



"CLINICAL STUDY OF CLAVIEN-DINDO CLASSIFICATION TO ASSESS THE GRADES OF COMPLICATION AND FACTORS RESPONSIBLE IN CASES OF GASTROINTESTINAL PERFORATIONS IN A TERTIARY CARE CENTRE"

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ABSTRACT

INTRODUCTION: Perforation peritonitis is one of the most common surgical emergencies across the globe. Gastrointestinal perforations have very high morbidity and mortality rates, irrespective of the type of operative procedure performed. The Clavien-Dindo system is nowadays widely used for complications after surgery for grading adverse events (i.e. complications) which occur as a result of surgical procedures and has become the standard classification system for many surgical specialties for open as well as laparoscopic surgeries . In this study, an attempt is made to find out various preoperative and intra operative factors that may responsible for adverse outcome and to identify the best management that could decrease the complication rate with special reference to CLAVIEN-DINDO classification.

MATERIALS AND METHODS: We did an observational study of 60 perforation peritonitis patients admitted in Department of Surgery, Sri Aurobindo Medical College and Post Graduate Institute, Indore, M.P. between November 2017 to May 2019(1 and 1/2 Year) on the basis of Clavien-Dindo classification.All were studied with respect to clinical features, time of presentation, comorbid conditions, investigations, intervention done, operative findings and postoperative course and all the data was entered in preformed proforma

RESULTS: Total 60 patients of perforation peritonitis admitted and treated in the department, During the period of November 2017 to May 2019. End of the study concludes the following points:

- In my study, most of the cases were between age group 20-39(50%). more common in males 41 (68.33%) who presented after 3 days from onset of symptoms 20 (33.33%) all of them had complications 20(100%). P Value was <0.001 which is significant. In 16 (26.6%) patient's comorbid conditions were present, out of them 12 (75%) patients were haemodynamically unstable and 9(56.25%) patient expired.In 29 (48.33%) patient size of perforation was more than 1 cm out of which complication observed in 28(96.55%) patient.. **P Value was <0.001 which is significant.** In 10 (16.66%) patients multiple perforations were found out of which 09 (90%) patients were unstable. Complication occurred in 09(90%) patients . In this group 6(60%) patient expired. **P Value was 0.001 which is significant** . In 24(40%) patients more than 500 ml intraperitoneal collection was found, out of which complications developed in all 24(100%) patients,, **Chi Square Value was 42.8 and P Value was <0.001 which is significant.**

Complication according to clavien -dindo classification 14 out of 60 (23.33%) patients had no complications, 4 (6.66%) had grade I complication, 5 (8.33%) had grade II complications, 12 (20%) had grade III complications, 11 (18.33%) had grade IV complications, and 14 (23.33%) had grade V complication rates .

CONCLUSION:Post-operative complications increase due to comorbid conditions, size and number of perforations and it also affects the outcome of the patient. It is observed that with the increase in contamination (intraperitoneal collection) morbidity increases.For the classification of complications, a new system is proposed by Clavien–Dindo which is very helpful during perforation surgery, it is used in all over the world and facilitates in comparisons or evaluation of various surgical . The new classification mainly focuses on the medical perspective, with a major emphasis on the risk, type of anaesthesia and procedures or therapy used to correct a complication. We therefore recommend the use of clavien-dindo classification of complications.

KEYWORDS : Perforation Peritonitis, risk factors, complications, outcome, clavien-dindo classification of complications.

INTRODUCTION:

Perforation peritonitis is one of the most common surgical emergencies across the globe. Gastrointestinal perforations have very high morbidity and mortality rates, irrespective of the type of operative procedure performed. The aim of the present study is to assess the complications and factors responsible for outcomes in cases of gastrointestinal perforations in a tertiary care centre and also to find out various determinants for safe outcomes in gastrointestinal perforation in terms of decreased morbidity and mortality and applying Clavien–Dindo classification for postoperative complications for evaluating the outcome.

The Clavien-Dindo system is nowadays widely used for complications after surgery for grading adverse events (i.e. complications) which occur as a result of surgical procedures and has become the standard classification system for many surgical specialties for open as well as laparoscopic surgeries.

Perforation peritonitis is one of the most common acute abdominal conditions in India because the disease mostly

affects the middle and lower socio-economically class, patients comes to emergency department in septic shock (systemic inflammatory response syndrome [SIRS]) and multi organ dysfunction syndrome [MODS] in later stages of the conditions .As patients present late with septicemia, fluid and electrolyte derangements, shock, and/or systemic inflammatory response syndrome the management becomes quite challenging.

The combination of general care of patients, correction of fluid loss, circulating volume and electrolyte imbalance, insertion of nasogastric tube and urinary catheter improved surgical technique, broad spectrum antimicrobial therapy, analgesia and intensive care support has improved the outcome of such cases. Despite of modern treatment, complications are very common in cases of perforated gastrointestinal tract, even at centers with best facilities, because the outcome also depends on certain factors like degree and duration of peritoneal contamination, age and fitness of the patient and the nature of underlying cause.

In this study, an attempt is made to find out various

preoperative and intra operative factors that may responsible for adverse outcome and to identify the best management that could decrease the complication rate with special reference to CLAVIEN-DINDO classification

CLAVINE DINDO CLASSIFICATION

The Clavien-Dindo system allows us to

- 1) Evaluate the quality of procedures and outcomes from a particular procedure
- 2) Compare different approaches or procedures as well as helps in comparison between surgeons, and health institutions
- 3) Analyze and records learning curves of surgical techniques.
- 4) Use it as the basis of improve quality of care and procedures
- 5) To standardize and measure surgical errors.
- 6) To accurately explain and compare different procedures to their patients in terms of risks and complications

Thereby improving management and prevention. The therapy used to correct a specific complication is the basis of this classification in order to rank a complication in an objective and reproducible manner. It consists of 7 grades (I, II, IIIa, IIIb, IVa, IVb and V).

METHODS AND DEFINITIONS OF COMPLICATIONS

Types of Outcome

The outcomes have been classified into complications, and sequelae. Complications have been defined as any deviation from the normal postoperative course. This definition also takes into account asymptomatic complications such as anaemia, arrhythmia.

Sequaele is a chronic condition that is a complication which follows a more acute condition.

Classification of Surgical Complications

The current modified classification is presented in Table I below with clinical examples. The management used to correct a specific complication remains the mainstay to categorized a complication. The classification had 7 grades, including 2 subgroups for grades 3 and 4, grades (I, II, IIIa, IIIb, IVa, IVb and V)

Table 1: Classification of surgical complications as per the classification proposed by Clavien-Dindo et al.

