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Retrospective Study of Tuberculosis Cases in Ajdabiya City, Libya during Period of 2010-2020

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Abstract

Tuberculosis (TB) is one of the most potentially fatal contagious diseases worldwide, especially in the developing countries. The aim of this study was to assess the pattern of TB in Ajdabiya, Libya. This cross-sectional study was carried out from January 2010 to December 2020 using medical records from the TBRegistry at National Center for Disease Control situated in Ajdabiya. The investigated variables included demographic characteristics, type of TB infection, and affected organs. All data were coded and statistically analyzed. Results showed that the total of 536 patients was enrolled in this study: 299 (55.8%) were males and 237 (44.2%) were females. In both sexes, 238 (44.4%) patients were affected with PTB, 214 (39.9%) patients were affected with EPTB, only 84 (15.7%) were presumptive patients. The highest incidence occurred in there productive age group 25-34 years (23.3 %) and housewives (27.6%). During the 11 years study period, the highest percentage of cases was during 2018and the lowest frequency was during 2011. The largest proportion of EPTB cases was pleural TB 45.3% followed by lymphatic TB 23.4%, then bone TB 11.2%.

Conclusion: Young, middle-aged male cases were highest in percentage. The highest percentage of TB was registered in 2018.

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Keywords: (TB) tuberculosis, (PTB) pulmonary, (EPTB) extraplmonary, Ajdabya.

دراسة إسترجاعية لحالات مرض السل في مدينة اجدابيا بليبيا خلال الفترة 2010-2020

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الملخص:

يعد مرض السل أحد أكثر الأمراض المعدية القاتلة في جميع أنحاء العالم، وخاصة في البلدان النامية. كان الهدف من هذه الدراسة تقييم نمط مرض السل في مدينة أجدابيا بليبيا. تم إجراء هذه الدراسة المقطعية في الفترة من يناير 2010 إلى ديسمبر 2020 باستخدام السجلات الطبية من سجل السل في المركز الوطني لمكافحة الأمراض في أجدابيا. وشملت المتغيرات التي تم التحقيق فيها مثل الخصائص الديموغرافية، ونوع الإصابة بالسل، والأعضاء المتضررة. تم ترميز جميع البيانات وتحليلها إحصائيا. النتائج أظهرت تسجيل مجموعة 536 مريضا في هذه الدراسة: 299 (55.8%) من الذكور و 237 (44.2%) من الإناث. في كلا الجنسين، تأثر 238 (44.4%) مريضا بالسل الرئوي و214 (39.9%) مريضا بالسل خارج الرئة. كان فقط 84 (15.7%) مرضى افتراضيين. أعلى نسبة ظهرت في المجموعة العمرية الإنتاجية 25-34 سنة (23.3%) وربات البيوت (27.6%). خلال فترة الدراسة التي استمرت 11 عاما، كانت أعلى نسبة للحالات خلال عام 2018 وأقل تكرار كان خلال عام 2011. كانت النسبة الأكبر من حالات السل الجنبي 45.3%، يليه السل اللمفاوي 23.4%، ثم السل العظمي 11.2%.

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الخلاصة: كانت حالات الشباب الذكور في منتصف العمر هي الأعلى بالنسبة المئوية. وتم تسجيل أعلى نسبة لمرض السل في عام 2018.

الكلمات المفتاحية: مرض الدرن، السل الرئوية، السل خارج الرئة، أجدابيا.

INTRODUCTION

Tuberculosis (TB) is a major cause of morbidity and mortality worldwide, especially in the developing countries. According to World health organization (WHO), new cases were increased from 8.8 million to 10.4 million in 2010 to 2015, respectively. Furthermore, number of individuals who died from TB increased from 1.1 million to 1.5 million in 2010 to 2018, respectively [1]. Globally, TB is one of the serious infectious diseases that causes death over the past 200 years, and it represents the second leading cause of death from an infectious disease worldwide after HIV infection [2,3].

