

**“POSSUM SCORING IN PREDICTING THE MORTALITY AND
MORBIDITY OF PATIENTS UNDERGOING EMERGENCY
LAPAROTOMY IN TIRUNELVELI MEDICAL COLLEGE HOSPITAL”**

A DISSERTATION SUBMITTED TO THE TAMILNADU

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In partial fulfillment of the requirement for the degree of

M.S. (GENERAL SURGERY)

BRANCH – I

Register No: 221711370



DEPARTMENT OF GENERAL SURGERY

TIRUNELVELI MEDICAL COLLEGE

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DECLARATION

I solemnly declare that the dissertation entitled **“POSSUM SCORING IN PREDICTING THE MORTALITY AND MORBIDITY OF PATIENTS UNDERGOING EMERGENCY LAPAROTOMY IN TIRUNELVELI MEDICAL COLLEGE HOSPITAL”** is done by me at Tirunelveli Medical College hospital, Tirunelveli. I also declare that this bonafide work or a part of this work was not submitted by me or any others for any award, degree, or diploma to any other University, Board, either in or abroad. The dissertation is submitted to The Tamilnadu Dr. M.G.R.Medical University towards the partial fulfilment of requirements for the award of M.S. Degree (Branch I) in General Surgery.

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PRINCIPAL INVESTIGATOR: Dr.VIKRAM BIRLA.R, MBBS.,

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Dear Dr.VIKRAM BIRLA.R, MBBS, The Tirunelveli Medical College Institutional Ethics Committee (TIREC) reviewed and discussed your application during The IEC meeting held on 27.10.2017.

THE FOLLOWING DOCUMENTS WERE REVIEWED AND APPROVED

1. TIREC Application Form
2. Study Protocol
3. Department Research Committee Approval
4. Patient Information Document and Consent Form in English and Vernacular Language
5. Investigator's Brochure
6. Proposed Methods for Patient Accrual Proposed
7. Curriculum Vitae of The Principal Investigator
8. Insurance /Compensation Policy
9. Investigator's Agreement with Sponsor
10. Investigator's Undertaking
11. DCGI/DGFT approval
12. Clinical Trial Agreement (CTA)
13. Memorandum of Understanding (MOU)/Material Transfer Agreement (MTA)
14. Clinical Trials Registry-India (CTRI) Registration

THE PROTOCOL IS APPROVED IN ITS PRESENTED FORM ON THE FOLLOWING CONDITIONS

1. The approval is valid for a period of 2 year/s or duration of project whichever is later
2. The date of commencement of study should be informed
3. A written request should be submitted 3weeks before for renewal / extension of the validity
4. An annual status report should be submitted.
5. The TIREC will monitor The study
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7. The PI should report to TIREC within 7 days of the occurrence of the SAE. If the SAE is Death, the Bioethics Cell should receive the SAE reporting form within 24 hours of the occurrence.
8. In the events of any protocol amendments, TIREC must be informed and the amendments should be highlighted in clear terms as follows:
 - a. The exact alteration/amendment should be specified and indicated where the amendment occurred in The original project. (Page no. Clause no. etc.)
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 - c. If the amendments require a change in the consent form, the copy of revised Consent Form should be submitted to Ethics Committee for approval. If the amendment demands a re-look at the toxicity or side effects to patients, The same should be documented.
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This is certify that this dissertation work title **“POSSUM SCORING IN PREDICTING THE MORTALITY AND MORBIDITY OF PATIENTS UNDERGOING EMERGENCY LAPAROTOMY IN TIRUNELVELI MEDICAL COLLEGE HOSPITAL”** of the candidate **Dr.VIKRAM BIRLA.R** with registration Number **221711370** for the award of M.S. Degree in the branch of **GENEARL SURGERY (I)**. I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion page and result shows **12 percentage** of plagiarism in the dissertation.

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LIST OF ABBREVIATIONS

ABG	-	Arterial Blood Gas Analysis
BP	-	Blood Pressure
DU	-	Perforation Duodenal ulcer perforation
DVT	-	Deep Vein Thrombosis
ECG	-	Electro Cardiogram
LBBB	-	Left Bundle Branch Block
PACU	-	Post Anesthesia Care Unit
POD	-	Post Operative Delirium
PR	-	Pulse Rate
PUO	-	Pyrexia of Unknown Origin
SSI	-	Surgical Site incision

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INTRODUCTION

The Physiological and Operative Severity Score for the enumeration of Mortality and morbidity (POSSUM) is a scoring system that is used to predict 30 day mortality and morbidity rates in patients who are undergoing surgery. It was developed by Copeland in 1991.

Emergency laparotomy is a common procedure having mortality rate considerably greater than that of elective laparotomy. Measuring the outcome of emergency laparotomy is very important for patients and treating surgeon, in which improvement in the health service can be achieved.

Copeland GP explained the creation of the POSSUM scoring system and described the correct analysis method. He suggested usage of POSSUM scoring system to identify high risk patients who could be benefited from preoperative optimization to provide better surgical care to the patients. He concluded by suggesting wider application of POSSUM in various surgical specialties and other countries to assess the quality of care by using the difference in the Observed: Expected ratio.

Factors making an impact on operative prognosis in developing countries are distinct from those affecting clinical and recovery parameters due to variance in physiological, economic and socio-cultural aspects.

With that in mind, POSSUM contains both physiological and operative finding variables. This scoring system is now used to guide for a better usage of health care resources to postoperative patients for a better prognosis .

AIM AND OBJECTIVE OF THE STUDY

1. Evaluation of POSSUM equation in patients undergoing EMERGENCY LAPAROTOMY
2. To identify high risk patients who could be benefited from preoperative optimization to provide better surgical care to the patients.

REVIEW OF LITERATURE

The POSSUM is two part scoring system that includes a physiological evaluation and a determining the operative severity. The physiological scoring includes 12 variables, each divided into 4 grades with an exponentially increasing score (1, 2, 4 and 8). The physiological variables are apparent at the time of surgery and include clinical symptoms and signs, results of simple biochemical and hematological investigations, and electrocardiographic changes. Highest score being given to the most deranged values. If a particular variable is not available, a score of 1 is allocated. Some variables may be assessed by means of clinical symptoms or signs or by means of changes on chest radiographic findings. The minimum score, therefore, is 12, with a maximum score of 88. The POSSUM physiology score based on these preoperative factors was predictive of outcome for individual operations, but not for groups of surgical patients as a whole. For example, a patient having an aortic aneurysm repair was likely to have a higher probability of death than the same patient having a psoas abscess drained. To address this, a six-factor operative severity score was added using similar methodology. POSSUM scores derived from the physiological values is a measure of pre-operative severity of illness. POSSUM has the advantage of including operative severity variables, which made it better in predicting mortality rates⁸.

The operative severity part of the score includes 6 variables, each divided into 4 grades with exponentially increasing score (1, 2, 4 and 8). The number of

operations indicates the chronology of the procedures within 30 days. The physiological and operative scores are obtained by, applying the preoperative physiological values and operative severity variables to physiological and operative severity assessment table for the P POSSUM system as developed by Copeland et al⁵ shown in TABLE 2 and 3.

Once the scores are known, it is possible to estimate the predicted risk for mortality using the following POSSUM equation for mortality and morbidity.

- Mortality: “ $\text{Log (R/1-R)} = -7.04 + (0.13 \times \text{physiological score}) + (0.16 \times \text{operative severity score})$ ”

Morbidity: “ $\text{Log (R/1-R)} = -5.91 + (0.16 \times \text{physiological score}) + (0.19 \times \text{operative severity score})$ ”

R indicates risk of mortality/morbidity, PS-Physiological score and OS-Operative score

The outcome of surgical intervention ,is not dependent solely on the ability of the operating the surgeon .The patients physiological status ,the disease that requires surgical correction, severity of the disease, the nature of the operation and the pre operative support services have a major effect on the ultimate outcome. It is evident to surgeons that mortality and morbidity rates do little to explain these differences and that the use of statistics is at best inaccurate and misleading⁴.

Patients value information concerning mortality and morbidity rates of surgical procedures. Thus there has been a search for accurate risk scoring systems that can be used to compare patient outcomes according to different units and hospitals⁵. Many scoring systems were developed that predict the risk of mortality with varying degrees of accuracy. Many scores have been devised which are ideally suited to special types of surgical procedure or to assessing particular types of complications. The ideal scoring system for the surgical audit purposes should assess mortality and morbidity and allow audit retrieval of surgical success. It should be quick and easy to use and should be applicable to all general surgical procedures in both the emergency and elective setting. It should be of use in all types of hospitals and should provide educational information⁵.

POSSUM system falls in between ASA scoring system commonly used by the anaesthetist and the APACHE system which is very elaborate¹⁰.

The only direct comparison between the two systems included 117 patients; it showed that POSSUM was more predictive of outcome than APACHE II⁸.

The POSSUM audit system (The Physiological and Operative Severity Score for enumeration of Mortality and morbidity) was designed to be easy and rapid to use and to have wide application across the general surgical spectrum both in the elective and emergency settings.⁶

In the present study, POSSUM scoring systems were applied prospectively to determine how they performed in predicting death in patients undergoing emergency laparotomy in our hospital, a group known to be at high risk of complications and death.

Origin and History of Laparotomy

The first successful laparotomy was done without any anesthesia by Ephraim McDowell in 1809 in Danville, Kentucky. 1881, Dr. George E. Goodfellow treated a miner around Tombstone, Arizona Territory, who had been shot in the abdomen with a .32-caliber revolver. Goodfellow operated the patient nine days after he was been shot

Terminology

It is originated from the Greek word ("lapara"), meaning "the soft part of the body in between thorax and pelvis, flank, and the suffix "-tomy" is also a Greek word meaning "a cut open."

GENERAL PRINCIPLES IN LAPAROTOMY

Laparotomy is opening the abdomen for surgical intervention.

Laparotomy can be –

1. ElectivelaparotomyElectivelaparotomywherein proper preoperative diagnosis has been established with various imaging and biochemical analysis. Even though it is done with proper preoperative diagnosis, being a magic box, in spite of all newer diagnostic aids, finding and diagnosis on opening may be entirely different from what was thought during evaluation. At that stage surgeon should be ready to alter the treatment strategy depending on the need³⁰.
2. EmergencylaparotomyIt is done in trauma and acute abdomen like peritonitis. Even here basic investigations like USG/CT abdomen and haematological assessment are done to proceed with laparotomy at the earliest. Midline vertical incision centered on the umbilicus with curve at umbilicus towards left side is done. This incision is called as incision of indecision/registrar's incision. It can be extended above or below easily depending on the need. It also can be extended horizontally if needed³⁰.

ABDOMINAL INCISIONS

Principles in Abdominal Incision

- Incision should give adequate proper *access* to the surgical site in the abdomen – well planned; with adequate exposure of adequate length. Patient should lie symmetrical the operation theatre table³⁰.
- It should be amenable for *extension* as needed. Muscle should be split as much as possible, not cut in vertical and oblique incisions³⁰.
- Incision should be chosen with plan so as to have proper accessibility, extensibility, safeguard of function, cosmetically acceptable and with possible least complications like dehiscence and incisional hernia³⁰.
- Care should be taken while opening the peritoneum. Abdominal contents should not be injured especially bowel. This is more important aspect in previous laparotomy patients. Peritoneum should be incised using fine scissor or scalpel after feeling the site of incision using fingers for any adherent bowel or omentum. One should not use cautery to incise peritoneum.
- If there is previous incision scar (re-laparotomy), care should be taken not to injure bowel while opening the peritoneum; it is better to open the peritoneum at a new site³⁰.
- Layer by layer incision should be done.
- Extension across umbilicus is done from left side of the umbilicus.

- Further cutting of the peritoneum after incising should be done under vision with two fingers underneath the peritoneum to prevent injury to bowel.
- Wound dehiscence is less in transverse incision than vertical incision.
- Drain should be kept through a separate incision; not through the main wound. If drain is passed through the main wound it will prejudice the strength of the final scar.
- Proper anaesthetic relaxation is essential before closure of the abdomen otherwise closure will be troublesome³⁰.

Exploratory Laparotomy

All opened abdomen should be explored by putting hand inside (right hand usually) – It is done through a proper method called as *laparotomy circuit*³⁰.

Table 1³⁰

<i>Outer laparotomy circuit</i>	<i>Inner laparotomy circuit</i>
<p>Begins at oesophagogastric junction</p> <p>↓ <i>Anticlockwise</i></p> <p>Stomach duodenum, liver, gallbladder</p> <p>↓</p> <p>Right colon, caecum, pelvis</p> <p>↓</p> <p>Sigmoid colon, descending colon, splenic flexure</p> <p>↓</p> <p>Spleen, left kidney, pancreas, aorta and transverse colon</p> <p>↓</p> <p><i>Completion of outer circuit.</i></p>	<p>Ligament of Treitz</p> <p>↓ Oblique from left to right</p> <p>Small bowel – jejunum and ileum with their mesentery</p> <p>↓</p> <p>To reach Ileocaecal junction</p> <p>↓</p> <p><i>Completion of inner circuit.</i></p>

Different Abdominal Incisions

- Upper midline.
- Upper right paramedian.
- Upper left paramedian.
- Kocher's incision (right subcostal).
- Left subcostal.
- Bucket handle.
- Upper horizontal.
- Toracoabdominal.
- Umbilical crease incision.
- Subumbilical.
- Incision for lumbar sympathectomy.
- Lower midline.
- Lower right or left paramedian.
- Incisions for appendectomy—McBurney's, Rutherford Morison's, Lanz, laparoscopic.
- Pfannenstiel incision.
- Lower horizontal .

