



## Original Article

## Surgical management of abdominal tuberculosis: A prospective single-center study

Mithun Barot<sup>a</sup>, Vipul D. Yagnik<sup>b\*</sup>, Kirankumar Patel<sup>a</sup>, Sushil Dawka<sup>c</sup>

<sup>a</sup>Department of Surgery, Pramukhswami Medical College, Karamsad, Gujarat, India, <sup>b</sup>Department Surgical Gastroenterology, Nishtha Surgical Hospital and Research Centre, Patan, Gujarat, India, <sup>c</sup>Department of Surgery, SSR Medical College, Belle Rive, Mauritius

## ABSTRACT

**Objective:** Tuberculosis (TB) can affect any part of the gastrointestinal tract. It is estimated that in 2018, 10 million people were affected with TB worldwide and there were 1.2 million TB deaths among human immunodeficiency virus-negative people. India has the highest TB burden in the world (27%), a significant proportion of which are of intestinal TB. The aims of this study were to assess clinical features and investigations for the diagnosis of abdominal TB and to analyze its various surgical manifestations and its management. **Materials and Methods:** From October 1, 2014, to October 30, 2016, a total of 50 patients meeting the inclusion criteria for the study, age between 15 and 65 years and diagnosis of symptomatic intestinal TB requiring surgery, were enrolled in the study. We used descriptive statistics to analyze the data. **Results:** Abdominal TB was most commonly seen in young adults. Intestinal obstruction was the most frequent presentation. The most common site of involvement in the present study was the ileum. Ultrasonography (USG) and X-ray were an integral part of the diagnosis, with computed tomography (CT) scan being rarely required. Although both anemia and erythrocyte sedimentation rate (ESR) are nonspecific, they may help in supporting the clinical and pathological findings. Most operations were elective, with intestinal obstruction being the most common indication and resection and end-to-end anastomosis performed most often. Histopathological examination was performed in all patients and showed caseating granuloma in 90% of cases, while 10% of cases had chronic noncaseating granulomas with ill-defined aggregates of epithelioid histiocytes. **Conclusion:** Abdominal TB causes a significant problem in diagnosis due to nonspecific symptomatology and lack of specific laboratory tests. USG and X-ray were an integral part of the diagnosis. CT scan is rarely required. Although anemia and ESR are both nonspecific features, they may help in supporting the clinical and pathological findings. The most common site of involvement in the present study was the ileum. Intestinal obstruction was the most common indication for operation, with resection and end-to-end anastomosis being the most common operation. The mainstay of treatment is medical therapy and timely surgical intervention is required in a sizable number of patients.

**KEYWORDS:** Abdominal tuberculosis, Ileum, Intestinal obstruction, Strictures, Surgery

Submission : 11-Aug-2020  
Revision : 21-Sep-2020  
Acceptance : 17-Oct-2020  
Web Publication : 24-Dec-2020

## INTRODUCTION

Globally, an estimated 10 million people contracted tuberculosis (TB) in 2018 with an estimated 1.2 million TB deaths among HIV-negative people in 2018 [1]. Eight countries accounted for two-thirds of the global total: India has the highest TB burden in the world (27%), followed by China (9%) [1]. TB can affect any part of the gastrointestinal tract. Intestinal TB may occur via reactivation of latent TB or by the ingestion of *Mycobacterium tuberculosis*. In the presence of active pulmonary TB or miliary TB, it may develop via hematogenous spread, via the contiguous spread of TB from

adjacent organs, or via lymphatic spread [2]. Abdominal TB usually occurs in four forms: tuberculous lymphadenopathy, peritoneal disease, intestinal TB, and visceral TB involving the solid organs. Often, a combination of these findings occurs in any individual patient. The diagnosis of extrapulmonary TB can be difficult as it presents with nonspecific clinical and radiological features and requires a high degree of suspicion

## \*Address for correspondence:

Dr. Vipul D. Yagnik,  
Department of Surgical Gastroenterology, Nishtha Surgical Hospital and  
Research Centre, Patan - 384 265, Gujarat, India.  
E-mail: vipul.yagnik@gmail.com