The tuberculosis is divided into pulmonary TB (PTB) and Extrapulmonary TB (EPTB) based on clinical manifestation. EPTB is defined as TB that involving organs other than lung (e.g. pleura, lymph node, genitourinary tract, abdomen, skin, bone and joints). EPTB involves relatively inaccessible sites and can cause much greater damage. Therefore, extrapulmonary tuberculosis usually presents more of a diagnostic problem than pulmonary tuberculosis. EPTB can involve any site in the body and the most common site is lymph node especially cervical lymph node which is followed by pleural TB that is more in high burden countries [4]. TB has been rising in Libya and became as a serious public health issue [5]. According to the WHO estimated for the period of 1990 to 2010, the incidence rate of TB in Libya was 40 per 100,000 people [6].Many surveys in Libya assessed the prevalence of TB. In 2010, a study was conducted in Northwestern Libya, revealed an estimated incidence of pulmonary TB cases among total population calculated as 0.09 cases/100,000 and estimated prevalence of total pulmonary TB cases calculated as 14 case/100,000 [7]. Amongst those patients there were missed cases which they considered presumptive or suspected cases that were

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presented at healthy facility with symptoms or signs suggestive of TB [8].

Screening and accurate diagnosis, followed by notification, and registration of TB cases were implemented all over Libya according to the National TB Strategy of the National Tuberculosis Control Program (NTP) for the effective control of TB. One of the registration sites is Ajdabiya Chest Center, where the current study was conducted. Although several studies were performed in different cities of Libya, there were no comprehensive studies in Ajdabiya. Therefore, the aim of this study is to determine the TB incidence rates which were registered at the National Center for Disease Control in Ajdabiya in the last 11 years.

MATERIALS AND METHODS

Study Location

The study was conducted at National Center for Disease Control situated in Ajdabiya, Libya. The diagnosis of TB in The National Center for Tuberculosis Control is made in line with the National Libya TB Control Program Guidelines of the Ministry of Health (NTP). Cases were categorized by major disease site, reported as either pulmonary TB (PTB) which diagnoses patients with tuberculosis by examining morning sputum smears for acid-fast bacilli (AFB) with Nielsen staining and chest x-rays for extra pulmonary tuberculosis (EPTB). Suspected of having TB or presumptive TB is someone presenting with any of TB symptoms if they were known to be in contact with infectious TB. The patients were registered and treated according to the Libyan National Tuberculosis Control Program.

Study design and Data collection

An eleven years retrospective descriptive analysis to assess the tuberculosis cases and risk factors of 536 TB patients, registered from January 2010 to December 2020 was carried out in the National Center for Disease Control in Ajdabiya. Demographic data such as gender, age categories, region, nationality and occupation were recorded. In addition, the success of treatment

and TB associated diseases such as AIDS and hepatitis were recorded in some cases.

Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software package, Version 20.The probability of association between the diagnosis and all tested factors, and also between the regional factor and the other factors was estimated by applying the Chi-Square test at probability of 1%. The total number of cases and their annual percentage were estimated based on gender, age categories, nationality, and region.

Ethical approval

Ethics approval to use, report, and publish the collected data was obtained from the Ministry of Health, Ajdabiya. Patient information was anonymized and deidentified prior to the analysis.

RESULTS

A total of 536 patients were enrolled in this study: 299 (55.8%) were males and 237 (44.2%) were females. 238 (44.4%) patients were significantly ($p<0.05$) affected with PTB, 157 (66%) of them were males, and 81 (34%) were females. While 214 (39.9%) patients were affected with EPTB, 104 (48.6%) of them were males and 110 (51.4%) were females. 84 (15.7%) were presumptive patients, 38 (45.2%) of them were males, and 46 (54.8%) were females (Table 1).Ages of patients were divided into age groups (Figure1). The highest incidence occurred in the age group 25-34 years (23.3 %) and the lowest incidence occurred at age group less than 15 years (5.8%). Naturally, the study found that the incidence of infection within the Libyan nationality is a huge (89.9%). The rest 10.1% TB patients were non-Libyan nationalities. Other than Libyan nationalities, Sudanese were more in number who got infection (5.4%), followed by Egyptians (1.9%) while the most decline percentage of infection was in the nationalities of chad (1.1%). Many more nationals were also infected but their infection rate was very low.

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On the basis of geographic area: 500 (93.3%) patients live in Ajdabya, while 36 (6.7%) patients live outside of Ajdabiya.