Fig 1

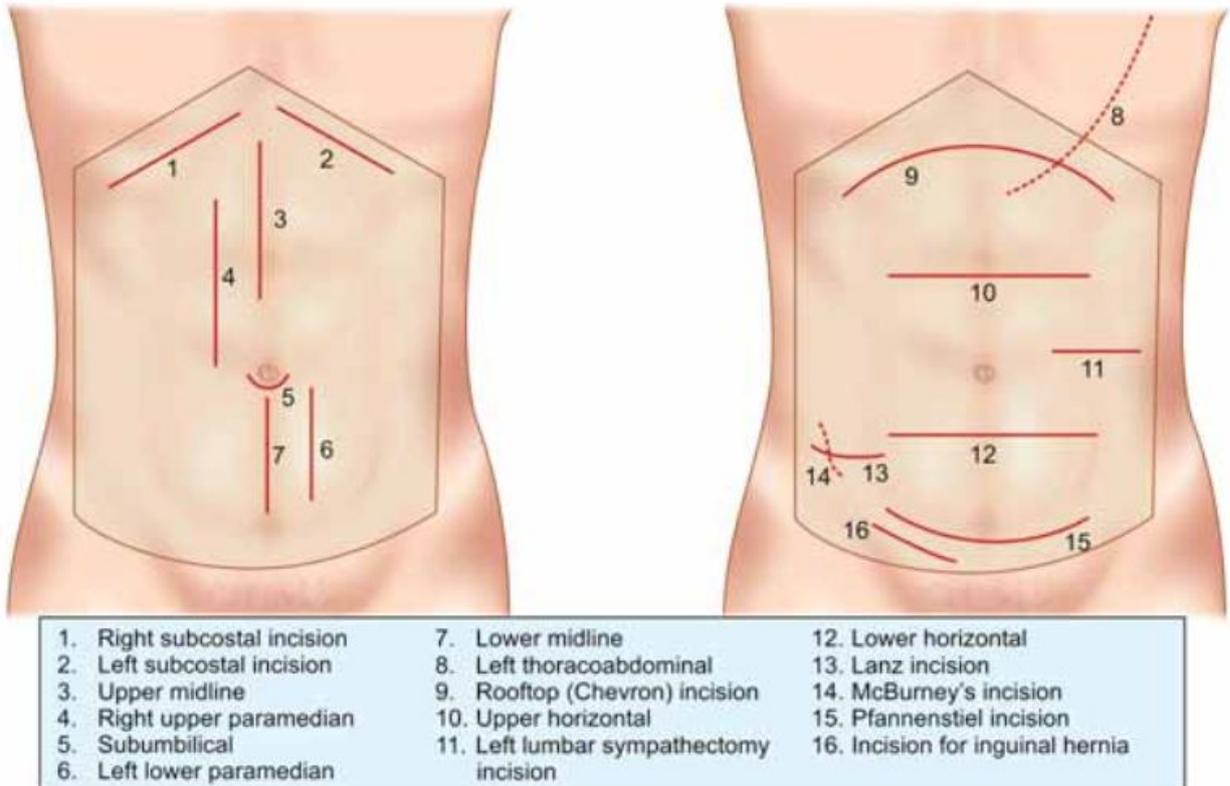


Fig. 2 Clinical Pictures



Fig 3. Clinical Pictures

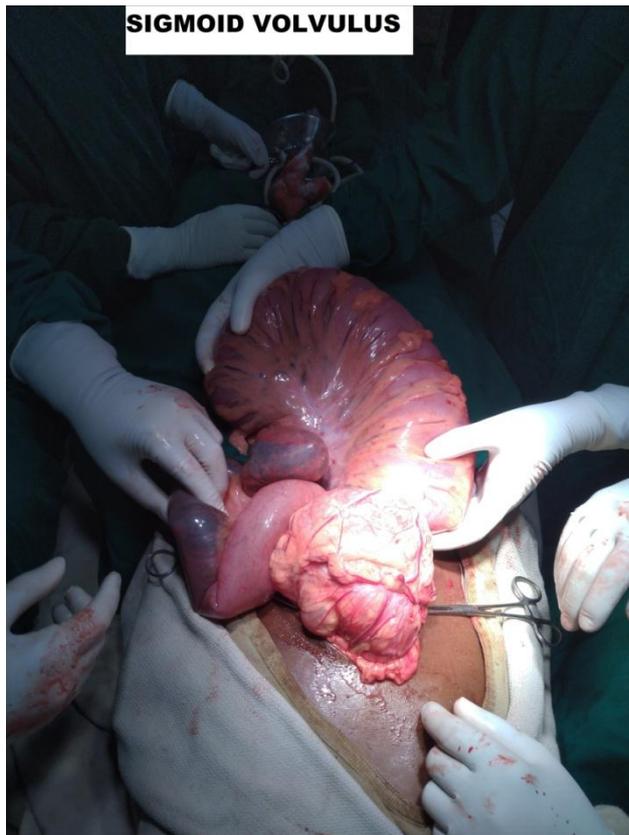
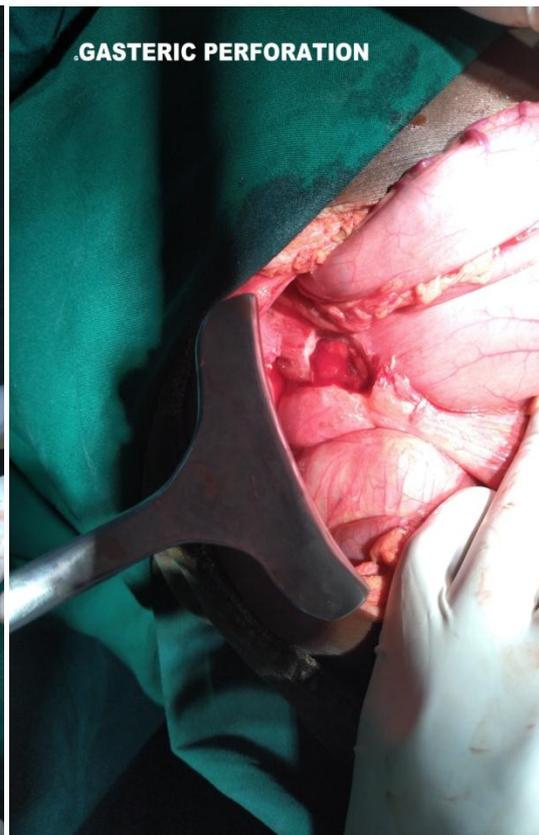


Fig 4 Clinical Pictures



MIDLINE INCISION

It is commonly advocated incision. It can be upper midline/lower midline or both upper and lower lengthy midline incision. Midline incision is easier to reach across linea alba with rapid access, minimum blood loss, and also quicker and easier to close.

Extension above or below will be easier and faster. In emergency surgeries and common elective surgeries midline incision is better. Midline incision gives excellent adequate exposure of the abdomen. It can be extended below, above, horizontally or obliquely or as thoracoabdominal when needed. Gastrectomy, pancreaticojejunostomy, hiatus hernia repair, pseudocyst surgery,

exposure of aorta, colectomy and biliary tract surgeries can be done with midline incision.

Upper Midline Incision

Skin is incised vertically in midline from xiphoid to umbilicus. Superficial fascia, external oblique fascia is incised. Whitish crisscross tough linea alba is visible. It is incised using monopolar cautery or 22 no. blade. Once incised in full depth linea alba separates away to visualise the extraperitoneal pad of fat and peritoneum.

Extraperitoneal pad of fat is separated of the peritoneum gently. Peritoneum appears like a shiny whitish thin structure. It is carefully held using a haemostat during expiration phase. One should be sure not to hold the deeper contents. Another haemostat is applied 5-10 mm away on the peritoneum horizontally so that peritoneum fold is lifted properly. Lifted fold of peritoneum is gently moved to make any content if at all to get dislodged and fold is pinched between the thumb and fingers to confirm that no content is felt. Peritoneum is incised using blade obliquely or using scissor towards just left of the midline which is avascular. Once peritoneum is opened air enters inside to distend peritoneum and content to fall deep. Both haemostats are reapplied to cut edges of the peritoneum. Using scissor peritoneum is cut above and below under vision or by placing fingers under the peritoneum to guard the contents with forward lift of the abdominal wall. One should be careful about the

adhesions in the peritoneum in the line of cut. Extension down is done by curving the incision left side of the umbilicus. Right side of umbilicus is vascular and falciform ligament is attached towards right side hence incision is made on the left side of the umbilicus. Few advocate incision vertically through the umbilical midline. Only abdominoperineal resection (APR) for carcinoma rectum incision is extended above from right side of the umbilicus as permanent colostomy is placed on the left side in left iliac fossa. Occasionally when approach to the OG junction is inadequate proximal extension is done by cutting the xiphoid process. Care must be taken not to injure terminal branches of internal mammary artery which can cause bleeding .

Lower Midline Incision

In the lower midline incision posterior rectus sheath is deficient, making incision downwards needs care as urinary bladder may get injured. Prevesical fat should not be incised. This fat cannot be separated of the deeper bladder. Bladder should be emptied before giving anaesthesia or an indwelling urinary catheter may be needed.

Midline Incision Closure

It is done using nonabsorbable monofilament suture material *number zero or 1*. Polyethylene/polypropylene/nylon/PDS (polydioxanone) is used. Silk and catgut are not used. Many advocate delayed absorbable suture material like no.

0 or 1 vicryl; but it is not as ideal as nonabsorbable monofilament suture material. *Continuous mass closure* is sufficient. Often locking sutures are placed. Peritoneum bite is not always necessary/compulsory as it will appose naturally when anterior layers are sutured. During continuous suturing in between supporting knots are placed at few points to prevent loosening and giving way of the suture line. Minimum distance to be kept between each bite is 1 cm; each bite should be taken 1 cm away from the cut margin. Linea alba/ anterior rectus sheath may retract after incision; and often bite is taken only from external oblique fascia of Gallaudet's instead of rectus sheath especially in the lower abdomen. This fascia is not strong and so will eventually dehisce to cause incisional hernia. One should maintain adequate uniform tension on the suture material. Over pulling may cause tissue strangulation. Length of the suture material required is 3 times the length of the abdominal wound. One should be careful while closing incision close to pubis due to close proximity of bladder. Inadvertent bite of the urinary bladder should be avoided. Similarly closing incision adjacent to umbilicus should be perfect otherwise defect may be left leading to incisional hernia at that site. Ending of the continuous suture is done using needle holder by knotting to the previous bite loop. It is better and stronger. At least 4-5 knots should be placed to make it stronger. Knot of the nonabsorbable suture material will persists and may project towards skin causing pain on the skin later and so knot should always be buried under the rectus sheath. Many use Aberdeen knot at the end in continuous suture.

Interrupted single layer mass closure using nonabsorbable suture material is also used with each suture 1 cm apart. Again often peritoneum is closed first by continuous suturing using 2 zero vicryl and rectus sheath is closed by continuous or interrupted (*layer by layer*) suturing. But now it is proved that there is no additional advantage by layer by layer closure.

PRINCIPLES IN CLOSURE OF THE ABDOMINAL INCISION WOUND

Layer by layer closure is good old standard. But it is now proved that peritoneum closure is not necessary.

In Layer by Layer Closures

Peritoneum is closed using vicryl or polypropylene; rectus sheath is closed with continuous locking monofilament nonabsorbable sutures; (interrupted sutures may be better if there is sepsis); subcutaneous tissue is closed using 3 zero rapid vicryl (ideal) or plain catgut; skin closed using interrupted mattress sutures. Skin stapler can be used as it is quicker and easy to remove; but it is not haemostatic, skin edge bleeding may occur.

Single Layer

Mass closure is also used. It is also equally good; rapid. Usually continuous suture is placed; but interrupted sutures also can be used. Skin is apposed separately. Retention sutures, used earlier after an emergency

surgery, is more often replaced by modified Smead Jones sutures. Retention suture is still practiced in many centers of world.

Modified Smead–Jones Sutures

It is interrupted specialised sutures used in the closure of abdomen as single layer excluding the skin. Linea alba is held with Allis' forceps. *Number one* polyethylene or PDS suture material is used. First bite on one side taken 3 cm away (width) from the margin from outside to inside; it is then passed through the corresponding opposite edge with 3 cm width from inside to outside; later again one small loop of 5 mm width from the edges of each side of the wound from first bite site to second bite site is taken; suture is knotted on the free edge of the first bite side. Full thickness bite holds the suture and maintains the tension in the wound. Smaller loop keeps the linea alba in apposed place. Large curved *Ferguson needle* is better to place these sutures. Each suture is placed at 2 cm interval. This is the type of suturing used at present in acute abdominal conditions instead of the retention sutures. Here also it is better to place all sutures under proper vision and knotting is done at the end. At least four knots should be placed. Excessive tension should be avoided. In upper abdomen peritoneum need not be included in the bite; but in lower abdomen as linea alba is indistinct, peritoneum is included in this.

L. E. Hughes Double Near and Far Suture

It is similar with same indications as Smead-Jones, with double near and far sutures placed to have a strong loop with knot on one side. While taking bite from the peritoneum, care should be taken not to take bites from bowel; if inadvertently taken leads into dangerous faecal fistula. Guarding the bowel using finger lift or using mop or using sergeant retractor is a must. Before finishing the final bites it is ideal to place index finger under the sutured peritoneum to confirm that suture line is perfect and without any bowel entangling. Drain if needed to place, it should be placed away from the min incision; usually along the anterior axillary line; side and site (upper or lower) is decided depending on the type and area of surgery. Often double drains are placed on the same or both sides.

Post-Operative Care and Complications:

The main aim of postoperative care is to give the patient a very quick, painless and safe a recovery from surgery as immediately possible. This needs the appropriate knowledge and skills to manage medically, as well as surgical and postoperative complications³².

Postoperative observations

The patient's vital signs including pulse rate, blood pressure and saturation, level of consciousness, pain and status of hydration are observed in post operative care unit and treatment is given. Operation-specific investigations

like Doppler flow for a free flap, periodic neurological evaluation and Baseline blood investigation, such as ABG, need to be performed whenever it is necessary.

The patient to be shifted from PACU when they fulfil the following criteria:

1. Patient is fully conscious.
2. Respiration and oxygenation are satisfactory.
3. Patient is in normal body temperature, no pain and no nausea.
4. Cardiovascular parameters are stable (Blood Pressure, Pulse rate).
5. Oxygen if needed, adequate fluids and analgesics have been prescribed.
6. No concerns related to the Operative procedure.

Classification of postoperative complications

1 Related to time after operation:

- immediate (within 6 hours of surgery);
- early (6–72 hours);
- late (>72 hours).

2 Generic and surgical procedure specific.

3 Clavian-Dindo: this relates to surgical complications only and is used to objectively and reproducibly measure the impact of the surgical complication on the outcome of the procedure³².

Respiratory system

Immediate respiratory complications

AIRWAY

Upper airway obstruction is one of the commonest immediate postoperative complications

Early and late respiratory complications

Early and late postoperative respiratory complications are a very important cause of postoperative morbidity and mortality. Complications include fever because of microatelectasis, , dyspnoea, bronchospasm, cough, hypercapnoea, atelectasis, pneumonia³².

X-ray chest showing Right upper lobe Atelectasis

Fig 5



Cardiovascular system

Immediate cardiovascular complications

Hypotension

Hypotension is because of hypovolaemia, myocardial impairment or vasodilatation from subarachnoid and epidural anaesthesia. Other causes of hypotension are bleeding, arrhythmias, sepsis, pulmonary embolism, tension pneumothorax, pericardial tamponade and anaphylaxis should also be considered in the differential diagnosis³².

Hypertension

It is due to pain, agitation, anxiety, bladder spasm secondary to urinary catheterisation or pre-existing poorly controlled hypertension. This may lead to bleeding from vascular suture lines, cerebrovascular haemorrhage and myocardial ischaemia or infarction³².

Myocardial Ischaemia

Symptoms are retrosternal pain radiating into the neck, jaw or arms, nausea, dyspnoea or syncope, but most of the time perioperative period are silent. ECG changes can include ST-elevation in two continuous leads, new LBBB or an arrhythmia. In the case of a non-ST segment MI, only a rise in serial troponin levels will clarify the diagnosis. Cardiologist should be involved in early to ensure the reperfusion³².

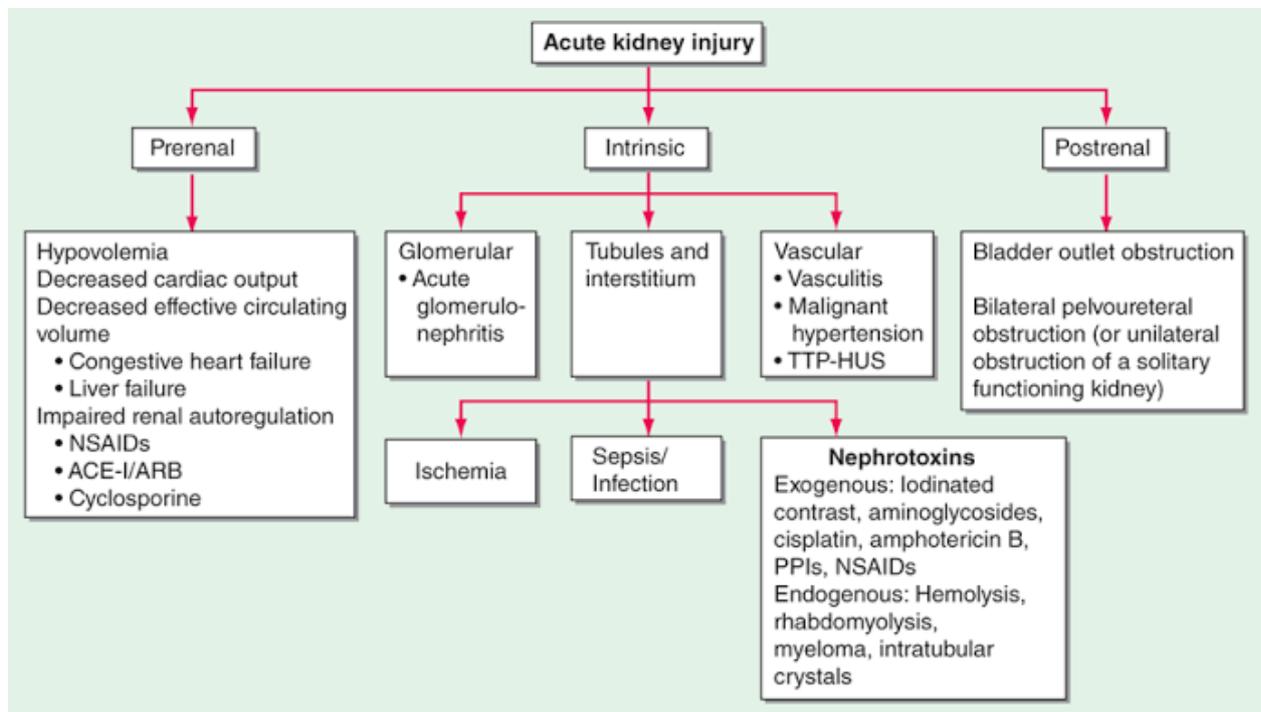
Arrhythmias

When it occurs in the postoperative period, arrhythmias can lead to hypotension, myocardial ischaemia and cardiac arrest. Correction of the underlying causes and rate controlled with Beta blockers, amiodarone or cardioversion, depending on the condition of the patient.

