

Role of Surgery and Laparoscopy in Management of Abdominal Tuberculosis

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ABSTRACT :

BACKGROUND:

Tuberculosis (TB) considered as the most communicable disease world wide. Among extra pulmonary TB the prevalence of abdominal TB shows rising tendency. Abdominal TB is defined as an infection of one or more common of two or more of the following sites; peritoneum, mesentery, gastrointestinal tract and or solid organs. Reported incidence of abdominal TB varies from country to country. The most common clinical features are abdominal pain, fever and weight loss.

OBJECTIVE:

To evaluate the role of surgery in the management of abdominal TB especially with the advent of minimal access surgery (laparoscopy) in the diagnosis of this disease.

PATIENT AND METHODS:

Prospective study was conducted in Al-Kadhymia Teaching Hospital over three years (2007-2010), fifty six patients with abdominal TB were included, the patients were managed by full surgical and or medical teams, results was analyzed by appropriate statistical measures.

RESULTS:

Most patients were in the 2nd, 3rd and 4th decades of life. Female to male ratio was 1.5:1. Most of the patients (82%) considered to have primary abdominal TB. Diagnostic laparoscopy was done for 21 patients and proved TB in 19 patients. Explorative laparotomy was done in 19 patients, the commonest operative finding was ascites and peritoneal tubercles.

CONCLUSION:

Abdominal TB should be considered in all patients who presented with unexplained abdominal symptoms and signs. Laparoscopy is an effective modality for diagnosis of abdominal TB.

KEY WORDS: abdominal tuberculosis, laparoscopy.

INTRODUCTION:

Tuberculosis (TB) was recognized in as early as 4th century and known as phthisis, lupus, and scrofula. Koch's described the bacillus in 1882⁽¹⁾. It is a common communicable disease worldwide. It has come back in both developed countries (due to trans global immigration, ageing of population, alcoholism, socioeconomic deprivation and acquired immune deficiency syndrome (AIDS))⁽²⁾, as well as in developing countries (due to poverty, overcrowding and lack of hygiene)⁽³⁾. In developing countries factors like poor case finding and improper treatment regarding dosage and duration result in emergence of multi drug resistant tuberculosis⁽⁴⁾.

The WHO also estimates that there are nearly 2 million deaths from tuberculosis annually, thus the disease ranks second only to human immunodeficiency virus (HIV) infection as an infectious cause of death⁽⁵⁾.

Among extra pulmonary tuberculosis the prevalence of abdominal tuberculosis shows rising tendency. Other types of extra pulmonary tuberculosis has comparatively good prognosis, although similar is true in the case of abdominal tuberculosis but in early phase only. So early diagnosis and early treatment is crucial⁽⁶⁾.

Abdominal tuberculosis is defined as infection of one or commonly of two or more of the following sites;

1. Peritoneal TB
2. Mesenteric and retroperitoneal TB lymphadenitis
3. Gastrointestinal TB
4. Solid organs TB⁽¹⁾.

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Reported incidence of abdominal tuberculosis varies from country to country. Worldwide its prevalence is 11 % of all extra pulmonary tuberculosis⁽⁷⁾. In Saudi Arabia, it comprises 16% of all extra pulmonary tuberculosis⁽⁸⁾, while in UK in 1995 it comprised 5%⁽⁹⁾. In Iraq extra pulmonary TB not yet estimated exactly but the WHO postulates that in 2005 the incidence of tuberculosis was higher in Iraq than in comparable countries⁽¹⁰⁾.

Although abdominal tuberculosis has a protean manifestation which depend on site of involvement, the most common clinical feature is the triad of abdominal pain, fever and weight loss. The diagnosis is often delayed because of non-specific presentation and is usually made through a combination of radiologic, microbiologic, histopathologic, endoscopic and molecular techniques⁽¹¹⁾.

The management of abdominal tuberculosis depends upon presentation and site and extent of involvement by the disease. It may be in the form of;

a. Conservative management; in the absence of complications like obstruction or perforation, the treatment is conservative when diagnosis is strongly suspected from other investigations like,

- 1-Pulmonary tuberculosis with abdominal symptoms.

- 2-Typical appearance on barium meal follow through or small bowel enema.

- 3-When diagnosis is established through peritoneal biopsy

- 4-Ultrasound or CT abdomen guided aspiration cytology⁽¹²⁾.