Table 1. Socio-Demographic Characteristics

Variable	Total sample (n=536)	PTB (n=238)	EPTB (n=214)	Pre-sumptive (n=84)
	n (%)	n (%)	n (%)	n (%)
Gender				
Male	299 (55.8%)	157 (29.3%)	104 (19.4%)	38 (7.1%)
Female	237 (44.2%)	81 (15.1%)	110 (20.5%)	46 (8.6%)
Age-year				
0-14	31 (5.8%)	2 (0.4%)	18 (3.4%)	11 (2.1%)
15-24	108 (20.1%)	50 (9.3%)	44 (8.2%)	14 (2.6%)
25-34	125 (23.3%)	66 (12.3%)	42 (7.8%)	17 (3.2%)
35-44	106 (19.8%)	53 (9.9%)	42 (7.8%)	11 (2.1%)
45-54	72 (13.4%)	33 (6.2%)	23 (4.3%)	16 (3.0%)
55-64	49 (9.1%)	18 (3.4%)	21 (3.9%)	10 (1.9%)
≥65	45 (8.4%)	16 (3.0%)	24 (4.5%)	5 (0.9%)
Nationality				
Libyan	482 (89.9%)	204 (38.1%)	200 (37.3%)	78 (14.6%)
Sudan	29 (5.4%)	19 (3.5%)	6 (1.1%)	4 (0.7%)
Egypt	10 (1.9%)	4 (0.7%)	4 (0.7%)	2 (0.4%)
Chad	6 (1.1%)	4 (0.7%)	2 (0.4%)	0 (0.0%)
Others	9 (1.7%)	7 (1.3%)	2 (0.4%)	0 (0.0%)
Region				
Ajdabiya	500 (93.3%)	220 (41%)	210 (39.2%)	70 (13.1%
Sabha	7 (1.3%)	4 (0.7%)	1 (0.2%)	2 (0.4%)
Alkofra	18 (3.4%)	7 (1.3%)	0 (0.0%)	11 (2.1%)
Sirte	3 (0.6%)	1 (0.2%)	2 (0.4%)	0 (0.0%)
Others	8 (1.5%)	6 (1.1%)	1 (0.2%)	1 (0.2%)

Table 2: Correlation of TB values with Socio-Demographic

Socio-Demographic	Tuberculosis	
	χ^2	P-value
Gender	18.272	<0.001*
Age-year	35.237	<0.001*
Nationality	12.724	0.122
Geographic area	38.961	<0.001*

χ^2 Chi-squared test
*Correlation is significant at the <0.001 level (2-tailed)

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The strength of association between tuberculosis and Socio-Demographic factors was assessed by calculating p value (Pearson's correlation coefficient). A p-value <0.05 was considered as significant whereas < 0.001 was considered as highly significant. The correlation between TB and gender, age of patients and geographic area were highly significant ($p<0.001$) while there is no strong correlation between TB and nationality (Table 2).

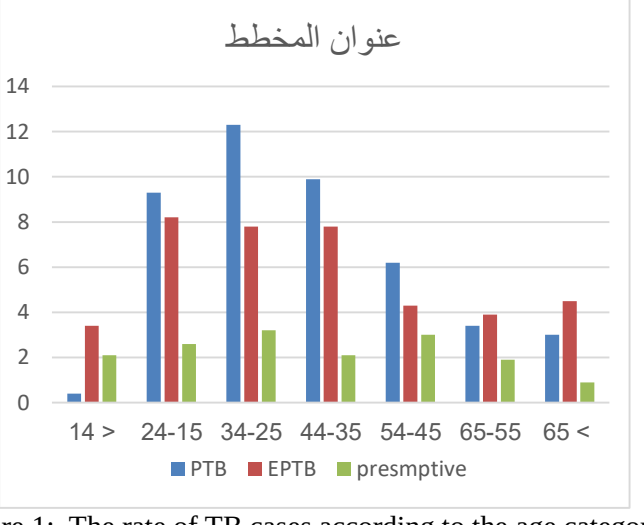

Figure 1: The rate of TB cases according to the age categories

The tuberculosis infections among different occupational category were also statistically evaluated. The most affected category by tuberculosis is found to be housewives (27.6%) followed by students (18.7%) and self-employed (17.4%) (χ^2= 53.7, P<0.001) (Figure 2).