Grade	Definition
Grade I	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. Acceptable therapeutic regimens are: drugs as antiemetics, antipyretics, analgetics, diuretics and electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside.
Grade II	Requiring pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included.
Grade III	Requiring surgical, endoscopic or radiological intervention
Grade III-a	Intervention not under general anesthesia
Grade III-b	Intervention under general anesthesia
Grade IV	Life-threatening complication (including CNS complications) # requiring IC/ICU-management
Grade IV-a	single organ dysfunction (including dialysis)
Grade IV-b	multi organ dysfunction
Grade V	Death of a patient

Suffix 'd'	If the patient suffers from a complication at the time of discharge, the suffix "d" (for 'disability') is added to the respective grade of complication. This label indicates the need for a follow-up to fully evaluate the complication.
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brain hemorrhage, ischemic stroke, subarrachnoidal bleeding, but excluding transient ischemic attacks (TIA); IC: Intermediate care; ICU: Intensive care unit

AIM & OBJECTIVES

AIM

Clinical study of Clavien-Dindo classification to assess the grades of complication and factors responsible in cases of gastrointestinal perforations in a tertiary care centre.

OBJECTIVES OF THE STUDY

1. To assess the factors responsible for deviation in outcome in gastrointestinal perforation.
2. To identify the diagnostic accuracy of used investigations tool to detect different organ perforation.
3. To assess the relation between pre-operative factors responsible for deviation in post-operative course & its relation with grades of complications observed by Clavien-Dindo classification.
4. To study the postoperative outcome during hospital stay and at discharge

MATERIALS AND METHODS

We did an observational study of all perforation peritonitis patients admitted in Department of Surgery, Sri Aurobindo Medical College and Post Graduate Institute, Indore, M.P between November 2017 to May 2019(1 and 1/2 Year) on the basis of Clavien-Dindo classification.

1) All the patients of perforation peritonitis who were admitted & managed in Department of Surgery at Sri Aurobindo Medical College and Post Graduate Institute between November 2017 to May 2019(1 and 1/2 Year) were studied with respect to clinical features, time of presentation, comorbid conditions, investigations, intervention done, operative findings and postoperative course and all the data was entered in preformed proforma.

INCLUSION CRITERIA: -

1. Patients who are willing for study.
2. All the patients both male and female in the age group more than 10 years with peritonitis caused by perforation of the gastrointestinal tracts were included in this study.

EXCLUSION CRITERIA: -

1. Patients who are not willing for study
2. All the patients with primary peritonitis, Anastomosis leakage causing postoperative peritonitis and corrosive.
3. Children below than 10 years.

DATA COLLECTION AND METHODS: -

Selection of cases: An informed written consent was taken from all the patients / relatives in groups after the approval of institutional ethic committee.

Source of data: Patients admitted to Sri Aurobindo medical college and post graduate institute, Indore (M.P)

SAMPLE: -

Total 60 patients of perforation peritonitis undergoing laparotomy were included according to the inclusion and exclusion criteria decided early in this study during the period of one and half year.

Data collection from patients by their clinical history, examination, with appropriate investigations. The cases were evaluated by history, clinical features and special tests if any required

METHOD OF DATA COLLECTION:

From cases attending our institute in which diagnosis of peritonitis is established by operative findings or surgical interventions during management. Therefore, nonrandomized sampling technique was used.

Pre designed semi structure questions were used
The study was approved by the institutional ethics committee and in line with the declaration of Helsinki and followed the guidelines laid out by the Indian council of medical research (ICMR). Written informed consent was taken from the patients participating in the study.

PROCEDURE PLAN: -

Patients presenting with gastrointestinal perforation coming in SAMC & PG Institute & admitted in Department of Surgery following details was recorded. Name, age, occupation, residence was recorded as per proforma case sheet. The presenting complaints and details were recorded in chronological orders. Patient's brief history was inquired and detail examination was done. General and systemic examination was done. These details were taken at the time of admission of patient to the hospital. Pre anesthetic check-up was before the surgery. Informed and written consent was taken from the patient and his/her relatives. Patient was kept nil by mouth 8 hours before the procedure according to NPO guidelines

Following investigations were done before the procedure

According to the site of perforation various surgical procedure were performed. Data was during preoperative, intraoperative and postoperative period.

INVESTIGATIONS: -

- **Routine investigations:** OT-Profile, serum electrolyte ESR, ECG, PT, INR
- **Specific investigations:** Chest X ray PA view, CECT abdomen, Liver function tests, Post-Operative Histopathology Report, USG whole abdomen, X-RAY abdomen erect

STATISTICAL ANALYSIS PLAN: -

- Percentage was used to represent the data.
- Data was analyzed using descriptive statistics and chi-square test. Suitable statistics software utilized for analysis and presented in the form of tables, figures, graphs and diagrams whenever necessary.
- P value <0.05 was considered as statistically significant.
- The outcome was measured as better outcome (Grades I, II, and No complications) and worse outcome (Grades III, IV, V and VI)
- According to Clavien Dindo classification, complications are represented by grade I-IV
- Microsoft excel was used to prepare the master charts.

OBSERVATION AND RESULTS

Table 2: Age, Comorbid Condition and Outcome

Age (N)%	Sex		Total No. N=60 (%)	Comorbid Condition		Outcome		Chi Square Value	P Value
	Male N=41	Female N=19		Present	Absent	Discharge	Expired		
<20 Years	02(66.6%)	01(33.3%)	03(5%)	-	03 (100%)	03 (100%)	00	6.30	0.043
20-39 Years	19 (55.8%)	15 (44.11%)	34 (56%)	05 (14.70%)	29 (85.29%)	25 (73.52%)	09 (26.47%)	24.8	<0.001
40-59 Years	13 86.6%	02 13.33%	15 (25%)	08 (53.33%)	07 (46.66%)	10 (66.66%)	05 (33.33%)	3.94	0.139
60 or More Years	07(87.5%)	01(12.5%)	08(13.33%)	02(25%)	06(75%)	08 (100%)	00	12.5	0.002

The above table 02 shows that the distribution of patients according to age and gender. The age group 20 or less has least number of patients 3(5%) out of which 2(66.66%) were male and 01(33%) was female. No patients had comorbidity 3(100%) and all the 3 (100%) patients were discharged, the age group 20-39 years was the largest group comprising of 34 (56%) patients out of which 19(55.8%) were male and 15 (44.11%) were female, comorbid conditions were present in 05(14.70%) and absent in 29(85.29%) people (85.29%). 25(73.52%) patients were discharged in this group and 9(26.47%) patients expired,.

