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ORIGINAL ARTICLE

PREVALENCE, DISTRIBUTION AND DETERMINANTS OF INTESTINAL TUBERCULOSIS IN ADULT INDOOR PATIENTS WITH ACUTE SMALL INTESTINAL OBSTRUCTION IN POPULATION OF PESHAWAR DIVISION, PAKISTAN

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ABSTRACT

Background: Acute small intestinal obstruction (ASIO) is one of the commonest causes of emergency hospital admissions, morbidity and mortality. Intestinal tuberculosis (ITB) is common cause of ASIO in developing countries leading to significant morbidity and mortality. Our objectives were to determine prevalence, distribution and determinants of ITB in adult indoor patients with ASIO in population of Peshawar Division, Pakistan.

Materials & Methods: This cross-sectional study was conducted at Department of Surgery Peshawar Medical College, Peshawar, Pakistan from January 2019 to June 2020. The data was collected from its three affiliated hospitals; Mercy Teaching Hospital, Kuwait Teaching Hospital & Prime Teaching Hospital, Peshawar. 207 ASIO subjects were selected from population at risk consecutively. Sex, age groups and presence of ITB were variables. Prevalence and distribution were described by count, percentage and confidence intervals for proportion for population. Hypotheses for distribution were tested by chi-square goodness of fit and of association by chi-square test of association.

Results: Out of 207 patients with ASIO, 128 (61.84%) were men and 79 (38.16%) women, 87 (42.03%) were in age group 18-40 and 120 (57.97%) in 41-60 years. Out of 207 patients with ASIO, 41 (19.81%) had ITB, while 166 (80.19%) had no ITB. Out of 41 ITB patients, 25 (12.08%) were men and 16 (7.73%) women, 17 (8.21%) in age group 18-40 and 24 (11.60%) in 41-60 years. The prevalence of ITB was similar to expected (p=.5695). The distribution across sex (p=.00001) was different and across age groups (p=.12501) was similar to expected. Presence of ITB was not associated to sex (p=.8992) and age groups (p=.9347).

Conclusion: Prevalence of intestinal TB in adult indoor acute small intestinal obstruction (ASIO) population of Peshawar Division, Pakistan was 19.81%. Prevalence was higher in men than women and higher in 41-60 years than 18-40 years age group population. Overall prevalence of intestinal TB was similar to expected. Observed distribution across sex was different and across age groups was similar to expected. Presence of intestinal TB was not associated to sex and age groups respectively.

KEY WORDS: Intestinal Obstruction; Tuberculosis; Prevalence; Distribution; Determinants; Sex; Age Groups; Pakistan.

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1. INTRODUCTION

1.1 Background: Acute small intestinal obstruction (ASIO) is important surgical emergency.[1-3] It is responsible for 2-4% of emergency visits, about 15% hospital admissions, and 20% of emergency surgeries for abdominal pain.[4,5] In the United States in 1994 small intestinal obstruction caused about 300,000 admissions, about 846,000 days of indoor care, and approximately 1.3 billion dollars in health care

cost.[6] Intestinal ischemia is complicating 7 to 42% of intestinal obstructions and significantly increases mortality associated with intestinal obstruction.[7]

Adhikari, et al.[8] from Calcutta, India from May 2005 to April 2008 demonstrated 14.17% (52*100/367=14.17%) intestinal TB (ITB) cases in 367 patients of acute intestinal obstruction, 7.36% (27*100/367=7.36%) mortality caused by acute intestinal obstruction out of which 3.82% (14*100/367=3.82%) mortality was caused by ITB and 3.54% (13*100/367=3.54%) by other causes respectively.