Renal and urinary system

Acute kidney injury

Fig 6



According to national guidance (National Institute for Health and Care Excellence, NICE) based on several definitions, acute kidney injury can be found by the following criteria

- a rise in serum creatinine of 26 $\mu\text{mol/L}$ or greater within 48 hours;
- a $\geq 50\%$ rise in serum creatinine known or presumed to have occurred within the past 7 days;
- a fall in urine output to less than 0.5 mL/kg/h for more than 6 hours in adults and more than 8 hours in children and young people;
- a $\geq 25\%$ fall in estimated glomerular filtration rate in children and young people within the past 7 days³².

Urinary retention

Inability to void after surgery is common in Post Operative patient especially in abdominal pelvic and perineal surgeries , or after procedures performed under spinal anaesthesia. Pain, hypovolaemia, inaccessible to urinals and bed pans and a lack of privacy on wards may contribute to urine retention. The diagnosis of retention is confirmed by clinical examination and by using ultrasonogram. Catheterisation should be performed prophylactically when an operation is expected to last 3 hours or longer, or when large volumes of intravenous fluids are administered³².

Urinary infection

Urinary infection is one of the most commonly acquired infections in the postoperative period. Patients may present with dysuria and/or pyrexia. Higher risk patients to develop Urinary infection are Immunocompromised patients, diabetics and those with a history of urinary retention. Treatment involves

adequate hydration, proper bladder drainage and antibiotics depending on the sensitivity of the microorganisms³².

Central nervous system

Postoperative delirium

With an increasingly frail and elderly population presenting for elective as well as in emergency surgery, the incidence of postoperative delirium is on the rise. POD is usually recognized late and has significant postoperative sequelae. POD can occur during recovery from general anesthesia or a few days after operation. The overall incidence of POD is 5–50%. It occurs more frequently in the elderly orthopaedic patient and those undergoing emergency surgical procedures. Delirium is associated with increased all-cause morbidity, mortality and discharge to a nursing home. There are two types of delirium – hyperactive (restlessness, incoherent speech, agitation, hallucinations) and hypoactive (withdrawn, poorly responsive to the environment, depressed).

Causes of Delirium

Table 2

Renal	Renal failure/uraemia Hyponatraemia and electrolyte disorders Urinary tract infection Urinary retention
Respiratory	Hypoxia, e.g. chest infection Atelectasis
Cardiovascular	Pulmonary embolism Dehydration Septic shock Myocardial infarction Chronic heart failure Arrhythmia
Drugs	Opiates including heroin Hypnotics Cocaine Alcohol withdrawal Hypoglycaemia
Neurological	Epilepsy Encephalopathy Head injury Cerebrovascular accident
Idiopathic (rare)	Hypothyroidism Hyperthyroidism Addison's disease

Preoperative risk factors for POD are pre-existing cognitive impairment, dementia, frailty, Parkinson's disease, severe illness, renal impairment and depression. Precipitating factors is the surgery³².

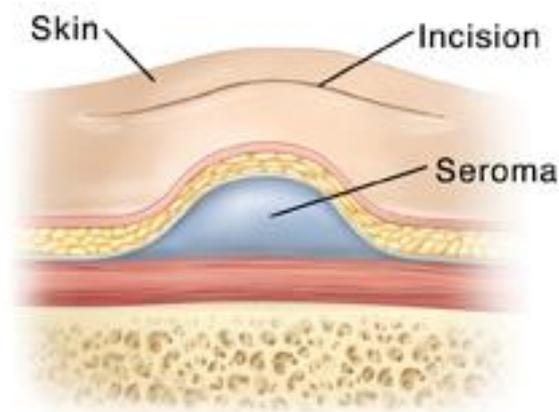
SURGICAL WOUND COMPLICATIONS

Seroma

A seroma is a collection of liquefied fat, serum, and lymphatic fluid under the incision site. The fluid is usually clear, yellow, and viscous and is found in the subcutaneous layer of the skin. Seromas represent the most benign complication after an operative procedure and are particularly likely to occur

when large skin flaps are developed in the course of the operation, as is often seen with mastectomy, axillary dissection, groin dissection, and large ventral hernia.

Fig 7



A seroma that reaccumulates after at least two aspirations is evacuated by opening the incision and packing the wound with saline-moistened gauze to allow healing by secondary intention³¹.

Hematoma

A hematoma is an abnormal collection of blood, usually in the subcutaneous layer of a recent incision or in a potential space in the abdominal cavity after extirpation of an organ (e.g., splenic fossa hematoma after splenectomy or pelvic hematoma after proctectomy). Hematomas are more worrisome than seromas because of the potential for secondary infection. Hematoma formation is related to inadequate hemostasis, depletion of clotting factors, or the presence of coagulopathy³¹.

Acute Wound Failure (Dehiscence)

Acute wound failure or wound dehiscence or a burst abdomen refers to postoperative separation of the abdominal musculo-aponeurotic layers. Wound dehiscence is among the most dangerous complications faced by operating surgeons and is of important concern because of the risk of evisceration, the need for some form of intervention, and the possibility of repeat dehiscence, surgical wound infection, and incisional hernia formation³¹.

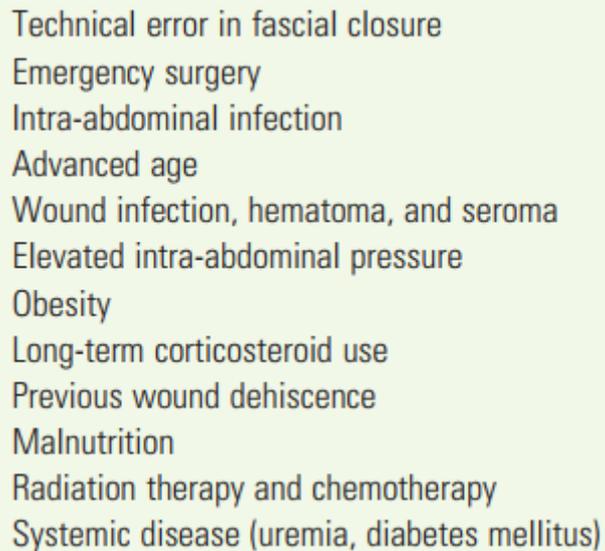
Fig 8



A deep wound infection is one of the most common causes of localized wound separation. Increased intra-abdominal pressure (IAP) is often the cause for wound disruption, and factors that adversely affect wound healing³¹.

Factor associated with wound Dehiscence

Fig 9



- Technical error in fascial closure
- Emergency surgery
- Intra-abdominal infection
- Advanced age
- Wound infection, hematoma, and seroma
- Elevated intra-abdominal pressure
- Obesity
- Long-term corticosteroid use
- Previous wound dehiscence
- Malnutrition
- Radiation therapy and chemotherapy
- Systemic disease (uremia, diabetes mellitus)

Surgical Site Infection

Surgical site infections (SSI) are an important problem for surgeons. Despite major improvements in antibiotics, better anesthesia, superior instruments, earlier diagnosis of surgical problems, and improved techniques for postoperative vigilance, wound infections continue to occur. Although some may view the problem as merely cosmetic, that view represents a shallow understanding of this problem, which causes significant patient suffering, morbidity, and mortality and is a financial burden to the health care system. Furthermore, SSIs represent a risk factor for the development of incisional hernia, which requires surgical repair³¹.

Fig 10



The surgical wound encompasses the area of the body, internally and externally, that involves the entire operative site.

Wounds are generally categorized as follows:

1. Superficial, which includes the skin and subcutaneous tissue
2. Deep, which includes the fascia and muscle
3. Organ space, which includes the internal organs of the body if the operation includes that area³¹.

Classification of surgical wound

Table 3

CATEGORY	CRITERIA	INFECTION RATE (%)
Clean	No hollow viscus entered Primary wound closure No inflammation No breaks in aseptic technique Elective procedure	1-3
Clean-contaminated	Hollow viscus entered but controlled No inflammation Primary wound closure Minor break in aseptic technique Mechanical drain used Bowel preparation preoperatively	5-8
Contaminated	Uncontrolled spillage from viscus Inflammation apparent Open, traumatic wound Major break in aseptic technique	20-25
Dirty	Untreated, uncontrolled spillage from viscus Pus in operative wound Open suppurative wound Severe inflammation	30-40

Deep vein thrombosis

Deep vein thrombosis (DVT) is a well-known and, when complicated by pulmonary embolus, potentially fatal complication of surgery. All hospitals must have protocol for screening all surgical patients to find those at risk for developing DVT and for implementing prophylactic measures. Methods of prevention are guided by the risk scoring systems and include the use of compression stockings, calf pumps and pharmacological agents, such as low

molecular weight heparin and Unfractionated Heparin .The symptoms and signs of DVT include calf muscle pain, swelling, warmth, redness and engorged veins. Most of the patient will show no physical signs. On palpation the calf muscle may be tenderMose's sign and there may be a positive for Homans' sign (calf pain on dorsiflexion of the foot), but this test is neither sensitive nor specific. Duplex Doppler ultrasound and venography are used to assess flow and the presence of a thrombosis. Other investigations include D-dimer. If a significant DVT is found (one that extends above the knee), treatment with parenteral anticoagulation initially, followed by longer-term warfarin or new oral anticoagulant (refer to national guidance, e.g.NICE; see Further reading). In some patients with a large DVT, a caval filter may be required to decrease the possibility of pulmonary embolism³¹.

Postoperative Ileus

Ileus a complicated process involving altered gastrointestinal nervous system, local hormonal factors, inflammatory factors, bowel handling and narcotic analgesia. Resection and anastomosis of bowel temporarily ceases the bowel activity due to inability to transmit the peristaltic waves from duodenal. Small bowel ileus recovers usually in 48 hours. Colonic ileus recovers in 4 days, gastric ileus in 4-5 days. Patient without ileus, recovery of motility of small bowel occurs in 12 hours; of stomach in 48 hours; of colon in 72 hours. Observation, correction of electrolytes, sepsis control, and nasogastric aspiration

is usually sufficient. Aspiration through nasogastric tube less than 200 ml; passing of flatus, return of bowel sounds are signs of recovery. *Bowel obstruction* occurring within 30 days after surgery is called as *early postoperative* bowel obstruction. It can be due to *primary ileus* without any precipitating factors or *secondary ileus* with precipitating factors or *mechanical bowel obstruction* commonly due to adhesions (90%). *Ileus* is a complicated process involving altered gastrointestinal nervous system, local hormonal factors, inflammatory factors, bowel handling, and narcotic analgesia.

Treatment is initially conservative— fluids, correction of electrolytes, sepsis. But if needed re-exploration is done to correct the mechanical obstruction of the bowel³⁰.

Anastomotic Leak

It is a common complication in gastrointestinal surgery often dreadful and life threatening. It may be intestinal or pancreatic or biliary fistulas/leak. *Factors*: Poor blood supply, sepsis, emergency resections, malignancy, old age, obesity, smoking, immune compromised patients, fluid collection or abscess formation, steroid therapy (steroid prevents collagen formation and healing), hypotension and hypoxia on table and in immediate postoperative period, presence of drains, shock, malnutrition, deficiencies, stapler related factors, specific diseases like carcinoma, tuberculosis, Crohn's disease, diverticulitis. Uncontrolled leak, abscess formation, electrolyte imbalance, anemia, malnutrition, sepsis are the effects. Renal failure,

multiorgan failure and death can occur if not controlled. Fistula should be classified as *low output* or *high output* depending on the quantity of fluid effluent in the fistula. If it is less than 500 ml it is called a low output fistula; if more than 500 ml it is high output fistula.

Often it is *also* classified as

low (below 200 ml/24 hours);

moderate (between 200–500 ml);

high (more than 500/day).

In pancreatic fistula if less than 200 ml it is classified as low or more than 200 ml it is high. *Skin excoriation* (effluent dermatitis) initially allergic later with skin infection is common presenting as pain, ulcers, intractable itching. In proximal fistula electrolyte imbalance, fluid loss, malabsorption is severe whereas in distal fistula (colonic) it is less severe.

Investigations: CT abdomen, CT fistulogram, contrast GI studies, enteroclysis, endoscopies, cystoscopy to see enterovesical fistula.

Treatment: TPN; evaluation of site of leak as whether it is end/lateral/low/high fistula; antibiotics; skin care with zinc oxide cream, adhesives, barriers, sealants, pouches; blood transfusion; rest to bowel by keeping the patient nil orally so that luminal secretions are reduced. If there is abscess, bleeding, peritonitis, bowel ischaemia re-laparotomy is done. Timing of re-exploration is in 24–48 hours once patient is stabilized. Thorough peritoneal wash with warm

saline is given. Site of leak is identified. Ileostomy, colostomy or internal by pass procedures are done depending on individual patients and site of pathology. *Spontaneous closure* of fistula is expected in 60% of patients.

Favorable factors for spontaneous closure of fistula are—tract more than 2 cm, single straight tract, lateral type, non-epithelialised tract, without sepsis or abscess or foreign body, defect in the bowel wall less than 1 cm, without distal obstruction and absence of specific diseases, adequate nutrition. Forty percent cases *surgical intervention* and correction is needed. *Unfavorable factors are*—short tract less than 2 cm, multiple tracts, associated internal tracts, end fistula, epithelialisation, presence of infection or abscess, and bowel wall defect more than 1 cm, presence of specific diseases, foreign body, and malnutrition. Somatostatin and its analogues help in reducing the GI secretions to reduce the fistula output. Enteral nutrition can be very well used in low proximal fistulas or in colonic fistulas. *Fistuloclysis* is a newer method of infusing the nutrient fluid directly through the fistula into the GI tract³⁰.

PUO

Patients develop pyrexia after major surgery; however, in most cases no cause is found in this case it is called Pyrexia of unknown origin. The inflammatory response to surgical trauma may manifest itself as fever, and so pyrexia does not always necessarily be sepsis. However, in all patients with pyrexia, a focus of infection should be sought. The causes of a raised temperature postoperatively include:

- atelectasis of the lung;
- superficial and deep wound infection;
- chest infection, urinary tract infection and thrombophlebitis;
- wound infection, anastomotic leakage, intracavitary collections and abscesses.

The possible causes of pyrexia of a non-infective origin include:

- DVT;
- transfusion reactions;
- wound haematomas;
- drug reactions.

Patients with a persistent pyrexia need a thorough review. Relevant investigations include full blood count, urine culture, sputum microscopy and blood cultures³¹.

MATERIALS AND METHODS

A prospective study that include patients who fulfilled the criteria of inclusion in the study, from seven General Surgical units at Tirunelveli Medical College and Hospital from the period of December 2017-June 2019.

INCLUSION CRITERIA

All cases of Emergency Laparotomy with age above 12 years old will be taken up for study.

EXCLUSION CRITERIA:

All cases of Elective Laparotomy.

Age below 12 year.

All trauma Laparotomy.

Source

The present study was conducted in the Department of Surgery, Govt.Tirunelveli Medical College, Tirunelveli

Data Source

Patient undergoing emergency laparotomy with in 24hr of admission under the department of General Surgery Tirunelveli medical college during the study period

Sample size

A total of 170 patients who underwent emergency laparotomy were studied.

The sample size calculation was undertaken as follows by taking the effects in general surgery, emergency death. The formula for calculation of sample size is

$$n = 2 \times \sqrt{pq/n} = 5\% \text{ of } p.$$

Where

n = required sample size, p = survived and q = died. $P=90.2\%$ and $q = 9.8\%$.

$2 \times \sqrt{90.2 \times 9.8 \div n} = 90.2 \times 5/100$. $2 \times \sqrt{90.2 \times 9.8 \div n} = 4.51$. By squaring both sides.

$$n = 4 \times 90.2 \times 9.8 \div 20.34 = 173.8. \text{ By rounding } 170.$$

The required samples for the study = 170.

Procedure

After obtaining clearance from Ethical committee. On the basis of selection criteria patient who underwent Emergency Laparotomy under Department of General Surgery were studied during the study period. With written consent from the patients. Patients History clinical findings were recorded in proforma

Routine Blood investigations

Complete Blood Count

Renal Function Test

Serum Electrolytes

And relevant clinical history like Cardiac, Respiratory and Central nervous system , Blood pressure, Pulse rate, X-ray Chest and Electro Cardiogram. Intra operative findings like peritoneal soiling, Blood loss and presence of malignancy are noted.

After collecting all the variables, each variable will be given a score according to its value by referring the Table 1 for physiological and Table 2 for operative scores.

- Mortality: “ $\text{Log (R/1-R) = -7.04 + (0.13 \times \text{physiological score}) + (0.16 \times \text{operative severity score})$ ”

Morbidity: “ $\text{Log (R/1-R) = -5.91 + (0.16 \times \text{physiological score}) + (0.19 \times \text{operative severity score})$ ”

R indicates risk of mortality/morbidity.

