Clinical and Diagnostic Features of Patients with Intestinal Tuberculosis in a Tertiary Hospital in Cebu City: A Twelve-Year Retrospective Cross-Sectional Analysis

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Abstract. Intestinal Tuberculosis (ITB) presents a significant diagnostic challenge due to its nonspecific clinical presentation and the lack of comprehensive local data to guide diagnostic strategies. This study aims to fill the gap by conducting a twelve-year retrospective cross-sectional analysis at a tertiary hospital in Cebu, Philippines. Electronic records of 209 patients aged 18 years old and above were first reviewed, focusing on clinical features, laboratory results, endoscopic findings, and CT scan of the abdomen. Initial screening identified 54 patients meeting the predefined criteria for gastrointestinal tuberculosis (GITB). In addition, statistical analyses, including logistic regression models, were employed to identify significant predictors of ITB which can further enhance the ITB diagnosis and management in the region.

Clinical manifestations observed include: symptoms and signs resembling those observed in malignancies and inflammatory bowel diseases, such as abdominal pain (92.6%), ascites (57.4%), fever (51.9%), hematochezia (25.9%), abdominal mass (24.1%) and intestinal obstruction (5.6%). The findings from CT scans of the abdomen were consistent with other studies, including the presence of matted mesenteric lymph nodes (79.6%), concentric mural thickening (57.4%), ileocecal involvement (44.4%). However, dilated bowel loops (20.4%), intestinal perforation (5.4%) and strictures (3.7%) were observed in only a few cases. Ileocecal involvement was found to be a dependable predictor among all the variables when logistic regression analysis was employed, emphasizing its diagnostic utility.

Our findings highlight the importance of local epidemiological insights in improving diagnostic strategies and patient outcomes. Consolidating the clinical profiles and diagnostic markers contributes to evidence-based strategies tailored to the Philippine context. This localized approach can further help medical professionals in making more informed decisions. Future studies could validate these findings to develop region-specific predictive tools, for a more time sensitive management of ITB.

Keywords. Intestinal Tuberculosis, Clinical features, Indicators, Ileocecal involvement.

Background of the Study

Tuberculosis is a significant cause of illness impacting both the health and the economic sectors worldwide. It is a communicable disease that can affect various organ systems. The Philippines ranks as the fourth largest contributor to TB, affecting approximately 500 individuals per 100 000[1]

ITB is a form of extra-pulmonary tuberculosis that primarily targets the gastrointestinal tract. Its clinical features can be subtle and insidious, often presenting with abdominal pain that may progress to complications such as strictures, bowel obstruction and perforation. This makes accurate diagnosis crucial for timely intervention.[2] Endoscopic finding such as circumferential

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and transverse ulcers, along with a patulous ileocecal (IC) valve, are suggestive but not pathognomonic for ITB.[3] However, in endemic areas, such as the Philippines, these characteristics highlight how crucial it is to have a high index of suspicion for ITB.

In countries such as Korea, China and India, various types of methods for establishing the diagnosis of ITB have been developed by combining clinical examination with other conventional examinations such as colonoscopy, histopathology examination of intestinal mucosal tissue, GeneXpert and radiological examination such as computed tomography (CT) scan.[6,7,8]

Laboratory investigations, while nonspecific, often reflect a chronic inflammatory process.[2] The advent of molecular diagnostic tools, such as GeneXpert® MTB/RIF Assay, has shown promise in detecting Mycobacterium tuberculosis (MTB) in extrapulmonary samples with high specificity. In a meta-analysis done in India, the pooled sensitivity of Genexpert on intestinal samples remained at 23% with a specificity of 100%[2,4,5] However, the application of these tests in the context of ITB in our local region faces significant challenges. These include logistical difficulties of some patients in sending specimens for testing and limited advanced diagnostic facilities. Additionally the high cost of GeneXpert further restricts its widespread use, especially in resource-constrained settings.

Despite recent advances in diagnostic techniques, a significant knowledge gap remains due to the lack of sufficient local epidemiological data on intestinal tuberculosis. Addressing this gap is critical, as the difficulty in collecting and sending specimens for GeneXpert often forces clinicians to rely heavily on clinical findings to supplement diagnostic suspicion. Without regional data on clinical features and diagnostic markers for ITB, accurate diagnosis and timely treatment remain challenging, underscoring the need for substantial studies within our specific regional context.

To address this gap, this study sought to conduct a twelve-year retrospective cross-sectional analysis of ITB cases at a tertiary hospital in Cebu, Philippines. Patients with ITB were systematically identified and profiled.

Significance of the Study

The study aims to identify and profile ITB patients by reviewing imaging studies, laboratory results, colonoscopic findings and clinical symptoms. The outcomes of this research will help clinicians better recognize ITB, particularly in settings where specimen collection and testing are unavailable or inconclusive. Moreover, the study will serve as a valuable foundation for future research to further refine diagnostic strategies and therapeutic approaches. It will help fill a gap in medical literature, providing insights that can inform evidence-based approaches.