Access this article online	
Quick Response Code: 	Website: <a href="http://www.tcmjmed.com">www.tcmjmed.com</a>
	DOI: 10.4103/tcmj.tcmj_206_20

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Barot M, Yagnik VD, Patel K, Dawka S. Surgical management of abdominal tuberculosis: A prospective single-center study. Tzu Chi Med J 2021;33:282-7.

for diagnosis. Abdominal TB, which is not as common as pulmonary TB, can cause significant morbidity and mortality. It is usually diagnosed late due to its nonspecific clinical presentation. Hence, it is essential to identify these lesions with a high index of suspicion, especially in endemic areas for early diagnosis and treatment. Abdominal TB is mainly a disease to be treated medically if possible and all efforts should be made to avoid surgery unless indicated. Whether tuberculous strictures resolve with antitubercular treatment (ATT) or not is controversial. A few studies state that the symptoms abate, but strictures remain in most patients [3,4]. Patel and Yagnik suggested that most intestinal tuberculous lesions, including strictures, resolve with ATT, suggesting that strictures are inflammatory rather than fibrotic [5]. Therefore, early diagnosis and management can prevent unnecessary surgical intervention. The aim of our research was to assess clinical features, investigation, and various surgical manifestation and its management.

## MATERIAL AND METHODS

This prospective study was conducted in the Department of General Surgery, B.J. Medical College and Civil Hospital, Ahmadabad, over 2 years. The study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Ethics Committee (IEC/certi/186/16), B.J. Medical College & Civil Hospital, Ahmadabad. Written informed consent was obtained from all patients before enrollment. From October 1, 2014, to October 30, 2016, a total of 50 patients were admitted from routine outpatients department (OPD) and emergency surgical departments meeting the inclusion criteria for the study: age between 15 and 65 years and diagnosed with symptomatic intestinal TB requiring surgery.

The aims of the study were to assess clinical features and investigations for the diagnosis of abdominal TB and to study its various surgical manifestations and its management. All patients were subjected to X-ray chest and ultrasonography (USG) of the abdomen along with routine blood investigation including erythrocyte sedimentation rate (ESR). Abdominal computed tomography (CT) was performed in case of chronic intestinal obstruction. We did not perform CT scan abdomen in all patients with obstruction, as in case of acute intestinal obstruction, we feel that this unnecessarily delays operation without significantly impacting management. We suspected abdominal TB on the basis of clinical presentation, laboratory, and radiological findings. Patients underwent either laparotomy or laparoscopy. Histopathology was performed in all patients. Chronic granulomatous inflammation and caseation necrosis along with the presence of giant cells were our diagnostic criteria. In the postoperative period, all the patients were placed on ATT category 1 (6 months) according to the Revised National Tuberculosis Control Program and followed up for 15 days, 21 days, 1 month, 3 months, and 6 months.

## RESULTS

During the study, 50 patients were seen. The median age at presentation was 32.24 years (range 17–65 years), and

26 patients were male. Most commonly involved age group was 21–30 years (40%). Both genders were almost equally affected (1.04:1). None of the patients had any history of previous treatment with ATT.

All 50 patients presented with abdominal pain [Table 1]. An abdominal lump was palpable in five patients (10%). All patients underwent USG and X-ray abdomen and chest. An abdominal CT examination was done in three patients. Thirty-seven patients had intestinal obstruction showing air–fluid levels in the X-ray. Free gas suggesting pneumoperitoneum was noted in three patients. USG revealed dilated and fluid-filled bowel loops in 74% of patients, mass in right iliac fossa (RIF) in ten patients, mesenteric lymphadenopathy in eight, and free fluid with internal septation in three. Contrast-enhanced CT abdomen revealed pulled-up cecum in all three patients. Twenty-seven patients (54%) were anemic, while 40 (80%) had raised ESR, though only 16 (32%) had neutrophilia. X-ray chest was positive for TB in only 8% of cases, which suggests recent active infection. Risk factors were present in 20 (40%) patients. Eight patients had diabetes, five had malnutrition, four were on corticosteroids for more than 1 month, two had head and neck malignancy, and one patient had end-stage renal disease.