2-3 days (36) (60%)	23 (63.88%)	13 (36.11%)	35 (97.22%)	01 (2.77%)	12.8	<0.001
>3days (20) (33.33%)	20 (100%)	-	07 (35%)	13 (65%)	19.33	<0.001

Above Table-3 shows that Patients presenting within 1 day or less from the onset of symptoms were 4(6.66%) out of which complications occurred in 1 (25%) patient rest 3(75%) had normal recovery. All the 4 patients in this group got discharged. **Chi Square Value was 4.8 and P Value was 0.028 which is significant.** In our study Majority of patients presented within 2-3 days from the onset of symptoms 36(60%) out of which complications occurred in 23(63.88%) patients and recovery without complication in 13(36.11%) patients. In this group 35(97.22%) patients got discharged and 1(2.77%) patient expired. **Chi Square Value was 12.8 and P Value was <0.001 which is significant.**

Table 3: Time of Presentation, Complication, Outcome

Time of presentation	Complication		Outcome		Chi square value	P value
	Present	Absent	Discharge	Expired		
1 day or less (04) (6.66%)	1 (25%)	3 (75%)	04 (100%)		4.8	0.028

Table 4: Time Of Presentation, Size Of Perforation, Haemodynamic

Time of Presentation	Size of Perforation		Haemodynamic condition		Outcome		Chi square test	P value
	1*1cm	>1*1cm	Stable	Unstable	Discharge	Expired		
1 day or less (04) (6.66%)	4 (100%)	-	04 (100%)	-	04 (100%)	-	11.1	0.011
2-3days (36) (60%)	26 (72.22%)	10 (27.77%)	27 (75%)	09 (25%)	35 (97.22%)	01 (2.77%)	12.4	0.006
>3days (20) (33.33%)	08(40%)	12 (60%)	03 (15%)	17 (85%)	07 (35%)	13 (65%)	32.3	<0.001

Above Table No. 4 shows that Patients presenting within 1 day or less from the onset of symptoms were 4 (6.66%) out of which all 4(100%) patients had size of perforation 1*1cm or less and in this group all 04(100%) patients were haemodynamically stable. All the 4 patients in this group got discharged. **Chi-Square Value was 11.1 and P Value was 0.011 which is significant.** Majority of patients presented within 2-3 days from the onset of symptoms in this group haemodynamically stable patient were 27(75%) and haemodynamically unstable were 09 (25%)

patients. Out of total patients in group 35(97.22%) patients got discharged and 1 (2.77%) patient expired. **Chi Square Value was 12.4 and P Value was 0.006 which is significant.** Patients who presented after 3 days from onset of symptoms 20 (33.33%). In this group haemodynamically stable patient were 03(15%) and haemodynamically unstable were 17 (85%) patients. out of total patients in this group 7 patient got discharged 7(35%) and 13 patients expired. **Chi Square Value was 19.33 and P Value was <0.001 which is significant**

Table 5: Comorbid Condition, Time Of Presentation , Haemodynamic Condition and Outcome

Comorbid Condition	Time of Presentation			Haemodynamic Condition		Outcome		Chi square test	P value
	1 Day or Less	2-3 Days	>3 Days	Stable	Un stable	Discharge	Expired		
Present (16) 26.60%	-	4 25%	12 75%	04 25%	12 75%	07 43.75%	09 56.25%	1.75	0.418
Absent (44) 73.33%	4 9.09%	32 72.7%	8 18.18%	30 68.18%	14 31.81%	39 88.63%	05 11.36%	5.54	0.020

Above Table-5 shows that in those 16 (26.6%) patients whom comorbid condition present 4 (25%) patient presented with in 2-3 days , 12 (75%) presented after 3 days and none of them presented within 1 days of onset of symptom ,the haemodynamically stable were 04 (25%) patients and unstable were 12 (75%) patients. In this group 07(43.75%) patients got discharged and 9(56.25%) patient expired. **Chi Square Value was 1.75 and P Value was 0.418 which is not significant** [however this table shows clearly increase in haemodynamically instability and mortality in presence of comorbid condition].

Comorbidities were absent in 44(73.33%) patient in those 32 (72.7%) presented with in 2-3 days, 08 (18.18%) presented after 3 days and 4 (9.09%) patient presented within 1 days of onset of symptom, of these the haemodynamically stable were 30 (68.18%) patients and unstable were 14 (31.81%) patients. In this group 39(88.63%) patients got discharged and 5 (11.36%) patient expired. **Chi Square Value was 5.54 and P Value was 0.020 which is significant.** [for comorbid condition, haemodynamically condition & outcome]

Table 6: Size of Perforation, Comorbid Condition and Complication

Size of perforation	Comorbid condition		Complication		Chi square Test	P value
	Present	Absent	Present	Absent		
1*1cm or less (31) (51.66%)	06 19.35%	25 88.64%	16 51.61%	15 48.38%	7.05	0.008
>1*1cm (29) (48.33%)	10 32.25%	19 65.51%	28 96.55%	01 3.44%	24.7	<0.001

Above Table No. 6 shows that 31 (51.66%) patient has perforation less or upto 1 cm size in this group in 06(19.35%) comorbid condition were present and absent in 25(88.64%), complication occurred in 16(51.61%) patients and no complication observed in 15(48.38%) patients. **Chi Square Value was 7.05 and P Value was 0.008 which is significant.**

present, absent in 19(65.51%) patient, complication observed in 28(96.55%) patient and in only 01 (3.44%) patient there was no complication. **Chi Square Value was 24.7 and P Value was <0.001 which is significant.**

In 29 (48.33%) patient size of perforation was more than 1cm out of which in 10(32.25%) patients comorbid condition were

Morbidity and complication were higher for cases of >= 1 cm of perforation as compared to those with perforation less than 1 cm. Thus, size of perforation affects mortality and morbidity in perforation peritonitis

Table 7: Number of Perforation, Haemodynamic Condition, Complication and Outcome

Number of Perforation	Haemodynamic Condition		Complication		Outcome		Chi square test	P value
	Stable	Un stable	Present	Absent	Discharge	Expired		
Single Perforation (50) 83.33%	33 66%	17 34%	3 70%	15 30%	42 84%	08 16%	4.57	0.102
Multiple Perforation (10) (16.66%)	01 10%	09 90%	09 90%	01 10%	04 40%	06 60%	13.1	0.001

Above Table 7 study reveals that 50(83.33%) patients had single perforation out of which 33 (66%) patients were haemodynamically stable and 17(34%) patients were unstable ,complication occurred in 35 (70%) patients and no complication found in 15(30%). In this group 42(84%) patients got discharged and 8(16%) patient expired. **Chi Square Value was 4.57 and P Value was <0.102 which is not significant.**

In 10 (16.66%) patients multiple perforations were found out of which only 01 (10%) patient is haemodynamically stable and 09 (90%) patients were unstable, complication occurred in 09(90%) patients and no complication were only in 01 (10%) patients. In this group 04(40%) patients got discharged and 6(60%) patient expired. **Chi Square Value was 13.1 and P Value was 0.001 which is significant**