General Objective

This study aimed to determine the clinical profile and diagnostic findings that can be predictors for Intestinal Tuberculosis in adult Filipino patients.

Specific Objectives

1. To determine the reported symptoms and signs, laboratory results and surgeries found in diagnosed ITB patients from 2012-2023 in a single tertiary hospital
2. To determine the patient demographics according to age, sex, co-morbid conditions that can predispose to intestinal tuberculosis
3. To correlate the collated findings with diagnosed ITB patients using logistic regression analysis.

Study Design and Study Setting

A single-center, retrospective, cross-sectional analysis of 209 patient charts were conducted at a 660-bed capacity private tertiary hospital located in Cebu City, Philippines, with data collected from the year 2012 to 2023.

Inclusion Criteria

1. Patients aged 18 years old and above who were admitted to the institution between 2012 and 2023.
2. Diagnosed cases of GITB based on the specified keywords used
3. Chief complaint of abdominal symptoms such as abdominal pain, discomfort, bloatedness, changes in bowel movement and hematochezia associated with weight loss and fever
4. At least one of the following diagnostics performed: CT scan or colonoscopy.
5. Diagnosed with abdominal TB with colonoscopy or imaging findings (CT or ultrasound)
6. GITB patients treated with HRZE regimen

Exclusion Criteria

1. A Disseminated TB without abdominal symptoms.
2. No CT scan or colonoscopy performed.
3. Disseminated TB with no inclusion of remarkable colon findings such as circumferential ulcers, transverse ulcers, granulomas, strictures and scars, and a patulous ileocecal valve or any unusualties at the ileum or cecum
4. TB peritonitis localized elsewhere without colonic involvement.
5. Patients diagnosed with ITB or GITB from other hospitals.
6. GITB diagnosis with incomplete workup due to discharge against medical advice (DAMA).

Sample Size

in this study, a total of 209 electronic charts were reviewed based on the keywords above used. Inclusion and exclusion criteria were applied, narrowing the sample size to a total of 54 patients. This was further reduced into 22 GeneXpert confirmed ITB patients and 32 presumptive ITB patients.

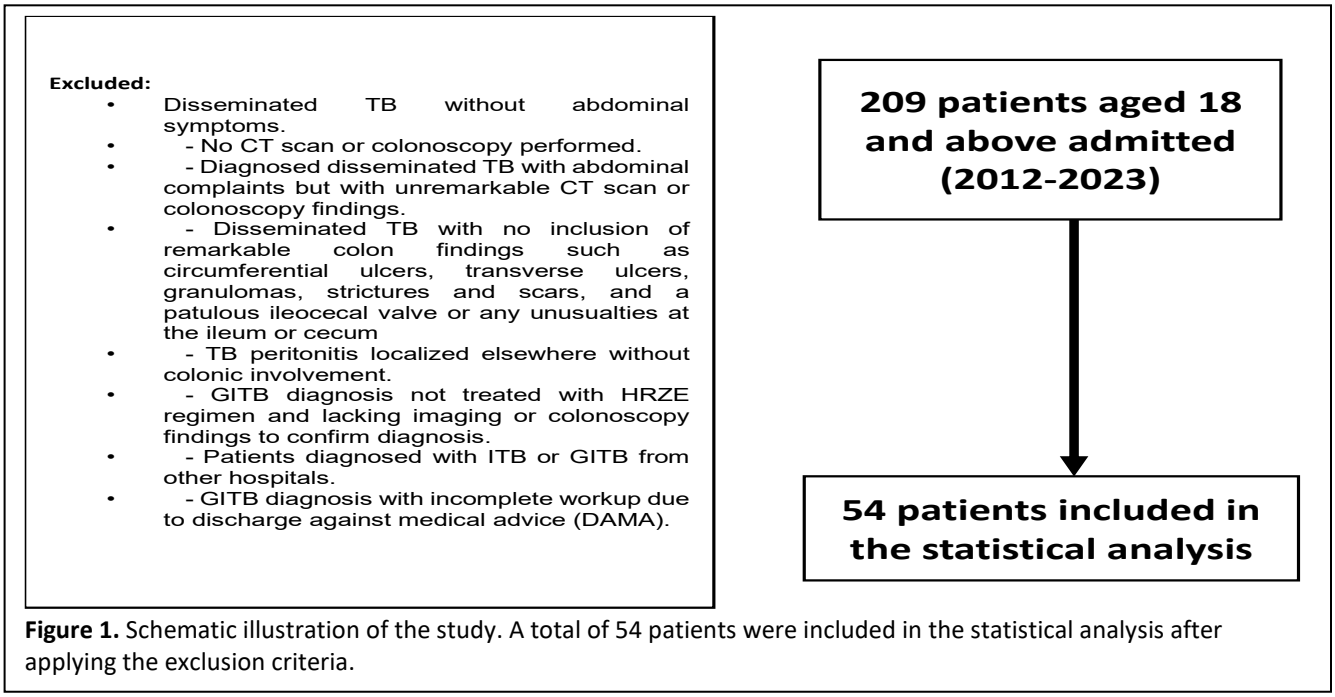

Figure 1. Schematic illustration of the study. A total of 54 patients were included in the statistical analysis after applying the exclusion criteria.