Eighteen patients underwent emergency surgery [Table 2], with the most common indication being intestinal obstruction in 15 patients followed by perforation [Figure 1] and peritonitis. Thirty-two patients underwent an elective

**Table 1: Clinical features and investigations**

Clinical features	Numbers of patients (n=50), n (%)
Abdominal pain	50 (100)
Nausea/vomiting	30 (60)
Constipation	25 (50)
Fever	23 (46)
Abdominal distension	19 (38)
Weakness	15 (15)
Weight loss	10 (20)
Alternating bowel habits	8 (16)
Diarrhea	7 (14)
Lump in the abdomen	5 (10)
Laboratory investigations	
Raised ESR	40 (80)
Neutrophilia	16 (32)
Hemoglobin <10 g (%)	27 (54)
Radiological investigations	
X-ray findings	
Air fluid level (X-ray abdomen)	37 (74)
Pneumoperitoneum	3 (6)
Active Koch's (X-ray Chest)	4 (8)
Ultrasonography	
Dilated and fluid filled bowel loop	37 (74)
Mass in RIF	10 (20)
Mesenteric lymph node	8 (16)
Free fluid with septation	3 (6)
CECT abdomen and pelvis	
Pulled cecum	3 (6)

ESR: Erythrocyte sedimentation rate, RIF: Right iliac fossa, CECT: Contrast-enhanced computed tomography

**Table 2: Operative findings and procedures**

Emergency versus elective	Number of patients (n=50), n (%)
Elective	32 (64)
Emergency	18 (36)
Site (intestinal/extraintestinal)	
Intestinal	37 (74)
Small bowel	16 (43.24)
Ileocecal region	13 (35.13)
Small bowel+colon	7 (18.91)
Large bowel	1 (2.70)
Extraintestinal but intra-abdominal	13 (36)
Operative findings	
Stricture (s)	26* (52)
Bands and adhesion	13 (26)
Ileocecal mass and mesenteric thickening	10 (20)
Mesenteric lymphadenitis	8 (16)
Multiple tubercles	3 (6)
Bowel perforation	3 (6)
Peritoneal adhesion with cocoon formation	2 (4)
Operative procedure	
Resection and end-to-end anastomosis	20 (40)
Adhesiolysis and evacuation of pus and biopsy	15 (30)
Limited ileocolic resection with ileoascending anastomosis	5 (10)
Right hemicolectomy	5 (10)
Diagnostic laparoscopic only	3 (6)
Stricturoplasty	1 (2)
Ileostomy with closure of ileostomy after 6 months	1 (2)

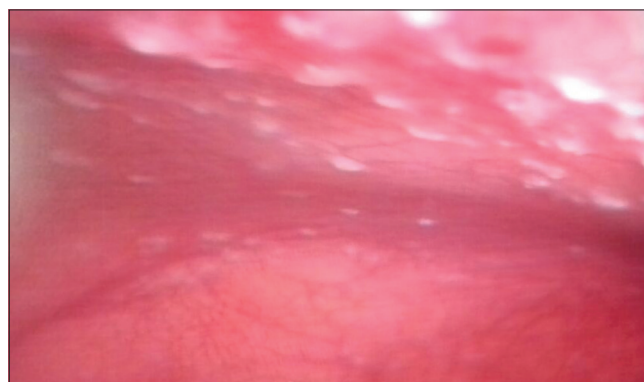
\*Of 26 patients with strictures, 13 had strictures at multiple sites

procedure. Overall, the most common indication for surgery was intestinal obstruction. Thirty-seven patients had intestinal disease, while the remaining 13 had intra-abdominal but extraintestinal disease. The most commonly involved part in our series was the ileum in 43.24% of patients. The ileocecal valve was involved in 35.13% of patients. Extraintestinal but intra-abdominal TB (26%) presents with mesenteric lymph nodes (16%), multiple peritoneal tubercle [Figure 2] (6%), and adhesion with cocoon formation (4%). 18 (36%) patients were either on ATT or had been in the past.