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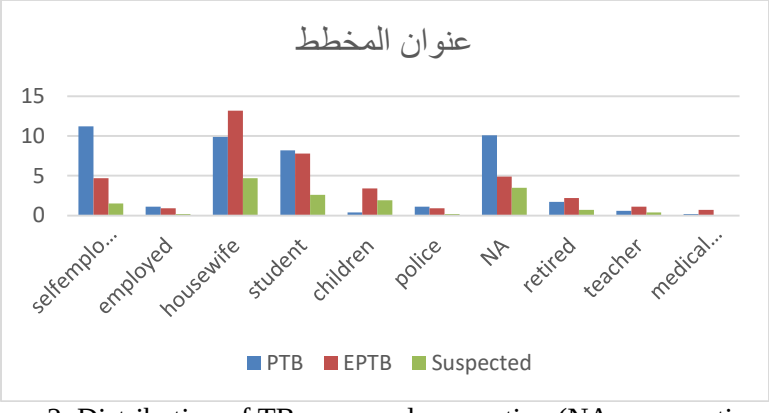

Figure 2: Distribution of TB cases and occupation (NA= occupation not available)

In contrast, a highest ratio of TB cases in Ajdabya was recorded in 2018 (approximately 14.6%), and the lowest ratio was 4.9% which was registered in 2011. Then, suddenly increased to 11.2% in 2012. In addition, the total number of TB cases was increased sharply during the period between 2013-2019 to 10.8% in 2019, then decline in 2020 to 7.5% (figure 3).

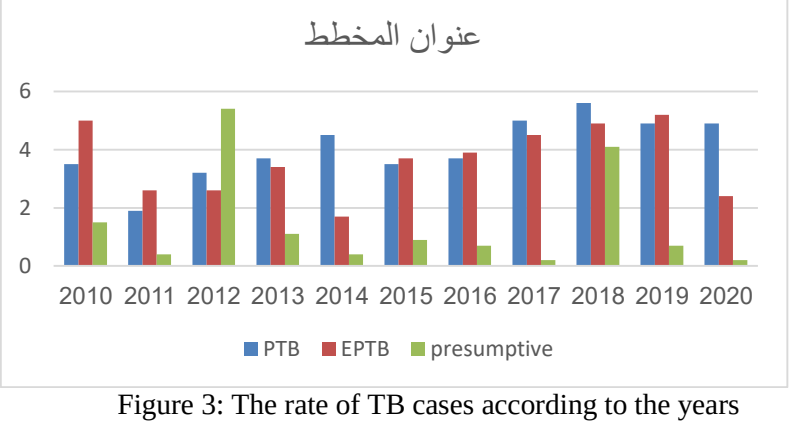

Figure 3: The rate of TB cases according to the years

On other hand, out of 536 patients, 381 (71.1%) were completed their treatment, while 106 (19.8%) were discontinued the course of

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treatment. Only 18 (3.4%) were recovery from disease and 31 (5.8%) were deceased (Table 3).

Table 3. Distribution of cases according to patient responsibility

Responsibility	Total sample (n=536)	PTB	EPTB	Presum-ptive	χ^2	P-value
Complete - treatment	381 71.1%)	164 (30.6%)	152 (28.4%)	65 (12.1%)	27.57	< 0.001 *
Discontinues	106 (19.8%)	46 (8.6%)	44 (8.2%)	16 (3%)		
Deceased	31 (5.8%)	10 (1.9%)	18 (3.4%)	3 (0.6%)		
Recovery	18 (3.4%)	18 (3.4%)	0 (0.0%)	0 (0.0%)		

TB and associated diseases in this study is classified into TB alone, which registered the highest percentage (97.6%), followed by TB with AIDS at a rate of 1.9%, then TB with hepatitis at a rate of 0.4%, whereas TB with hepatitis and AIDS was only 0.2% (Table 4).