Most cases of subacute intestinal obstruction, conservative management is in the form of nasogastric aspiration, intravenous fluids and anti tuberculosis therapy^(12, 13).

b.Surgical management; in the form of either diagnostic laparoscopy or laparotomy when diagnosis cannot be reached by available investigations, or therapeutic for complications like persistent intestinal obstruction, perforation and others as mentioned below⁽¹⁴⁾.

PATIENTS AND METHODS:

A prospective study was conducted in Al kadhymia teaching hospital over three years from June 2007 to June 2010, fifty six patients with abdominal TB were included. They had been admitted either to the surgical, medical, pediatric or emergency department according to the age and clinical presentation. The criteria for diagnosis of abdominal tuberculosis were clinical suspicion, laboratory findings, operative findings, proven histologically, demonstration of AFB and response to anti-tuberculosis drugs. In all cases, assessment was done by detailed history and physical examination, routine laboratory tests, Chest X-ray, abdominal X-ray and abdominal ultrasonography. Patients with normal chest X-rays but had symptoms and signs of abdominal tuberculosis were considered to have primary abdominal tuberculosis. Other invasive or non invasive tests done but not for all patients like peritoneal aspirate, ultrasound guided FNA and CT scan of abdomen, others necessitate formal explorative laparotomy or diagnostic laparoscopy, all patients had been managed by medical and surgical teams.

RESULTS:

The age range was 9-55 years. Most patients 47 (84%) were in the 2nd, 3rd and 4th decades of life. Thirty one (55%) patients were below the mean age which was 24 years. Of the 56 patients, 33 (59%) were females and 23(41%) were males, the female to male ratio was 1.5:1. The majority of patients were from low to moderate socioeconomic status and 39 (70%) patients live in rural or crowded poor urban areas. Forty six (82%) patients considered to have primary abdominal tuberculosis, other 10 (18%) patients were considered as secondary abdominal tuberculosis, as their chest X-ray findings were consistent with pulmonary tuberculosis, 8 (14%) of them were known cases and had been initiated on anti TB drugs.

The most common presenting findings were abdominal pain (89%), fever (83.9%) and weight loss (73.2%), other clinical features are shown in table (1).

Table 1: Clinical features at the time of presentation

| Signs & symptoms | No. of patients | Percentage % |
|------------------------|-----------------|--------------|
| Abdominal pain | 50 | 89 |
| fever | 47 | 83.9 |
| Weight loss | 41 | 73.2 |
| Ascites | 27 | 48.2 |
| Night sweating | 24 | 42.8 |
| Abdominal mass | 18 | 32.1 |
| Intestinal obstruction | 12 | 21.4 |
| Acute abdomen | 9 | 16.1 |
| Diarrhea/constipation | 8 | 14.2 |

Investigations:

Hematological tests; revealed anaemia in 36 (64%) patients, leucocytosis with relative lymphocytosis in 31 (52%) and elevated ESR in 45 (80%) patients.

Biochemistry of blood revealed hypoalbuminaemia in 32 (57%) cases and most of them had intestinal tuberculosis rather than peritoneal one. Elevated transaminase and alkaline phosphatase levels found in 17 (30%) cases.

Abdominal X-ray showed dilated small bowel loops with air fluid levels in 15 (27%) cases reflecting a degree of intestinal obstruction or ileus, also variable calcification in 5 (9%) cases.

Abdominal US was positive in 46 (82%) patients; free peritoneal fluid in 42 (75%), enlarged lymph nodes in 14 (25%) cases, thickened bowel wall in 13(23%) and abdominal mass or masses in 9(16%) cases.

Abdominal CT scan done in 40 patients. Findings were present in 35(87.5%) of them. There was ascites in 23(57%) cases, omental and mesenteric thickening and strands in 20 (50%), thickened adherent bowel loops in 17 (42%), and enlarged lymph nodes with or without abscess in 15 (37%) cases.

Peritoneal fluid aspirates done in 27 cases. It was straw in color in all cases as shown in figure (1), of them 22(81%) cases was exudative (protein >3 g/dl), lymphocytes predominant in 20 (74%) cases, AFB not detected and culture was positive for tuberculosis bacilli in 2 (7%) cases only.

Ultrasound guided FNA of abdominal mass or enlarged lymph nodes done for 18 cases, of them 11 (61%) cases the retrieval of characteristic epitheloid cells was successful.



Figure 1: Straw color tuberculous ascites.