Table 8: Intra-peritoneal Collection, Complication, Haemodynamic Condition, Duration of Hospital Stay and Outcome

Intra Peritoneal Collection	Complication		Haemodynamic Condition		Duration of Hospital Stay		Outcome		Chi square test	P value
	Present	Absent	Stable	Unstable	Upto 14 Days	> 14 Days	Discharge	Expired		
UPTO 500ml (36) (60%)	20 55.55%	16 44.44%	28 77.77%	8 22.22%	17 47.22%	19 52.77%	35 97.22%	01 2.77%	25.9	<0.001
>500ml (24) (40%)	24 100%	-	06 25%	18 75%	10 41.66%	14 58.33%	11 45.83%	13 54.16%	42.8	<0.001

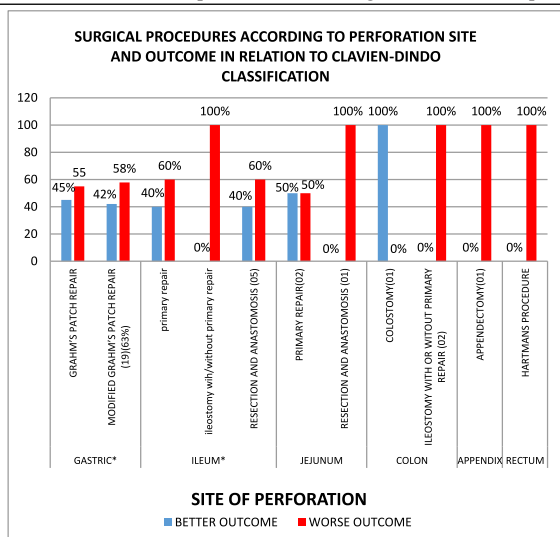
Above Table No. 8 shows that In our study intraperitoneal collection upto 500 ml is found in 36(60%) patient out of the group complication developed in 20(55.55%) patient and no complication seen in 16(44.44%) patients, haemodynamic stability seen in 28(77.77%) patients & unstability present in 8(22.22%) patients ,duration of hospital stay upto 14 days in 17(47.22%) and more than 14 days in 19(52.77%) patients. In this group 35(97.22%) patients got discharged and 1(2.77%) patient expired. Chi Square Value was 25.9 and P Value was <0.001 which is significant.

In second group intraperitoneal collection more than 500 ml is found in 24(40%) patient out of the group complication developed in all 24(100%)patient, haemodynamic stability seen in 06(25%) patients & unstability present in 18(75%) patients ,duration of hospital stay upto 14 days in 10(41.66%) and more than 14 days in 14(58.33%) patients. In this group 11 (45.83%) patients got discharged and 13(54.16%) patient expired. Chi Square Value was 42.8 and P Value was <0.001 which is significant.

Table 9: Various Surgical Procedures According to Perforation Site and Outcome in Relation to Clavien- Dindo Classification

Site of Perforation	No. of Patient	(%)	Surgical Procedure	Better Outcome (clavien-dindo classification No Complication, Grade-I, Grade-II,) N (%)	Worse Outcome (Clavien-Dindo Grade III, IV and V) N (%)	
GASTRIC*	30	49.18%	Graham's Patch Repair (11)(36%)	05 (45%)	06 (55%)	Chi square test- 0.031 Df- 01 ,P value- 0.858
			Modified Graham's Patch Repair (19) (64%)	08 (42%)	11(58%)	
ILEUM*	23	37.7%	Primary Repair (15) (65.21%)	06(40%)	09 (60%)	Chi square test- 1.84, Df- 02, P value- 0.399
			Ileostomy With/Without Primary Repair (03) (13.04%)		03 (100%)	
			Resection and Anastomosis (05) (21.74%)	02 (40%)	03(60%)	
JEJUNUM	03	4.91%	Primary Repair (02) (66.66%)	01 (50%)	01(50%)	Chi square test- 0.750, df- 1, P value- 0.386
			Resection and Anastomosis (01) (33.33%)		01(100%)	
COLON	03	4.91%	Colostomy (01) (33.33%)	01(100%)		Chi square test- 3.00, df- 1, P value- 0.083
			colostomy with Primary Repair (02) (66.66%)		02(100%)	
APPENDIX	01	1.63%	Appendectomy (01) (100%)		01 (100%)	NA
RECTUM	01	1.63%	Hartman's Procedure (01) (100%)		01(100%)	NA

One patient had both gastric and ileal perforation therefore n=61 in above observation table



Graph 1: Bar chart showing Various Surgical Procedures According to Perforation Site and Outcome in Relation to Clavien- Dindo Classification

Above Table No.9 & Graph No. 1 shows that Most of gastric perforation 30 (49.18%) was managed by graham's patch repair 11 (36%), 5 (45%) patient had better outcome and 6 (55%) patient had worse outcome. modified graham's patch repair in 19 (64%), 8 (42%) patient had better outcome and 11

(58%) patient had worse outcome.

Next major group was ileal perforation 23(37.7%) was managed by primary repair 15 (65.21%), 6 (40%) patient had better outcome and 9 (60%) patient had worse outcome. Ileostomy with or without primary repair done in 03 (%), all 3(100%) had worse outcome and resection and anastomosis done in 05(21.74%) patients, 2 (40%) patient had better outcome and 3 (60%) patients had worse outcome.

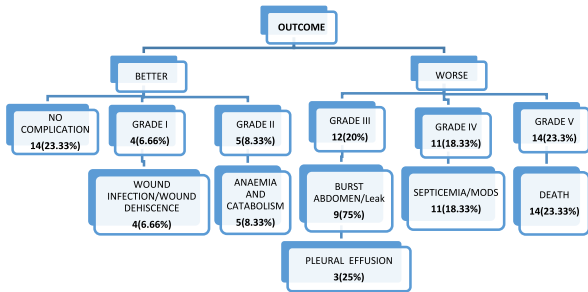
Next was jejunum perforation 3(4.91%) was managed by primary repair 02(66.66%) patients, 01(50%) patient had better outcome, 1 (50%) patient had worse outcome and resection and anastomosis done in 01(33.33%) patients 1(100%) patients had worse outcome Colon perforation seen in 3 (4.91%) patients managed by colostomy in 1 (33.33%) had better outcome whereas 2(66.66%) patient with primary repair 2 (100%) patients both had worse outcome Appendix and rectum perforation seen in one (1.63%) patient both of them had worse outcome

P value is significant for gastric and ileal perforation

Most common procedure performed was exploratory laparotomy with modified graham's omental patch repair in 19 (31 %) patients followed by primary repair in 17(27.86%) patient for ileal and jejunal perforation , graham's patch repair done in 11(18.03%) patients, resection and anastomosis in 06 (9.83%) ,ileostomy performed in 5(8.19%) patient , colostomy ,appendectomy and Hartsmans procedure in 1 patient(1.63%) respectively.