Table 4. Tuberculosis and various associated diseases

Associated Diseases	Frequency (n=536)	(%)	χ^2	P-value
TB alone	523	97.6%	8.363	0.213
TB with HIV infection	10	1.9		
TB with Hepatitis C infection	2	0.4		
TB with HIV and Hepatitis C	1	0.2		

The results of Chi-Square test exhibit a massive significant association between the diagnosis and all of gender, age categories, region, occupation, year and responsibility of patients to treatment at $p< 0.01$. On the contrary, the results of Chi-Square test found out that there is no significant accompaniment between the diagnosis and all of nationality ($p=0.122$) and other diseases associated with tuberculosis ($p = 0.213$).

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Table 5. Distribution of EPTB cases according to organ affected

EPTB organ affected	Frequency (n=214)	(%)
Pleura	97	45.3
LN	50	23.4
Bone	24	11.2
BCG	15	7
GIT	12	5.6
Military	10	4.7
Skin	3	1.4
CNS	3	1.4

Note: CNS = central nervous system; GIT = gastrointestinal tract; LN = lymph nodes.
BCG = Bacillus Calmette- Guerin Vaccine

The most affected extra pulmonary site was pleura (45.3%) followed by lymph nodes (23.4%) then bone (11.2%). Skin and central nervous system were equal (1.4%) (Table 5).

DISCUSSION

Despite the availability of effective pharmacotherapy TB remains a major global health problem for the last decades. Globally, 10.0 million people affected with TB in 2019, a number that has been declining very slowly in recent years. 56% of them are men with age ≥15 years, women accounted for 32% and children that aged <15 years were 12%. Among all those affected, 8.2% were people living with HIV and 1.2 million TB deaths among HIV-negative people in 2019 [9].

In this study, the total number of TB cases from January 1, 2010 to December 31, 2020 was 536 cases, while a study conducted at Statistics Department of the National Center for Disease Control in Ajdabiya, Libya. The present study revealed that males have a higher rate of infection than females. Similarly, other studies that were done in Benghazi and Tobruk cities, Libya regarding gender of patients estimated that the incidence rate among males was higher than females [10, 11]. In Ismailia city, Egypt Negm F et al 2015 found that tuberculosis was common among men (67.8%) than women (32.2%) [12]. This could be explained by the fact that males usually work and interact more with infected people than

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females in addition to other risk factors for tuberculosis such as cigarette and shisha smoking which are associated with pulmonary tuberculosis [13]. In addition, many women may not seek medical advice due to factors related to illiteracy, cultural, and traditional attitudes which may neglect the females' health status. On the other hand, Mohamed et al. estimated that 70.87% of patients were females and 29.13% were males who admitted to the Assiut Chest Hospital, Egypt from 2005 to 2009 [14]. Similarly, study in Saudi Arabia reported a higher percentage of women compared to men because women work outside with a greater chance of exposure to infection [15, 19]**.**

Regarding the age groups at our study, it was observed that the prevalence of TB was the highest 63.4% in the productive age (15-44 years). This agree with Previous study was done in Libya by Ismail et al in Tobruk showed the prevalence of TB cases were found to be among age group 15 to 34 years (49.7 %) [12**]**. Similarly, many studies are done in Arabic countries found that high incidence of TB among reproductive age groups [13,15]. In Africa, Mori and Leung also reported that 74% of the cases were at age group 15-44 years which agreed with study is done in Nigeria about 82% of TB patients were between 16 and 45 years [16**]**. The lowest prevalence at this study was in the extremes of ages, those < 15 years and those > 65 years. The difficulty in diagnosis and low awareness of paediatricians about reporting requirements that leads to lower proportion of notified childhood tuberculosis cases. According of WHO 2020, men that aged ≥15 years are accounted for 56% of the people who developed TB in 2019; women are accounted for 32% and children that aged <15 years are for 12% [9]**.** In contrast to our research results, study was done 2011 in Taiwan recorded that the age group (≥65 years) were among the most infected with TB [17].

According to nationality, the study found that incidence of infection within the Libyan nationality was a huge (89.9%), whereas, non-Libyan cases were 10.1%. The most frequent nationalities among non-Libyan cases were from neighboring countries; Sudanese were more in number who got infection

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(5.4%), followed by Egyptians TB infections (1.9%). Other nationals were also infected but the rate was very less. This result was in agreement with many studies were done in Libya estimated that the Libyan nationality cases had the highest percentage compared with non-Libyan cases [11, 12, 18].