Data Collection Process

Institutional review board (IRB) approval was obtained prior to the commencement of the study. A list of patients with a diagnosis of disseminated TB, intra abdominal TB, TB of peritoneum, peritonitis with extrapulmonary TB diagnosis, TB of mesentery, colitis secondary to Koch's, and GITB from January 1, 2012 to December 31, 2023 were obtained from the Medical Records section of the tertiary hospital. The International Classification of Diseases (ICD) codes of the ff were used: Gastrointestinal Tuberculosis (A18.3 and K93), Extrapulmonary tuberculosis (A15.4 – A15.6, A15.8 and A16.3 – A16.6, A16.8, A17 – A19). Patient confidentiality was maintained by anonymizing data during the review process.

Eligible case records were selected based on predefined inclusion criteria. Data were then entered into a predefined electronic database using unique patient codes, capturing demographic details including age, sex, comorbidities and relevant medical histories such as surgeries done and frequent symptoms observed. Laboratory test results commonly obtained during the management of ITB in our setting included a complete blood count (CBC) and inflammatory markers (CRP, LDH, ESR, albumin), serum sodium and imaging studies such as CT scan of the abdomen. The following laboratory findings were considered: anemia (<10g/dl), leukocytosis (>10.8 10^3/uL), elevated CRP (>5mg/L), elevated ESR (>20mm/hr), Hyponatremia (<134mmol/L), elevated LDH (>250U/L), hypoalbuminemia (<3.4g/dl).

CT scan images of the entire abdomen were evaluated for specific findings of: involvement of the ileocecal region, matted mesenteric lymph nodes, concentric mural thickening, thickening of the colon or dilation of bowel loops, presence of bowel masses, and signs of obstruction or perforation. Colonoscopic results were reviewed and findings of: granulomas/nodules, strictures, colonic ulcers and ileocecal valve involvement were included. Some patients meeting the inclusion criteria underwent exploratory laparotomy, details of the specific surgeries performed were noted. Biopsies retrieved during these procedures tested positive using GeneXpert. An extensive electronic chart review was done to document these results. A total of 22 cases of confirmed intestinal tuberculosis (ITB) were recorded based on final diagnosis and positive GeneXpert results.

Ethical Considerations

Ethical considerations were paramount throughout this research, adhering strictly to the principles outlined in the Declaration of Helsinki and the National Ethical Guidelines for Health and Health-related Research (2017). Approval for the study protocol was obtained from the private tertiary hospital's Institutional Ethics Review Board (IERB) prior to commencement.

Confidentiality was maintained by excluding patient names from the data files used for analysis. To safeguard privacy, each patient was assigned a unique alphabetical code known only to the research team. Access to both the source code and the collected data was restricted to authorized researchers and the biostatistician. Excel sheets used for data processing were carefully structured to prevent any potential disclosure of patient identities. No conflicts of interest were declared.

Statistical Analysis

Statistical analyses were performed using SPSS v21. Descriptive statistics summarized patient demographics, including age, gender distribution and prevalence of co-morbid conditions. Data included means, standard deviations, medians, and frequencies for categorical variables. The annual frequency of ITB and summative distribution of diagnostic methods were also analyzed. In addition, a logistic regression model was employed to estimate the probability that ITB occurrence based on the predictor variables collected. A two-step method involving both univariate and multivariate logistic regression analyses was then incorporated to this study.

Univariate logistic regression analysis identified clinical features and diagnostic indicators associated with intestinal tuberculosis (ITB) in the selected cohort of patients. The alpha level was set at 0.10 for this initial screening phase. Results of the univariate analysis are summarized in Table 1. In the multivariate logistic regression step, multiple predictor variables were included in the same model to assess their combined and independent effects on the outcome. This helped control for potential confounding factors and provided a clearer picture of the unique contribution of each predictor.

Results

The study reviewed 209 patient charts from 2012 to 2023 which focused on the terms related to gastrointestinal tuberculosis, disseminated TB, Intraabdominal TB, TB of peritoneum, and colitis secondary to Koch's. After the initial screening, another review of the patient's history, physical examination, CT scan and colonoscopy findings identified 54 cases diagnosed as intestinal tuberculosis.

The study cohort comprised a total of 54 patients presumptively diagnosed with intestinal tuberculosis (ITB), with ages ranging from 18 to 80 years. The mean age was 40.31 years (SD = 17.186), indicating a wide range of age groups affected by ITB. Most of these patients were males (61.1%). Among the patients, 21 (38.9%) were female and 33 (61.1%) were male.