Tuberculosis (TB) is the 10th important cause of death throughout the world. It is the first leading cause of mortality from a single infection. Globally in 2018, there were about 10 million incident TB cases. Globally 1.2 million deaths in HIV non-infected patients and 251,000 deaths in HIV infected patients were caused by TB.[9] Pakistan is ranked 5th in 30 high-prevalent countries for TB and 5th for drug-resistant TB. Estimated TB incidence, prevalence and mortality is respectively 267, 341 and 27 per 100,000 population with about 525,000 new TB cases annualy.[10]

Intestinal TB is very common in developing countries.[11] Intestinal obstruction is the most common complication of ITB.[12,13] Choudhary, et al[14] (n=156) from Uttarakhand, India from 2011 to 2016 reported 13.56% mortality due to tubercular ASIO.

Nguyen, et al.[15] from Ho Chi Minh, Vietnam from 1992 to 1998 (n=513) highlighted 4.48% (23*100/513=4.48%) prevalence of ITB in intestinal obstruction, of which 3.90% (20*100/513=3.90%) were men and 0.58% (3*100/513=0.58%) women, 1.36% (7*100/513=1.36%) were in age group 20-40 years and 3.12% (16*100/513=3.12%) in 41-70 years. Chitumalla, et al[16] from Hyderabad, India from October 2013 to September 2015 elaborated 4.88% (2*100/41=4.88%) ITB cases in 41 patients of ASIO.

Tasnim, et al[17] from Rajshahi, Bangladesh from Sep. 2010 to Aug. 2011 showed 2.8% (7*100/250=2.8%) frequency of ITB in 250 patients with intestinal obstruction. Maik, et al[18] from Jamshoro, Pakistan from June 2004 to June 2009 demonstrated 25.58% (55*100/215=25.58%) ITB in 215 ASIO patients. Sultan, et al[19] from Karachi, Pakistan from September 2016 to October 2019 reported 7.5% (9*100/120=7.5%) prevalence of ITB in 120 intestinal obstruction cases.

1.2 Research Problems (RPs), Knowledge Gaps (KGs) & Rationale

The first step in solving a problem is to know the overall and group wise burden of the problem/ disease. Thereafter we can work for its determinants (causes/ risk factors) and solution/ treatment. We have adopted "Marwat's Logical Trajectory of Research Process".[20-23] Unawareness about the prevalence, distribution (across sex and age groups) and determinants (association to sex and age groups) of intestinal TB in adult indoor ASIO population of Peshawar Division, Pakistan are our five RPs. Unavailability of data regarding these RPs are our five knowledge gaps and hence rationale for our project.

1.3 Research Questions (RQs)

RQ-1: What is the prevalence of intestinal TB in adult indoor ASIO population of Peshawar Division, Pakistan?

RQ 2-3: What is the distribution of intestinal TB across the sex and age groups in adult indoor ASIO population of Peshawar Division, Pakistan?

RQ 4-5: What is the association between intestinal TB and sex and age group in adult indoor ASIO population of Peshawar Division, Pakistan?

1.4 Research Objectives (ROs)

The objectives of our study were to find the:

RO-1: prevalence of intestinal TB in adult indoor ASIO population of Peshawar Division, Pakistan.

RO 2-3: distribution of intestinal TB across the sex and age groups in adult indoor ASIO population of Peshawar Division, Pakistan.

RO 4-5: association between intestinal TB and sex and age group in adult indoor ASIO population of Peshawar Division, Pakistan.

1.5 Research Hypotheses (Null)

H_{01}: The observed prevalence of intestinal TB is similar to expected in adult indoor ASIO population of Peshawar Division, Pakistan. (RQ1, RO1)

H_{02}: The observed distribution of intestinal TB across the sex is similar to expected in adult indoor ASIO population of Peshawar Division, Pakistan. (RQ2, RO2)

H_{03}: The observed distribution of intestinal TB across the age groups is similar to expected in adult indoor ASIO population of Peshawar Division, Pakistan. (RQ3, RO3)

H_{04}: Presence of intestinal TB and sex are not associated with each other in adult indoor ASIO population of Peshawar Division, Pakistan. (RQ4, RO4)

H_{05}: Presence of intestinal TB and age groups are not associated with each other in adult indoor ASIO population of Peshawar Division, Pakistan. (RQ5, RO5)

1.6 Significance: This study will determine the burden of the problem i.e. intestinal TB overall and in sex and age groups in adult indoor ASIO population in high TB-prevalent countries like Pakistan. Further this study may identify associations of sex and age groups to ITB in adult indoor ASIO population. It will help the public health specialists and clinicians to plan reasonable steps.