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Surgical interventions:

Diagnostic laparoscopy done for 21 patients. It was diagnostic in 19 (90%) of them, it showed ascites, lesions like peritoneal tubercles, thickened rolled up omentum, enlarged lymph nodes, masses, thickened with or without adherent bowel loops, strictures and tubo-ovarian involvement, biopsies taken and were diagnostic in 19 cases, other 2 cases histology showed non specific chronic inflammation and fibrosis.

Explorative laparotomy done for 19 patients. Nine (47%) patients presented with acute abdominal pain, after resuscitation, laparotomy was undertaken by amidline incision. Distal ileal perforation found in 3 cases, 2 of them managed by limited resection with anastomosis of diseased segment, other one managed by right hemicolectomy with ileo-transverse anastomosis due to extensive stricture involving the ileocaecal region and associated suspicious mass. Abscess of

mesenteric lymph nodes were found in 2 cases, evacuated and drained out as shown in figure (2). The other 4 cases had no bowel perforation, but there was unclear ascitic fluid (proved by culture to be secondarily infected with E-coli and Bacteroids).

Six patients (31.5%) explored for doubtful diagnosis and suspicious abdominal masses. Biopsies were only taken and proved to be tuberculosis.

Four patients (21%) explored for small intestinal obstructions non responsive to conservative therapy, careful adhesiolysis was done for two cases, segmental resection and anastomosis for one case and stricturoplasty for the other one. Representative biopsies had been taken for the 19 cases and all turn to be diagnostic for abdominal tuberculosis. Table 2 shows a summary of the operative findings.



Figure 2: Tuberculous abscess mesenteric lymph node.

Table 2 :Operative findings

| Findings | No. of patients | percentage |
|-----------------------------|-----------------|------------|
| Ascites | 15 | 79 |
| Peritoneal tubercles | 13 | 68 |
| Adhesions and or bands | 11 | 57.8 |
| Mass (single, multiple) | 10 | 52 |
| Lymphadenopathy | 10 | 52 |
| Abscess | 5 | 26 |
| Stricture(single, multiple) | 4 | 21 |
| Perforation | 3 | 15 |

DISCUSSION:

Abdominal tuberculosis is said to be a disease of young adults⁽¹⁵⁾. Most studies indicate that it most commonly occurs below 30 years of age^(16,17). The same was observed in our study 55% patients were aged 9-24 years. Most of the studies show similar incidence among both females and males⁽¹⁸⁾, although few had shown higher incidence in female⁽¹⁹⁾. Females predominate the Males in our study (F: M =1.5:1). This is supported by other local studies done in Saudi Arabia (F: M=1.2:1) and in Pakistan (F: M=1.3:1)⁽¹⁾. Some workers report that the disease is more common in males in the western countries while in developing countries female predominate⁽²⁰⁾. This may be due to the fact that in many third world countries the female assumes a nursing role among the family members⁽²¹⁾. 70% of our patients were from moderate to low socioeconomic group, similar observation is reported by Taj et al who had 85% of patients from low socioeconomic class⁽²²⁾, this is mostly due to the fact that poverty is associated with poor nutritional status and hygiene, overcrowding, sharing living room and utensils, such an environment will facilitate tubercle bacillus spread and growth.

The high prevalence of primary abdominal tuberculosis in the present series (82% of patients) is in accordance with most of the other studies conducted in developing countries. A study done by Naseer et al in surgery unit of Bolan medical college Quetta, he found that out of 86 patients, 62(72%) were considered to have primary intestinal tuberculosis and 24 (26%) had secondary intestinal tuberculosis with remarkable chest X rays⁽²³⁾, while studies from developed countries had shown secondary tuberculosis to be more common⁽²⁴⁾.

In our series, the most common presenting clinical features were abdominal pain (89%), fever (83%) and weight loss (73.2). Recent prospective trials conducted by Muneef et al⁽²⁵⁾ in Saudi Arabia from 1984 to 1997 and Imran Hassan et al⁽²⁶⁾ in the United States at a tertiary referral center between January 1992 and June 2001 had shown similar clinical features; (abdominal pain 76%, fever 70% and weight loss 68%) and (Abdominal pain 76%, weight loss 64%, fever 55%) respectively.

In addition to anemia, lymphocytic leukocytosis and raised ESR, the presence of hypoalbuminemia (57%) were common in intestinal TB. This finding is supported by a study done by J. Ramesh et al in Blackburn in England, (73% had hypoalbuminemia), which is believed to be due to

malabsorption associated with intestinal obstruction, diarrhea and vomiting⁽²⁷⁾.

