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Trends in pattern of tuberculosis in Sharkia Governorate at Ministry of Health and Population Chest Hospitals from 2016 to 2019

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Abstract: Background: Tuberculosis is a communicable disease that is one of the leading cause of death from a single infectious agent (ranking above human immunodeficiency virus/acquired immunodeficiency syndrome). The aim of this work was to study the trend of applying the tuberculosis control program at the ministry of health and population chest hospitals, Sharkia, Egypt.

Results: This retrospective cross-sectional study was carried out using medical records from the tuberculosis registry at Ministry of Health and Population chest hospitals, Sharkia Governorate. The investigated variables included demographic characteristics, type of tuberculosis infection, and affected organs. All data were coded and statistically analyzed. A total 1404 cases of tuberculosis were notified between 2016 and 2019 with male predominance, where 67.1% were males and 32.9% were females. The highest number of tuberculosis patients was from the reproductive age groups. During the 4-year study period, the highest percentage of cases was new cases and the highest frequency of cases was during 2017 and the lowest frequency was during 2016. There was a decline in the total number of cases in 2018 and 2019 after sharp increase of total cases in 2017: pulmonary tuberculosis cases showed a sharp decline in 2017; however, there was an increase in extrapulmonary tuberculosis cases during 2017 then a slight decrease in 2018 and 2019. Of the pulmonary tuberculosis cases, 83.8% were smear-positive tuberculosis.

Conclusions: Pulmonary smear-positive and new cases were the most common among the recorded cases of tuberculosis. Productive age groups represented large percentage of the studied cases of tuberculosis. Lymph node and bones were the most common sites of extrapulmonary tuberculosis among reported cases in this study.

Keywords: Sharkia, Pattern of tuberculosis, National Tuberculosis Control Program, Tuberculosis control

Background

Tuberculosis (TB) is a communicable disease that is a major cause of ill health, 1 of the top 10 causes of death worldwide and the leading cause of death from a single infectious agent. Globally, about 10.0 million people infected with TB in 2019, a number that has been

decreasing very slowly in recent years. In HIV-negative people in 2019, there were an estimated 1.2 million TB deaths in addition to 208,000 deaths among HIV-positive people [1].

TB was one of the challenges included in sustainable development goals adopted by the United Nations that aims to end the epidemics of TB worldwide [2].

Egypt is a middle/low TB burden country. The National Tuberculosis Control Program (NTP) has been applied through the Egyptian Ministry of Health and

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Population since September 2007 and showed remarkable decline in the incidence of TB from 21/100,000 to 13/100,000 populations in the period from 2006 to 2017; TB prevention, diagnosis, and treatment saved 37 million lives [3]. Screening, diagnosis, notification, and registration of TB cases were implemented all over Egypt according to the National TB Strategy of the National Tuberculosis Control Program [4].

Sharkia Chest Hospitals at the Ministry of Health and Population are registration sites of tuberculosis. Sharkia Governorate is the 3rd most populous of the governorates of Egypt, located in the northern part of the country; it has 7,459,413 inhabitants [5].

Aim of this study

The present work aimed to study the trend of applying the TB control program at the Ministry of Health and Population (MOHP) chest hospitals, among Sharkia populations with the following objectives:

- (1) Assess the TB pattern and patients characteristics.
- (2) Evaluate the output of TB program across Sharkia Governorate.

Patients

A retrospective cross-sectional study was carried out at MOHP chest hospitals, Sharkia Governorate. The study sample included all registered TB patients ($n = 1404$) during the study time from 1 January 2016 to 31 December 2019 (duration of 4 years).

Data were gathered from TB registry and medical records from the Sharkia Health Directorate. Identification and review of the documents and records which evaluate plan/guidelines. And the input processes and output data of studied patients who were under cover of the MOHP national tuberculosis control program were revised and filtered according to documentations, where all non-documented data were excluded from the final statistical analysis.

Methods

The collected data included the following:

- (1) TB registration code and the year.
- (2) Sociodemographic data, which included age, sex, and residence.
- (3) Forms of TB: pulmonary (either smear-positive or smear-negative) and extrapulmonary (their sites as, lymph node, intestine, meninges, bone, renal).

The diagnosis of TB in Sharkia Chest Hospitals is made according to the National Egyptian TB Control Program Guidelines of the Ministry of Health (NTP) [4]. Cases were categorized as either pulmonary TB (PTB) or

extrapulmonary TB (EPTB). The PTB group comprised cases with PTB that were either sputum smear-positive or sputum smear-negative according to a sputum smear examination.

After discussion by expert committee including a clinician and a radiologist, smear negative PTB were identified if three successive samples of sputum smears were negative twice and chest radiography was compatible with active PTB. Also, if acid fast bacilli were detected by other means, such as bronchoalveolar lavage.