2. MATERIALS AND METHODS

2.1 Design, Setting & Duration: This cross-sectional study was conducted at the Department of Surgery, Peshawar Medical College, Peshawar, Pakistan from January 2019 to June 2020. The data was collected from its three affiliated hospital; Mercy Teaching Hospital, Kuwait Teaching Hospital & Prime Teaching Hospital Peshawar.

2.2 Population, Sample Size & Technique and Sample Selection: Peshawar Division (consisting of Districts Peshawar, Nowshera, Charsadda, Khyber and Mohmand) is the most populous division of Khyber Pukhtunkhwa; a province in the north-west of Pakistan. Its population was 8,922,465 in 2017 Census. Age group 18-60 years was assumed to contribute its 50%, hence 4,461,233 persons. With overall presumed prevalence rate of 0.1% of ASIO in this age group, the population with ASIO (population at risk) will be around 4,461 (0.1*4,461,233/100= 4,461) persons. With so much population, prevalence rate of 25.58%[9] of ITB in this population, margin of error 5.81% and confidence interval of 95%, sample size was calculated as 207 using online calculator Raosoft®.[24]

Consecutive non-probability sampling technique was used. Adult (≥18-60 years) indoor patients with ASIO were eligible for inclusion with no exclusion criteria.

2.3 Conduct of Procedure: All patients with clinical and radiological evidence of ASIO coming to emergency department of hospital were admitted, resuscitated and stabilized. A detailed history and thorough clinical examination was carried out in all the patients. Patients were asked to remain nil per oral and all base-line investigations including CXR were carried out. X-rays abdomen (erect and supine) and ultrasound (abdomen and pelvis) were done in all the patients. Surgical laparotomy was done on the earliest available list. All intestinal specimens/ biopsies were sent for histopathology. Patients with confirmed ITB, when clinically stable, were referred to physician for anti-tuberculosis therapy.

2.4 Data Collection Plan: Secondary data was collected through literature search, while primary data was collected through observation. Primary data was collected for the following two demographic variables (attributes); sex (men, women), age groups (18-40 years, 41-60 years) and one research variable (attributes); presence of ITB (yes, no). The data type was nominal for all these variables.

2.5 Data Analysis Plan

2.5.1 Descriptive Analysis and Estimation of Parameters: Descriptively the two demographic and one research variable was analyzed by count and percentage. Estimation of parameters for proportion for the population was given as confidence interval at confidence level of 95%, using Wilson score interval for the binomial distribution through an online statistical calculator.[25] It would mean that if the confidence interval is calculated for an infinite number of samples with a sample size of 207, 95% of the calculated confidence intervals will contain the true value of the proportion of the population.

2.5.2 Testing of Hypotheses

Observed and expected prevalence and observed and expected distribution of ITB by sex and age groups were analyzed separately using chi-square goodness of fit test by an online calculator (H_{01}-H_3).[26-28] The association between the presence of ITB and sex and age groups was calculated by using chi-square test of association/ independence by an online calculator (H_{04-05}).[26,27,29] Observed counts, expected counts, their difference, chi-square value, degree of freedom and level of significance were given at alpha .05.

3. RESULTS

3.1 Descriptive Statistics & Estimation of Parameters

3.1.1 Sample Description & Prevalence of ITB in adult indoor ASIO population: Out of 207 patients with ASIO, 128 (61.84%) were men and 79 (38.16%) women, 87 (42.03%) were in age group 18-40 years and 120 (57.97%) in age group 41-60 years.