Then physiological and operative scores are summed up applied in Possum equation to achieve observed Mortality and Morbidity.

There is website fully dedicated to calculate the equation which really a cumbersome work for a surgeon to do. Which makes this process much easier, to get value in a short period of time.

Website for calculation <https://sfar.org/scores2/possum2.php>

Patient is then observed for a period of 30 days after surgery to look for post operative complications. At risk patients were given more post operative care for a better outcome. The prime motive of this study is to find and give at most care for the high risk patients.

Table-3 Physiological Score

Parameters	1	2	4	8
Age (years)	≤60	61-70	≥71	-
Cardiac Sign	No failure	Diuretic, Digoxin, Antianginal, antihypertensive	Peripheral edema, Warfarin, Mild Cardiomegaly	Raised JVP, Cardiomegaly
Respiratory	No dyspnea	Mild COPD	Moderate COPD	Fibrosis, Consolidation, Dyspnea on rest
Systolic Blood Pressure (mm of Hg)	110-130	100-109 131-170	90-99 ≥171	≤89
Pulse (b.p.m)	50-80	40-49 81-100	101-120	≤39 ≥121
Glasgow Coma Scale	15	12-14	9-11	≤8
Hemoglobin (gm/dl)	13-16	11.5-12.9 16.1-17	10-11.4 17.1-18	≤9.9 ≥18.1
WBC count	4000-10000	3100-3900 10100-20000	≤3000 ≥20100	-
Urea (mmol/L)	≤7.5	7.6-10	10.1-15	≥15.1
Sodium (meq/L)	≥136	131-135	126-130	≤125
Potassium (meq/L)	3.5-5	3.2-3.4 5.1-5.3	2.9-3.1 5.4-5.9	≤2.8 ≥6
ECG	Normal	Atrial Fibrillation	Abnormal rhythm, ST-T and Q wave changes	

Table-4: Operative score

Parameter	1	2	4	8
Operative severity	minor	moderate	major	Major+
Multiple Procedure	1	2	>2	
Total Blood Loss (ml)	<100	101-500	501-999	≥1000
Peritoneal Soiling	none	Minor (serous fluid)	Local pus	Free bowel content
Cancer	None	Primary only	Nodal Metastasis	Distant metastasis
Mode of Surgery	elective	Emergency (>2-24hr)	Emergency (<2 hr)	

Statistical analysis and interpretation:

The collected data will be organized in the forms of tables. The continuous variables will be analyzed in terms of means and interpreted by student independent “t” test. In respect of categorical variables will be expressed in terms of percentages and they will be interpreted by χ^2 (Chi-square) test. The prediction of mortality and morbidity will be undertaken by Hosmer and Lemeshow goodness of fit test. The above statistical procedures will be performed with the help of the statistical package namely IBM SPSS statistics-20. The P values less than or equal to 0.05 ($P \leq 0.05$) will be treated as statistically significant..

RESULTS:

Table-5: Description of study subjects according to their age and gender.

Age group	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
<20	6	3.5	0	0.0	6	3.5
20-29	13	7.6	3	1.8	16	9.4
30-39	23	13.5	4	2.4	27	15.9
40-49	31	18.2	9	5.3	40	23.5
50-59	30	17.6	7	4.1	37	21.8
60-69	22	12.9	8	4.7	30	17.6
70-79	12	7.1	2	1.2	14	8.2
Total	137	80.6	33	19.4	170	100.0
Mean± SD	47.2±15.1		49.6±13.7		47.6±14.9	
Significance	“t”=0.843, df=168, P=0.400				Range= 16-79	

The above table-5 describes and compare the ages of study subjects according to their sex and total subjects. The mean age of males was 47.2±15.1years and female was 49.6±13.7 years. The mean difference was not statistically significant (P>0.05). The mean age of the total subjects was 47.6±14.9 years with range of 16-79 years.

Fig-11: Percentage comparison of gender wise age distribution:

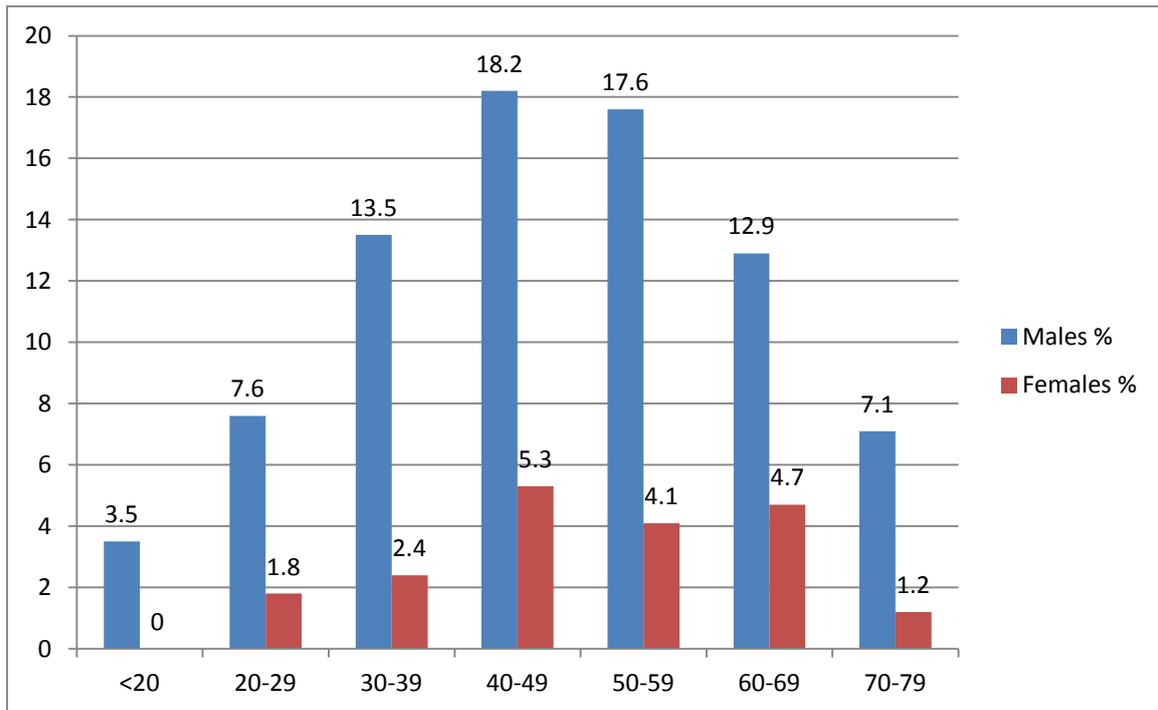


Fig-12: Percentage distribution of ages of the total subjects:

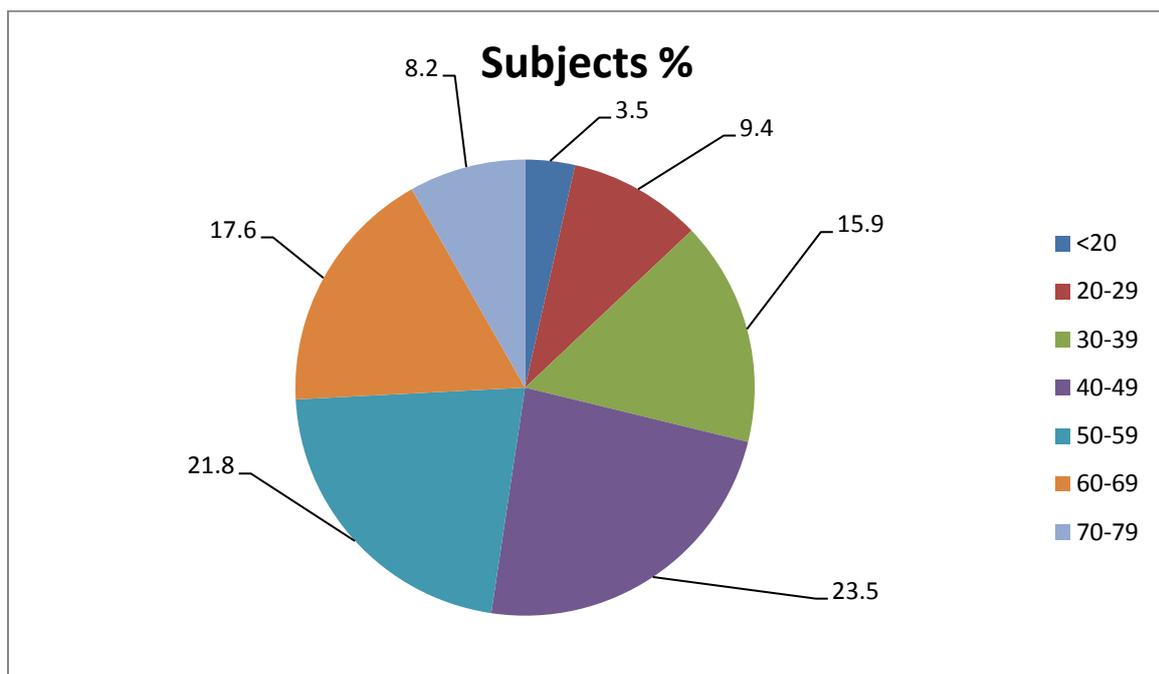


Table-6:Outcome of the subjects according to the Diagnosis:

Sl No	Diagnosis	Outcome				Signi
		No comp	Comp	Death	Total	
1	Acute appendicitis with ileal gangrene	1	0	0	1	$\chi^2 =$ 60.603 df=52 P=0.193
2	Acute Intestinal Obstruction	3	2	1	6	
3	Adhesive intestinal obstruction	6	0	2	8	
4	Appendicular abscess	1	0	0	1	
5	Appendicular perforation	2	1	0	3	
6	Appendicular perforation adhesive intestinal obstru	1	0	0	1	
7	Descending colon growth	1	0	0	1	
8	Du perforation	36	31	7	74	
9	Du perforation&Appendicitis	1	0	0	1	
10	Fecal peritonitis	0	0	1	1	
11	Gastric perforation	9	6	2	17	
12	Hepatic flexure growth	0	2	0	2	
13	Ileal perforation	5	4	1	10	
14	Intestinal band obstruction	10	1	0	11	
15	Intestinal obstruction ileal gangrene	4	2	0	6	
16	J-J intussusception	1	0	0	1	
17	Obstructed incisional hernia	0	2	0	2	
18	Obstructed paraumbilical hernia	0	2	0	2	
19	Obstructive rt inguinal hernia	1	0	0	1	
20	Pelvis abscess	1	0	0	1	
21	Rectal Growth obstruction cecal perforation	0	1	0	1	
22	Recto Sigmoid growth	0	0	1	1	
23	Rectosigmoid growth acute intestinal obstruction	1	0	0	1	
24	Ruptured Liver Abscess	2	1	0	3	
25	Sigmoid colon growth	2	4	1	7	
26	Sigmoid volvulus	4	1	0	5	
27	Splenic flexure growth	0	2	0	2	
Total		92	62	16	170	

The above table-6 states the diagnosis with outcome. The total perforation was 74 (43.5%). Among them 36 were no complaints, 31 were complaints and 7 were died. Next to that Intestinal band obstruction total was 10 (5.9%). Among them 9 were no complaints and 1 had complaint. Among the total subjects 92 (54.1%) were no complaints and 62 (36.5%) were complaints. The remaining 16 (9.4%) were died. The differences between them was not statistically significant ($P > 0.05$).

Table-7: Type of surgery with outcome of the subjects:

Sl No	Type of surgery	Outcome				Signific
		No comp	Comp	Death	Total	
1	Adhesiolysis & Transverse loop colostomy	0	0	1	1	$\chi^2 = 125.603$ Df=90 P=0.008
2	Adhesiolysis and drainage	4	0	0	4	
3	adhesiolysisjejunal perforation closure peritonea	0	0	1	1	
4	Adhesion release appendicectomy	1	0	0	1	
5	Adhesive band release	1	0	0	1	
6	antrectomy GJ JJ FJ	0	1	0	1	
7	Appendicectomy	2	0	0	2	
8	Appendicectomy, abscess drainage	1	0	0	1	
9	Appendicetomy, Resection & anastomosis of ileum	1	0	0	1	
10	Appendicetomy&Meckel's Diverticulum Resection & an	0	1	0	1	
11	Band release	8	1	0	9	
12	Band release with Meckel's diverticulectomy	1	0	0	1	
13	Colosigmoidanastomosis	1	0	0	1	
14	Diversion colostomy	0	1	0	1	
15	Emergency laparatory& Transverse loop colostomy	1	0	0	1	
16	Emergency laparatory resection adhesolysis	0	1	0	1	
17	Explorative laporatory/peritoneal lavage/primary closure	0	0	1	1	
18	Graham line omental patch closure	1	0	0	1	
19	Hartmann's procedure	0	0	1	1	

20	Hernia release peritoneal lavage and drainage	0	1	0	1
21	Hernia release with resection and anastomosis of ileum	1	0	0	1
22	Hernia release resection and anastomosis	0	1	0	1
23	Ileal perforation closure- loop ileostomy , adhesi	0	0	1	1
24	Ileocolic anastomoiss& colorectal anastomosis	1	0	0	1
25	Limited ileal resection	1	0	0	1
26	Limited resection and anastomosis	1	0	0	1
27	Limited resection and anastomosis of ileum	5	4	0	9
28	Loop ileostomy	0	2	0	2
29	Obstrucion release omentectomy mesh repair	0	1	0	1
30	Perforation closure with omental patch and AGJ	1	0	0	1
31	Perforation closure-AGJ	1	0	0	1
32	Peritoneal lavage and drainage	3	0	0	3
33	Peritoneal lavage limited resection and anastomosis	0	1	0	1
34	Peritoneal lavage patch closure and drainage	46	36	9	91
35	Peritoneal lavage patch closure appendicectomy and	1	0	0	1
36	Peritoneal lavage, drainage	0	1	0	1
37	Peritoneal lavage, Perforation closure, ileostomy	0	1	0	1
38	Primary closure AGJ	0	1	0	1
39	Primary closure AGJ Drainage	1	0	0	1
40	Primary closure ileo transverse anastamosis	0	0	1	1
41	Resection anastomosis of ileum and anatomical repair	0	1	0	1
42	Resection anastomosis of ileum and appendicectomy	1	0	0	1
43	Resection and anastomosis	4	1	0	5
44	Resection proximal colostomy	0	0	1	1
45	Rt Hemicolectomy ileo transverse anastomosis	0	1	0	1
46	Transverse loop colostomy	3	5	0	8
Total		92	62	16	170

The above table-7 states the surgical procedures performed among the study subjects. The Peritoneal lavage patch closure and drainage was the maximum as 91 (53.5%). Among them 46 (27.1%) had no complaints and 36 (21.2%) had complaints. The remaining 9 (5.3%) died. Among the total, 92 (54.1%) had no complaints and 62 (36.5%) reported complaints. The total deaths were 16 (9.4%).

Table 8 – Percentage distribution of out come.

SI No		Frequency	%
1	Anastomotic leak	1	.6
2	Expired	16	9.4
3	LRI	10	5.9
4	No complaints	93	54.7
5	PUO	11	6.5
6	SSI	19	11.2
7	SSI/LRI	10	5.9
8	UTI	2	1.2
9	Wound dehiscence	8	4.7
10	Total	170	100.0

Surgical site infection is the most common complication in the occurred in our study group with 11.2% next being PUO with 6.5%

Table-9: Comparison of age score between the outcomes:

Sl No	Outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.0	0.2	28.911	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	1.5	0.9			
3	Death	16	2.4	1.5			

The above table-9 states the comparison between the mean age scores of outcome. The mean scores of no complaints were 1.0 ± 0.2 . The scores of the complaints were 1.5 ± 0.9 and the deaths was 2.4 ± 1.5 . The differences of mean scores were statistically very highly significant ($P < 0.001$).

