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Demographic Factors and Clinic pathological Findings in Patients with Non-Traumatic Perforation of Gastrointestinal (GI) Tract: A Study from Rural Area of Chhattisgarh

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Abstract: Gastrointestinal (GI) perforation is an important emergency situation that usually requires prompt surgery. Present study aimed at investigating the demographic factors and clinic pathological findings in patients with non-traumatic perforation of gastrointestinal (GI) tract. This cross-sectional observational study was carried out on patients of Department of general surgery at Late Lakhiram Agrawal Memorial Government Medical College (LAMGMC) Raigarh, Chhattisgarh, India from September 2014 to August 2016. A total 100 adult subjects (both male and females) of all age groups were included in this study. Majority of the cases were diagnosed as Peptic Perforation (59%) followed by Typhoid Perforation (34%). Common-age for Peptic perforation was 41-60 years of age (54.2%), Typhoid perforation was 0-20 years of age (44.1%) and appendicular perforation was 21-40 years of age (40%). Most of the cases were male (78%), working as labor (33%), belonging to low socioeconomic status (66%) and residing in a rural area (99%). Most common Presenting complaints were a pain in the abdomen (100%), distension of abdomen (77%), constipation (76%), vomiting (48%) and fever (36%). Most common findings are pallor (70%), dehydration (64%), tachycardia (55%), hypotension (53%) Tachypnea (42%), abdominal tenderness (100%), abdominal guarding (92%), distension of abdomen (81%), bowel sounds are absent (67%).Majority of cases of perforation were of younger age, male, working as laborer, belonging to low socio-economic status and residing in the rural area, most commonly presenting with pain in abdomen and distension of abdomen, the most common finding of examination were pallor, dehydration tachycardia, abdominal tenderness, guarding and distension. Limitations of our study small sample size, lack of a control group and a lack of other parameters (other medical conditions, the effect of the drug, duration of the untreated condition, management) of GI Perforation.
Keywords: Clinic pathological Findings, Gastrointestinal (GI) Tract, Non-Traumatic Perforation, Peptic perforation, Typhoid perforation.

INTRODUCTION

Gastrointestinal (GI) perforation is an important emergency situation that usually requires prompt surgery. Prompt detection of Gastrointestinal (GI) tract perforation is important for the diagnosis of life-threatening conditions in patients with acute abdomen [1, 2]. A number of causes can lead to Gastrointestinal tract perforations (blunt or penetrating trauma, peptic ulcer, inflammatory disease, foreign body, a neoplasm or iatrogenic factors); and has variable clinical presentations, particularly in the early clinical course [3].

A peptic ulcer is the most common cause of upper gastrointestinal perforation and responsible for about 50% of all cases. Mortality rates up to 30% and mortality increases with increasing age and is significantly higher in patients who have another medical co-morbidity [2, 4]. Typhoid fever is a severe febrile illness caused primarily by the gram-negative bacillus Salmonella typhi [5]. Although intestinal hemorrhage is the most common complication of typhoid fever, intestinal perforation is the complication associated with highest morbidity and mortality [5]. Mortality rates of intestinal perforation following typhoid fever are 5% to 62% [6]. The acute appendicitis is the most common surgical disease [7]. Acute appendicitis is a common cause of abdominal pain in all ages since it occurs in 7 % of the population and has an incidence of 1.1 cases per 1.000 persons each year [8]. The obstruction of the lumen of the appendix is the main causative factor in the perforation of the appendix. The mortality and morbidity are increased in cases of perforated appendix [7, 9]. The incidence of the appendicitis is more in the younger age group and decreases with the advancing age. The male to female ratio is 1.3:1 [9].

Diagnosis largely depends on imaging examinations, and the correct diagnosis of the presence, level, and cause of perforation is imperative for appropriate patient management and surgical planning. The mainstay of treatment for bowel perforation is surgery [10]. Endoscopic, laparoscopic and laparoscopic-assisted procedures are now being increasingly performed instead of conventional laparotomy. Moreover, if any signs and symptoms of generalized peritonitis are absent and the perforation site has sealed spontaneously, then a perforated duodenal ulcer can be treated with non-surgical procedures [11].

Unfortunately, the delay in diagnosis and management lead to a poor outcome and increase mortality. Gastrointestinal tract perforations are common in this part of the country while very few studies have been done on this subject. With this background, this study was conducted to study the clinicopathology of gastrointestinal tract perforations with the primary objective of the study was to study the demographic factors and clinic pathological findings in patients with non-traumatic perforation of gastrointestinal (GI) tract among patients admitted at our institution, over a 2-year period. our study is a small step toward the future to fulfill the lacuna in this area.