Out of 207 patients with ASIO, 41 (19.81%) had ITB, while 166 (80.19%) had no ITB. Estimated prevalence in population is shown below. (Table 3.1.1)

Table 3.1.1: Prevalence of intestinal TB in adult indoor ASIO population of Peshawar Division, Pakistan (n=207)

Variable	Attributes	Sample statistics		95%CI for proportion for population	
		Count	Percentage	Lower	Upper
Presence of intestinal TB	Yes	41	19.81%	14.95	25.77
	No	166	80.19%	74.23	85.05
Total		207	100.00	Population parameters	

3.1.2 Distribution of positive cases of ITB in adult indoor ASIO population across the sex and age group: The distribution of positive cases of ITB by sex and age group in adult indoor ASIO population of Peshawar Division is shown in Table 3.1.2. Here the frequency of ITB in sample and its estimated prevalence in population was higher in men 12.08% than women 7.73% and higher in age group 41-60 years 11.60% than age group 18- 60 years 8.21%.

3.2 Hypotheses Testing:

3.2.1 Observed vs. expected prevalence of ITB in adult indoor ASIO population (H_{01}): Our observed counts for the presence of ITB (yes: no) were 41:166 from a sample of 207 against expected counts of 55:160 from a sample of 215 as reported by Maik, et al.[2] from Jamshoro, Pakistan from June 2004 to June 2009. With different sample sizes/ denominators, comparison was not appropriate. Hence the expected counts and expected percentages were adjusted for a sample of 207. The expected counts of 55:215 were replaced by 52.95:154.05. Adjusted expected percentages came similar to expected percentages, so not changed. (Table 3.2.1.1)

Chi-square goodness of fit test showed p-value greater than alpha. H_{01} was declared as true and therefore accepted; showing that the observed prevalence is similar to the expected prevalence. Simply, the prevalence of 19.81% of ITB in our population is similar to what we were expecting from the adjusted expected percentage/ prevalence of 25.58% from Maik, et al.[2] (Table 3.2.1.2)

3.2.2 Observed vs. expected distribution of positive cases of ITB by sex in adult indoor ASIO population (H_{02}): Our observed distribution for men versus women was 25:16 out of 41 positive cases from a sample of 207 adult indoor ASIO patients against expected counts of 20:3 out of 23 positive cases of ITB in 513 adult indoor ASIO population

Table 3.1.2: Distribution of positive cases of intestinal TB across the sex and age groups in adult indoor ASIO population of Peshawar Division, Pakistan (n=41/207)

Variables	Attributes	Sample size	Sample statistics		95% CI for proportion	
			Count	Percentage	Lower	Upper
Sex	Men	128	25	25*100/207=12.08%	8.31	17.22
	Women	79	16	16*100/207=7.73%	4.81	12.19
Age groups	18-40years	187	17	17*100/207=8.21%	5.19	12.75
	41-60 years	120	24	24*100/207=11.60%	7.97	16.75
Total		207	41	41*100/207=19.81%	7.56	8.64

Table 3.2.1.1: Observed, expected and adjusted expected counts and percentages for prevalence of intestinal TB in adult indoor ASIO population of Peshawar Division, Pakistan (n=207)

Presence of intestinal TB	Observed counts	Observed %ages	Expected counts	Expected %ages	Adjusted expected counts	Adjusted expected %ages
Yes	41	19.81%	55	25.58%	55*207/215=52.95	52.95*100/207= 25.58%
No	166	80.19%	160	74.42%	160*207/215=154.05	154.05*100/207=74.42%
Total (n)	207	100%	215	100.00%	207.00	100.00%

Table 3.2.1.2: Observed vs. expected prevalence of intestinal TB in adult indoor ASIO population of Peshawar Division, Pakistan (n=207)

Variable	Attributes	O	E	O-E	$(O-E)^2$	$(O-E)^2/E$	χ^2	d.f.	p-value
Presence of intestinal TB	Yes	41	52.95	-11.95	142.80	2.70	3.624	1	.05695
	No	166	154.05	11.95	142.80	0.93	H_{01} accepted at alpha .05		
	Total	207	207.00	Chi-square goodness of fit with Yates correction					