Plain X-ray of abdomen showed positive findings in 15 patients. Those findings include calcified lymph nodes, features of obstruction *i.e.*, dilated bowel loops with multiple air fluid levels and evidence of ascitis or perforation. In addition, there may be calcified lymph nodes, calcified granulomas and hepatosplenomegaly⁽²⁸⁾.

Although abdominal ultrasound (US) was carried out on all patients, it is operator dependant; it showed variable findings in 82% of patients. CT scan when available was more sensitive and clarifies findings in 87.5%.

A study done by Uzunkoy A et al⁽²⁹⁾, they noticed abnormalities in all patients abdominal ultrasound and the same was with abdominal CT scan, while in the series reported by Muneef et al⁽²⁵⁾, only 80% showed abnormal CT scan and findings were non-specific.

As in our study, previous series and literatures mentioned that assay of ascitic fluid aspirate is neither specific nor sensitive for abdominal tuberculosis, but it can give hint about diagnosis and help exclusion of other causes of ascites. Tuberculous ascites is usually straw in color with high protein content plus lymphocytes predominant cytology, but rarely can retrieve TB bacillus by AFB stain or culture because extrapulmonary disease is paucibacillary^(1, 30). Recently the use of polymerase chain reaction technology on ascitic fluid is highly specific and sensitive but It is expensive and requires highly sophisticated lab technology⁽³¹⁾.

U/S guided fine needle aspiration and cytology of lesions or lumps in expert hands is diagnostic in majority of cases. Epitheloid cell granulomas with Langhan's giant cells, lymphocytes, plasma cells and caseating necrosis are diagnostic⁽¹⁾. In our study it was diagnostic in 61% of those who underwent guided FNA cytology. The results will be better with more experience in the procedure.

Laparoscopy with biopsy of the lesion is an effective modality for diagnosis of peritoneal tuberculosis in most of the cases⁽²⁶⁾. A retrospective analysis of records of abdominal tuberculosis done by Ibrarullah M et al, revealed that the laparoscopy provide positive diagnosis of tuberculosis in 87% subjects⁽³²⁾, while Ramesh et al and his group revealed that laparoscopy is diagnostic in 94.5% of cases⁽²⁷⁾, these results are comparable with our findings which was 90%, so when laparoscopy is available,

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laparotomy or small incision open Peritoneal biopsy is rarely performed.

Role of laparotomy in abdominal TB can be grouped into diagnostic elective procedures and therapeutic ones. Surgery might be required when malignancy could not be ruled out or may coexist and when diagnosis cannot be confirmed with reasonable accuracy. Therapeutic surgery in abdominal TB may be needed in intestinal obstruction due to single or multiple strictures, adhesions, mass, or due to cocoon formation and intra abdominal abscess due to confined perforation or mesenteric abscess. Similarly surgery may be required in internal or external enteric fistula, free perforation of tuberculous ulcer, hemorrhage⁽¹⁾.

OPERATIVE FINDINGS;

As mentioned above, of the 19 patients in our study who necessitate formal laparotomy; 11 patients (57.8%) had adhesions and /or bands, 10 (52%) patients had mass(s), lymphadenopathy also in 10 (52%) cases, 4(21%) had strictures in small bowel, and 3 (15%) cases had ileal perforation, More than one of the above mentioned findings were present in most of the patients but they were grouped as above according to the predominant site of involvement. Our results regarding operative findings are comparable to the results of other studies, Ismail M et al reported that 25 patients (50%) had adhesions and / or bands, 21(42%) had strictures in small bowel (most commonly in distal ileum), mesenteric lymph node enlargement (17 cases 34%). Perforation was present in 8 cases (16%)⁽³³⁾, Jamil and Zafar found that peritoneal involvement and adhesions are reported to be 61%, strictures in 17%, ileocacal mass in 13% and perforation in 39% of the cases

OPERATIVE PROCEDURES;

Two (10%) of those patients with distal ileal perforation were managed by limited resection with anastomosis, another patient was managed by right hemicolectomy with ileo-transverse anastomosis,