Out of 50 patients, 47 underwent exploratory laparotomy, and three patients underwent diagnostic laparoscopy [Table 2]. On exploration, stricture was the most common finding, being present in 26 patients, all being of the small bowel. Of these, 13 patients had multiple strictures. The most commonly performed operation in the study was resection with end-to-end anastomosis in 20 patients, followed by adhesiolysis and evacuation of pus in 15 patients. In five patients with RIF mass, limited ileocolic resection [Figure 3] with ileoascending anastomosis was performed, the rationale for the conservative surgery being that TB is fundamentally a systemic disease. Diagnostic laparoscopy was performed in patients with normal X-ray and infective collection on USG. At laparoscopy, we noted multiple ileal tubercles with turbid fluid and biopsy was taken. Diagnostic laparoscopy was performed in three patients.



**Figure 1:** Ileal perforation secondary to tuberculosis



**Figure 2:** Diagnostic laparoscopy revealed multiple peritoneal tubercle



**Figure 3:** Limited ileocolic resection for tuberculosis

The incidence of postoperative complications was 24%, with the most common being wound infection 12%, followed by chest infection and burst abdomen.

Histopathological examination was performed in all patients and showed caseating granuloma in 90% of cases, while 10% cases had chronic granuloma without caseation with ill-defined aggregates of epithelioid histiocytes. Of the

50 patients, only 2 were demonstrated as ZN stain positive. All patients were diagnosed as having TB.

All patients were given ATT for 6 months and followed up; complete resolution of symptoms and gain in weight was noted in all patients.

## DISCUSSION

Abdominal TB is an infection of the gastrointestinal tract, peritoneum, solid abdominal viscera, or abdominal lymphatics with *M. tuberculosis* [6]. Risk factors include cirrhosis, HIV, diabetes, malignancy, chemotherapy, and peritoneal dialysis.

In the current study, we describe the demographic characteristics, clinical features, laboratory findings, operative findings, operative procedure, and complications associated in a surgical candidate with abdominal TB in a tertiary center. The disease commonly affects young adults, and males and females are equally affected [7,8]. In our study, abdominal TB was most commonly seen in the 3<sup>rd</sup> decade with a mean age of 29.58 years and the male:female ratio was 1.04:1.

Abdominal TB is noted for its varied clinical presentation. It can mimic many clinical gastrointestinal conditions, presenting as acute, chronic, acute-on-chronic, or even incidentally. Still, in this study, we included only acute or acute-on-chronic problems with only three cases of chronic intestinal obstruction. The most common symptom is abdominal pain (in all patients), followed by nausea/vomiting, constipation, fever, and abdominal distention. In this study, 37 patients presented with intestinal obstruction, 3 patients presented with perforation, and 10 patients had ileocecal mass (seven patients with mass had intestinal obstruction).

Abdominal TB poses a considerable diagnostic challenge due to nonspecific symptoms, diagnostics, and findings. Moreover, a variety of investigations are required for abdominal TB diagnosis. As we included only surgical patients referred to us or directly presenting to our department, we did not perform routine diagnostic methods such as colonoscopy and biopsy and gene Xpert for luminal TB, [5] ascitic fluid analysis with ADA measurement for tubercular ascites, or diagnostic laparoscopy for mesenteric lymph node biopsy. We included only those patients who required surgical intervention based on X-ray and USG findings as well as clinical presentation.

Laboratory investigations are nonspecific and unhelpful in the diagnosis of abdominal TB. Clinical awareness and a high index of suspicion are mandatory for diagnosis [9]. Over half of our patients were anemic. In a few studies, the incidence of anemia in patients with TB was as high as 80% [10,11]. Malabsorption, nutritional deficiency, and suppression of erythropoiesis by inflammatory mediators are responsible for anemia in TB [12]. The ESR is often moderately raised in 79.3% of patients in abdominal TB [13]. We found the prevalence of raised ESR to be as high as 80% in our study. Neutrophilia is uncommon; 32% of our patients had neutrophilia. Shi *et al.* observed anemia and raised ESR in 64.7% and 72%, respectively [14]. Anemia and ESR are nonspecific parameters deranged in many chronic conditions,

including abdominal TB, but they may be of help in supporting other clinical, radiological, and pathological findings [15].