Table 10: Clavien-Dindo classification system for surgical complication and management of complication

COMPLICATION	MANAGEMENT	CLAVIEN-DINDO'S CLASSIFICATION (Grades I, II, III, IV, V)
NO COMPLICATION	NO ADDITIONAL MANGEMENT	NO COMPLICATION (14) (23.33%)
WOUND INFECTION/WOUND DEHISCENCE	OPENED AT BED SIDE & DRESSING	GRADE I (4) (6.66%)
LOSS OF BLOOD AND CATABOLISM	BLOOD TRANSFUSION & TOTAL PARENTAL NUTRITION	GRADE II (5) (8.33%)
(a) PLEURAL EFFUSION (b) BURST ABDOMEN/ LEAK	PLEURAL TAPPING SECONDRY CLOSURE/ RE-EXPLORATION	GRADE III-α (3) (25%) (12) (20%) GRADE III-b (9) (75%)
(a) SINGLE ORGAN FAILURE (b) MODS/ SEPTICEMIA	ICU CARE ICU CARE/VENTILLATORY SUPPORT/DIALYSIS	GRADE IV-α (11) (18.33%) GRADE IV-b
DEATH (14) (23.33%)	-	GRADE V (14) (23.33%)



Graph 2: Flow chart Shows outcome and grading with postoperative complications of various perforations.

Above Table No. 10 and Graph no. 25 shows that the management of complications during hospital stay and from the study it was found that 14 out of 60 (23.33%) patients are discharged with no complications, 4 (6.66%) cases of wound infection/wound dehiscence were managed by sutures opened at bedside and regular sterile dressing done (grade I complication), 5 (8.33%) patients had anaemia and catabolism were managed by blood transfusion and total parenteral nutrition (grade II complications), out of 12 (20%), 3(25%) patients had pleural effusion managed by pleural tapping and 9 (75%) had burst abdomen or leak managed by secondary closure /re-exploratory (grade III complications), 11(18.33%) patients of single organ failure, MODS/ septicemia managed in ICU care/ventilator support/dialysis (grade IV complications), and 14 (23.33%) patients expired (grade V complication rates)

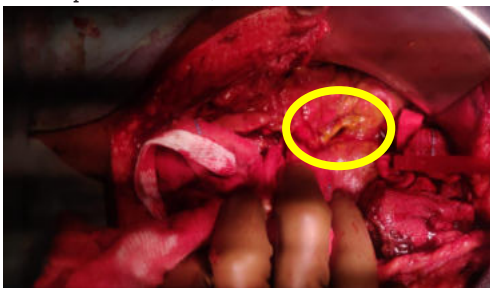


Figure 14: Showing prepyloric perforation



Figure 15: Showing ileal perforation

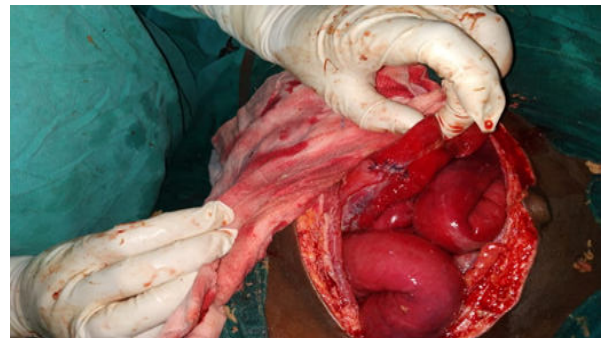


Figure 16: Showing primary repair of ileal perforation

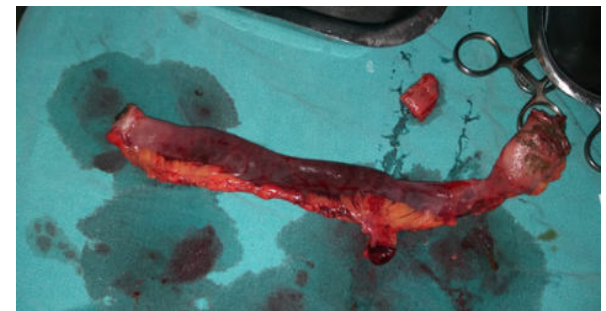


Figure 17: Showing Perforation with gangrenous bowel

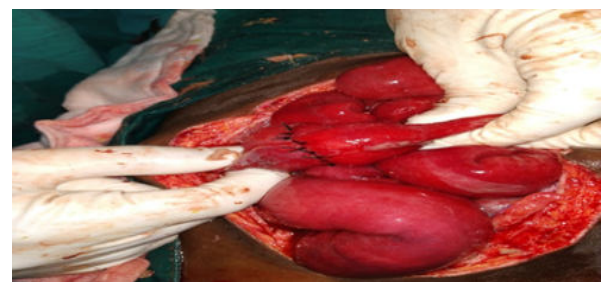


Figure 18: showing Resection and Anastomosis

DISCUSSION

The aim of the present study is to assess the complications and factors responsible for outcomes in cases of gastrointestinal perforations in a tertiary care centre and also, to find out various determinants for safe outcomes in gastrointestinal perforation in terms of decreased morbidity and mortality and applying Clavien–Dindo classification for postoperative complications for evaluating the outcome.

Despite of modern treatment, complications are very common in cases of perforated gastrointestinal tract, even at centers with best facilities, in this study, an attempt is made to find out various preoperative and intra operative factors that may be responsible for adverse outcome and to identify the best management that could decrease the complication rate. In the

present work entitled "Clinical Study of Clavien-Dindo Classification to Assess the Grades of Complication and Factors Responsible in Cases of Gastrointestinal Perforations in a Tertiary Care Centre c.

1-AGE AND COMORBID CONDITION WISE DISTRIBUTION

In our study the age group 20-39 years was the largest group comprising of 34 (56%) patients out of which 19 (55.88%) were male and 15(44%) were female, comorbid conditions were present in

Similar studies: -

1) **Abdulhameed MME, et al. (2016)** study shows that Maximum patients were in the age group of 20-39 year has 47 patient out of which 46(98%) patients recovered and 1(2%) patient expired, followed by age group 40-59 year has 28 patients out of which 20 (71.5%) patients recovered and 8(28.5%) patient expired, Next age group of more than 60 year comprising of 21 patient out of which 15(71.5%) patients recovered and 6 (28.5%)patient expired. The age group 20 year or less has 4 patient only out of which 4(100%) all patients are recovered and discharge.