Six patients (31.5%) were explored for doubtful diagnosis and suspicious abdominal masses. Biopsies were taken and proved tuberculosis. Four patients (21%) were explored for small intestinal obstructions, non responsive to conservative therapy, careful adhesiolysis was done for 2 (10%) cases, segmental resection and anastomosis for 1(5%) case and stricturoplasty for the other 1(5%). Naseer Baluch et al performed resection and end to end anastomosis in 47% cases, right

hemicolectomy in 33.2%, ileostomy, stricturoplasty and biopsy only in 6.6% each⁽³⁵⁾, while Ismail M et al had ileostomy in 6(12%) presenting with ileal perforation, right hemicolectomy in one case, resection of strictures and end to end anastomosis in 16 cases (32%) stricturoplasty in 6 cases (12%) release of adhesions in 19(38%) and biopsy only in 8(16%)⁽³³⁾. The operative procedures are adopted according to the area of involvement, stage of the disease, condition of the patient, expertise available and preference of the surgeon. Therefore it is difficult to standardize and match these procedures. Our overall mortality was 3 patients (5%), 2 (70%) of them were those who presented with diffuse peritonitis, Aluorain et al reported overall mortality to be 8% of them 42.8% had diffuse peritonitis⁽³⁶⁾. and Ismail M et al reports overall mortality of 6%, 37.5% of them had diffuse peritonitis⁽³³⁾.

Mumtaz et al concludes in his study that no single investigation except tissue histopathology is 100% diagnostic of abdominal tuberculosis⁽³⁷⁾. We also found that all patients who underwent explorative laparotomy and most of those underwent diagnostic laparoscopy revealed positive histology for tuberculosis. However in situations where tissue histopathology cannot be done, a fairly good idea can be made to suspect abdominal tuberculosis by combination of clinical features, imaging studies and various other investigative procedures in order to use therapeutic trial.

CONCLUSION:

Abdominal tuberculosis should be considered in all patients who present with unexplained abdominal symptom and signs. It continues to represent a diagnostic challenge to clinicians and the diagnosis can be difficult to make because of the varied presentation, the low percentage with positive microscopy for acid-fast bacilli and the time delay of up to several weeks for a positive TB culture, therefore the thresholds for laparoscopy and/or laparotomy for the diagnosis were low. The diagnosis could be made rapidly by these methods, and early treatment instituted

Management requires combination of antitubercular drugs and surgery – for diagnosis as well as therapy for complications of the disease. Treatment outcome is favorable if started earlier and supported with balanced diet

REFERENCES:

