL	1		10	24	72	10	12	48	7		5
130	U	26	6	37	PREVIOUS 2 LSCS	CASES	1	5	10	24	48	5	10	24	9		5
131	R	23	2	38	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	12	24	7		5
132	R	24	2	39	PREVIOUS 1 LSCS	CONTROL	1		6	24	72	8	12	48	7		7
133	R	23	1	41	SEVERE OLIGOHYDROMNIOS	CASES	1	2	3	10	48	3	10	12	10		4
134	R	24	2	40	PREVIOUS 1 LSCS	CASES	1	2	4	12	48	4	12	36	9		4
135	U	25	2	38	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	18	24	7		7
136	R	27	2	37	SEVERE OLIGOHYDROMNIOS	CASES	1	4	8	12	48	3	12	24	10		4
137	U	28	3	37	PREVIOUS 1 LSCS	CASES	1	2	4	12	36	4	8	12	10		4
138	R	29	4	38	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	16	48	7		7
139	U	30	1	41	FETAL DISTRESS	CONTROL	1		6	24	56	6	12	48	8		6
140	R	25	3	40	CORD PRESENTATION	CONTROL			6	24	72	6	12	48	7		5
141	R	20	1	39	SEVERE OLIGOHYDROMNIOS	CASES		2	2.5	10	48	2.5	8	12	10		4
142	R	20	2	39	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	16	48	7		7
143	R	30	3	38	PREVIOUS 1 LSCS	CASES	1	2	4	12	48	4	12	24	9		5
144	R	20	1	38	FETAL DISTRESS	CASES	1	2	3.5	12	48	3.5	8	12	10		4
145	R	25	3	38	PREVIOUS 2 LSCS	CASES	1	3	5	12	48	5	10	24	9		5
146	R	36	3	38	PREVIOUS 2 LSCS	CASES	1	3	6	24	48	6	16	24	9		7
147	U	21	4	39	PREVIOUS 1 LSCS	CONTROL	1		6	24	36	6	12	24	7		5
148	R	22	2	38	MCDA TWIN GESTATION	CONTROL	1		8	36	72	8	16	48	6		10
149	R	21	1	39	NPOL	CASES	1	2	4	12	36	4	8	12	10		4
150	R	28	2	37	PREVIOUS 1 LSCS	CONTROL	1		6	24	72	6	12	24	8		4
151	R	28	1	40	CPD	CONTROL	1		6	24	48	6	12	24	7		5
152	U	24	1	38	CPD	CONTROL	1		5	24	72	5	16	36	7		7
153	U	30	3	39	PREVIOUS 2 LSCS	CASES	1	3	6	24	48	6	12	36	8		8
154	U	24	1	40	FETAL DISTRESS	CONTROL	1		7	24	48	7	16	36	7		5
155	U	25	1	42	CPD	CASES	1	2	3	10	36	3	10	12	10		4
156	U	18	1	37	BREECH	CONTROL	1		6	24	72	6	16	24	7		5
157	U	29	2	40	PREVIOUS 1 LSCS	CONTROL	1		8	20	48	8	16	36	7		6
158	U	26	3	37	PREVIOUS 2 LSCS	CASES	1	3	4.5	16	48	4.5	12	24	10		15
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161	R	24	1	40	CPD	CONTROL	1		8	24	72	8	16	24	7		7
162	R	21	3	40	PREVIOUS 1 LSCS	CASES	1	2	4	12	48	4	12	24	10		4
163		26	4	40	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	16	48	6		10
164	R	24	1	40	SEVERE OLIGOHYDROMNIOS	CASES	1	2	4	10	24	4	6	12	10		4
165	R	23	4	39	BREECH	CASES	1	2	3	12	48	3	12	24	10		4
166	U	25	4	42	PREVIOUS 1 LSCS	CASES	1	2	4	10	48	4	6	24	9		5