USG abdomen is part of the initial investigation panel in abdominal TB [16]. In a recent review, an abdominal ultrasound was found abnormal in 68% of cases [17]. USG abdomen was abnormal in all our cases. X-ray chest was positive for TB in only 8% of cases, suggesting recent active infection. CT scan abdomen was performed in only three cases, which showed pulled-up cecum. CT scan findings suggestive of abdominal TB were mesenteric/omental stranding (50%), ascites (37%), and retroperitoneal lymphadenopathy (31%) [17]. Although CT scan abdomen is routine in some countries, we do not routinely perform abdominal CT as it would not change our decision for exploratory laparotomy and only add to cost and delay.

Risk factors were present in 20 patients. Thirty patients did not have any risk factors; thus, the incidence in the present study was 40%.

Recent studies suggest that routine antitubercular chemotherapy for 6 months is useful for treating patients with abdominal TB [18]. As many as 85% of the cases of intestinal TB can be managed with medical treatment; surgery is indicated only in 15% of cases for perforation, obstruction, bleeding, abscess, etc. [19]. About 20%–40% of patients of abdominal TB present with an acute abdomen and require emergency surgery [20]. The patients with subacute obstruction initially can be managed conservatively, and surgery can be planned electively. Recent studies show that most patients (76%) of abdominal TB require emergency surgery [21]. In our study, the majority of patients (64%) required elective surgery, with the most common indication for emergency surgery being intestinal obstruction in 15 patients followed by perforation in 3. Our findings differed from other recent studies and showed that most patients could be operated on an elective basis.

The most common involved site is the ileocecal region, affected in 75% of cases [6]. Wani *et al.* also reported that the ileocecal region was the most common most common site [22]. However, our study contradicts this finding, as the most commonly involved part in our patients was the ileum (43.24%). The ileocecal valve was involved in 35.13% of cases. Extraintestinal but intra-abdominal TB (26%) presents with mesenteric lymph nodes (16%), multiple peritoneal tubercles (6%), or adhesion with cocoon formation (4%).

There are many surgical options for the management of abdominal TB, depending on operative findings. Stricture was the most common finding in our study, being present in 26/50 patients, all being small bowel strictures. Majority of the intestinal lesions resolve with ATT. A few studies indicate that even strictures resolve with routine ATT and suggest that stricture are inflammatory rather than fibrotic [5,23]. Aggarwal *et al.* reported that only 25% of the patients with stricture respond well to ATT, and it depends upon the location of the stricture [4].

Tubercular perforations are mostly ileal and proximal to a stricture. In our study too, all three perforations were

proximal to a stricture. If perforation and stricture are close to one another, segmental resection is performed [24]. If the stricture is distant, it can be dealt with by stricturoplasty or resection, depending on its length, and the perforation can be closed in layers [22]. Our patients had perforation close to strictures. Therefore, we performed resection with end-to-end anastomosis as recommended [24].

Multiple strictures were seen in half of our patients with stricture. Multiple stricture is an indication for resection and anastomosis [25,26]. Because of the risk of malabsorption and obstruction, bypass procedures such as ileotransverse anastomosis are not performed nowadays [7]. The most commonly performed operation in the study was resection with end-to-end anastomosis in 20 patients, followed by adhesiolysis and evacuation of pus in 15 patients. Multiple strictures are less likely to respond to ATT than that of single stricture [4,9,23]. Despite high failure rates, ATT remains the first line of treatment. Failure of treatment and obstruction are indications for surgery [27]. Right hemicolectomy or limited ileocolic resection with ileoascending anastomosis was performed in 5 patients each due to RIF mass. Therefore, patients with abdominal TB can either be managed with ATT, endoscopic measures, or surgery. Colonoscopic intervention is difficult in small bowel lesions, particularly stricture.

Ahmed *et al.* recommended histopathology for diagnosing TB, and, in a high TB prevalent area, it is a reliable gold standard [28]. They also concluded that in endemic areas, the majority of granulomatous lesions without necrosis should be considered to be TB and suggested more specific tests such as TB-polymerase chain reaction or immunohistochemistry for diagnosis in developed countries [28]. Caseation necrosis is particularly associated with *M. tuberculosis* and has been found to be more specific and sensitive [29]. Being in a high TB prevalent area, we rely on histopathology for the diagnosis of TB. We observed chronic caseating granulomatous inflammation in 90% of our patients. In 10% of cases, we noticed chronic granuloma without caseation and with ill-defined aggregates of epithelioid histiocytes. Of the 50 patients, only 2 proved ZN stain positive.