O= Observed count, E= Expected count, χ^2 =chi-square statistic, d.f. = degree of freedom

as reported by Nguyen, et al.[1] from Ho Chi Minh, Vietnam from 1992 to 1998. With different sample sizes/ denominators, comparison was not appropriate. Hence the expected counts and expected percentages were adjusted for a sample of 207. The expected counts of 20:3 were replaced by 35.65:5.35 and expected percentages of 3.90%:0.58% were replaced by 17.22%:2.59%. (Table 3.2.2.1)

Chi-square goodness of fit test showed p-value <alpha. H_{02} was declared as false and therefore rejected, showing that the observations did not match the expected values of the population. In simple words, our observed prevalence of ITB in men 12.08% was statistically lower to what we expected (adjusted expected) for men 17.22% & our observed prevalence of ITB in women 7.73% was higher to what we expected (adjusted expected) for women 2.59% from Nguyen, et al.[1] (Table 3.2.2.2)

3.2.3 Observed vs. expected distribution of positive cases of intestinal TB by age groups in adult indoor ASIO population (H_{03}): Our observed distribution for age group 18-40 years versus 41-60 years was 17:24 out of 41 positive cases from a sample of 207 against expected counts of 7:16 in age group of 20-40 years versus 41-70 years out of 23 positive cases of ITB in 513 adult indoor ASIO population as reported by Nguyen, et al.[1] With different sample sizes/ denominators, comparison was not appropriate. Hence the expected counts and expected percentages were adjusted for a sample of 207. The expected counts of 7:16 were replaced by 12.48:28.52 and expected percentages of 1.36%:3.12% were replaced by 6.03%:13.78%. (Table 3.2.3.1)

Chi-square goodness of fit test showed p-value >alpha. H_{02} was declared to be true and therefore accepted, showing that the observations match the

Table 3.2.2.1: Observed, expected and adjusted expected counts and percentages for distribution of positive cases of intestinal TB by sex in adult indoor ASIO population of Peshawar Division, Pakistan (n=41/207)

Presence of intestinal TB	Observed counts	Observed %ages	Expected counts	Expected %ages	Adjusted expected counts	Adjusted expected %
Positive cases in men	25	25*100/207 =12.08%	20	20*100/513 =3.90%	20*41/23 =35.65	35.65*100/207 =17.22%
Positive cases in Women	16	16*100/207 =7.73%	3	3*100/513 =0.58%	3*41/23 =5.35	5.35*100/207 =2.59%
Total positive	41	41*100/207 =19.81%	23	23*100/513 =4.48%	23.00*41/23 =16.00	41.00*100/207 =19.81%

Table 3.2.2.2: Observed vs. expected distribution of positive cases of intestinal TB by sex in adult indoor ASIO population of Peshawar Division, Pakistan (n=41/207)

Variable	Attributes	O	E	O-E	$(O-E)^2$	$(O-E)^2/E$	χ^2	d.f.	p-value
Sex	Men	25	35.65	-10.65	1.74	113.42	24.382	1	<.00001
	Women	16	5.35	10.65	1.74	113.42	H_{02} rejected at alpha .05		
	Total	41	41.00	Chi-square goodness of fit test with Yates correction					

O= Observed count, E= Expected count, χ^2= chi-square statistic, d.f. = degree of freedom

Table 3.2.3.1: Observed, expected and adjusted expected counts and percentages for distribution of positive cases of intestinal TB by age groups in adult indoor ASIO population of Peshawar Division, Pakistan (n=41/207)

Presence of intestinal TB	Observed counts	Observed %ages	Expected counts	Expected %ages	Adjusted expected counts	Adjusted expected %
Positive cases in age group 18-40 years	17	17*100/207 =8.21%	7	7*100/513 =1.36%	7*41/23 =12.48	12.48*100/207 =6.03%
Positive cases in age group 41-60 years	24	6*100/196 =11.60%	16	16*100/513 =3.12%	16*41/23 =28.52	28.52*100/207 =13.78%
Total positive	41	16*100/196 =19.81%	23	23*100/280 =4.48%	23*41/23 =41.00	16.00*100/196 =19.81%

expected values of the population. It simply means that our observed prevalence of ITB in age group 18-40 years 8.21% was statistically similar to what we were expecting for age group 20-40 years 6.03 % & our observed prevalence of intestinal TB in age group 41-60 years 11.60% was also similar to what we were expecting for age group 41-60 years 13.78% (adjusted expected) by Nguyen, et al.[1] (Table 3.2.3.2)