MATERIALS AND METHODS

Research design

For the porous of present study cross-sectional observational design was used.

Sample and sampling technique

For the purpose of the present study the purposive sampling technique was used. Total 100 adult subjects (both male and females) of all age groups were included in this study in out of 832 in our study criterion.

Procedure

The cross-sectional observational study was carried out on patients of Department of general surgery at Late Lakhiram Agrawal Memorial Government Medical college (LAMGMC) Raigarh, Chhattisgarh which caters to a large volume of referred cases from the north-eastern part of Chhattisgarh state in India from September 2014 to August 2016.

Patient admitted to ward diagnosed with non-traumatic Gastrointestinal (GI) tract perforation of Either sex who gave informed consent were included in the study. Patients with traumatic Gastrointestinal (GI) tract perforation, other pre-existing sever general medical condition and who refuses to give informed consent were excluded from the study.

After obtaining written informed consent, a detailed history was obtained from patient and relatives, a well-designed questionnaire was used to collect the data of the recruited patients. The questionnaire included socio-demographic characteristics such as age, gender, residency, occupation, symptoms such as pain in abdomen its site nature and radiation, vomiting its frequency and nature; distension of abdomen; constipation; fever its grade and type.

A thorough general examination was carried out in each case, with special attention to pulse, respiration temperature, blood pressure, the degree of dehydration and pallor. A careful and detailed examination of the abdomen was carried out with special reference to distension of abdomen, tenderness, guarding, abdominal girth, the presence of free fluid in the peritoneal cavity; obliteration of liver dullness, rebound tenderness and bowel sounds. Per rectal examinations was done to find out any evidence of pelvic abscess e.g. bulging of anterior rectal wall, bogginess or tenderness. P/V examination in relevant female patients was carried out to detect the collection of fluid in the pouch of Douglas.

Peritoneal Paracentesis was performed. After paracentesis aspirated fluid was examined for physical appearance, odor and placed in a sterile culture tube. Microscopic examination, culture, and sensitivity of the isolated organism to the different antibiotic was determined. In general condition of the patient permitted to shift the patient to the department of radiology, the patient was submitted to scout film of the abdomen in erect posture including both domes of the diaphragm.

Statistical analysis

Demographic Factors and Clinicopathological Findings were analyzed using descriptive analysis technique and recorded as total number (n) and percentage (n%).

RESULTS

Table-1 Shows distribution of cases in Surgical wards and it reveals that total 3591 cases admitted in Surgical wards, 832 cases admitted with acute Abdomen out of which 100 cases were of non-traumatic GIT perforation (12.01% of acute abdomen, 2.78% of total admission).

Table-1: Shows distribution of cases in Surgical Wards

Total no. of admissions in Surgical wards	Total no. of admissions of acute Abdomen cases	Total no. of cases of Non- traumatic GIT perforation	% of cases of Non-traumatic GIT perforation of acute abdomen	% of cases of Non-traumatic GIT perforation of total admission
3591	832	100	12.01%	2.78%

Table-2 Shows distribution of cases (non-traumatic GIT perforation) according to etiological factors and it shows that majority of the cases were diagnosed as Peptic Perforation (59%) followed by Typhoid Perforation (34%).

Table-2: Shows distribution of cases (Non- traumatic GIT perforation) according to aetiological factors

S.N.	Aetiological Factor	No. of cases (n)	Percentage (n%)
1	Peptic Perforation	59	59
2	Typhoid Perforation	34	34
3	Appendicular Perforation	5	5
4	Others	2	2
	Total	100	100

Table-3: Shows demographic profile of cases (Non- traumatic GIT perforation)