2) **Nabi I, et al. (2016)** study shows that the patients varied from 19 to 60 years with most of the patients falling within the age range of 21-30 years. Their mean age was 34.42 years. The majority of patients were male (77.6% male vs. 22.4% female).

3) **Mewara B, et al. (2017)** study shows that the mean age of presentation was 40.29 years, There are 89 males (89%) and as compared to 11 females (11%). Out of 100 patients, 7 patients (7%) died in the post-operative period.

4) **Singh A, et al. (2016)** study shows that Most of the patients were <40 year of age (58%). Majority of the patients were males (270 males and 80 females). The male-to-female ratio was 3.3:1.

5) **Keshri A, et al. (2016)** study shows that out of 180 patient 142(82.22%) male and 32(17.78%) female. age group <20 year, 10 survived 1 died, Age group 21-50, 101 survived 3 died, age group >50 61 survived 4 died,

II - TIME OF PRESENTATION

In our study Majority of patients presented within 2-3 days from the onset of symptoms 36(60%) out of which complications occurred in 23(63.88%) patients and recovery without complication in 13(36.11%) patients. In this group 35(97.22%) patients got discharged and 1(2.77%) patient expired, P Value was <0.001 which is significant. Next group was of patients who presented after 3 days from onset of symptoms 20 (33.33%) all of them had complications 20(100%). However out of 20 patients. In this group 7 patient got discharged 7(35%) and 13 (65%) patients expired P Value was <0.001 which is significant. Smallest group was of Patients presenting within 1 day or less from the onset of symptoms were 4 (6.66%) out of which complications occurred in 1 (25%) patient rest 3(75%) had normal recovery. All the 4 patients in this group got discharged P Value was 0.028 which is significant.

Similar studies: -

1) **Abdulhameed MME, et al. (2016)** - Out of 100 patients time of presentation 1 day or less is 29(29%) patients out of which 29(100%) is recovered and 0(0%) is expired, 2-3 days 55(55%) patients out of which 49(89%) is recovered and 6(11%) is expired and more than 3 days 16(16%) patients out of which 6(37.5%) is recovered and 10(62.5%) is expired. Mean Time of presentation 2.27 days and standard deviation is 1.12. Recovered 84 (84%) patient and death 16 patient. Statistical test is 't' test and p value are < 0.001 implies mortality increases with delayed presentation.

2) **Jobta R, et al.(2006)** study shows that the time taken by the patient between onset of symptoms and presentation to the hospital was less than 24 hours in 235(47%) cases and more than 24 hours in 269(53%) cases.

3) **Malik P, et al. (2014)** study shows that less than 24 hours 532 (38%) patient and more than 24 hours 868(62%) patient out of 1400.

4) **Mewara B, et al. (2017)** study shows that Out of 100 patients only 34 patients had presented within 24 hours of onset of symptoms and the 66% patients had presented after 24 hours of onset of symptoms. Out of 100 patients, 7 patients (7%) died in the post-operative period. All of these 7 patients had presented late, after the 48 hours. The 14 patients had reported post-operative complications

III - COMORBID CONDITION

In our study comorbidities were absent in 44(73.33%) patient in those 32 (72.7%) presented with in 2-3 days , 08 (18.18%) presented after 3 days and 4 (9.09%) patient presented within 1 days of onset of symptom, of these the haemodynamically stable were 30 (68.18%) patients and unstable were 14 (31.81%) patients. In this group 39(88.63%) patients got discharged and 5(11.36%) patient expired. **and P Value was 0.020 which is significant.** [for comorbid condition, haemodynamically condition & outcome]

In those whom comorbid condition present 16 (26.6%) patients in those 4 (25%) patient presented with in 2-3 days, 12 (75%) presented after 3 days and none of them presented within 1 days of onset of symptom, the haemodynamically stable were 04 (25%) patients and unstable were 12 (75%) patients. In this group 07(43.75%) patients got discharged and 9(56.25%) patient expired. **Chi Square Value was 1.75 and P Value was 0.418 which is not significant** [increase in haemodynamically instability and mortality in presence of comorbid condition].

Similar study:-

1) **Abdulhameed MME, et al. (2016)** study shows that Comorbid condition present in 25 patient out of which 15 (60%) patient is recovered and 10 (40%) is expired and absent in 75 out of which 69(92%) patient is recovered and 6(8.1%). Statistical test is chi-square test and p-value 0.001, which shows that comorbid conditions like diabetes, hypertension, COPD and renal failure increase mortality.

IV-HAEMODYNAMIC CONDITION

Majority of patients presented within 2-3 days from the onset of symptoms 36(60%) out of which in 26(72.22%) patients size of perforation was 1cm or less and in 10 (27.77%) patient it was more than 1*1cm. In this group haemodynamically stable patient were 27(75%) and haemodynamically unstable were 09 (25%) patients. out of total patients in group 35(97.22%) patients got discharged and 1(2.77%) patient expired. **Chi Square Value was 12.4 and P Value was 0.006 which is significant.**

Next group of patients who presented after 3 days from onset of symptoms 20 (33.33%), out of which in 08(40%) of them size of perforation was 1cm or less & in 12 (60%) more than 1*1cm size. In this group haemodynamically stable patient were 03(15%) and haemodynamically unstable were 17 (85%) patients. **out of total patients** In this group 7 patients got discharged 7(35%) and 13 patient expired. **Chi Square Value was 19.33 and P Value was <0.001 which is significant.**

Similar studies:-

1) **Paryani JJ, et al. (2013)** found that mortality rate was 80% for patients with blood pressure <100 mm Hg
2) **Kamble R S, et al. (2016)** study shows that 7.69% of the cases with heart rate <100/min died which was significantly

less as compared to 25% of cases with heart rate ≥ 100 /min, but difference was not statistically significant and 29.17% of the cases with heart rate < 100 /min had hospital stay > 10 days which was less as compared to 61.11% of cases with ≥ 100 heart rate, and the difference was statistically significant.

This result shows that 35.71% of the cases with blood pressure < 90 mmHg died which was significantly more as compared to 8.33% of cases with blood pressure ≥ 90 mmHg, and the difference was statistically significant and 77.77% of the cases with blood pressure < 90 mmHg had hospital stay > 10 days which was more as compared to 33.33% with Blood Pressure ≥ 90 mmHg, and the difference was statistically significant. This result indicates that, 8.57% of the cases with respiratory rate < 24 /min died which was less as compared to 33.33% of the cases with respiratory rate ≥ 24 /min, and the difference was statistically significant and 31.25% of the cases with respiratory rate < 24 /min had hospital stay > 10 days which was less as compared to 80.00% of the cases with respiratory rate ≥ 24 /min, and the difference was statistically significant.