Twelve patients developed postoperative complications, with the most common being wound infection (12%) followed by chest infection (8%) and burst abdomen (4%). All patients were followed up for 6 months, and complete resolution of symptoms and weight gain was noted in all.

The mortality rate ranges between 4% and 12% due to delayed diagnosis and injudicious treatment [19]. High mortality rate between 14% and 50% is observed in toxemia, hypoproteinemia, anemia, and immunosuppression [9,22]. There was no mortality among the patients studied.

Retrospectively, all our patients were cured following ATT, which confirms the diagnosis. This study also suggests that in endemic or high-prevalence areas, one can treat TB on the basis of strong clinical suspicion supported by laboratory, radiology, and histopathological examination.

## Limitations of the study

As we included patients presenting to the surgical OPD and emergency at a medical college hospital, there could have been some uncaptured selection bias. Furthermore, we did not perform CT scan abdomen in all patients with obstruction for logistical reasons elaborated earlier.

Salient observations from this study are:

1. Although ileocecal involvement is the most common location for intestinal TB, we found the ileum to be the most common site, particularly for surgical abdominal TB
2. Suspected abdominal TB in endemic areas based on X-ray and USG can be successfully managed without the need for CT
3. Limited resection with ileoascending anastomosis is as good as right hemicolectomy and is a practical operative alternative.

## CONCLUSION

Abdominal TB causes a significant problem in diagnosis due to nonspecific symptomatology and lack of specific laboratory tests. A high index of suspicion is required, and diagnosis chiefly relies on strong clinical suspicion and aggressive investigation. It is most commonly seen in young adults. Intestinal obstruction was the most frequent presentation. USG and X-ray were an integral part of the diagnosis. CT scan is rarely required. Although anemia and ESR are both nonspecific features, they may help in supporting the clinical and pathological findings. The most common site of involvement in the present study was the ileum. Intestinal obstruction was the most common indication for operation, with resection and end-to-end anastomosis being the most common operation. In endemic or high-prevalence areas, one can treat TB on the basis of strong clinical suspicion supported by laboratory, radiology, and histopathological examination. The mainstay of treatment is medical therapy though timely surgical intervention is required in a sizable number of patients.

## Acknowledgment

We want to acknowledge the help provided by Dr. G.H. Rathod, Professor and Head of Department of Surgery, B.J. Medical College and Civil Hospital, Ahmadabad. We are also thankful to Dr. R.A. Makwana, Assistant Professor, Dr. R.P. Gadani, Assistant Professor, Dr. R.K. Patel, Assistant Professor, Department of Surgery, and B.J. Medical College, for their support and invaluable guidance. We would also like to acknowledge the help of Dr. M.M. Prabhakar, Medical Superintendent, Civil Hospital, Ahmadabad.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. World Health Organization. Global Tuberculosis Report 2018. Geneva: World Health Organization; 2018. Available from: [https://www.who.int/tb/publications/global\\_report/en/](https://www.who.int/tb/publications/global_report/en/). [Last accessed on 2019 Dec 17].