S.N.	Demographic Factors	Peptic		Typhoid		Appendicular		Others		Total
		n = 59	n%	n = 34	n%	n = 5	n%	n = 2	n%	N = 100
1	**Age (Years)**									
	0-20	3	5.08	15	44.1	1	20	1	50	20
	21-40	16	27.1	14	41.1	2	40	0	0	32
	41-60	32	54.2	5	14.7	2	40	1	50	40
	≥ 60	8	13.5	0	0	0	0	0	0	8
2	**Sex**									
	Male	48	81.3	25	73.5	3	60	2	100	78
	Female	11	18.7	9	26.5	2	40	0	0	22
3	**Occupation**									
	Labourer	19	32.2	12	35.3	2	40	0	0	33
	Farmer	19	32.2	7	20.6	1	20	1	50	28
	Housewife	11	18.6	6	17.6	1	20	0	0	18
	Govt. Employee	7	11.9	0	0	0	0	0	0	7
	Student	1	1.7	6	17.6	1	20	0	0	8
	Others	2	3.4	3	8.8	0	0	1	50	6
4	**Socio-Economic Status**									
	Lower	39	66.1	23	67.6	3	60	1	50	66
	Middle	20	33.9	11	32.4	2	40	1	50	34
	Upper	0	0	0	0	0	0	0	0	0
5	**Residence**									
	Rural	54	91.5	30	88.2	5	100	2	100	91
	Urban	5	8.5	4	11.7	0	0	0	0	9

Table-3 Shows demographic profile of cases (Non- traumatic GIT perforation) and it shows that majority of cases of Peptic perforation were of 41-60 years of age (54.2%), Typhoid perforation were of 0-20 years of age (44.1%) followed by 21-40 years of age (41.1%) and Appendicular perforation were of 21-40 years of age (40%) and 41-60 years of age (40%). Most of the cases were male (78%), working as labor (33%), belonging to low socioeconomic status (66%) and residing in a rural area (99%).

Table-4: Shows presenting Complaints of cases (Non- traumatic GIT perforation)

S.N.	Presenting Complaints	Peptic		Typhoid		Appendicular		Others		Total
		n = 59	n%	n = 34	n%	n = 5	n%	n = 2	n%	N = 100
1	Pain in abdomen	59	100	34	100	5	100	2	100	100
2	Distension of abdomen	45	76	26	76	4	80	2	100	77
3	Constipation	46	78	24	71	4	80	2	100	76
4	Vomiting	27	46	17	50	2	40	2	100	48
5	Fever	7	12	26	76	2	40	1	50	36
6	Retention of urine	5	8	1	3	1	20	0		7
7	Diarrhoea	2	3	1	3	0	0	0		3

Table-4 Shows Presenting Complaints of cases (non- traumatic GIT perforation) and it shows that majority of cases were presented with complaints of pain in abdomen (100%), distension of abdomen (77%), constipation (76%), vomiting (48%) and fever (36%).

Table-5: Shows general Examination of cases (Non- traumatic GIT perforation)

S.N.	Signs	Peptic		Typhoid		Appendicular		Others		Total
		n = 59	n%	n = 34	n%	n = 5	n%	n = 2	n%	N = 100
1	Dehydration	35	59.3	25	73.5	3	40	2	100	64
2	Tachycardia	31	52.5	23	67.6	1	20	0	0	55
3	Hypotension	24	40.7	26	76.5	2	40	1	50	53
4	Tachypnea	24	40.7	16	47	2	40	0	0	42
5	Pallor	42	71.2	26	76.5	3	60	1	50	70
6	Icterus	0	0	1	3	0	0	0	0	1

Table-5 Shows general examination of cases (non- traumatic GIT perforation) and it shows that majority of cases having signs of pallor (70%), dehydration (64%), tachycardia (55%), hypotension (53%) and Tachypnea (42%).

Table-6: Shows local Examination of cases (Non- traumatic GIT perforation)

S.N.	Signs	Peptic		Typhoid		Appendicular		Others		Total
		n = 59	n%	n = 34	n%	n = 5	n%	n = 2	n%	N = 100
1	Distension of Abdomen	48	81.5	26	76.5	5	100	2	100	81
2	Abdominal tenderness	59	100	34	100	5	100	2	100	100
3	Abdominal guarding	54	91.5	33	97.1	4	80	1	50	92
4	Rebound tenderness	5	8.5	6	17.6	4	80	0	0	15
5	Obliterated Liver dullness	28	47.5	15	44.2	0	0	1	50	44
6	Free fluid in peritoneal cavity	19	32.2	17	50	0	0	1	50	37
7	Bowel sound									
	I. Absent	40	67.8	25	73.5	2	40	0	0	67
	II. Sluggish	19	32.2	8	23.5	3	60	1	50	29
	III. Exaggerated	0	0	1	3	0	0	1	50	2
8	P/R Examination									
	I. Ballooning	43	72.9	29	85.3	3	60	2	100	77
	II. Bogginess	25	42.4	12	35.4	2	40	0	0	39

Table-6 Shows local examination of cases (non- traumatic GIT perforation) and it shows that majority of cases having abdominal tenderness (100%), abdominal guarding (92%), distension of abdomen (81%), bowel sounds are absent (67%), P/R examination shows ballooning (77%), obliterated liver dullness (44%) and free fluid in peritoneal cavity (37%).