Several comorbid conditions were observed among ITB patients. Among the 54 patients, hypertension (HTN) was present in 31.5% of patients and diabetes was found in 11.1%. pulmonary tuberculosis (PTB) was prevalent in 77.8% of patients. Immunocompromised patients were defined as those diagnosed with HIV, those with AIDS-defining illnesses, or those with a CD4 count of 200 or less. This group was identified in 35.2% of cases. Conditions such as cancer (5.6%) and systemic lupus erythematosus (SLE, 9.3%) were also observed.

	Frequency	Percent
Total	54	100
Gender (M)	33	61.1
Gender (F)	21	38.9
PTB	42	77.8
immunocompromised	19	35.2
HTN	17	31.5
DM	6	11.1
SLE	5	9.3
Cancer	3	5.6
Chronic hep b	1	1.9
Maintenance HD	1	1.9
On HD with SLE	1	1.9
MDS	1	1.9
Multiple Sclerosis	1	1.9
Psoriasis	1	1.9
Asthma	0	0

Table 1. Clinical features of Patients with Intestinal tuberculosis

	Frequency	Percent
ABDOMINAL PAIN	50	92.6
ASCITES	31	57.4
FEVER	28	51.9
HEMATOCHEZIA	14	25.9
DIARRHEA	13	24.1
ABDOMINAL MASS	13	24.1
INTESTINAL OBSTRUCTION	3	5.6
HYPOALBUMINEMIA	36	66.7
ANEMIA	29	53.7
HYPONATREMIA	27	50
LEUKOCYTOSIS	15	27.8
ELEVATED LDH	12	22.2
ELEVATED CRP	8	14.8
ELEVATED ESR	7	13

Table 2. Clinical Symptoms and Diagnostic Findings of Patients with ITB

The most prevalent symptoms were abdominal pain (92.6%), ascites (57.4%), fever (51.9%), hematochezia

(25.9%), abdominal mass and diarrhea (24.1%). Laboratory findings such as hypoalbuminemia (66.7%), anemia (53.7%) and hyponatremia of <134mmol/L (50%) were notable laboratory findings observed.

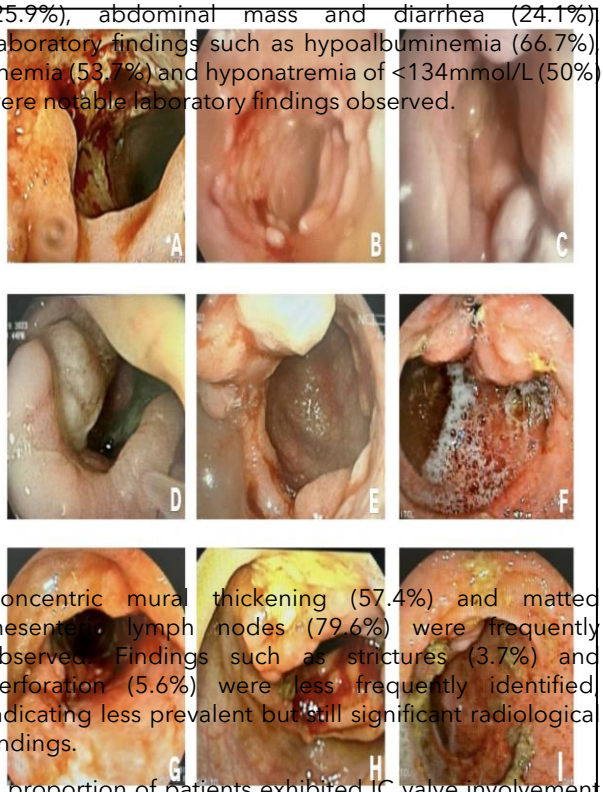

Figure 1: Actual Collated Colonoscopic Findings: A: Terminal Ileitis with Ulcer; B. and C: Multiple Pseudopolyp/Nodules on Terminal Ileum; D: Polypoid Lesions on Cecal area; E: Large Circumferential Ulcer with hyperemic edematous mucosa with polypoid lesion; F: Ileocecal valve and adjacent mucosa with ulcerations; G: Multiple Aphthous ulcers with bleeding noted upon flushing at cecum; H and I: Multiple ulceration at cecum partially obstructing terminal ileum

Concentric mural thickening (57.4%) and matted mesenteric lymph nodes (79.6%) were frequently observed. Findings such as strictures (3.7%) and perforation (5.6%) were less frequently identified, indicating less prevalent but still significant radiological findings.