Fig-13: Mean age score comparison between the outcomes

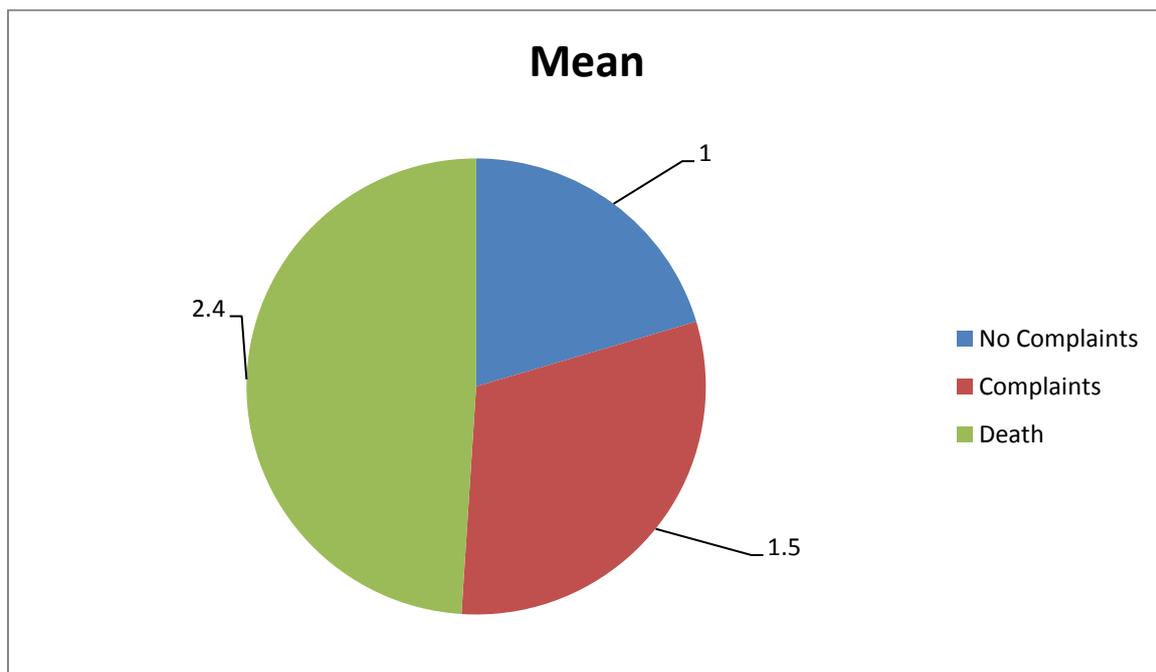


Table-10: Comparison of CVS scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.0	0.2	10.025	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	1.3	0.5			
3	Death	16	1.2	0.4			

The above table-5 states the comparison between the mean CVS scores of outcome. The mean scores of no complaints were 1.0 ± 0.2 . The scores of the complaints were 1.3 ± 0.5 and the deaths was 1.2 ± 0.4 . The differences of mean scores were statistically very highly significant ($P < 0.001$).

Fig-14: Mean CVS score comparison between the outcomes

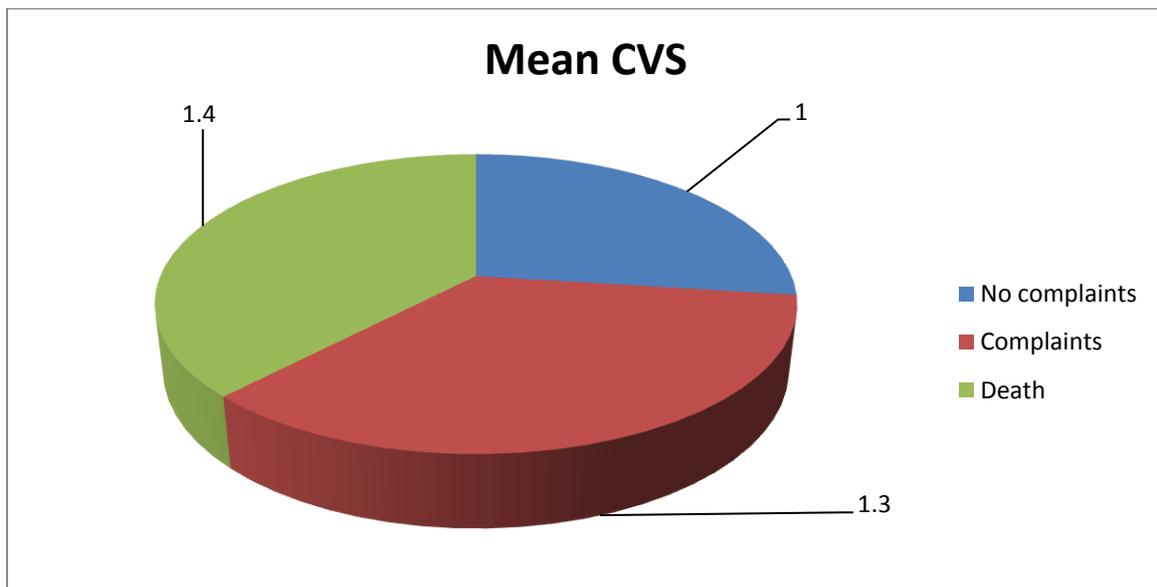


Table-11: Comparison of RS scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.2	0.4	38.866	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	2.1	1.2			
3	Death	16	3.1	1.7			

The above table-11 states the comparison between the mean RS scores of outcome. The mean scores of no complaints were 1.2 ± 0.4 . The scores of the complaints were 2.1 ± 1.2 and the deaths was 3.1 ± 1.7 . The differences of mean scores were statistically very highly significant ($P < 0.001$).

Fig-15 :Mean RS score comparison between the outcomes

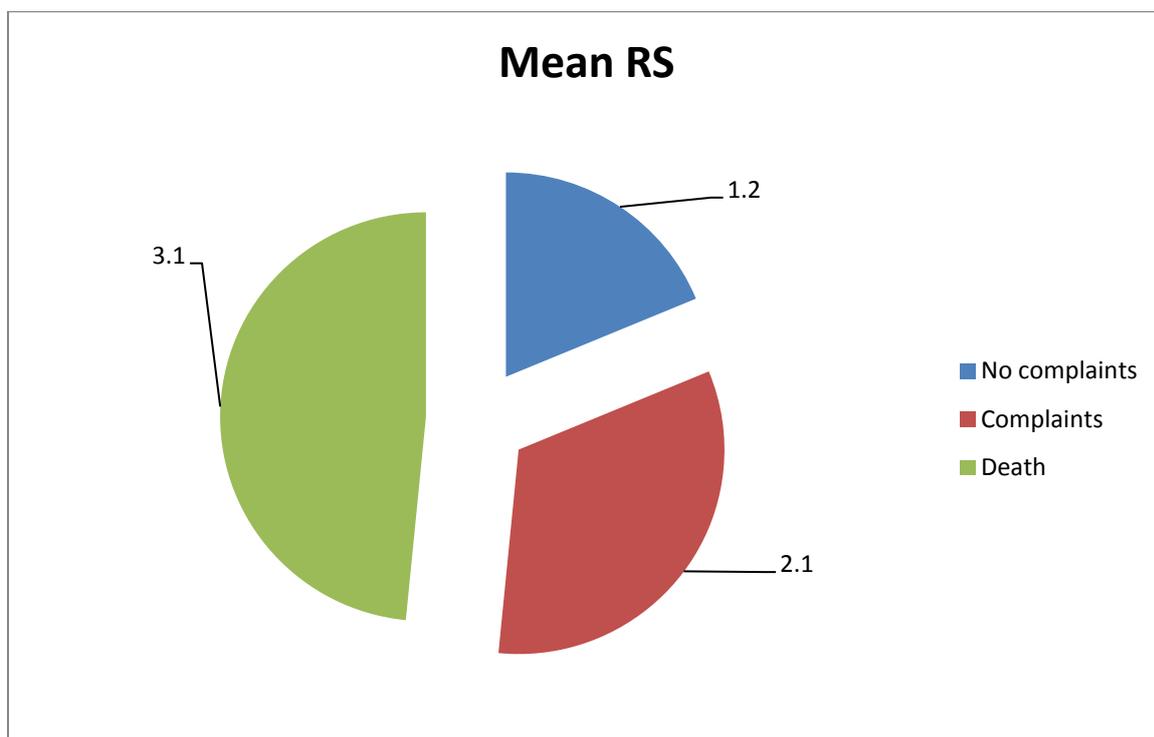


Table-12: Comparison of ECG scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.1	0.4	2.408	P=0.093	The difference b/w means was not statistically significant
2	Complaints	62	1.3	1.2			
3	Death	16	1.6	1.2			

The above table-12 states the comparison between the mean ECG scores of outcome. The mean scores of no complaints were 1.1 ± 0.4 . The scores of the complaints were 1.3 ± 1.2 and the deaths was 1.6 ± 1.2 . The differences of mean scores were statistically not significant ($P < 0.001$).

Fig-16 :Mean ECG score comparison between the outcomes:

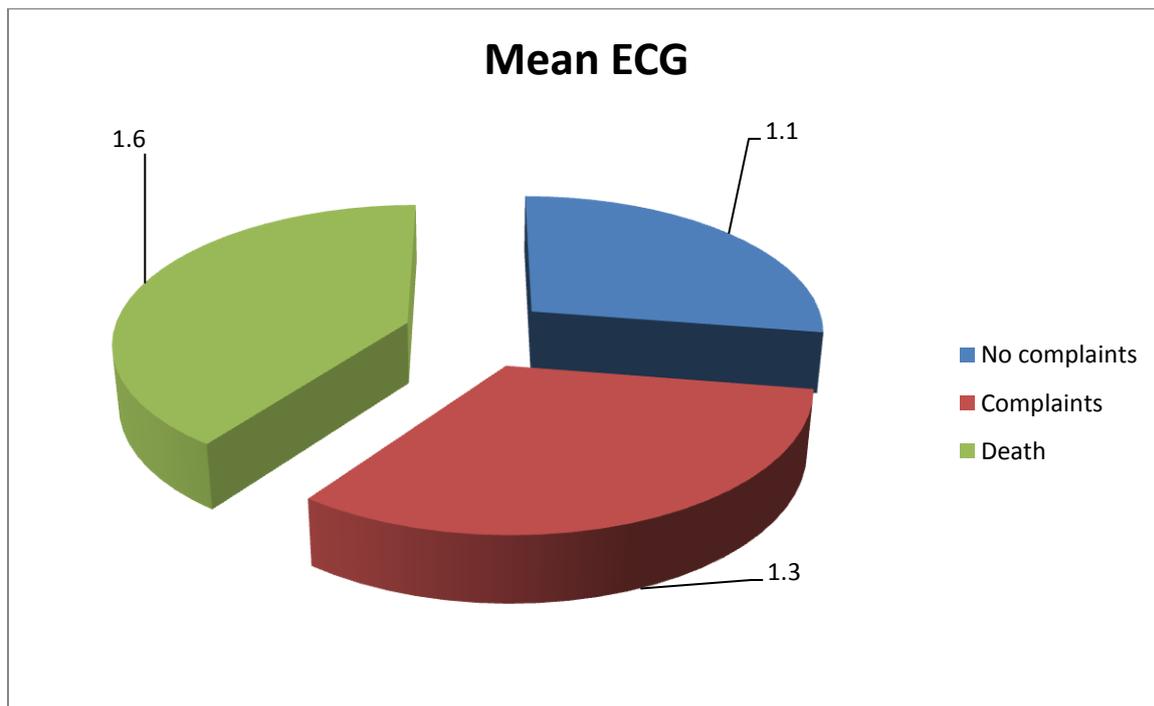


Table-13: Comparison of BP scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.5	0.8	6.263	P=0.002	The difference b/w means was statistically significant
2	Complaints	62	1.9	1.2			
3	Death	16	2.6	2.3			

The above table-13 states the comparison between the mean BP scores of outcome. The mean scores of no complaints were 1.5 ± 0.8 . The scores of the complaints were 1.9 ± 1.2 and the deaths was 2.6 ± 2.3 . The differences of mean scores were statistically highly significant ($P < 0.01$).

Fig-17: Mean BP score comparison between the outcomes:

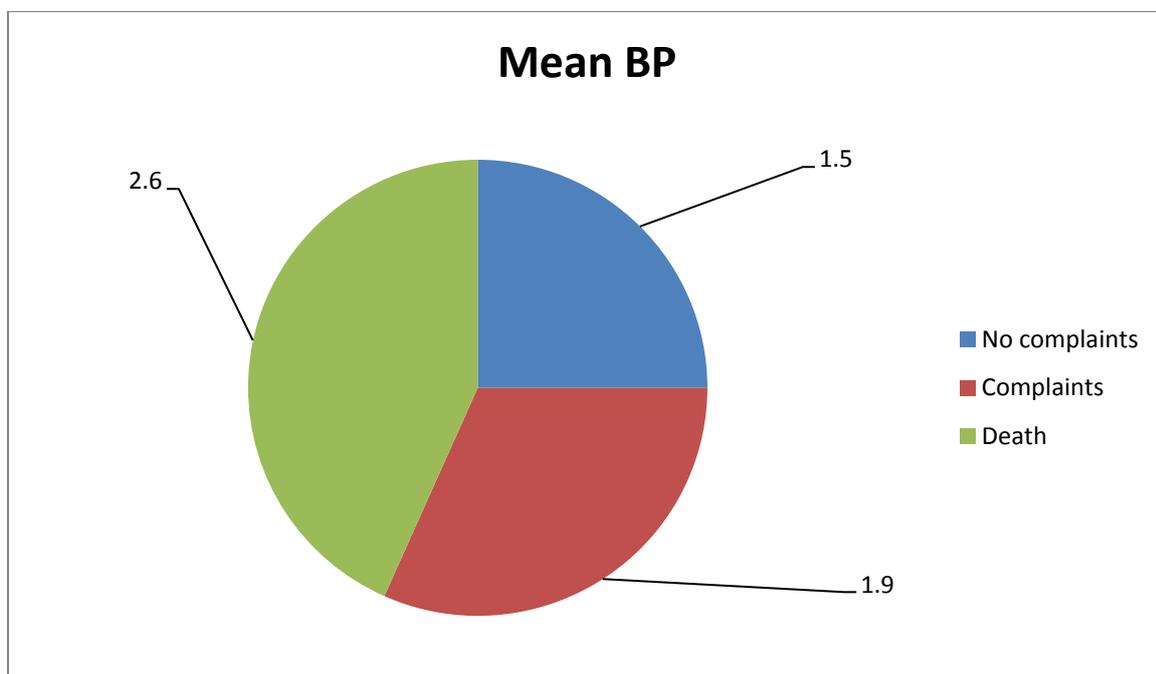


Table-14: Comparison of pulse scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	2.6	1.2	1.567	P=0.212	The difference b/w means was not statistically significant
2	Complaints	62	2.9	1.2			
3	Death	16	3.2	2.1			

The above table-14 states the comparison between the mean pulse scores of outcome. The mean scores of no complaints were 2.6 ± 1.2 . The scores of the complaints were 2.9 ± 1.2 and the deaths was 3.2 ± 2.1 . The differences of mean scores were not statistically significant ($P < 0.01$).

Fig-18: Mean pulse score comparison between the outcomes

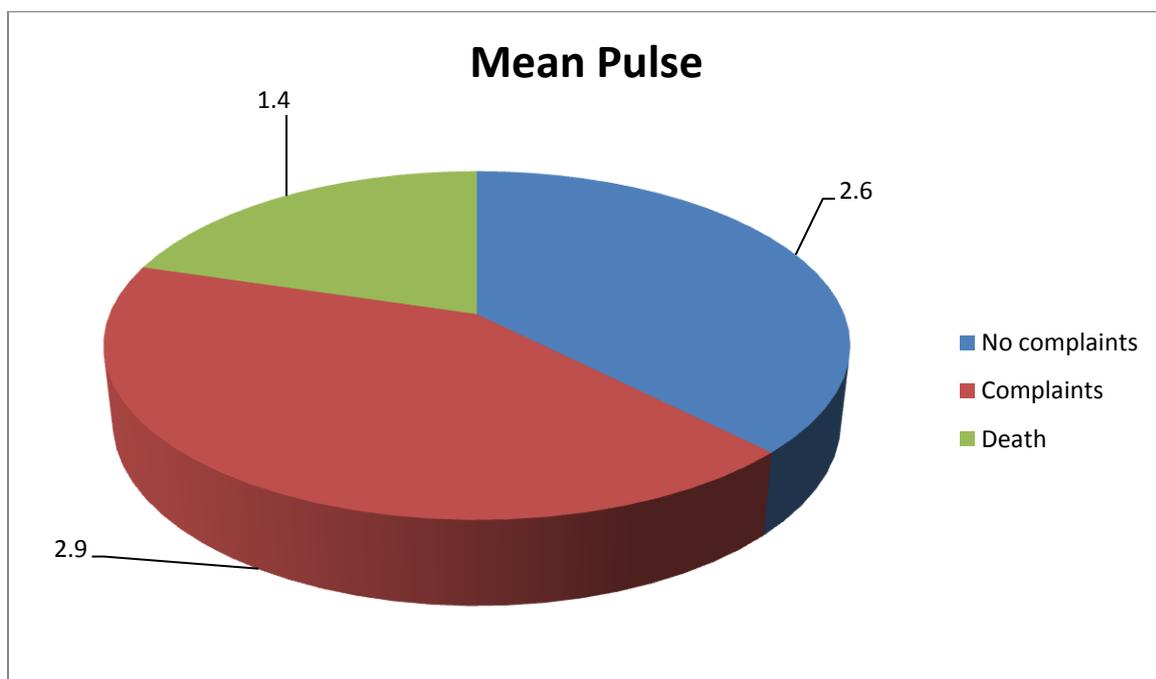


Table-15: Comparison of Hb scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	2.7	2.1	24.855	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	5.0	2.6			
3	Death	16	1.8	1.2			

The above table-15 states the comparison between the mean Hb scores of outcome. The mean scores of no complaints were 2.7 ± 2.1 . The scores of the complaints were 5.0 ± 2.6 and the deaths was 1.8 ± 1.2 . The differences of mean scores were statistically very highly significant ($P < 0.001$).