1. Gautam M P, Karki P, Rijal S. Abdominal Tuberculosis. Journal of Nepal Medical Association 2004; 43: 40-48.

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2. Corbett EL, Watt CJ, Walker N, Maher D, Williams BG, Raviglione MC, Dye C. The growing burden of tuberculosis: Global trends and interaction with the HIV epidemic. *Arch Intern Med.* 2003; 163: 1009-21.
3. Lingentelser T, Zek J, Marks IN, et al. Abdominal tuberculosis, still a potentially lethal disease. *Am J Gastroenterol* 1993;85: 744-50.
4. Khan MH. Tuberculosis, need to revitalize its control program in Pakistan. *J Coll Physicians Surg Pak* 1997;6: 3.
5. Dye C, Scheele S, Dolin P, Pathania V, Raviglione MC. Global burden of tuberculosis: estimated incidence, prevalence, and mortality by country: WHO Global Surveillance and Monitoring Project. *JAMA* 1999; 282: 677-86.
6. Rosengart TK, Coppa GF. Abdominal mycobacterial infection in immunocompromized patients. *Am J Surg* 1990; 159: 125- 31.
7. Anonymous. Management of non-respiratory tuberculosis. *Lancet* 1986; 1: 1423-4.
8. Al-Karawi MA, Mohamed AE, Yasawy MI, et al. Protean manifestation of gastrointestinal tuberculosis. *J Clin Gastroenterol* 1995;20: 225-32.
9. Klimach OE, Ormerod LP. Gastrointestinal tuberculosis: a retrospective review of 109 cases in a district general hospital. *Q J Med* 1985; 56: 569-78.
10. World Health Organization. Global tuberculosis control. WHO report 2006.
11. Baloch NA, Anees S, Baber M, Maingal M et al. Abdominal tuberculosis, A review of 68 cases. *J Surg. Pak.* 2002; 7:12-4.
12. Watters DAK: Surgery for tuberculosis before and after HIV infection. *B.J.S* 1997; 84; 8-14.
13. Vanderpool DM, Larry O: Primary tuberculous enteritis *Surg. Gynaecol. Obstet.* 1988; 167.
14. Acharya SK, Tandon BN: Abdominal tuberculosis in waters DAK, Kure CF (eds) *Gastroenterology in tropics and subtropics.* London Mc Millon 1995; 85- 102.
15. Amber G. The reappearance of abdominal tuberculosis. *Surg. Gynaecol. Obstet.* 1991; 172; 432.
16. Manohar A, Shujee AF, Haffeje AA, Pethengell E: Symptoms and investigative findings in 145 patients with tuberculosis peritonitis diagnosed by peritoneoscopy and biopsy over a five year period. *J. Surg.* 1996; 11-12; 38-40.
17. Shukla HS, Hughes LE: Abdominal tuberculosis in sementies a containing problem. *BJS* 1978; 65: 403.
18. Dolin PJ, Raviglione MC, Kochi A. Global tuberculosis incidence and mortality during 1990-2000. *Bull World Health Organ* 1994; 72: 213-20.
19. Vij JC, Malhotra V. Choudhary V et al. A clinicopathological study of abdominal tuberculosis. *Indian J of Tubercul* 1992;39: 213-20.
20. Homan WP, Grofe WR, Dineem P: A 44 year experience with tuberculosis enterocolitis. *World J Surg.* 1991; 2:45-50.
21. Findlay JM: Gastrointestinal tuberculosis; recent advances in surgery. *Churchill Livingstone, Edinburgh* 198;10.
22. Taj M, Mumtaz K, Naeem M, Omer AK: experience with abdominal tuberculosis *JPMI* 1988; 12: 72-80.
23. Nseer Ahmed, Manzoor Ahmed, Fida Ahmed: A study of 86 case of abdominal tuberculosis. *J of Surgery Pakistan (international)* 2008;13: 30-32.
24. Addison NV. Abdominal tuberculosis, a disease revived. *Ann R Coll Surgeons. Eng* 1983; 65: 105-11.
25. Muneef MA, Memish Z, Mahmoud SA, Sadoon SA, Bannatyne R, Khan Y. Tuberculosis in the belly: a review of forty-six cases involving the gastrointestinal tract and peritoneum. *Scand J Gastroenterol.* 2001; 36:528-32.
26. Hassan I, Brilakis ES, Thompson RL, Que FG. Surgical management of abdominal tuberculosis. *Gastrointest Surg.* 2002;6: 862-7.
27. J. Ramesh, G.S. Banait , L.P. Ormerod. Abdominal tuberculosis in a district general hospital: a retrospective review of 86 cases. *Q J Med* 2008; 101:189-95.
28. M.P. Sharma & Vikram Bhatia Abdominal tuberculosis. Review Article. *Indian J Med Res* 120, October 2004, 305-315
29. Uzunkoy A ; Harma M ; Harma M Diagnosis of abdominal tuberculosis: Experience from 11 cases and review of the literature. *World Journal of Gastroenterology* 2004: 3647-49.
30. Raviglione MC, O'Brien RJ. Tuberculosis. In Fauci AS, Braunwald E, Isselbacher KJ, Wilson JD, Martin JD et al. eds. *Harrison's Principles of Internal Medicine, Fifteenth edition.* New York, Mc-Graw Hill, 1998: 1024-34.

31. Brisson-Noel A, Gicquel B, Lecossier V, Levy-Febault V, Nassif X and Hance AJ. Rapid diagnosis of tuberculosis by amplification of mycobacterial DNA in clinical samples. *Lancet* 1989; 2: 1069-71
32. Ibrarullah M, Mohan A, Sarkari A, Srinivas M, Mishra A, Sundar TS. Abdominal tuberculosis: diagnosis by laparoscopy and colonoscopy. *Trop Gastroenterol.* 2002;23: 150- 3.
33. Ismail M, Farmanullah, Mumtaz Khan. Surgical Management of Abdominal Tuberculosis. *Journal of post graduate medical institute.* 2003; 17: 32 – 41.
34. Jamil A, Zafar IM. Abdominal tuberculosis; PIMS experience. *J. Surg. PIMS* 1996;11:38-40.
35. Naseer B, Tufail M, Khalid D, Mahmood A: Abdominal tuberculosis. A varied presentation. *Pak. J. Surg* 1993; 9: 8-12.
36. Al-Quorain AA, Fachazi 3I, Shim SBD, Alfreihi HM, Al-Gindan YM, Al-Awad N: Abdominal tuberculosis in Saudi Arabia, A clinico-Pathological study of 65 patients. *Ann Gastroenterol.* 1993; 88: 75-9.
37. Mumtaz Khan, Ismail M. Diagnosis of Adominal Tuberculosis in surgical patients. *Journal of post graduate medical institute* 2004;18: 500 – 6.