Table-7: Shows Radiological Investigation (Plain X-Ray Abdomen)

S.N.	Findings	Peptic		Typhoid		Appendicular		Others		Total
		n = 59	n%	n = 34	n%	n = 5	n%	n = 2	n%	N = 100
1	Ground glass opacity	50	84.74	28	82.34	2	40	1	50	81
2	Gas under diaphragm	46	77.96	19	5.88	0	0	1	50	66
3	Gas under diaphragm + Fluid level	4	6.77	6	7.64	0	0	1	50	11
4	Fluid levels with distended loops of intestine	2	3.8	3	8.8	3	60	0	0	8
5	No gas or Fluid level only haziness	2	3.8	2	5.88	2	40	0	0	6

Table-7 Shows findings of Radiological investigation (Plain X-Ray Abdomen) of cases (non-traumatic GIT perforation) and it shows that most of the cases having ground glass opacity (81%), gas under the diaphragm (66%) and gas under diaphragm with fluid level (11%).

Table-8: Shows peritoneal Tapping of cases (Non- traumatic GIT perforation)

S.N.	Paracentesis	Peptic		Typhoid		Appendicular		Others		Total
		n = 59	n%	n = 34	n%	n = 5	n%	n = 2	n%	N = 100
	No. of cases	59	59	34	34	5	5	2	2	100
I.	Positive tap	40	67.8	31	91.2	4	80	2	100	77
II.	Negative tap	19	32.2	3	8.8	1	20	0	0	23

Table-8 Shows findings of Peritoneal tapping of cases (non- traumatic GIT perforation) and it shows that most of the taping (77%) were positive (peptic 67.8%, typhoid 91.2%, appendicular 80% and others 100%).

Table-9 Shows physical appearance of Peritoneal fluid and it shows that most of the samples were purulent (45 %) and serous (10%).

Table-9: Shows physical appearance of Peritoneal fluid

S.N.	Appearance	Peptic		Typhoid		Appendicular		Others		Total
		n = 59	n%	n = 34	n%	n = 5	n%	n = 2	n%	N = 100
1	Purulent	21	35.5	21	67.7	2	40	1	50	45
2	Serous	8	13	2	5.88	0	0	0	0	10
3	Serosanguinous	1	1.69	3	8.82	2	40	1	50	7
4	Bilious	6	10.16	1	2.94	0	0	0	0	7
5	Purulent bile stained	3	5.09	1	2.94	0	0	0	0	4
6	Faeculent	1	1.69	3	8.82	0	0	0	0	4

Table-10 Shows microscopic appearance of Peritoneal fluid and it shows that most of the samples were loaded with pus cells/HPF (39%).

Table-11 Shows culture pattern of Peritoneal fluid and it shows that in most of the samples E. coli (42%), Klaeruginosa (15%) and Ps. Aeruginosa (7%) were isolated.

Table-10: Shows microscopic examination of Peritoneal fluid

S.N.	Findings	Peptic		Typhoid		Appendicular		Others		Total
		n = 59	n%	n = 34	n%	n = 5	n%	n = 2	n%	N = 100
1	Loaded with pus cells/HPF	19	32.1	17	50.00	2	40	1	50	39
2	Few pus cells /HPF	10	16.94	5	14.7	0	0	0	0	15
3	Loaded with pus cells + RBS/HPF	3	5.08	5	14.7	2	40	0	0	10
4	Few pus cells+ RBS /HPF	8	13.55	4	11.76	0	0	1	20	13

Table-11: Shows culture pattern of Peritoneal fluid

S.N.	Organism isolated	Peptic		Typhoid		Appendicular		Others		Total
		n = 59	n%	n = 34	n%	n = 5	n%	n = 2	n%	N = 100
1	E. coli	18	30.50	19	55.89	3	75	2	100	42
2	Klaeruginosa	9	15.25	5	14.70	1	25	0	0	15
3	Ps. Aeruginosa	3	5.08	4	11.76	0	0	0	0	7
4	Str. Viridance	1	1.69	0	0	0	0	0	0	1
5	Staph. Aureus	1	1.69	1	2.94	0	0	0	0	2
6	Str. Pyocyaneus	1	1.69	0	0	0	0	0	0	1
7	Sterile	7	11.86	2	5.88	0	0	0	0	9

DISCUSSION

Gastrointestinal (GI) perforation is an emergency situation that usually requires prompt surgery. Prompt detection of Gastrointestinal (GI) tract perforation is important for the diagnosis of life-threatening conditions in patients with acute abdomen [1, 2].