Fig-19: Mean pulse score comparison between the outcomes

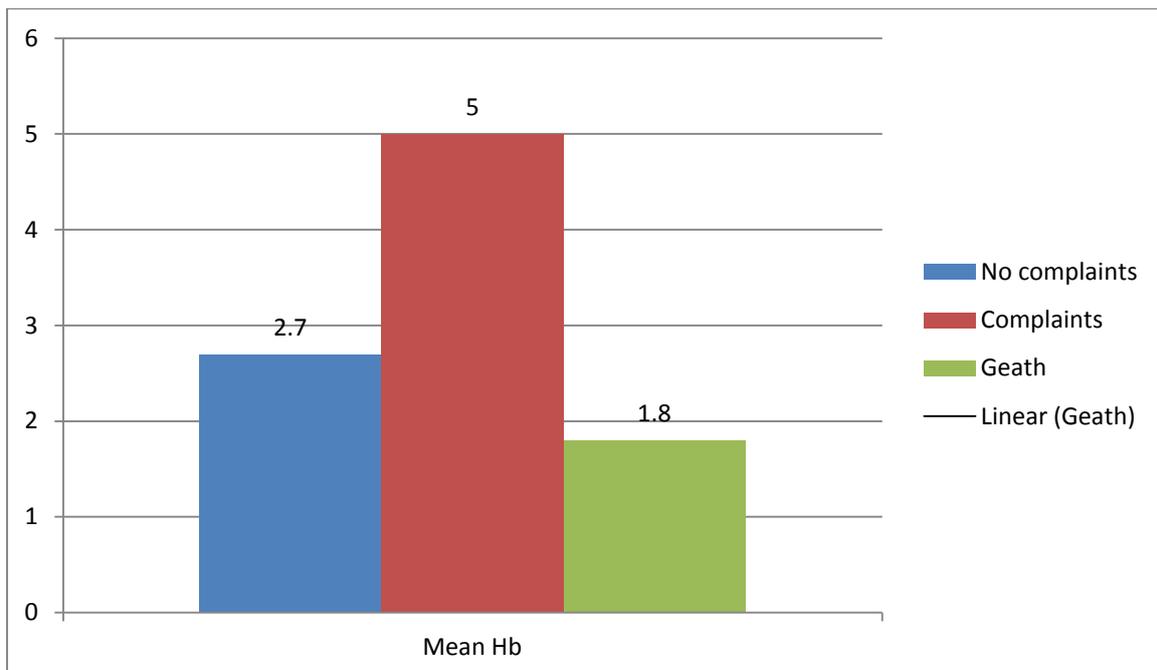


Table-16: Comparison of WBC scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.8	0.8	4.710	P=0.010	The difference b/w means was statistically significant
2	Complaints	62	2.2	1.1			
3	Death	16	2.5	1.3			

The above table-16 states the comparison between the mean WBC scores of outcome. The mean scores of no complaints were 1.8 ± 0.8 . The scores of the complaints were 2.2 ± 1.1 and the deaths was 2.5 ± 1.3 . The differences of mean scores were statistically highly significant ($P < 0.01$).

Fig-20: Mean WBC score comparison between the outcomes

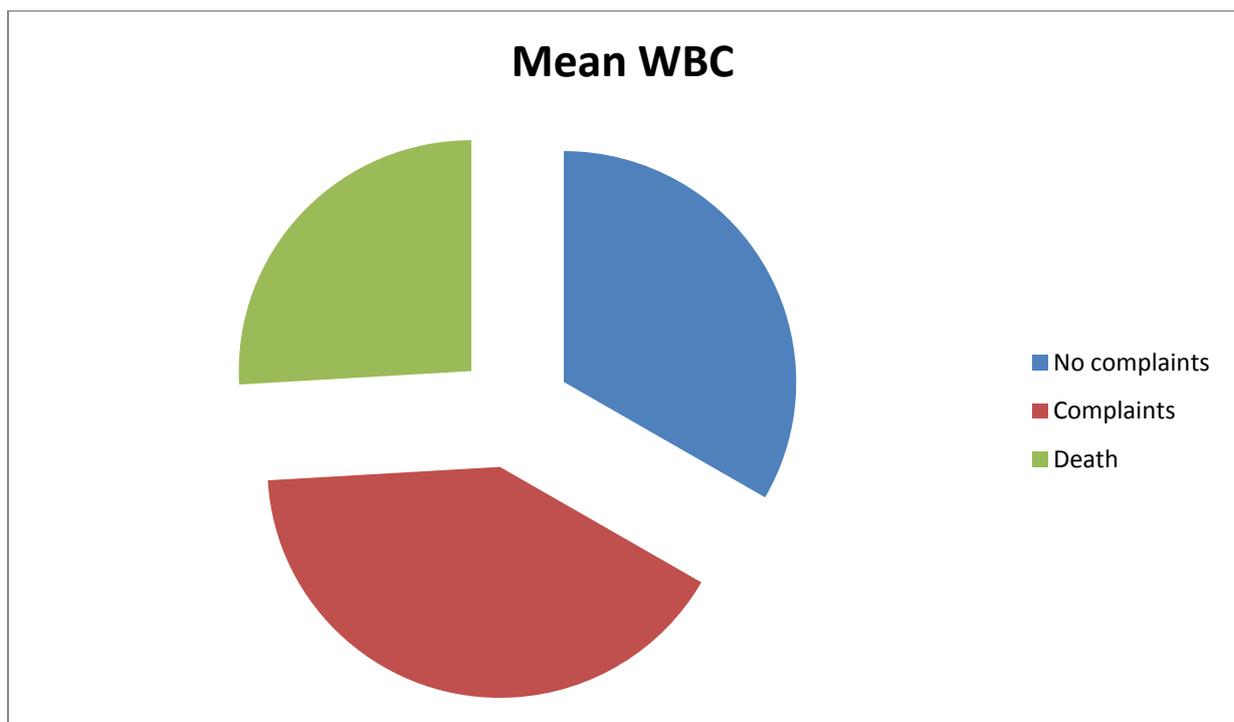


Table-17: Comparison of Urea scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	3.4	2.1	41.130	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	6.1	2.6			
3	Death	16	7.5	1.4			

The above table-17 states the comparison between the mean urea scores of outcome. The mean scores of no complaints were 3.4 ± 2.1 . The scores of the complaints were 6.1 ± 2.6 and the deaths was 7.5 ± 1.4 . The differences of mean scores were statistically highly significant ($P < 0.001$).

Fig-21: Mean Urea score comparison between the outcomes

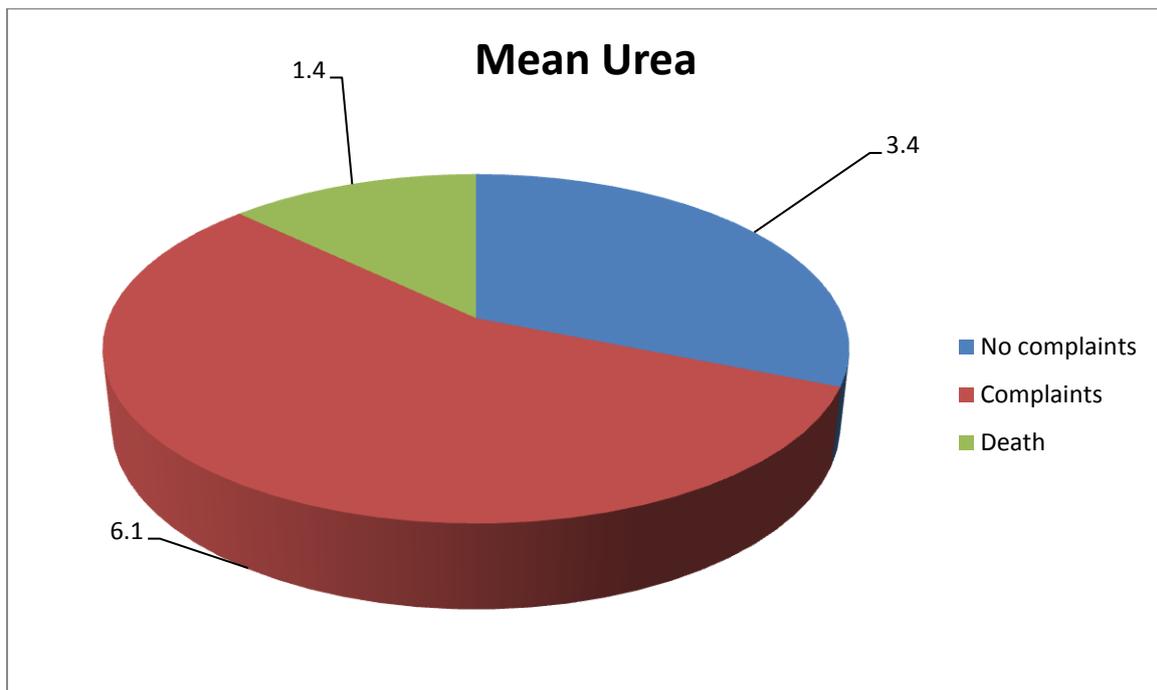


Table-18: Comparison of Na scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.0	0.2	7.695	P=0.001	The difference b/w means was statistically significant
2	Complaints	62	1.5	1.2			
3	Death	16	1.9	1.8			

The above table-18 states the comparison between the mean Na scores of outcome. The mean scores of no complaints were 1.0 ± 0.2 . The scores of the complaints were 1.5 ± 1.2 and the deaths was 1.9 ± 1.8 . The differences of mean scores were statistically highly significant ($P < 0.01$).

Fig-22: Mean Na score comparison between the outcomes

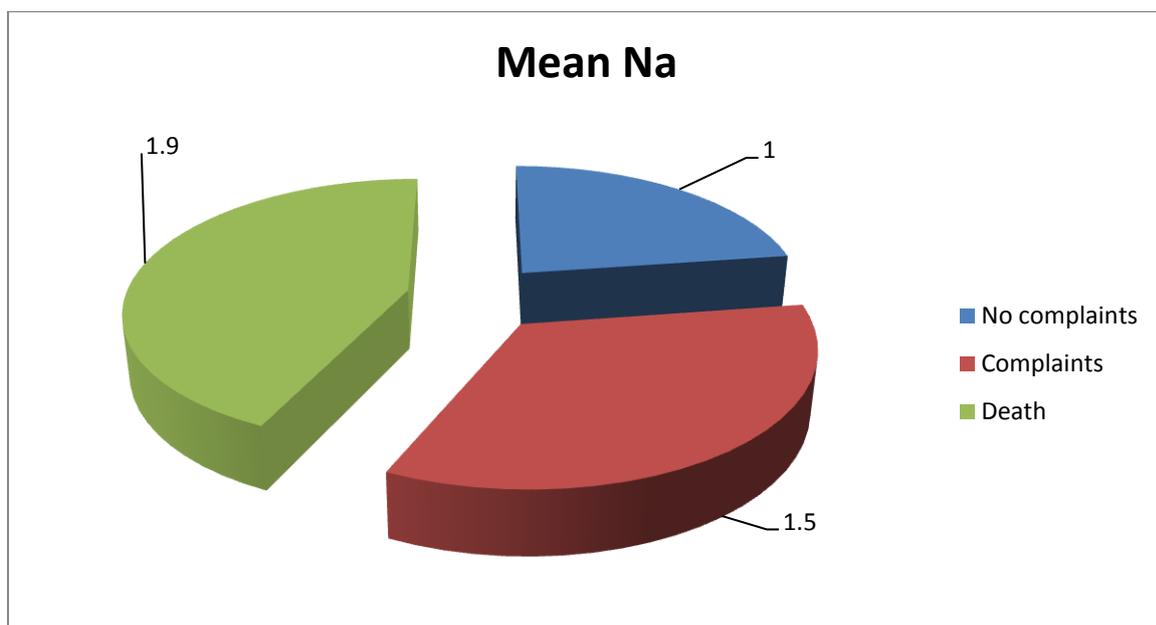


Table-19: Comparison of K scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.2	0.7	16.829	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	1.1	0.6			
3	Death	16	2.8	2.8			

The above table-19 states the comparison between the mean K scores of outcome. The mean scores of no complaints were 1.2 ± 0.7 . The scores of the complaints were 1.1 ± 0.6 and the death was 2.8 ± 2.8 . The differences of mean scores were statistically highly significant ($P < 0.01$).

Fig-23: Mean K score comparison between the outcomes

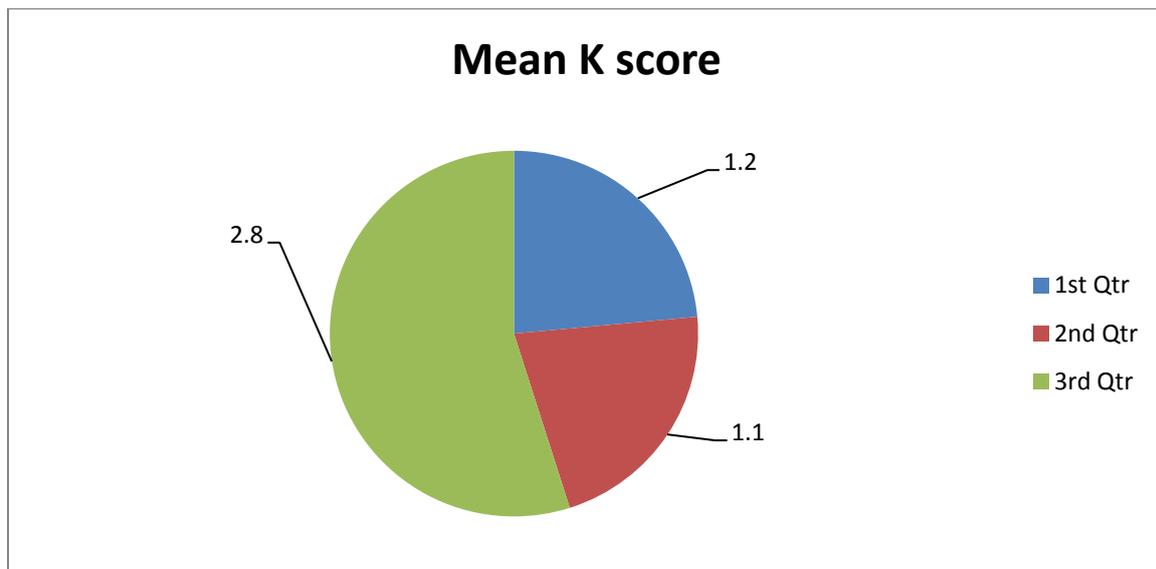


Table-20: Comparison of Total scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	19.6	3.7	76.200	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	28.0	5.8			
3	Death	16	31.5	6.8			

The above table-20 states the comparison between the mean total scores of outcome. The mean total scores of no complaints were 19.6±3.7. The scores of the complaints were 28.0±5.8 and the death was 31.5±6.8. The differences of mean scores were statistically highly significant (P<0.01).