167	U	25	1	37	BREECH	CASES	1	2	4	12	48	4	10	12	10		4
168	U	20	1	40	FETAL DISTRESS	CONTROL	1		6	24	60	6	16	24	7		7
169	U	25	1	39	CPD	CASES	1	2	3.5	10	48	3.5	8	12	10		4
170	R	18	1	40	FETAL DISTRESS	CASES	1	2	4	10	36	4	8	12	10		4
171	R	24	3	37	PREVIOUS 2 LSCS	CONTROL	2		6	12	48	6	12	24	7		5
172	U	21	2	39	PREVIOUS 1 LSCS	CASES	1	3	4.5	10	48	4.5	12	24	9		5
173	R	22	2	38	PREVIOUS 1 LSCS	CONTROL	1		8	16	60	8	16	36	7		7
174	R	20	1	41	SEVERE OLIGOHYDROMNIOS	CASES	1	2	3	10	48	3	10	12	10		4
175	R	19	1	37	FETAL DISTRESS	CONTROL	1		6	24	72	6	18	36	6		7
176	U	27	3	39	NPOL	CASES	1	2	3	12	36	3	8	12	10		4
177	R	23	3	39	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	18	36	7		5
178	R	24	2	37	PREVIOUS 1 LSCS	CASES	1	2	3.5	10	36	3.5	10	24	9		5
179	U	29	2	39	PREVIOUS 1 LSCS	CASES	1	3	6	10	48	6	10	24	9		4
180	U	33	3	42	MATERNAL REQUEST	CONTROL	1		8	18	48	8	12	48	7		7
181	R	27	5	39	ANHYDRAMNIOS	CASES	1	2	4	12	48	4	10	24	9		4
182	R	24	1	41	SEVERE OLIGOHYDROMNIOS	CONTROL	1		8	24	72	6	12	36	8		5
183	U	22	2	39	CPD	CONTROL	1		8	12	72	8	12	36	7		6

184	U	35	2	38	SEVERE OLIGOHYDROMNIOS	CONTROL	1		6	16	72	6	12	48	7		5
185	U	27	2	40	PREVIOUS 1 LSCS	CASES	1	2	3.5	10	48	3.5	10	36	9		4
186	U	29	3	40	FETAL DISTRESS	CONTROL	1		6	24	72	6	12	48	8		5
187	U	24	1	38	FETAL DISTRESS	CASES	1	2	3	8	48	8	8	36	10		3
188	R	26	3	38	PREVIOUS 1 LSCS	CASES	1	2	3.5	10	48	3.5	12	24	10		5
189	U	23	3	39	PREVIOUS 1 LSCS	CONTROL	1		6	24	72	6	12	48	7		5
190	R	24	2	39	PREVIOUS 1 LSCS	CASES	1	2	4	24	72	4	12	24	8		4
191	R	23	2	39	PREVIOUS 1 LSCS	CONTROL	1		8	12	72	8	12	36	8		5
192	R	27	2	40	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	12	48	7		6
193	R	26	3	37	PREVIOUS 2 LSCS	CONTROL	1.5		10	24	48	8	12	48	8		5
194	U	22	2	38	PREVIOUS 1 LSCS	CASES	1	1	2	12	36	2	10	24	10		4
195	U	29	2	39	PREVIOUS 1 LSCS	CONTROL	1		6	24	72	6	12	48	8		6
196	R	30	2	38	PREVIOUS 1 LSCS	CASES	1.5	3	5	24	48	5	12	24	9		5
197	U	21	2	40	FETAL DISTRESS	CASES	1	2	2.5	12	48	2.5	10	24	10		4
198	U	28	4	40	BREECH	CASES	1	2	3	12	48	3	10	24	9		4
199	R	27	4	37	PREVIOUS 2 LSCS	CONTROL	1		8	12	72	8	12	48	8		5
200	R	26	2	40	FETAL DISTRESS	CONTROL	1		6	24	72	8	12	48	7		7
201	U	21	1	39	CPD	CONTROL	1		6	18	72	6	12	48	8		5
202	U	19	1	40	CPD	CONTROL	1		8	12	72	8	12	24	8		5
203	U	22	2	40	PREVIOUS 1 LSCS	CASES	1	2	3.5	12	48	3.5	6	24	9		4