2. Debi U, Ravisankar V, Prasad KK, Sinha SK, Sharma AK. Abdominal tuberculosis of the gastrointestinal tract: Revisited. *World J Gastroenterol* 2014;20:14831-40.
3. Singh H, Krishnamurthy G, Rajendran J, Sharma V, Mandavdhare H, Kumar H, et al. Surgery for abdominal tuberculosis in the present Era: Experience from a tertiary-care center. *Surg Infect (Larchmt)* 2018;19:640-5.
4. Aggarwal P, Kedia S, Sharma R, Bopanna S, Madhusudhan KS, Yadav DP, et al. Tubercular intestinal strictures show a poor response to anti-tuberculous therapy. *Dig Dis Sci* 2017;62:2847-56.
5. Patel B, Yagnik VD. Clinical and laboratory features of intestinal tuberculosis. *Clin Exp Gastroenterol* 2018;11:97-103.
6. Sheer TA, Coyle WJ. Gastrointestinal tuberculosis. *Curr Gastroenterol Rep* 2003;5:273-8.
7. Kapoor VK. Abdominal tuberculosis. *Postgrad Med J* 1998;74:459-67.
8. Ahmed ME, Hassan MA. Abdominal tuberculosis. *Ann R Coll Surg Engl* 1994;76:75-9.
9. Akinkuolie AA, Adisa AO, Agbakwuru EA, Egharevba PA, Adesunkanmi AR. Abdominal tuberculosis in a Nigerian teaching hospital. *Afr J Med Med Sci* 2008;37:225-9.
10. Rana S, Farooqui MR, Rana S, Anees A, Ahmad Z, Jairajpuri ZS. The role of laboratory investigations in evaluating abdominal tuberculosis. *J Family Community Med* 2015;22:152-7.
11. Abro A, Siddiqui FG, Akhtar S, Memon AS. Spectrum of clinical presentation and surgical management of intestinal tuberculosis at tertiary care hospital. *J Ayub Med Coll Abbottabad* 2010;22:96-9.
12. Weiss G, Goodnough LT. Anemia of chronic disease. *N Engl J Med* 2005;352:1011-23.
13. Schwenk A, Macallan DC. Tuberculosis, malnutrition and wasting. *Curr Opin Clin Nutr Metab Care* 2000;3:285-91.
14. Shi XC, Zhang LF, Zhang YQ, Liu XQ, Fei GJ. Clinical and laboratory diagnosis of intestinal tuberculosis. *Chin Med J (Engl)* 2016;129:1330-3.
15. Sharma MP, Bhatia V. Abdominal tuberculosis. *Indian J Med Res* 2004;120:305-15.
16. Van Hoving DJ, Griesel R, Meintjes G, Takwoingi Y, Maartens G, Ochodo EA. Abdominal ultrasound for diagnosing abdominal tuberculosis or disseminated tuberculosis with abdominal involvement in HIV-positive individuals. *Cochrane Database Syst Rev* 2019;9:CD012777.
17. Weledji EP, Pokam BT. Abdominal tuberculosis: Is there a role for surgery? *World J Gastrointest Surg* 2017;9:174-81.
18. Jullien S, Jain S, Ryan H, Ahuja V. Six-month therapy for abdominal tuberculosis. *Cochrane Database Syst Rev* 2016;11:CD012163.
19. Cho JK, Choi YM, Lee SS, Park HK, Cha RR, Kim WS, et al. Clinical features and outcomes of abdominal tuberculosis in southeastern Korea: 12 years of experience. *BMC Infect Dis* 2018;18:699.
20. Dandapat MC, Mohan Rao V. Management of abdominal tuberculosis. *Indian J Tuberc* 1985;32:126-9.
21. Bhansali SK. Abdominal tuberculosis. Experiences with 300 cases. *Am J Gastroenterol* 1977;67:324-37.
22. Wani MU, Parvez M, Kumar SH, Naikoo GM, Jan M, Wani HA. Study of surgical emergencies of tubercular abdomen in developing countries. *Indian J Surg* 2015;77:182-5.
23. Anand BS, Nanda R, Sachdev GK. Response of tuberculous stricture to antituberculous treatment. *Gut* 1988;29:62-9.
24. Pattanayak S, Behuria S. Is abdominal tuberculosis a surgical problem? *Ann R Coll Surg Engl* 2015;97:414-9.
25. Katariya RN, Sood S, Rao PG, Rao PL. Stricture-plasty for tubercular strictures of the gastro-intestinal tract. *Br J Surg* 1977;64:496-8.
26. Pujari BD. Modified surgical procedures in intestinal tuberculosis. *Br J Surg* 1979;66:180-1.
27. Goenka MK, Majumder S, Kumar S, Sethy PK, Goenka U. Single center experience of capsule endoscopy in patients with obscure gastrointestinal bleeding. *World J Gastroenterol* 2011;17:774-8.
28. Ahmed HG, Nassar AS, Ginawi I. Screening for tuberculosis and its histological pattern in patients with enlarged lymph node. *Patholog Res Int* 2011;2011:417635.
29. O'Dowd G, Bell S, Wright S. *Wheater's Pathology: A Text, Atlas and Review of Histopathology*. China: Elsevier; 2020. p. 47-64.