Fig-24: Mean Total score comparison between the outcomes

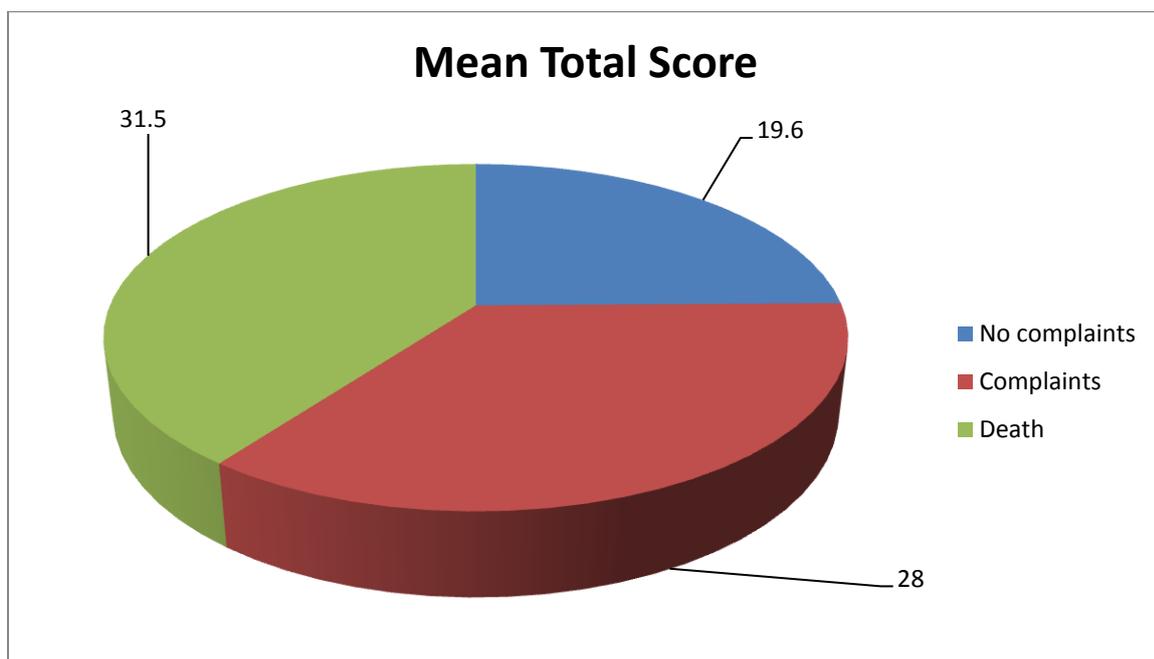


Table-21: Comparison of procedures between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.0	0.0	4.058	P=0.019	The difference b/w means was statistically significant
2	Complaints	62	1.1	0.4			
3	Death	16	1.3	0.8			

The above table-21 states the comparison between the mean procedure scores of outcome. The mean total scores of no complaints were 1.0 ± 0.0 . The scores of the complaints were 1.1 ± 0.4 and the death was 1.1 ± 0.8 . The differences of mean scores were statistically significant ($P < 0.05$).

Fig-25 :Mean procedures comparison between outcomes:

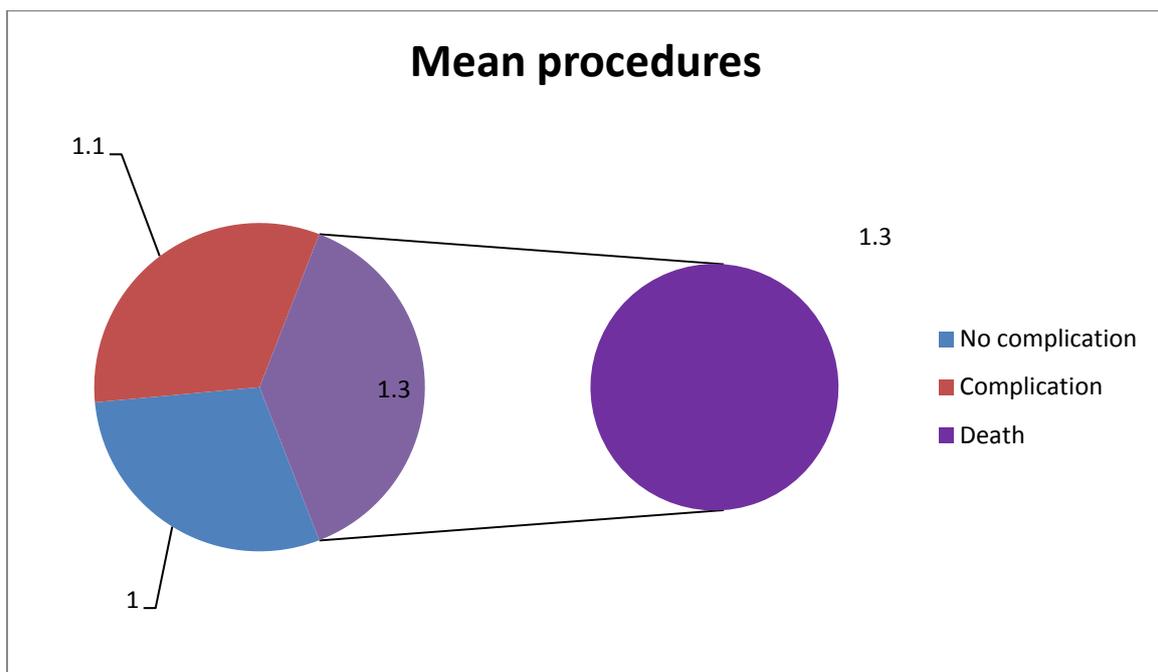


Table-22: Comparison of blood loss between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.5	0.8	10.835	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	1.9	1.2			
3	Death	16	2.8	1.8			

The above table-22 states the comparison between the mean blood loss scores of outcome. The mean total scores of no complaints were 1.5 ± 0.8 . The scores of the complaints were 1.9 ± 1.2 and the death was 2.8 ± 1.8 . The differences of mean scores were statistically significant ($P < 0.001$).

Fig-26 Mean blood loss score comparison between the outcomes:

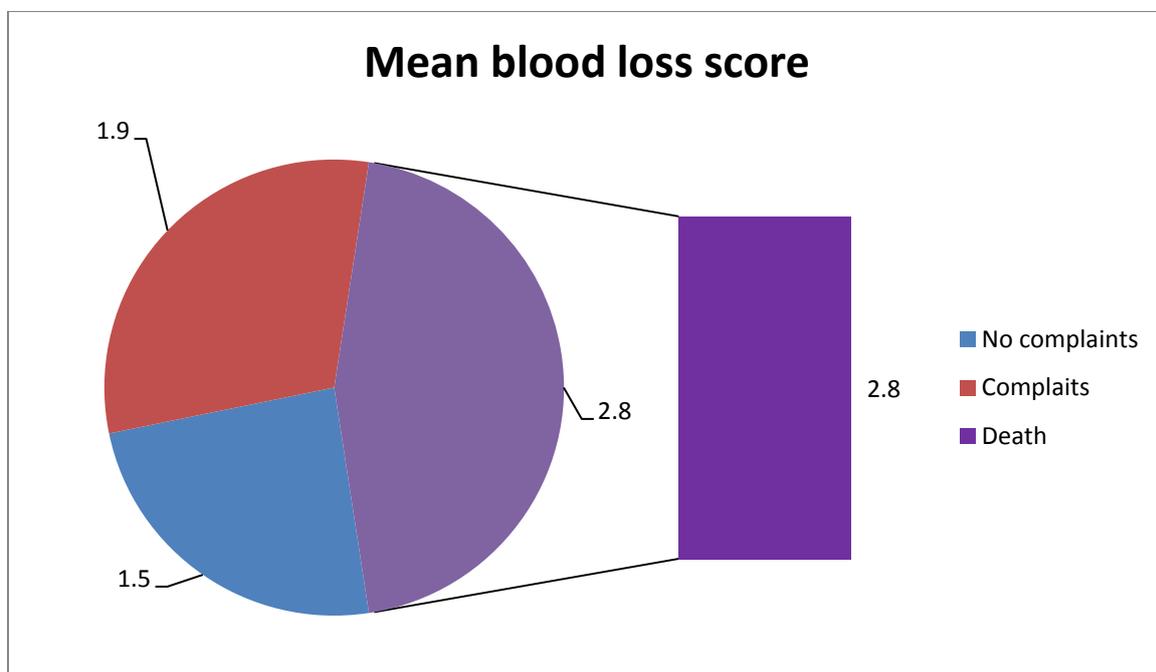


Table-23: Comparison of peritoneal soiling between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	5.2	2.7	4.186	P=0.017	The difference b/w means was statistically significant
2	Complaints	62	6.1	2.6			
3	Death	16	6.8	2.2			

The above table-23 states the comparison between the mean peritoneal soiling scores of outcome. The mean total scores of no complaints were 5.2 ± 2.7 . The scores of the complaints were 6.1 ± 2.6 and the death was 6.8 ± 2.2 . The differences of mean scores were statistically significant ($P < 0.05$).

Fig-27: Mean peritoneal soiling score between the outcomes:

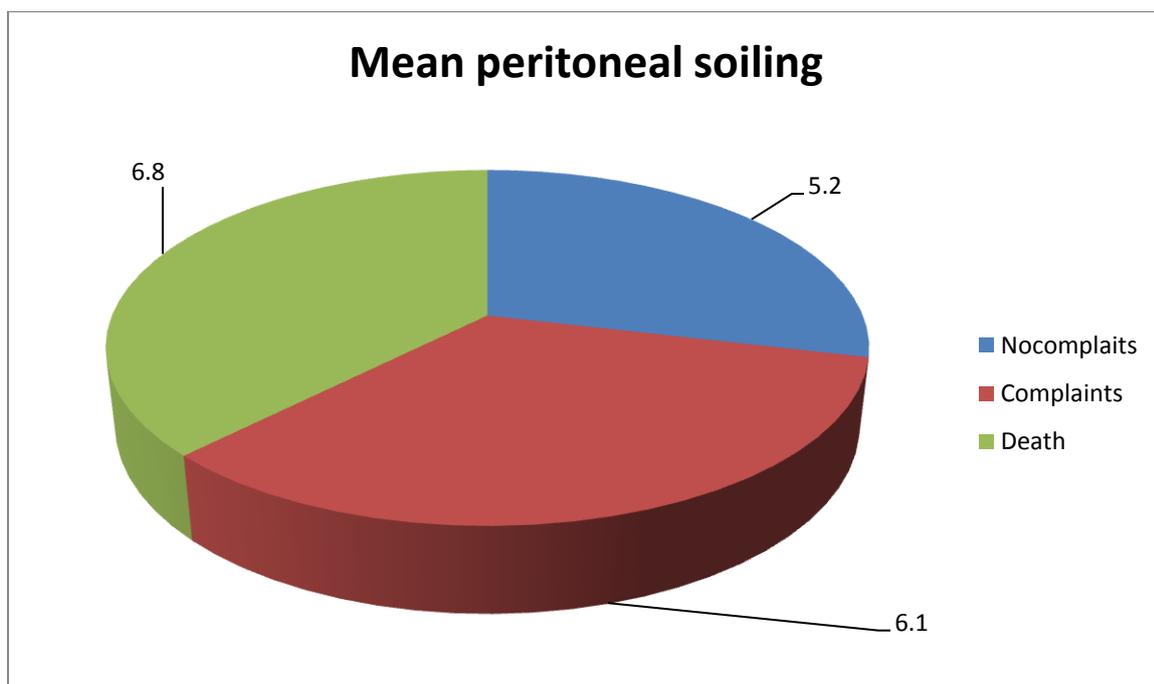


Table-24: Comparison of Malignancy between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	1.1	0.4	7.138	P=0.001	The difference b/w means was statistically significant
2	Complaints	62	1.3	1.0			
3	Death	16	2.1	2.4			

The above table-24 states the comparison between the mean Malignancy scores of outcome. The mean total scores of no complaints were 1.1 ± 0.4 . The scores of the complaints were 1.3 ± 1.0 and the death was 2.1 ± 2.4 . The differences of mean scores were statistically significant ($P < 0.01$).

Fig-28: mean malignancy score comparison between the outcomes:

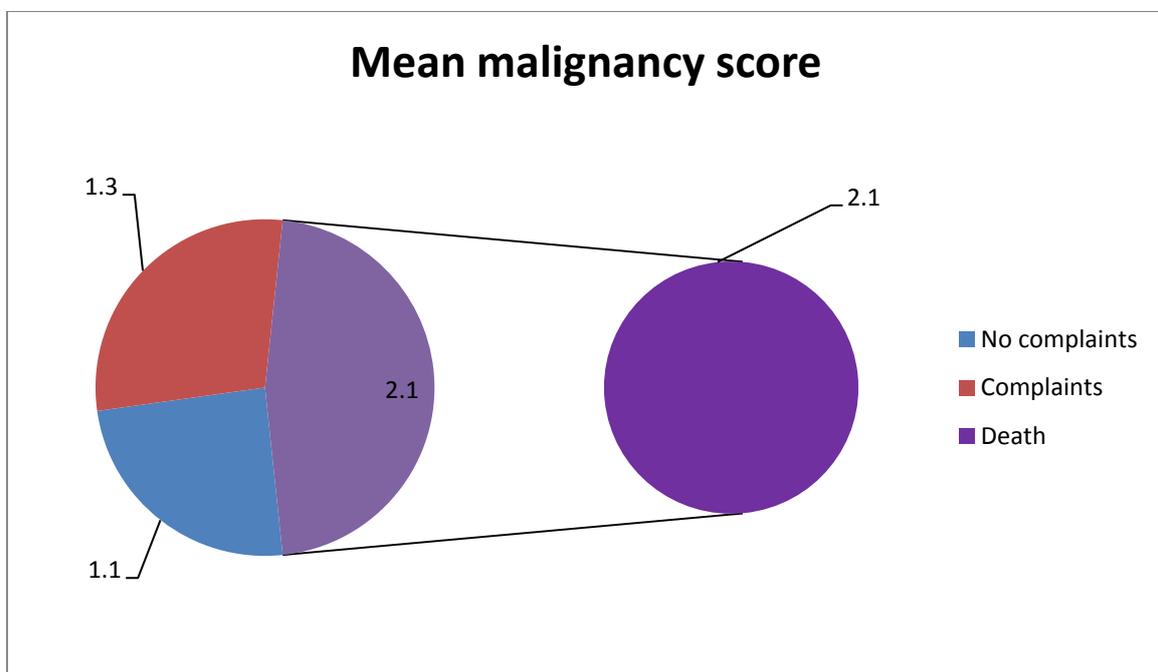


Table-25: Comparison of mode of surgery between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	4.0	0.3	2.160	P=0.119	The difference b/w means was not statistically significant
2	Complaints	62	4.0	0.0			
3	Death	16	3.8	0.8			

The above table-25 states the comparison between the mean mode of surgery scores of outcome. The mean total scores of no complaints were 4.0 ± 0.3 . The scores of the complaints were 4.0 ± 0.0 and the death was 3.8 ± 0.8 . The differences of mean scores were not statistically significant ($P > 0.05$).

Fig-29: mean mode of surgery comparison between the outcomes:

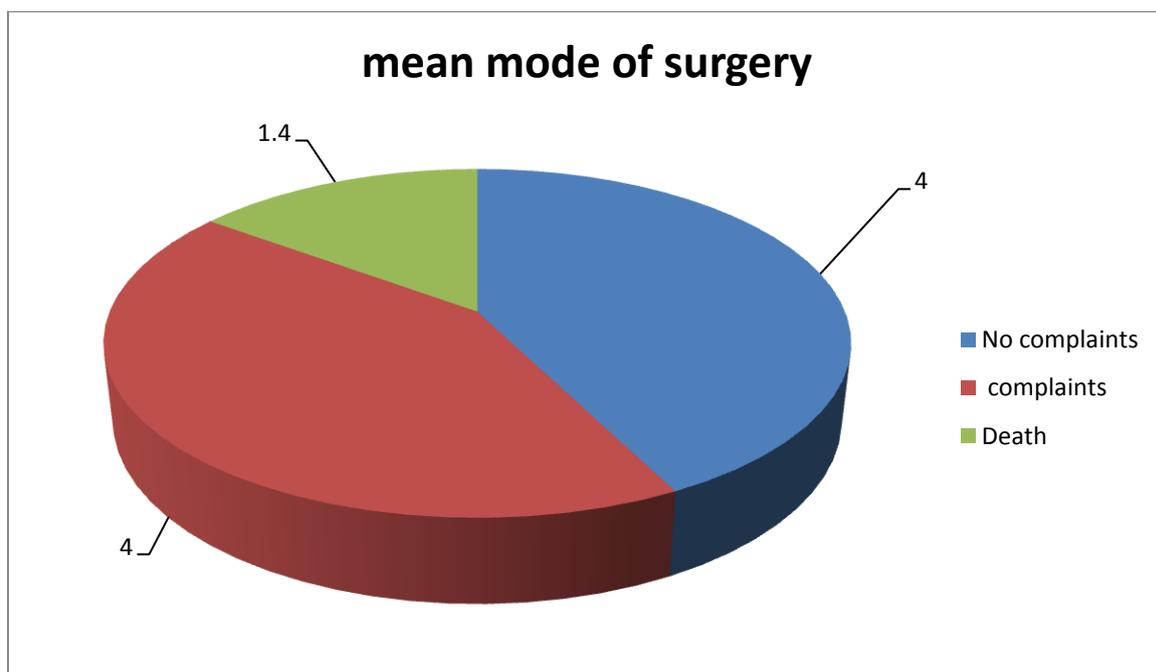


Table-26: Comparison of total outcome scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	16.8	2.5	20.912	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	18.4	2.2			
3	Death	16	20.8	3.5			

The above table-26 states the comparison between the mean total outcome scores of outcome. The mean total scores of no complaints were 16.8 ± 2.5 . The scores of the complaints were 18.4 ± 2.2 and the death was 20.8 ± 3.5 . The differences of mean scores were statistically significant ($P < 0.001$).