204	U	23	2	40	PREVIOUS 1 LSCS	CONTROL	1.5		7	24	72	7	12	24	9		5
205	R	24	2	38	PREVIOUS 1 LSCS	CASES	1	2	4	12	48	4	8	24	10		4
206	R	23	3	39	PREVIOUS 1 LSCS	CASES	1	2	4	12	48	4	6	24	10		4
207	U	19	1	40	ANHYDRAMNIOS	CASES	1	2	2.5	10	48	2.5	6	24	10		3
208	R	19	1	37	CPD	CONTROL	1		6	16	72	6	12	48	7		7
209	U	19	1	40	CPD	CONTROL	1		6	24	72	6	12	48	7		7
210	U	27	3	38	PREVIOUS 2 LSCS	CASES	1	2	3	12	48	3	8	48	9		5
211	R	27	1	38	PRECIOUS PREGNANCY WITH MATERNAL REQUEST	CONTROL	1		6	12	48	6	12	48	8		5
212	R	23	3	40	PREVIOUS 2 LSCS	CONTROL	1		8	24	72	8	12	48	7		5
213	R	30	2	38	PREVIOUS 1 LSCS	CONTROL	1		7	18	56	7	12	48	8		7
214	U	19	2	38	SEVERE OLIGOHYDROMNIOS	CONTROL	1		6	18	72	6	12	24	8		5
215	R	19	1	40	SEVERE OLIGOHYDROMNIOS	CONTROL	1		6	24	72	6	10	24	8		5
216	R	20	2	40	PREVIOUS 1 LSCS	CASES	1	2	3.5	10	48	3.5	6	24	10		4
217	R	27	4	38	PREVIOUS 1 LSCS	CASES	1	2	3	12	48	3	6	24	10		4
218	U	30	2	40	PREVIOUS 1 LSCS	CASES	1	2	4	12	48	4	8	24	10		3
219	U	20	2	40	PREVIOUS 1 LSCS	CONTROL	1		6	12	54	6	12	24	8		5
220	U	21	2	39	PREVIOUS 1 LSCS	CASES	1	2	3	10	48	3	6	24	10		3
221	R	23	2	39	PREVIOUS 1 LSCS	CONTROL	1		5	16	50	5	10	24	9		4
222	R	28	5	37	PREVIOUS 2 LSCS	CASES	1	3	5	12	72	5	10	24	9		4
223	R	21	1	39	POOR BISHOPS SCORE	CONTROL	1		5	24	72	5	12	24	8		5
224	U	23	2	38	PREVIOUS 1 LSCS	CONTROL	1		6	18	72	6	10	24	8		5
225	U	28	5	37	PREVIOUS 2 LSCS	CASES	1	3	5	24	72	5	10	24	9		5
226	U	24	3	38	MALPRESENTATION	CASES	1	2	3	10	48	3	6	24	10		3
227	U	22	2	39	PEVIOUS 1 LSCS	CONTROL	1		5	24	72	5	12	24	8		5
228	R	30	1	40	SEVERE OLIGOHYDROMNIOS	CONTROL	1		8	16	72	8	12	24	8		4
229	R	21	1	40	SEVERE OLIGOHYDROMNIOS	CONTROL	1		8	18	48	8	10	48	8		4
230	U	24	1	38	POOR BISHOPS SCORE	CASES	1	2	2.5	10	48	2.5	6	24	10		3
231	U	28	2	39	PREVIOUS 1 LSCS	CONTROL	1		7	12	48	7	12	24	9		4
232	U	26	3	39	MATERNAL REQUEST	CONTROL	1		8	18	48	8	12	24	8		4
233	R	21	1	39	NPOL	CONTROL	1		8	12	48	8	12	24	8		5
234	U	18	1	39	POOR BISHOPS SCORE	CONTROL	1		8	30	72	8	12	48	7		5
235	R	20	1	41	FETAL DISTRESS	CASES	1	1	2	18	48	2	6	24	10		4
236	R	22	4	39	SEVERE OLIGOHYDROMNIOS	CONTROL	1		7	24	72	7	12	36	7		7
237	R	28	3	36	PRDVIOUS 1 LSCS	CASES	1	2	3	16	34	3	6	24	10		5
238	R	37	4	36	PREVIOUS 2 LSCS	CASES	1	3	6	30	72	6	10	48	9		7
239	R	28	3	40	PRECIOUS PREGNANCY WITH MATERNAL REQUEST	CASES	1	2	3	16	34	3	6	24	10		5
240	R	34	4	41	NPOL	CASES	1	1	2	16	48	2	6	24	10		4