According to the region, the incidence of TB cases is particularly high in Ajdabiya (93.3%), followed by Akofra city (3.4%) which is Libyan-Sudan border then Sabha city (1.3%). The frequent illegal emigration of Sudanese to Alkofra city has probably made this region most vulnerable for these infections which resemble to problem that was happen in Emsaed town which is on the Libyan-Egyptian border as WHO classification that can cause increase in the incidence of TB cases among these regions in Libya [10, 19].

Among of the different occupational category that assessed in this study, the housewives had the most affected category of (27.6%) followed by students were (18.7%) and self-employed (17.4). The lowest incidence was among medical staff (0.9%), teachers (2.1%) and policeman (2.2%). This result is consistent with other studies were done in Libya and Sudan reported that the most affected category by tuberculosis is found to be housewives (19.9%, 21%) followed by self-employed (18.3%, 11%) and students (17.7%, 10%) respectively [10, 20].

The incidence of tuberculosis in Ajdabiya in the past eleven years was increased sharply due to disruption of the health system in the period following 2011 that is caused by the war and political changes in Libya [23]. The lowest ratio was registered in 2011 (4.9%). Then suddenly increased to 11.2% in 2012 to reach to the highest ratio during 2018 (14.6%). The decrease in incidence in 2011 may be due to the conditions of war and a decline in patient visitation to the hospitals. Besides to that presumptive TB patients were high in year 2012 (48.3%) that might have dropped out of care during the diagnostic period and that has been established as major problem. Similarly study was done in Benghazi, it is noted that the proportion of patients increased in 2010 (16.4%) then taped to 11.0% in 2011 to reach 9.4% in 2018 [11].

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Despite the enforced legislations which was first introduced in 1973 to control tuberculosis infection in Libya, TB is considered to be high in Libya [24]. The country has been severely affected by war in recent decades and has a large of population were displaced internally in Libya lead to inadequate treatment and irregular drug supplies. In this study, the responsibility of patients to treatment has been shown that, most of the cases (71.1%) were completed their course of TB treatment which can be explained by increasing awareness of cases by treatment protocol besides to that treatment in Libya is free. As well as, incidence cases that were interrupted the course of treatment at a rate of 19.8% and this can lead to treatment failure and drug resistance. Unsuccessful treatment may result from irregularity in taking treatment and loss of follow up, which may be due to patients being transferred to another unit. Moreover, many patients stop treatment as soon as they feel better [12]. While recovery from disease and deceased in this study were 3.4% and 5.8% respectively.

The most common opportunistic infection among HIV patients is tuberculosis. There is a lack of data concerning the effect of HIV and HCV co-infection in Libyan patients with TB. The current study revealed that most of the cases were TB alone without infectious disease, while 1.9% of cases were HIV positive and small percentage of TB with hepatitis C. Moreover, there is no significant association between TB and any infectious disease as AIDS and hepatitis. Unlike, the results of another researches estimated the association of TB with AIDS recorded the highest rate among other diseases associated with TB [21, 22]. Dye and Williams, 2019 reported there was relation between TB and AIDS in 12 African countries that were used the antiretroviral therapy for AIDS patients was gave satisfactory results in reducing TB infection in patients with HIV from 2003 to 2016 [22].

The largest proportion of EPTB cases in this study was pleural TB (45.3%) followed by lymphatic TB (23.4%) then bone TB (11.2%). Other sites account for small proportion. Similar studies were done in Egypt found that lymph node, pleura and bone represented the most common organs affected by EPTB [25, 26].

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TB pleurisy were higher among males than females (56.7% Vs 43.3%), whereas all other types were more common among females with statistical significant difference (χ^2= 45.97, P-value = 0.0001). This result was in agreement with study in Cairo, Egypt from 2009 to 2013 found that TB pleurisy were higher among males (58.9%) than females (41.1%) [25].

CONCLUSION

Tuberculosis constitutes a major global health problem infecting millions of people each year, with a particular heavier burden on the developing world. The TB affects the most productive age groups, and this requires more attention in TB control programs aiming at these age groups to decrease TB morbidity and mortality.

LIMITATION OF STUDY

The unavailability of clinical data, radiologic findings, and other laboratory investigations, in particular, the culture results of patients, are the limitations of this study.

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