V - SIZE OF PERFORATION

In our study 31 (51.66%) patient has perforation less or upto 1 cm size in this group in 06(19.35%) comorbid condition were present and absent in 25(88.64%) complication occurred in 16 (51.61%) patients and no complication observed in 15(48.38%) patients. **Chi Square Value was 7.05 and P Value was 0.008 which is significant.**

In 29 (48.33%) patient size of perforation was more than 1cm out of which in 10(32.25%) patients comorbid condition were present, absent in 19 (65.51%) patient, complication observed in 28(96.55%) patient and in only 01 (3.44%) patient there was no complication. **Chi Square Value was 24.7 and P Value was < 0.001 which is significant**

Similar studies: -

1] **Abdulhameed MME et al. (2016)** study shows that Size of perforation Up to 1 cm in 77 patient (77%) out of which 71 (92%) patient recovered and 6(8%) patient expired and size of perforation is more than 1 cm in 23 patient out of which 15(65%) patient recovered and 8 (35%) patient expired. Mean size of perforation is 1.29 cm and standard deviation is .518. Statistical test is 't' test and p value are 0.001 implies size of perforation influence outcome.

2] **Gupta S, et al. (2010)** study shows that Size of perforation is between 0- < 0.5 cm in 293 patient, 0.5- < 1 cm in 57 patient, 1- < 2 cm in 35 patient and more than 2 cm in 15 patients.

VI - NUMBER OF PERFORATION

Our study reveals that 50(83.33%) patients had single perforation out of which 33 (66%) patients were haemodynamically stable and 17(34%) patients were unstable, complication occurred in 35 (70%) patients and no complication found in 15(30%). In this group 42(84%) patients got discharged and 8(16%) patient expired. **Chi Square Value was 4.57 and P Value was < 0.102 which is not significant.**

In 10 (16.66%) patient's multiple perforations were found out of which only 01 (10%) patient is haemodynamically stable and 09 (90%) patients were unstable, complication occurred in 09(90%) patients and no complication were only in 01 (10%) patients. In this group 04(40%) patients got discharged and 6(60%) patient expired. **Chi Square Value was 13.1 and P Value was 0.001 which is significant**

Similar studies: -

1] **Rao R, et al. (2016)** study shows that there is single perforation in 79% patient, two perforation in 4% patient and multiple perforation in 17% patient

2] **Manikanta K S, et al. (2016)** study shows that Single

perforations were observed in 33(66%) patients, two perforations were found in 7(14%) patients, three perforations in 6(12%) patients, whereas four perforations were seen in 4(8%) patients.

VII-INTRAPERITONEAL COLLECTION

In our study intraperitoneal collection upto 500 ml is found in 36(60%) patient out of the group complication developed in 20(55.55%) patient and no complication seen in 16(44.44%) patients, haemodynamic stability seen in 28(77.77%) patients & instability present in 8(22.22%) patients, duration of hospital stay upto 14 days in 17(47.22%) and more than 14 days in 19(52.77%) patients. In this group 35(97.22%) patients got discharged and 1(2.77%) patient expired. **Chi Square Value was 25.9 and P Value was < 0.001 which is significant.**

In second group intraperitoneal collection more than 500 ml is found in 24(40%) patient out of the group complication developed in all 24(100%) patient, haemodynamic stability seen in 06(25%) patients & instability present in 18(75%) patients, duration of hospital stay upto 14 days in 10(41.66%) and more than 14 days in 14(58.33%) patients. In this group 11 (45.83%) patients got discharged and 13(54.16%) patient expired. **Chi Square Value was 42.8 and P Value was < 0.001 which is significant.**

Similar studies: -

Kamble R S, et al. (2016) Out of 50 patients 16 patients had ≥ 1000 ml of contamination out of which 5 died which was more than the patients died of having < 1000 ml contamination. There result reveals that, 8.8% of cases with < 1000 ml of contamination died which was significantly less as compared to 31.2% of cases with ≥ 1000 ml, and the difference is statistically significant and 29.0% of the cases with < 1000 ml contamination had > 10 days hospital stay which was significantly less as compared to 81.8% of cases with ≥ 1000 ml and the difference is statistically significant.

VIII- HOSPITAL STAY

In our study Most of gastric perforation 29(49.18%). Duration of hospital stay upto 14 days in 14 (48.27%) patient and more than 14 days in 15(51.72%) patient Followed by ileal perforation 22(36.66%). Duration of hospital stay upto 14 days in 11 (50%) patient and more than 14 days in 11(50%) patient Next was jejunum perforation 3(5%) Duration of hospital stay upto 14 days in 1 (33.33%) patient and more than 14 days in 02(66.66%) patient, Colon perforation seen in 3 (5%) Duration of hospital stay upto 14 days in 1 (33.33%) patient and more than 14 days in 02(66.66%) patient Appendix, rectum perforation and gastric and ileal perforation both seen in 1(1.63%) patient each of them had duration of hospital stay more than 14 days with complication present.

similar studies: -

1] **Manikanta KS, et al. (2016)** study shows that the length of hospital stay ranged from 6 days to 22 days, the average hospital stay being 13.28 days. The patients who underwent simple primary closure had an average stay of 12.7 days. Their counterparts who had the procedure of resection anastomosis had an average stay of 14.4 days

IX-COMPLICATIONS

In our study 14 out of 60 (23.33%) patients had no complications, 4 (6.66%) patient had wound infection/wound dehiscence, 5 (8.33%) patient had loss of blood and catabolism, 12 (20%) patient had pleural effusion or burst abdomen/ leak, 11 (18.33%) patient had single organ failure or Mods/ Septicemia, and 14 (23.33%) patient had death.

Similar studies: -

1] **Nabi I, et al. (2016)** study shows that the postoperative complications are wound infection 18.4%, wound dehiscence

3.9%, respiratory complications 10.5%, septicemia 5.2%, and abdominal collection 3.9%. An anastomosis leak occurred in 2.6% of patients with typhoid ileal perforation and ileocaecal tuberculosis managed by resection anastomosis in emergency surgery (Table 3). Redo surgery and tension suturing was required in 3.9% of patients. The overall mortality was 3.9%. Postoperative complications were noticed mostly in those patients who presented late with faecal peritonitis, septicemia, and associated comorbidity.