A proportion of patients exhibited IC valve involvement (35.2%). Thirty-eight percent (38.9%) of patients had colonic ulcers, highlighting a significant gastrointestinal pathology in the study group. Other colonoscopic findings such as granulomas (25.9%) and strictures (3.7%) were also observed. (Figure 1)

Furthermore, the study revealed that hepatobiliary tuberculosis was the most commonly affected extrapulmonary site in patients with ITB, occurring in 13% of the cases. Other organs involved included the pericardium and pelvis each involved in 5.6% of cases, along with duodenum and lymph nodes, each in 3.7% of cases. These findings feature the diverse presentation of tuberculosis and the importance of considering extrapulmonary involvement particularly in endemic areas, where diagnostic delays can occur due to non-specificity of the disease. Surgical interventions, including exploratory laparotomy (13%) and organ-specific surgeries, were conducted in a subset of patients, underscoring the complexity of managing ITB. (See Appendix. Table 5.1).

Table 4. Colonoscopic Findings of ITB patients

	Frequency	Percent
	Frequency	Percent
COLONIC ULCERS	21	38.9
IC VALVE INVOLVEMENT	19	35.2
GRANULOMAS/ NODULES	14	25.9
STRICTURES	2	3.7

		Percentage
Hepatobiliary TB	7	13
Pelvic	3	5.6
Pericardium	3	5.6
Duodenum	2	3.7
Lymph node	2	3.7
Mesenteric	1	1.9
Pelvic, Hepatobiliary Tb	1	1.9
Pericardium, Pelvic	1	1.9

Table 5. Frequency of Other organs involved

In reference to Appendix A- Table 6, and 7, a cross tabulation and test of association was done. The Alpha was set at 0.05. The following variables were not associated with ITB: sex (p = 1.00), year admitted (p = 0.338), the comorbidities such as hypertension (p = 0.563), diabetes mellitus (DM) (p = 0.678) and pulmonary tuberculosis (PTB) (p = 0.517). There was no significant association found between immunocompromised status and even cancer.

While previous studies have reported a stronger association between ITB and certain comorbidities such as PTB and immunosuppression, the lack of significant

association in this study may be attributed to the relatively small sample size and its retrospective design which may have limited the power to detect these associations.

There was no significant association with ITB diagnosis and abdominal pain (p = 1) and fever (p = 1). Marginally significant association with diarrhea (p = 0.109) and abdominal mass (p = 0.109) was noted with ITB. There was a significant association with hematochezia (p = 0.011), intestinal obstruction (p = 0.062) and ascites (p = 0.013) with Intestinal Tuberculosis. Common laboratory findings were also assessed. There was no significant association found between ITB diagnosis and anemia (Hb < 10 g/dL) (p = 0.585), elevated ESR (p=0.491), hyponatremia (p=0.749), elevated LDH (0.322), elevated CRP (0.608), hypoalbuminemia (0.262), CT scan findings of matted mesenteric lymph node (p=0.316) and concentric mural thickening (0.757). Colonoscopic findings such as granulomas and nodules (p=1), and strictures (p=0.527) had no significant association. However, leukocytosis had marginally significant association with ITB diagnosis (p = 0.121).

Significant association with ITB observed in these CT scan results: ileocecal involvement (p=0), dilated bowel loops (p=0.027) and perforation (p=0.049). Meanwhile colonoscopic findings of IC valve involvement (p=0.008) and colonic ulcers (p=0.030) proved to have a significant association with ITB.

The study then followed a two-step method involving both univariate and multivariate logistic regression analyses to explore the associations between the various clinical and laboratory variables and the occurrence of ITB cases. In the univariate analysis findings, all those with a p value < 0.10 were included in the model building (See Appendix,

Table 8). A stepwise regression was done. Diarrhea, hematochezia, intestinal obstruction, abdominal mass, ascites and leukocytosis, CT scan findings of ileocecal involvement and dilated bowel loops were included in the model building.

	B	S.E.	Wald	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
ILEOCECAL INVOLVEMENT	2.924	0.794	13.554	0	18.623	3.926	88.35
HEMATOCHEZIA	1.016	0.912	1.243	0.265	2.763	0.463	16.5
Constant	-2.186	0.629	12.077	0.001	0.112		

TABLE 10.3 Outcome = α + β1(HEMATOCHEZIA) + β2 (ILEOCECAL INVOLVEMENT)

	B	S.E.	Wald	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
ILEOCECAL INVOLVEMENT	4.364	1.475	8.758	0.003	78.606	4.366	1415.119
DIARRHEA	0.127	1.137	0.012	0.911	1.136	0.122	10.552
HEMATOCHEZIA	2.428	1.342	3.274	0.07	11.332	0.817	157.167
INTESTINAL OBSTRUCTION	20.261	20914.912	0	0.999	6.3E+08	0	.
ABDOMINAL MASS	2.834	1.648	2.956	0.086	17.02	0.673	430.667
ASCITES	1.176	1.356	0.751	0.386	3.24	0.227	46.247
LEUKOCYTOSIS	2.21	1.347	2.692	0.101	9.12	0.65	127.863
Constant	-5.563	2.234	6.2	0.013	0.004		

TABLE 9. Univariate Logistic Regression Model

Clinical Variables

Among the clinical variables examined, univariate analysis revealed that hematochezia (p = 0.007) showed strong associations with ITB, meeting the criteria for inclusion in subsequent multivariate modeling.