241	R	26	2	39	PREVIOUS 1 LSCS	CASES	1	1	2	12	48	2	6	24	10		4
242	U	29	1	38	SEVERE OLIGOHYDROMNIOS	CONTROL	1		5	20	58	5	12	24	8		6
243	R	28	2	37	PREVIOUS 1 LSCS	CONTROL	1		6	24	58	6	12	24	8		7
244	R	23	2	41	PREVIOUS 1 LSCS	CONTROL	1		8	22	72	8	12	36	8		7
245	U	31	1	39	BREECH	CONTROL	1		5	20	48	5	10	24	9		4

246	U	21	1	40	FETAL DISTRESS	CASES	1	2	3	12	48	3	8	24	9		5
247	R	24	2	40	PREVIOUS 1 LSCS	CONTROL	1		6	20	52	6	10	24	8		7
248	R	23	1	38	FETAL DISTRESS	CASES	1	1	2	12	48	2	6	24	10		4
249	U	21	3	42	MATERNAL REQUEST	CASES	1	1	2	12	34	2	6	24	10		4
250	U	24	1	40	CPD	CONTROL	1		6	20	50	6	12	24	8		5
251	R	25	2	39	PREVIOUS 1 LSCS	CASES	1	3	4.5	20	48	4.5	10	24	10		4
252	R	24	2	38	FETAL DISTRESS	CONTROL	1		8	20	72	8	12	48	8		7
253	U	29	1	37	MATERNAL REQUEST	CASES	1	1	2	18	48	2	8	36	10		5
254	U	27	6	37	BAD OBSTRETIC HISTORY	CASES	1	1	2	16	48	2	6	24	10		6
255	R	41	1	41	FETAL DISTRESS	CONTROL	1		5	24	72	5	10	24	8		7
256	R	25	1	39	FETAL DISTRESS	CONTROL	1		6	20	72	8	12	48	7		7
257	R	22	1	39	FETAL DISTRESS	CONTROL	1		6	20	72	6	12	48	8		6
258	R	32	6	41	FETAL DISTRESS	CONTROL	1		8	22	72	8	12	72	7		7
259	U	23	1	38	FETAL DISTRESS	CONTROL	1		6	24	72	6	8	24	8		5
260	U	25	2	40	CPD	CONTROL	1		6	18	72	6	12	36	7		5
261	U	27	3	38	PREVIOUS 2 LSCS	CONTROL	1		8	24	72	8	12	48	7		7
262	R	23	2	39	PREVIOUS 1 LSCS	CASES	1	2	4	16	36	4	6	24	10		4
263	U	27	1	39	PPROM WITH UNFAVORABLE CERVIX	CONTROL	1		6	20	48	6	12	48	8		5
264	R	23	2	40	CPD	CONTROL	1		6	24	72	6	10	48	7		7
265	U	40	1	40	PRECIOUS PREGNANCY WITH MATERNAL REQUEST	CONTROL	1		5	20	448	5	10	36	7		5
266	R	23	2	36	MATERNAL REQUEST	CONTROL	1		6	20	72	6	10	48	6		6
267	R	30	2	35	ANHYDRAMNIOS	CONTROL	1		8	20	72	8	12	72	6		15
268	U	30	2	40	SEVERE OLIGOHYDROMNIOS	CASES	1	1	2	8	36	2	6	12	10		4
269	R	27	5	38	PREVIOUS 1 LSCS	CONTROL	1		7	20	72	7	12	72	7		7
270	R	20	1	40	SEVERE OLIGOHYDROMNIOS	CASES	1	1	2	10	48	2	6	12	10		4
271	R	29	3	38	PREVIOUS 2 LSCS	CONTROL	1		8	24	72	8	12	48	7		7
272	R	25	2	37	PREVIOUS 1 LSCS	CASES	1	2	3	12	48	3	6	24	10		5
273	U	35	3	38	PREVIOUS 1 LSCS	CASES	1	2	3	12	48	3	6	24	10		5
274	R	23	1	40	NPOL	CONTROL	1		5	20	48	5	6	24	8		5
275	U	20	2	38	PREVIOUS 1 LSCS	CONTROL	1		6	24	72	6	12	48	6		7
276	U	20	1	41	SEVERE OLIGOHYDROMNIOS	CASES	1	1	2	12	48	2	6	24	10		5
277	R	29	3	40	PREVIOUS 2 LSCS	CASES	1	2	4	16	72	4	12	24	9		5