2] Manikanta KS, et al. (2016) shows that Complications occurred in 22 (44%) out of 50 cases. The common complications seen were respiratory tract infections, wound infections, wound dehiscence, and fecal fistula. Out of 50 patients wound infections seen in 19(38% of total patients) patients, wound dehiscence in 12(24% of total patients) patients, and respiratory complications in 8(16% of total patients). Faecal fistulae were seen in 8 (16% of total patients) cases. The highest complication rate was seen with resection anastomosis, out of 17 patients 13 developed complications. The least complication rates were with simple primary closure, out of 33 patients 9 developed complications. Among the 50 patients 6 patients succumbed to death. All the patients who died were undergone resection anastomosis. There was no mortality in the primary simple closure segment. Septicemia causes 04 (66.67%) patient death, faecal fistula causes 01(1.67%) patient death and acute respiratory distress syndrome causes 1 (1.67%) patient death. The mortality rate was 12%.

X-CLAVIEN-DINDO CLASSIFICATION

In our study Using the Clavien–Dindo classification, 14 out of 60 (23.33%) patients had no complications, 4 (6.66%) had grade I complication, 5 (8.33%) had grade II complications, 12 (20%) had grade III complications, 11 (18.33%) had grade IV complications, and 14 (23.33%) had grade V complication rates.

Similar studies:-

1] Singh A, et al. (2016) study shows that Using the Clavien–Dindo classification, 134 out of 350 (38.28%) patients had no complications, 63 (18%) had grade I complication, 58 (16.57%) had grade II complications, 32 (9.14%) had grade III complications, 25 (7.14%) had grade IV complications, and 38 (10.85%) had grade V complication rates Discussion Intestinal perforation is the most dreadful complication in developing countries leading to diffuse peritonitis

SUMMARY

This was an observational prospective study was carried out in Department of General Surgery, Sri Aurobindo Medical College and PG. Institute, Indore, which includes total 60 patients of perforation peritonitis admitted and treated in the department, During the period of November 2017 to May 2019. End of the study concludes the following points:

- In my study, most of the cases were between age group 20-39(50%).
- Perforation peritonitis more common in males 41 (68.33%), male: female ratio being 2.1:1.
- Comorbidities were present maximum in age group 40-59 years in (53.33%) patients and absent in (46.66%) patients. (66.66%) patients were discharged in this group and (33.33%) patients expired.
- In our study Majority of patients presented within 2-3 days from the onset of symptoms 36(60%).
- Patients who presented after 3 days from onset of symptoms 20 (33.33%) all of them had complications 20(100%). In this group 7 patient got discharged 7(35%) and 13 (65%) patients expired. P Value was <0.001 which is significant.
- In our study Most common symptoms in patients presenting with perforation is Abdominal pain in 60

(100%) patients. 45(75%) patients had constipation & obstipation, 41 (68.33%) patients had vomiting, 33(55%) of patients had fever, 17 (28.33%) patients had abdominal distensions the other common symptoms.

- Out of 60 patients, all 60(100%) patients had abdominal tenderness and guarding, 47 (78.33%) patients had absent bowel sounds, 42(70%) patients had tachycardia, 26 (43.33%) patients had hypotension, 23 (38.33%) patients had tachypnoea and 21 (35%) patients had low urinary output.
- In 16 (26.6%) patient's comorbid conditions were present, out of them 12(75%) patients presented after 3 days of onset of symptoms. 12 (75%) patients were haemodynamically unstable. In this group 07(43.75%) patients got discharged and 9(56.25%) patient expired
- In 29 (48.33%) patient size of perforation was more than 1 cm out of which in 10(32.25%) patients comorbid condition were present, absent in 19 (65.51%) patient, complication observed in 28(96.55%) patient and in only 01 (3.44%) patient there was no complication. **P Value was <0.001 which is significant**
- In 10 (16.66%) patients multiple perforations were found out of which only 01 (10%) patient is haemodynamically stable and 09 (90%) patients were unstable. Complication occurred in 09(90%) patients and no complication were only in 01 (10%) patients. In this group 04(40%) patients got discharged and 6(60%) patient expired. **P Value was 0.001 which is significant.**
- In 24(40%) patients more than 500 ml intraperitoneal collection was found, out of which complications developed in all 24(100%) patients, haemodynamic instability was present in 18(75%) patients, duration of hospital stay was more than 14 days in 14(58.33%) patients. In this group 11 (45.83%) patients got discharged and 13(54.16%) patients expired. **Chi Square Value was 42.8 and P Value was <0.001 which is significant.**
- In our study most common site of perforation was gastric perforation 30(49.18%) out of which 11 (36%) patients were managed by Graham's patch repair, 5 (45%) patient had better outcome and 6 (55%) patient had worse outcome. Modified Graham's patch repair in 19 (64%), 8 (42%) patient had better outcome and 11 (58%) patient had worse outcome. Next major group was ileal perforation 23(37.7%) was managed by primary repair 15 (65.21%), 6 (40%) patient had better outcome and 9 (60%) patient had worse outcome. Ileostomy with or without primary repair done in 03 (13.04%), all 3(100%) had worse outcome and resection and anastomosis done in 05(21.74%) patients 2 (40%) had better outcome and 3 (60%) patients had worse outcome. **P valve is significant for gastric and ileal perforation.**
- Most common procedure performed was exploratory laparotomy with modified graham's omental patch repair in 19 (31%) patients followed by primary repair in 17(27.86%) patient for ileal and jejunal perforation, graham's patch repair done in 11(18.03%) patients.
- Complication according to clavien-dindo classification 14 out of 60 (23.33%) patients had no complications, 4 (6.66%) had grade I complication, 5 (8.33%) had grade II complications, 12 (20%) had grade III complications, 11 (18.33%) had grade IV complications, and 14 (23.33%) had grade V complication rates

CONCLUSION

Perforation peritonitis is a life-threatening condition and requires urgent hospital care, resuscitation and surgery. Early resuscitation and surgery are required to decrease morbidity and mortality. Management and outcomes of perforation peritonitis depends on various factors such as perioperative and intra operative condition.

Post-operative complications increase due to comorbid

conditions, size and number of perforations and it also affects the outcome of the patient. It is observed that with the increase in contamination (intraperitoneal collection) morbidity increases.

On the basis of risk stratification in Peritonitis patients its management requires lots of expensive modalities, skill, monitoring and treatment to provide better care to the patient. For the classification of complications, a new system is proposed by Clavien–Dindo which is very helpful during perforation surgery, it is used in all over the world and facilitates in comparisons or evaluation of various surgical outcomes between different centres, therapies or surgeons. Clavien-Dindo classification helps us to distinguish a normal postoperative course and the severity of complications, which allows us to compare postoperative morbidity and evaluate the outcomes. The new classification mainly focuses on the medical perspective, with a major emphasis on the risk, type of anaesthesia and procedures or therapy used to correct a complication.

We therefore recommend the use of clavien-dindo classification of complications. We also recommend a larger study with a bigger sample size for better analysis of clavien-dindo classification of complications and to confirm the findings of our study.

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