Diagnostic Variables

From the diagnostic variables, ileocecal involvement (p = 0.064) and dilated bowel loops (p = 0.064) demonstrated significance in predicting ITB.A multivariate logistic regression model was made. It was observed that there was a statistically significant association (p = 0.01) between hematochezia and ITB. Individuals presenting with hematochezia had 5.833 times higher odds of having intestinal tuberculosis compared to those without, after adjusting for other variables. Similarly, ileocecal involvement also showed a strong association (p < 0.001) between this variable and ITB. Patients with ileocecal involvement had 24 times higher odds of having ITB compared to those without, highlighting its significant predictive value. (See Appendix, Table 10)

When combining both hematochezia and ileocecal involvement in the model, ileocecal involvement remained strongly significant (p < 0.001), suggesting it captures a substantial portion of the variance previously attributed to hematochezia. Conversely, while the association of hematochezia is positive, it did not reach statistical significance indicating a potential confounding effect or overlap in predictive power with ileocecal involvement.

The change in significance suggests multicollinearity. Both ileocecal involvement and hematochezia are likely correlated. When both variables are included, they share explanatory power.

Discussion

The present study showed that there was no significant association between age and sex with ITB cases. However, it is notable that there is a higher proportion of male patients in this study which aligns with previous epidemiological trends suggesting a male predominance in ITB cases.[4]

Although no significant associations were found with the mentioned comorbidities, the data revealed an upward trend and an increased susceptibility among immunocompromised individuals (HIV patients and patients with cancer), those with systemic lupus erythematosus (SLE), and patients undergoing maintenance hemodialysis (HD). A multi centered prospective study in China published that the risk of developing active TB was higher in SLE.[9] Numerous studies have documented a significantly elevated risk of tuberculosis (TB) in patients with chronic kidney disease (CKD), especially among those undergoing dialysis.[10] This discrepancy of results may be attributed to the limitations in sample size, single-center design or the retrospective nature of the study. Furthermore, it is also possible that regional or institutional differences in patient demographics influenced the findings in this study. This suggests the need for further investigation with larger and more diverse patient cohorts across multiple healthcare institutions.

The analysis identified significant associations of ITB diagnosis with symptoms and signs of hematochezia, intestinal obstruction, and ascites [3, 4, 11] Hematochezia lost its significance when ileocecal involvement was included in the model. This suggests that ileocecal involvement likely explains a substantial portion of the variance previously attributed to hematochezia which can be further explained by its pathology.

CT is the mainstay for investigating suspected abdominal tuberculosis. The most common CT finding is mural thickening, which is typically concentric. The findings that strongly suggest tuberculosis in the presence of ileocecal involvement are skip areas of concentric mural thickening with associated luminal narrowing with or without proximal dilatation.[13] [14] There are various signs that have been described in ITB such as the "inverted umbrella" sign known as Fleischner sign, Goose neck deformity, Stierlin sign and String sign, the latter manifesting as acute inflammation on a chronically involved colon.[13, 15]

Other notable findings include enlarged mesenteric and para-aortic lymph nodes and in cases of severe complications, strictures, fistulas, obstruction and perforation of the colons. [14, 15, 16] Due to its pathology, the lesions of ITB can be classified into ulcerative and ulcero-hypertrophic thus presence of granulomas are well observed[15] In this study, granulomas and calcifications were included in the initial tabulation however, due to prevalence of "NA" in the findings, these factors did not meet the criteria to be part of the CT scan tabulated data. Furthermore, the study concluded that ileocecal involvement is a statistically significant predictor ($p < 0.05$) with an odds ratio of 78.606 in logistic regression analysis. Strictures and perforation on CT scan were insignificant statistically, however increased frequency of these variables were observed.

Colonoscopic findings of concentric mural thickening and involvement of the ileocecal (IC) valve are consistent with the clinical presentations of the disease. [3, 10, 11, 12, 13] The most common site for ITB is the ileocecal region involving approximately 64% of the cases of GITB. [15] Contributing factors such as stasis, presence of abundant lymphoid tissue, increased rate of absorption at ileocecal site and a closer contact of the bacilli with the mucosa concluded the reason for the predilection at ileocecal area [15, 16, 17]

Limitations

The study is subject to several constraints. Its single-center design and limited sample size restrict the generalizability and predictive validity of the findings. Inherent limitations include its retrospective approach and the potential for selection bias within the study population. Furthermore, the study only focused on retrospectively profiling epidemiologic data from patients diagnosed with ITB to elucidate associated factors. The study also did not take into account outpatient outcomes which can be pivotal for comprehensive evaluation.