278	U	20	3	40	PREVIOUS 1 LSCS	CASES	1	2	3	12	48	3	6	24	9		5
279	U	21	2	35	FETAL DISTRESS	CASES	1	2	2.5	12	48	2.5	6	24	10		10
280	U	28	3	38	PREVIOUS 2 LSCS	CASES	1	2	4	24	48	4	6	24	10		5
281	R	25	2	37	PREVIOUS 1 LSCS	CONTROL	1		6	16	48	6	12	24	8		5
282	U	23	1	40	FAILED INDUCTION	CASES	1	1	2	12	48	2	6	24	10		4
283	R	25	1	41	FETAL DISTRESS	CONTROL	1		6	24	48	6	12	24	7		5
284	U	25	1	41	FETAL DISTRESS	CONTROL	1		5	20	72	5	12	48	7		5
285	R	24	1	40	CPD	CASES	1	1	2	10	36	2	6	24	10		3
286	R	20	2	38	PREVIOUS 1 LSCS	CASES	1	2	3	12	48	3	10	24	9		5
287	U	24	1	39	FETAL DISTRESS	CONTROL	1		6	20	58	6	10	48	8		5
288	U	32	3	40	SEVERE OLIGOHYDROMNIOS	CASES	1	1	2	8	48	2	6	24	10		5
289	R	24	1	41	CPD	CASES	1	1	2	8	48	2	6	24	10		6
290	R	23	3	38	PREVIOUS 2 LSCS	CONTROL	1		8	24	72	8	12	48	7		7
291	R	19	1	39	FETAL DISTRESS	CASES	1	1	2	10	48	2	6	24	10		3
292	U	24	3	38	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	12	48	7		7
293	R	26	3	40	MATERNAL REQUEST	CASES	1	1	2	8	48	6	6	24	10		4
294	R	25	3	39	BAD OBSTRETIC HISTORY	CONTROL	1		5	22	48	5	10	48	8		5
295	R	22	1	36	FETAL DISTRESS	CASES	1	1	2	10	36	2	6	24	10		4
296	U	27	1	40	CPD	CASES	1	1	2	10	48	2	6	24	10		4
297	R	25	2	39	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	12	36	7		5
298	R	20	1	38	MATERNAL REQUEST	CONTROL	1		8	28	48	8	12	24	8		7
299	R	31	2	41	PREVIOUS 1 LSCS	CONTROL	1		8	30	48	12	12	48	7		5
300	R	27	3	39	BAD OBSTRETIC HISTORY	CONTROL	1		6	24	72	6	12	24	8		5
301	U	27	2	37	PREVIOUS 1 LSCS	CASES	1	2	3.5	16	48	6	6	24	10		5
302	U	22	4	39	PREVIOUS 1 LSCS	CASES	1	2	4	20	48	4	6	36	9		5
303	U	24	3	36	PREVIOUS 2 LSCS	CASES	1	3	6	18	72	6	6	48	10		5
304	U	24	3	39	PREVIOUS 2 LSCS	CASES	1		5	16	48	5	6	36	9		5
305	U	26	3	39	PREVIOUS 2 LSCS	CONTROL	1		8	22	72	8	12	48	7		7
306	U	27	1	39	PREVIOUS 1 LSCS	CASES	1	1	2	10	48	2	6	24	10		4

	307	U	27	3	37	FETAL DISTRESS	CONTROL	1		5	18	48	5	10	34	7		5
	308	R	21	1	40	CPD	CASES	1	1	2	10	48	2	6	24	10		4
	309	U	30	5	40	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	12	48	6		5
	310	U	22	2	40	PREVIOUS 1 LSCS	CASES	1	2	3	12	48	6	6	24	10		5
	311	R	20	1	38	FETAL DISTRESS	CASES	1	1	2	10	36	2	6	24	10		4
	312	U	24	2	41	FETAL DISTRESS	CONTROL	1		6	18	72	6	12	48	7		7
	313	U	30	2	39	PREVIOUS 1 LSCS	CONTROL	1		8	24	72	8	12	72	6		7
	314	R	23	3	39	PREVIOUS 1 LSCS	CONTROL	1		6	20	48	6	12	48	7		5