Our study reveals that a significant number of cases admitted with acute Abdomen were of non-traumatic GIT perforation (12.01%) and diagnosed with Peptic Perforation and Typhoid Perforation. Majority of cases of Peptic perforation were of 41-60 years of age, Typhoid perforation was of 0-40 years of age and Appendicular perforation was of 21-60 years of age. Majority of cases were male, working as laborer, belonging to low socio-economic status and residing in the rural area. Studies conducted by Søreide, Thorsen, Harrison, Bingener, Møller, Ohene-Yeboah *et al*., [4]; Van Leerdam [2]; Hosoglu, Aldemir, and Akalin *et al*., [5] also shows similar findings and they concluded that the Peptic ulcer is the most common cause of upper gastrointestinal perforation and responsible for about 50% of all cases. Mortality rates are up to 30% which

increases with increasing age and is significantly higher in patients with another medical co-morbidity [2, 4]. Typhoid fever is a severe febrile illness caused primarily by the gram-negative bacillus Salmonella typhi [5]. Intestinal perforation of typhoid fever is associated with higher rate of morbidity and mortality [5]. Typhoid perforation was more common in the low socio-economic group as they are more prone to consuming contaminated water with urine and fecal matter.

Our findings are in line with studies conducted by Alvarado [8]; Voermans, Le Moine, Von Renteln, Ponchon, Giovannini, Bruno *et al*., [9] and Furukawa, Sakoda, Yamasaki, Kono, Tanaka, and Nitta *et al.*, [7], They concluded that acute appendicitis occurs in all age groups and occurs in about 7 % of the population [8], the incidence of appendicitis is more in the younger age group compared to old age and the male to female ratio is around 1.3:1 [9].

Our study findings show that most common presenting complaints were a pain in the abdomen, distension of abdomen, constipation, vomiting, and fever. General examination cases reveal that majority of cases having pallor, dehydration, tachycardia, hypotension, and Tachypnea. Local examination shows that majority of cases having abdominal tenderness, abdominal guarding, distension of abdomen, absent bowel sounds, P/R examination shows ballooning, obliterated liver dullness and free fluid in the peritoneal cavity. Studies by Marsicovetere, Ivatury, White, & Holubar [12]; Alvarado [8]; Kordzadeh, Melchionda, Rhodes, Fletcher, & Panayiotopolous [13]; Kassir, Boueil-Bourlier, Baccot, Abboud, & Dubois *et al*., [14] concluded that flatulent dyspepsia, epigastric pain, abdominal discomfort, anorexia, and nausea or vomiting, tenderness in the right lower quadrant, diffuse abdominal tenderness, rebound pain (blumberg sign), decreased or absent bowel sounds, elevation of the temperature (oral temperature of 37.3^0 c or more) and leukocytosis are the most common presenting symptoms and findings of GI perforation. Radiological investigation (Plain X-Ray Abdomen) shows that most of the cases having ground glass opacity, gas under diaphragm and gas under diaphragm with fluid level and Computed tomography (CT) remained the investigative modality of choice [13].

Findings of Peritoneal tapping shows that most of the taping were positive and physical appearance was purulent and serous. Microscopic appearance of Peritoneal fluid shows that most of the samples were loaded with pus cells/HPF. Culture pattern shows E. coli, Klaeruginosa and Ps. Aeruginosa were isolated in most of the samples. A study by Reuken, Kruis, Maaser, Teich, Büning, & Preiß *et al.*, [15] also revealed that the most common microbial pathogens isolated were *E. coli*, *Streptococcus* spp., Enterococci, Candida, and anaerobes. Resistance to third-generation cephalosporins, penicillins with beta-lactamase inhibitors and quinolones were observed in most of the patients, these findings are in line with our study results.