Conclusion

This study provides a detailed profile of demographic, clinical, and diagnostic characteristics among patients with intestinal tuberculosis in 2012-2023 in a private tertiary hospital in Cebu, Philippines. The most prevalent

symptoms were abdominal pain, ascites, fever and hematochezia. Concentric mural thickening and matted mesenteric lymph nodes were frequently observed. A proportion of patients exhibited IC valve involvement and colonic ulcers. However, hematochezia, intestinal obstruction, ascites and CT findings of concentric mural thickening, and ileocecal (IC) involvement were the factors that proved to be significantly associated with Intestinal tuberculosis.

Among these variables, ileocecal involvement was the most reliable predictor of ITB. Its consistent significance across all tested models emphasizes its clinical value for prediction and decision-making in the diagnosis and management of ITB.

Recommendations

This study recommends future investigation employing larger, multi-center studies to strengthen the robustness of the data through increased participant numbers. Future prospective studies should include enhanced correlation analysis to validate and refine the findings. Furthermore, future researches should explore additional variables and incorporate longitudinal data to better understand the disease presentation and improve predictive models.

Funding

The research was conducted without external funding or financial support.

Conflict of Interest

The authors report no conflicts of interest related to this study.

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APPENDIX A: RESULTS

Table 5.1: Surgeries

Patients	Actual Numbers	Percent
Stat Exploratory Surgery	7	13

Table 6: Characteristics and Symptomatology Variables among ITB Patients

		Diagnosed ITB		Total	p-value
		(-)	(+)		
SEX	Female	12	9	21	1.00
		57.10%	42.90%	100.00%	
	Male	20	13	33	
		60.60%	39.40%	100.00%	
YEAR ADMITTED	2012	2	3	5	0.338
		40.00%	60.00%	100.00%	
	2013	3	0	3	
		100.00%	0.00%	100.00%	
	2015	2	1	3	
		66.70%	33.30%	100.00%	
	2018	3	6	9	
		33.30%	66.70%	100.00%	
	2019	7	2	9	
		77.80%	22.20%	100.00%	
	2020	7	7	14	
		50.00%	50.00%	100.00%	
	2021	2	0	2	
		100.00%	0.00%	100.00%	
	2022	1	1	2	
		50.00%	50.00%	100.00%	
	2023	5	2	7	
		71.40%	28.60%	100.00%	
HTN	(-)	23	14	37	0.563
		62.20%	37.80%	100.00%	
	(+)	9	8	17	
		52.90%	47.10%	100.00%	
DM	(-)	29	19	48	0.678
		60.40%	39.60%	100.00%	

	(+)	3	3	6	
		50.00%	50.00%	100.00%	
ASTHMA	(-)	32	22	54	NA
		59.30%	40.70%	100.00%	
Total	(+)	0	0	10	
		0.00%	0.00%	0.00%	
PTB	(-)	6	6	12	0.517
		50.00%	50.00%	100.00%	
	(+)	26	16	42	
		61.90%	38.10%	100.00%	
IMMUNOCOMPROMISED	(-)	20	15	35	0.775
		57.10%	42.90%	100.00%	
	(+)	12	7	19	
		63.20%	36.80%	100.00%	
CANCER	(-)	29	22	51	0.262
		56.90%	43.10%	100.00%	
	(+)	3	0	3	
		100.00%	0.00%	100.00%	
ABDOMINAL PAIN	(-)	2	2	4	1.00
		50.00%	50.00%	100.00%	
	(+)	30	20	50	
		60.00%	40.00%	100.00%	
FEVER	(-)	15	11	26	1.00
		57.70%	42.30%	100.00%	
	(+)	17	11	28	
		60.70%	39.30%	100.00%	
DIARRHEA	(-)	27	14	41	0.109
		65.90%	34.10%	100.00%	
	(+)	5	8	13	
		38.50%	61.50%	100.00%	
HEMATOCHEZIA	(-)	28	12	40	0.011
		70.00%	30.00%	100.00%	
	(+)	4	10	14	
		28.60%	71.40%	100.00%	
INTESTINAL OBSTRUCTION	(-)	32	19	51	0.062
		62.70%	37.30%	100.00%	
	(+)	0	3	3	
		0.00%	100.00%	100.00%	

ABDOMINAL MASS	(-)	27	14	41	0.109
		65.90%	34.10%	100.00%	
	(+)	5	8	13	
		38.50%	61.50%	100.00%	
ASCITES	(-)	9	14	23	0.013
		39.10%	60.90%	100.00%	
	(+)	23	8	31	
		74.20%	25.80%	100.00%	
ANEMIA <10	(-)	16	9	25	0.585
		64.00%	36.00%	100.00%	
	(+)	16	13	29	
		55.20%	44.80%	100.00%	
LEUKOCYTOSIS	(-)	26	13	39	0.121
		66.70%	33.30%	100.00%	
	(+)	6	9	15	
		40.00%	60.00%	100.00%	