3.2.4 Association of presence of ITB to sex in adult indoor ASIO population (H_{04}): Presence of ITB (dependent variable) to sex (independent variable) in adult indoor ASIO population was substantiated by chi-square test of association. Having p-value more than alpha, H_{04} was declared as true and therefore accepted, revealing that the presence of intestinal TB is independent of sex i.e. presence of ITB and sex are not associated to each other. (Table 3.2.4)

3.2.5 Association of presence of ITB to age groups in adult indoor ASIO population (H_{05}): Presence of ITB (dependent variable) to age groups (independent variable) in adult indoor ASIO population was substantiated by chi-square test of association. Having p-value more than alpha, H_{05} was declared as true and therefore accepted, revealing that the presence of ITB is independent of age groups i.e. presence of ITB and age groups are not associated to each other. (Table 3.2.5)

Table 3.2.3.2: Observed vs. expected distribution of positive cases of intestinal TB by age groups in adult indoor ASIO population of Peshawar Division, Pakistan (n=41/207)

Variable	Attributes	O	E	O-E	$(O-E)^2$	$(O-E)^2/E$	χ^2	d.f.	p-value
Age groups	18-40 years	17	12.48	4.52	20.43	1.64	2.353	1	.12501
	41-60 years	24	28.52	-4.52	20.43	0.72	H_{03} accepted at alpha .05		
	Total	41	41.00	Chi-square goodness of fit test with Yates correction					

O= Observed count, E= Expected count, χ^2= chi-square statistic, d.f. = degree of freedom

Table 3.2.4: Association of presence of intestinal TB to sex in adult indoor ASIO population of Peshawar Division, Pakistan (n=207)

Variable/ Attributes	Presence of intestinal TB		Rows Total	χ^2	d.f.	p-value
	Yes	No				
Sex	O (E) [χ^2]	O (E) [χ^2]		Chi-square test of association with Yates correction		
Men	25 (25.35) [0.00]	103 (102.65) [0.00]	128	.016	1	.8992
Women	16 (15.65) [0.01]	63 (63.35) [0.00]	79			
Columns Total	41	166	207	H_{04} accepted at alpha 0.05		

O= Observed count, E= Expected counts, χ^2= chi-square statistic, d.f. = degree of freedom

Table 3.2.5: Association of presence of intestinal TB to age groups in adult indoor ASIO population of Peshawar Division, Pakistan (n=207)

Variable/ Attributes	Presence of intestinal TB		Rows Total	χ^2	d.f.	p-value
	Yes	No				
Age groups	O (E) [χ^2]	O (E) [χ^2]		Chi-square test of association with Yates correction		
18-40 years	17 (17.23) [0.00]	70 (69.77) [0.00]	87	.0067	1	.9347
41-60 years	24 (23.77) [0.00]	96 (96.23) [0.00]	120			
Columns Total	41	166	207	H_{05} accepted at alpha 0.05		

O= Observed count, E= Expected count, χ^2= chi-square statistic, d.f. = degree of freedom

4. DISCUSSION

4.1 Prevalence of ITB in adult indoor ASIO population (H_{01}): The prevalence of ITB in our study was 19.81% (14.95%-25.77% at 95% CL). Almost similar prevalence 25.58% (within our 95% CI) to our study was reported by Maik, et al.[2] from Jamshoro, Pakistan from June 2004 to June 2009 in 215 ASIO patients.