Fig-30: Comparison of total outcome between the outcome:

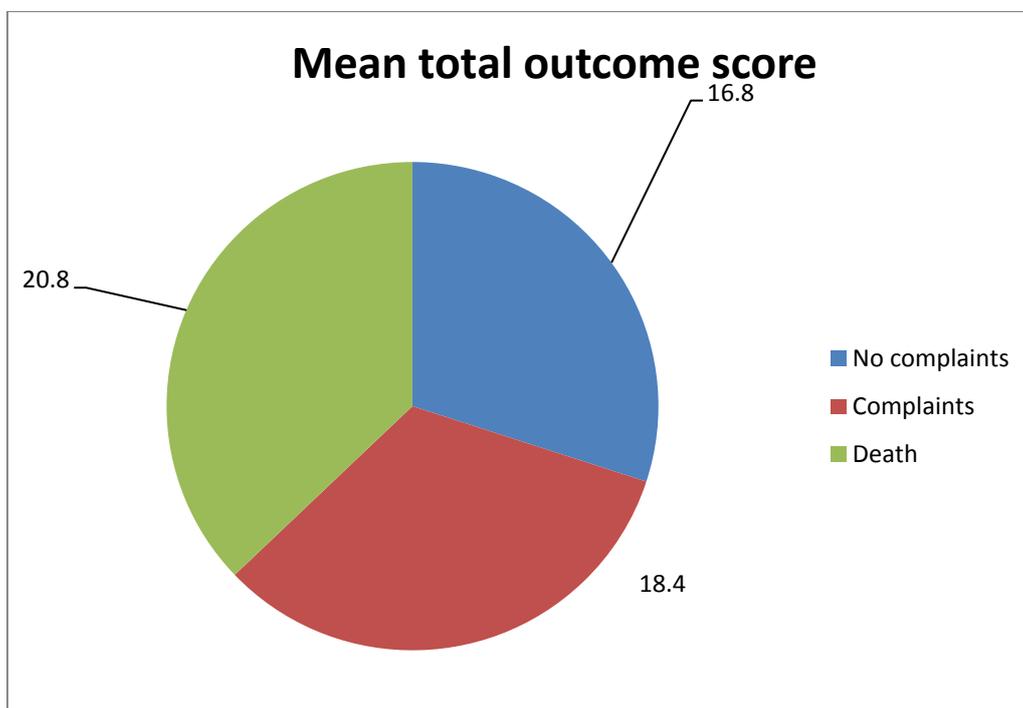
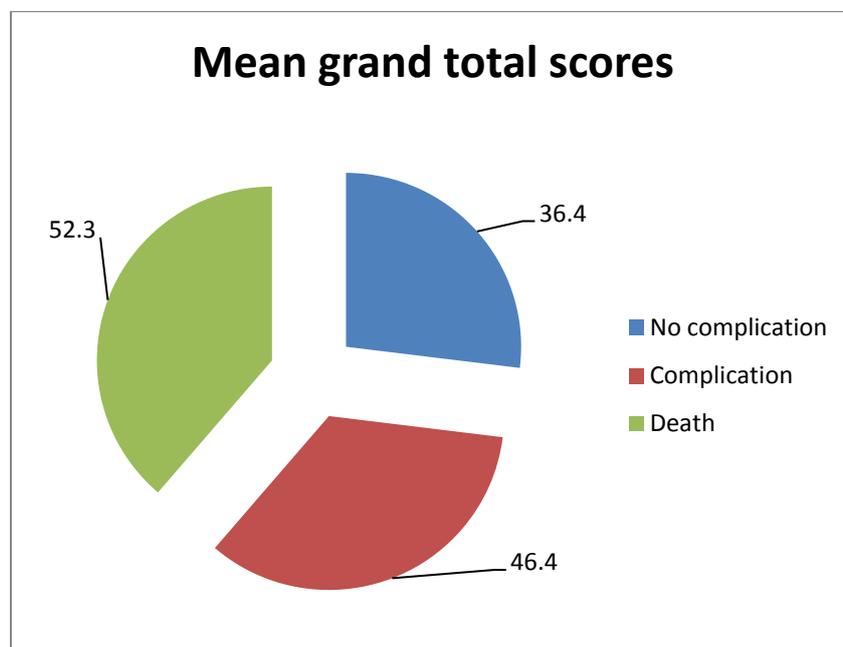


Table-27: Comparison of Grand total scores between the outcomes:

Sl No	outcomes	n	Mean	SD	“F”	Significance	Comparison
1	No complaints	92	36.4	4.3	104.845	P<0.001	The difference b/w means was statistically significant
2	Complaints	62	46.4	6.3			
3	Death	16	52.3	5.6			

The above table-27 states the comparison between the mean total outcome scores of outcome. The mean total scores of no complaints were 36.8 ± 4.3 . The scores of the complaints were 46.4 ± 6.3 and the death was 52.3 ± 5.6 . The differences of mean scores were statistically significant ($P < 0.001$).

Fig-31: Mean grand total scores between outcomes:



Prediction of mortality of study subjects:

Table-28: Classification Table

Observed			Predicted		
			1=No mortality, 2= Mortality		Percentage Correct
			No	Yes	
Step 0	1=No	No	154	0	100.0
	mortality,2= Mortality	Yes	16	0	.0
	Overall Percentage				90.6

The above classification table -28 tells us the observed and predicted the observed and predicted values at the initial stage.

Table-29: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.072	8	1.000

At final entry of the variable , the above table -24 states the Chi-square value as 0.72and the was not statistically significant (P=1.00)

Table-30: Contingency Table for Hosmer and Lemeshow Test

	1=No mortality,2= Mortality = No		1=No mortality,2= Mortality = Yes		Total	
	Observed	Expected	Observed	Expected		
Step 1	1	17	17.000	0	.000	17
	2	17	17.000	0	.000	17
	3	17	17.000	0	.000	17
	4	17	17.000	0	.000	17
	5	17	17.000	0	.000	17
	6	19	19.000	0	.000	19
	7	17	17.000	0	.000	17
	8	17	17.000	0	.000	17
	9	15	15.193	2	1.807	17
	10	1	.807	14	14.193	15

The above contingency table-30explained the observed and expected values of the mortality No and yes.

Table-31: Classification Table

Observed		Predicted		
		1=No mortality,2= Mortality		Percentage Correct
		No	Yes	
Step 1	1=No mortality,2= No	153	1	99.4
	Mortality Yes	1	15	93.8
	Overall Percentage			98.8

a. The cut value is .500

The above final classification table 31 reveals that the 99.4% among the observed subjects. Among the death 93.8% was observed as mortality. Among the predicted and doubtful subjects, the 98.5% will expect mortality.

Prediction of morbidity of study subjects:

Table-32: Classification Table

Observed			Predicted		
			1= Nomorbidity,2= Morbidity		Percentage Correct
			No	Yes	
1= Nomorbidity,2=	No		92	0	100.0
Step 0	Morbidity	Yes	78	0	.0
Overall Percentage					54.1

The above classification table tells us the observed and predicted the values at the initial stage of morbidity

Table-33: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	19.111	8	.014

The above table -33 reveals the significance of Chi- square test.

Table-34: Contingency Table for Hosmer and Lemeshow Test

	1= Nomorbidity,2= Morbidity = No		1= Nomorbidity,2= Morbidity = Yes		Total
	Observed	Expected	Observed	Expected	
Step 1	19	18.629	0	.371	19
2	16	16.119	1	.881	17
3	15	15.604	2	1.396	17
4	14	14.547	3	2.453	17
5	14	12.545	3	4.455	17
6	11	8.920	6	8.080	17
7	1	4.024	16	12.976	17
8	0	1.343	17	15.657	17
9	2	.254	15	16.746	17
10	0	.016	15	14.984	15

Table-35: Classification Table^a

Observed			Predicted		
			1= Nomorbidity,2= Morbidity		Percentage Correct
			No	Yes	
Step 1	1= Nomorbidity,2= No		85	7	92.4
	Morbidity	Yes	12	66	84.6
	Overall Percentage				

a. The cut value is .500

The above final classification table -35 reveals that the 92.4% among the observed subjects had no morbidity. Among the morbidity 84.6% was observed as mortality. Among the predicted and doubtful subjects, the 88.8% will expect morbidity.

Table 36 Comparison of Observed and Predicted Morbidity

Morbidity	Morbidity %	No Morbidity %	Z	Significance
Observed	45.9%	54.1%	0.56	P>0.05
Predicted	42.9%	57.1%		

The above table 36 compares the observed and predicted morbidity. The observed morbidity was 45.9% and the predicted morbidity was 42.9%. The difference between the observed and predicted morbidity was not statistically significant (P>0.05).

DISCUSSION

Emergency surgical intervention is a life saving measure which plays a crucial role in the patient survival. So timely intervention and appropriate procedure with meticulous post operative monitoring is the important factor in the prognosis of the severely ill patient who is in need of urgent surgical intervention. Along with the above mentioned factor patient factor that is patients general condition , performance status, presence of co morbidities, socio economic status and education also plays an equal role in patients prognosis.

Patients outcome after surgery is the indicator for the quality of a Health Care System. This cannot be assessed just merely with crude mortality and morbidity. To set a Benchmark system to assess the Outcome a patients in a Health care system there are several risk scoring system in a critically ill patient. Among which is specifically created to assess an operative patients is POSSUM Scoring System. It gives a qualitative analysis and patient specific analysis of surgical outcome patients.

In this current study total of 170 study subjects were analyzed using POSSUM Scoring System. And we observed 16 deaths and 62 patients with complications which would make of mortality 9.6% and morbidity 36.4%. This was compared with the predicted mortality and morbidity value using Homer – Lemeshow Test. On analyzing both there was no statistically significant difference between the observed and predicted value of mortality(P=1) and

morbidity (P=0.56) . With this we conclude that POSSUM Scoring System is a reliable risk scoring system to predict the Mortality and Morbidity in surgical patients.

In HarinatHa SreeHarsha , Rai SP et al study conducted on Efficacy Of POSSUM Score In Predicting The Outcome In Patients Undergoing Emergency Laparotomy. 15 patients died (mortality rate of 15%). The POSSUM predicted mortality was 20 deaths. O:E ratio of 0.71 was obtained. There was no statistically significant difference between the observed and predicted mortality rates ($\chi^2=1.72$, $p=0.974$). 71 patients experienced complications. The POSSUM predicted morbidity was 61 patients. O:E ratio of 1.19 was obtained. There was no statistically significant difference between the observed and predicted morbidity rates ($\chi^2=1.594$, $p=0.991$)²⁹.

In Manivannan Dhanraj, Prabhakaran Murugan, et al study on Evaluation of POSSUM scoring in patients undergoing emergency laparotomy for hollow viscus perforation. The morbidity prediction ranges from 91- 100% morbidity rates seen in 21 patients and 31-40% morbidity rates seen in 22 patients when using POSSUM score. But the morbidity was observed in 63 patients out of 100. The prediction using POSSUM and the observed morbidity were found to be identical when compared .

In R. S. Mohil, D. Bhatnagar et al study POSSUM and P-POSSUM for risk-adjusted audit of patients undergoing emergency laparotomy. When the linear method of analysis was used POSSUM overpredicted morbidity, and there was a significant difference between the observed and predicted values (observed to expected (O : E) ratio 0.68). The prediction was more accurate when the exponential method was used (O : E ratio 0.91). POSSUM also significantly overpredicted mortality when analysed by the linear method (O : E ratio 0.39), but the prediction improved when exponential analysis was used (O : E ratio 0.62). Applying linear and exponential analyses for P-POSSUM, the O : E ratios for mortality were 0.66 and 0.88 respectively.

POSSUM is a good predictor of morbidity and mortality in patients undergoing emergency laparotomy. P-POSSUM predicts mortality equally well. Both equations may be used for risk-adjusted surgical audit of patients undergoing emergency laparotomy²⁸.

SUMMARY

In this study, We studied 170 patients who admitted in Emergency Department at Govt. Tirunelveli Medical College Hospital and underwent Emergency Laparotomy during the period of December 2017-June 2019 with follow up for 30 days, To observe the mortality and morbidity and possible intervention to improve the prognosis of the high risk patient.

Most common indication for emergency laparotomy in this study is Duodenal perforation (74) , secondly Gastric perforation (17) followed by ileal perforation (10). Male were the predominantly affected with total 133 patients and 37 females. Most common age group affected is 40 to 60.

In our study we observed total of 16 deaths 9.6% and 63 patients with complications 36.4%. Most common cause for death is Duodenal perforation. Most common complications follow by Emergency surgery is Surgical Site Infection 11.2% followed by LRI 5.9%.

Possum scoring system was applied to predict the post operative mortality and morbidity. On analyzing observed and predicted value, there was no statistically significant difference between the observed and predicted value of mortality($P=1$) and morbidity ($P=0.56$) .

This study conclude that Possum scoring system is most reliable tool to predict the outcome of emergency surgical patients.

CONCLUSION

- In Surgical Audit Crude mortality and morbidity is an unreliable indicator so with the use of Possum scoring system patient specific mortality and morbidity can be assessed. Possum scoring system is one of the dependable scoring system to assess the post operative patient.
- High risk patients can be benefited from peri-operative optimization.
- In our study there was No statistically significant variation noted between the observed as well as predicted morbidity($P=0.56$) and mortality ($P=1.00$). Hence the current study suggests that the POSSUM scoring system is a most reliable for predicting post-operative mortality and morbidity and which may help to improve the prognosis of the patients.

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PROFORMA

1. Name : Age : Sex :
2. Address :
3. I.P. No : Unit / Ward :
4. Date of Admission :
5. Date of Surgery :
6. Date of Discharge :
Chief Complaints :
Past History :
General Examination :
PULSE RATE :
BLOOD PRESSURE :
CVS :
RS :
P/A :
CNS:
GCS:
INVESTIGATIONS :
Hb :
UREA :
SERUM Na⁺:
SERUM K⁺ :
WBC COUNT :
ECG :
OPERATIVE SEVERITY
MULTIPLE PROCEDURES
TOTAL BLOOD LOSS
PERITONEAL SOILING
PRESENCE OF MALIGNANCY
MODE OF SURGERY

**நோயாளிகளுக்கு அறிவிப்பு மற்றும் ஒப்புதல் படிவம்
(மருத்துவ ஆய்வில் பங்கேற்பதற்கு)**

ஆய்வு செய்யப்படும் தலைப்பு:

பங்கு பெறுவரின் பெயர்:

பங்கு பெறுவரின் வயது:

		பங்கு பெறுவர் இதனை குறிக்கவும் ✓
1.	நான் மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்களை படித்து புரிந்து கொண்டேன். என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டுள்ளது என அறிந்து கொண்டேன்.	<input type="checkbox"/>
2.	நான் இவ்வாய்வில் தன்னிச்சையாக தான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும், எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.	<input type="checkbox"/>
3.	இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்து மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன்.	<input type="checkbox"/>
4.	இந்த ஆய்வின் மூலம் கிடைக்கும் தகவலையோ, முடிவையோ பயன்படுத்திக் கொள்ள மறுக்க மாட்டேன்.	<input type="checkbox"/>
5.	இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக் கொள்கிறேன் எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின் படி நடந்து கொள்வதுடன், ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிக்கிறேன். என் உடல் நலம் பாதிக்கப்பட்டாலோ, அல்லது எதிர்பாராத, வழக்கத்திற்கு மாறான நோய்குறி தென்பட்டாலோ உடனே இதை மருத்துவ அணியிடம் தெரிவிப்பேன் என உறுதி அளிக்கிறேன்.	<input type="checkbox"/>

பங்கேற்பவரின் கையொப்பம் / இடம்

கட்டிடவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம்

ஆய்வாளரின் கையொப்பம் / இடம்

ஆய்வாளரின் பெயர்

மையம்

கல்வியறிவு இல்லாதவற்கு (கைரேகை வைத்தவர்களுக்கு) இது அவசியம் தேவை

சாட்சியின் கையொப்பம் / இடம்

பெயர் மற்றும் விலாசம்