Table 7: Laboratory results

Laboratory Variables		**DIAGNOSED ITB**		**Total**	**pvalue**
		(-)	(+)		
LEUKOCYTOSIS	(-)	26	13	39	
		66.70%	33.30%	100.00%	0.121
	(+)	6	9	15	
		40.00%	60.00%	100.00%	
ELEVATED ESR	(-)	4	0	4	0.491
		100.00%	0.00%	100.00%	
	(+)	5	2	7	
		71.40%	28.60%	100.00%	
HYPONATREMIA	(-)	14	5	19	0.749
		73.70%	26.30%	100.00%	
	(+)	18	9	27	
		66.70%	33.30%	100.00%	
ELEVATED LDH	(-)	12	1	13	0.322
		92.30%	7.70%	100.00%	
	(+)	9	3	12	
		75.00%	25.00%	100.00%	
ELEVATED CRP	(-)	4	4	8	0.608
		50.00%	50.00%	100.00%	

	(+)	6	2	8	
		75.00%	25.00%	100.00%	
HYPOALBUMINEMIA	(-)	3	5	8	0.262
		37.50%	62.50%	100.00%	
	(+)	22	14	36	
		61.10%	38.90%	100.00%	
ILEOCECAL INVOLVEMENT	(-)	24	3	27	0.000
		88.90%	11.10%	100.00%	
	(+)	6	18	24	
		25.00%	75.00%	100.00%	
MATTED MESENTERIC LN	(-)	2	3	5	0.316
		40.00%	60.00%	100.00%	
	(+)	30	13	43	
		69.80%	30.20%	100.00%	
CONCENTRIC MURAL THICKENING	(-)	12	5	17	0.757
		70.60%	29.40%	100.00%	
	(+)	20	11	31	
		64.50%	35.50%	100.00%	
DILATED BOWEL LOOPS	(-)	28	9	37	0.027
		75.70%	24.30%	100.00%	
	(+)	4	7	11	
		36.40%	63.60%	100.00%	
PERFORATION	(-)	31	16	47	0.049
		66.00%	34.00%	100.00%	
	(+)	0	3	3	
		0.00%	100.00%	100.00%	
IC VALVE INVOLVEMENT	(-)	13	6	19	0.008
		68.40%	31.60%	100.00%	
	(+)	4	15	19	
		21.10%	78.90%	100.00%	
COLONIC ULCERS	(-)	6	3	9	0.030
		66.70%	33.30%	100.00%	
	(+)	4	17	21	
		19.00%	81.00%	100.00%	
GRANULOMAS/NODULES	(-)	6	11	17	1.000
		35.30%	64.70%	100.00%	
	(+)	5	9	14	
		35.70%	64.30%	100.00%	

STRUCTURES	(-)	11	18	29	0.527
		37.90%	62.10%	100.00%	
	(+)	0	2	2	
		0.00%	100.00%	100.00%	

Table 8: Univariate Analysis Findings

Variables	Score	Sig.
AGE	0.06	0.806
SEX	0.064	0.801
YEARADMITTED	0.122	0.727
HTN	0.41	0.522
DM	0.24	0.624
PTB	0.548	0.459
IMMUNOCOMPROMISED	0.185	0.667
CANCER	2.184	0.139
ABDOMINAL PAIN	0.153	0.695
FEVER	0.051	0.821
DIARRHEA	3.068	0.08
HEMATOCHEZIA	7.372	0.007
INTESTINAL OBSTRUCTION	4.62	0.032
ABDOMINAL MASS	3.068	0.08
ASCITES	6.724	0.01

Diagnostic Variables	Score	Sig.
ANEMIA	0.433	0.51
LEUKOCYTOSIS	3.191	0.074
ELEVATED ESR	0.686	0.408
HYPONATREMIA	0.686	0.408
ELEVATED LDH		**
ELEVATED CRP		**
HYPOALBUMINEMIA		**
ILEOCECAL INVOLVEMENT	3.429	0.064
MATTED/MESENTERIC LN		**
CONCENTRIC MURAL THICKENING	1.143	0.285
DILATED BOWEL LOOPS	3.429	0.064
PERFORATION	0.381	0.537

IC VALVE INVOLVEMENT		**
COLONIC ULCERS		**
GRANULOMAS/NODULES		**

Note: ** Variables that did not have enough cases.

Table 10.1: Outcome = α + β1(HEMATOCHEZIA)

	B	S.E.	Wald	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
HEMATOCHEZIA	1.764	0.685	6.631	0.01	5.833	1.524	22.33
Constant	-0.847	0.345	6.03	0.014	0.429		

Table 10.2: Outcome = α + β2(Ileocecal Involvement)

	B	S.E.	Wald	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	**Upper**
ILEOCECAL INVOLVEMENT	3.178	0.773	16.912	0	24	5.277	109.149
Constant	-2.079	0.612	11.531	0.001	0.125		