Following five studies showed lower prevalence of intestinal TB than ours: Sultan, et al.[3] from Karachi, Pakistan from September 2016 to October 2019 reported 7.5% prevalence of intestinal TB in 120 intestinal obstruction cases. Tasnim, et al.[4] from Rajshahi, Bangladesh from Sep 2010 to Aug 2011 showed 2.8% frequency of intestinal TB in 250 patients with intestinal obstruction

Chitumalla, et al.[2] from Hyderabad, India from October 2013 to September 2015 elaborated 4.88% ITB cases in 41 patients of ASIO. Adhikari, et al.[2] from Calcutta, India from May 2005 to April 2008 demonstrated 14.17% intestinal Tb cases in 367 patients of acute intestinal obstruction. Nguyen, et al.[1] from Ho Chi Minh, Vietnam from 1992 to 1998 (n=513) highlighted 4.48% prevalence of ITB in intestinal obstruction. No study could be retrieved from the literature which shows higher prevalence of ITB than our study.

Our observed prevalence of ITB in adult indoor ASIO 19.81% from a sample of 207 was similar (p=.5695) to what we expected as 25.58% from a study by Maik, et al.[2] from Jamshoro, Pakistan from a sample of 215.

4.2 Distribution of positive cases of ITB in adult indoor ASIO population by sex (H_{02}): The prevalence of ITB in our study was more in men 12.08% (95% CI 8.31-17.22) than women 7.73% (95% CI 4.81-12.19). Similarly higher prevalence in men as 3.90% and lower prevalence in women as 0.58% was shown by Nguyen, et al.[1] from Ho Chi Minh, Vietnam from 1992 to 1998 (n=513).

Our observed prevalence of ITB in men 12.08% was lower to what we expected (adjusted expected) for men 17.22% & our observed prevalence of ITB in women 7.73% was higher to what we expected (adjusted expected) for women 2.59% from Nguyen, et al.[1] from Ho Chi Minh, Vietnam from 1992 to 1998 (n=513) (Table 3.2.2.2)

4.3 Distribution of positive cases of ITB in adult indoor ASIO population by age groups (H_{03}): The prevalence of ITB in our study was more in age group 41-60 years 11.60% (95% CI 7.97-16.75) than age group 18-40 years 8.21% (95% CI 5.19-12.75). Similarly higher prevalence in age group 41-70 years as 3.12% and lower prevalence in age group 18-40 years as 1.36% was shown by Nguyen, et al.[1] from Ho Chi Minh, Vietnam from 1992 to 1998 (n=513).

Our observed prevalence of ITB in age group 18-40 years 8.21% was statistically similar to what we were expecting for age group 20-40 years 6.03 % & our observed prevalence of ITB in age group 41-60 years 11.60% was also similar to what we were expecting for age group 41-60 years 13.78% (adjusted expected) by Nguyen, et al.[1] from Ho Chi Minh, Vietnam from 1992 to 1998. (Table 3.2.3.2)

4.4 Association of presence of ITB to sex in adult indoor ASIO population (H_{04}): In our study there was no association between the presence of ITB and sex (Table 3.2.4, p= .8992). No study could be drawn from literature to compare with our study.

4.5 Association of presence of ITB to age groups in adult indoor ASIO population (H_{05}): In our study presence of ITB and age groups were not associated to each other (Table 3.2.5, p=.9347). No study could be drawn from literature to compare with our study.

5. CONCLUSIONS & RECOMMENDATION

Prevalence of intestinal TB in adult indoor acute mechanical small intestinal obstruction (ASIO) population of Peshawar Division, Pakistan was 19.81%. It was more in men than women and more in 41-60 years than 18-40 years age group population. Overall prevalence of intestinal TB was similar to expected. Observed distribution across sex was different and across age groups was similar to expected. Presence of intestinal TB was not associated to sex and age groups respectively.

Health care providers specifically surgeons should have low threshold for intestinal TB in adult indoor ASIO population in high TB prevalent areas like Pakistan, send intestinal specimens/biopsies for histopathology, culture and PCR to early diagnose intestinal TB and start its management as early as possible to prevent morbidity and mortality.

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CONFLICT OF INTEREST
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All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.