CONCLUSION

Gastrointestinal (GI) perforation is an emergency situation that usually requires prompt surgery. Majority of cases of perforation were of younger age, male, working as laborer, belonging to low socio-economic status and residing in the rural area, most commonly presenting with pain in abdomen and distension of abdomen, most common finding of examination were pallor, dehydration tachycardia, abdominal tenderness, guarding and distension. Radiological investigation (Plain X-Ray Abdomen) shows ground-glass opacity, gas under diaphragm and gas under diaphragm with the fluid level. Most of the Peritoneal tapping were positive, purulent, loaded with pus cells/HPF and culture pattern shows E. coli, Klaeruginosa and Ps. Aeruginosa.

Despite our best effort, there are limitations of our study, which includes Small sample size, lack of a control group and a lack of other parameters (other medical conditions, the effect of the drug, duration of the untreated condition, management) of GI Perforation. These limitations can be overcome in the future studies.

CONFLICT OF INTEREST

The authors declare no conflicts of interest in this work

REFERENCES

1. Devi PS, Manikantan G, Chisthi MM. Gastrointestinal perforations: a tertiary care center experience. International Surgery Journal. 2017 Jan 25;4(2):709-13.
2. Van Leerdam ME. Epidemiology of acute upper gastrointestinal bleeding. Best Practice & Research Clinical Gastroenterology. 2008 Apr 1;22(2):209-24.
3. Coppolino FF, Gatta G, Di Grezia G, Reginelli A, Iacobellis F, Vallone G, Giganti M, Genovese EA. Gastrointestinal perforation: ultrasonographic diagnosis. Critical Ultrasound Journal. 2013 Dec 1;5(S1):S4.
4. Søreide K, Thorsen K, Harrison EM, Bingener J, Møller MH, Ohene-Yeboah M, Søreide JA. Perforated peptic ulcer. The Lancet. 2015 Sep 26;386(10000):1288-98.
5. Hosoglu S, Aldemir M, Akalin S, Geyik MF, Tacyildiz IH, Loeb M. Risk factors for enteric perforation in patients with typhoid fever. American journal of epidemiology. 2004 Jul 1;160(1):46-50.
6. Jain S, Meena LM, Ram P. Surgical management and prognosis of perforation secondary to typhoid fever. Tropical Gastroenterology. 2017 Jun 1;37(2):123-8.

7. Furukawa A, Sakoda M, Yamasaki M, Kono N, Tanaka T, Nitta N, Kanasaki S, Imoto K, Takahashi M, Murata K, Sakamoto T. Gastrointestinal tract perforation: CT diagnosis of presence, site, and cause. Abdominal imaging. 2005 Oct 1;30(5):524-34.
8. Alvarado A. How to improve the clinical diagnosis of acute appendicitis in resource limited settings. World Journal of Emergency Surgery. 2016 Dec;11(1):16.
9. Voermans RP, Le Moine O, Von Renteln D, Ponchon T, Giovannini M, Bruno M, Weusten B, Seewald S, Costamagna G, Deprez P, Fockens P. Efficacy of endoscopic closure of acute perforations of the gastrointestinal tract. Clinical Gastroenterology and Hepatology. 2012 Jun 1;10(6):603-8.
10. Khattak S, Aslam S, Kamal A. Acute appendicitis: an audit of 663 cases. Gomal Journal of Medical Sciences. 2010 Dec 31;8(2).
11. Anandaravi BN, Ramaswami B. Appendicular perforation and its contributing factors. International Surgery Journal. 2017 May 24;4(6):2007-9.
12. Marsicovetere P, Ivatury SJ, White B, Holubar SD. Intestinal Intussusception: Etiology, Diagnosis, and Treatment. Clinics in colon and rectal surgery. 2017 Feb;30(1):30-9.
13. Kordzadeh A, Melchionda V, Rhodes KM, Fletcher EO, Panayiotopolous YP. Blunt abdominal trauma and mesenteric avulsion: a systematic review. European Journal of Trauma and Emergency Surgery. 2016 Jun 1;42(3):311-5.
14. Kassir R, Boueil-Bourlier A, Baccot S, Abboud K, Dubois J, Petcu CA, Boutet C, Chevalier U, Montveneur M, Cano MI, Ferreira R. Jejuno–ileal diverticulitis: Etiopathogenicity, diagnosis and management. International journal of surgery case reports. 2015 Jan 1;10:151-3.
15. Reuken PA, Kruis W, Maaser C, Teich N, Büning J, Preiß JC, Schmelz R, Bruns T, Fichtner-Feigl S, Stallmach A. Microbial spectrum of intra-abdominal abscesses in perforating Crohn's disease: Results from a prospective German Registry. Journal of Crohn's and Colitis. 2018 Feb 5.