On the other hand, if the patient had a local extrapulmonary lesion with symptoms compatible with TB, and if a biopsy from the lesion was positive for *Mycobacterium tuberculosis* or had caseating granuloma, a diagnosis of EPTB was made. The EPTB group comprised any extrapulmonary disease site: pleural, lymphatic, bone and/or joint, genitourinary, meningeal, peritoneal, and few cases including eye, breast, and pericardial TB reported as "other" [6].

- (4) Anti-TB therapy was also recorded and patients were categorized as either new or previously treated cases according to the patient's history (previously treated cases were further stratified to relapsed cases, treatment after interruption cases and treatment failure cases). Anti-TB treatment is provided for free and according to standardized regimens of NTP [4].
- (5) Resistance for anti-tuberculous drugs either rifampicin or multidrug resistance (MDR).
- (6) HIV testing.

Statistical analysis

The collected data were analyzed by computer using Statistical Package of Social Services version 24 (SPSS) (IBM corporation, NYK, USA). Data were represented in tables and graphs, categorical qualitative variables were expressed as absolute frequencies (number) and relative frequencies (percentage).

Results

This cross-sectional study was carried out using medical records from the TB registry in Sharkia, it included 12 districts, and data was collected retrospectively for 4 year's duration from 2016 to 2019. Among total number of 612,989 adult cases attending 12 district hospitals, the highest attendance rate was 82,167 cases at Zagazig City in 2019. The epidemiology service was notified of 1404 cases of TB. The highest frequency of diagnosed cases was during 2017 and the lowest frequency was during 2016. On the other hand, there was an increased attendance at outpatient clinics for chest symptoms during 2019 as shown in Table 1. There was a decline in the total number of cases in 2018 and 2019 after sharp

Table 1 Number of tuberculosis cases from 2016 to 2017

Year	Frequency	%
2016	334	23.8 %
2017	389	27.7%
2018	342	24.4%
2019	339	24.1%
Total	1404	100%

increase in 2017. PTB cases showed a sharp decline in 2017. As regards EPTB, cases increased during 2017 then a slight decrease in 2018 and 2019 (Fig. 1).

Regarding demographic characteristics, there was a male predominance among patients diagnosed with TB with a male/female ratio of 2:1, where 67.1% (941 out of 1404 cases) were males and 32.9% (463 out of 1404 cases) were females. Higher numbers of affected patients were of reproductive age and lower numbers from extremes of age (Table 2). A small percentage of cases were below 15 years old (3.9%). However, for adults (> 15 years), the most predominant age ranged from 25 to 34 years, followed by 35 to 44 years old through all the study period from 2016 to 2019 (Fig. 2). There were 1404 patients with TB including either newly diagnosed or relapsed cases or previously treated cases. Among these cases, 60.4% (*n* = 848) had PTB and 39.6% (*n* = 556) had EPTB. Out of 740 newly diagnosed pulmonary TB cases, the majority was smear-positive sputum (83.8% of them) (Table 3).

Zagazig District, followed by Belbes, Minia El Kamh, and Fakous, was the highest in distribution of both PTB and EPTB (Table 4). Despite that Belbes is the 2nd highest district in Sharkia, there was a regression in the total number of cases across the studied period; however, DiarbNegm, which was one of the lowest prevalence in

Table 2 Demographic characteristics of tuberculosis cases

Variable	Frequency (N = 1404)	%	
Sex	Male	941	67.1%
	Female	463	32.9%
Age groups	0–4 years	14	1 %
	5–14 years	41	2.9%
	15–24 years	206	14.7%
	25–34 years	312	22.2%
	35–44 years	258	18.4%
	45–54 years	241	17.2%
	55–64 years	235	16.7%
> 65 years	97	6.9%	

2016, showed a sharp progression in TB cases during 2019.

The most common affected extra pulmonary site was lymph nodes (30.2%) of cases followed by bone (28.4%), and then pleura (Table 5). The most common cases were new PTB cases, relapse occurs in 6.4% of total cases (Fig. 3). However, relapse in PTB is more common than EPTB (7.1% vs 5.4%) respectively (Tables 6 and 7). Resistance to rifampin and MDR showed remarkable decrease throughout the study period from 2016 to 2019, and about 1% of cases were drug resistant (Table 8).

As regards HIV test, about 25% of the studied TB cases did it; 12 cases of them were HIV-positive, and all of them were Zagazig District residents. The peak of HIV infection rate was in 2017, and then decreased slightly in 2018 and 2019 (Table 9).

Discussion

Effective planning to prevent the TB disease requires accurate information collection as well as data on the

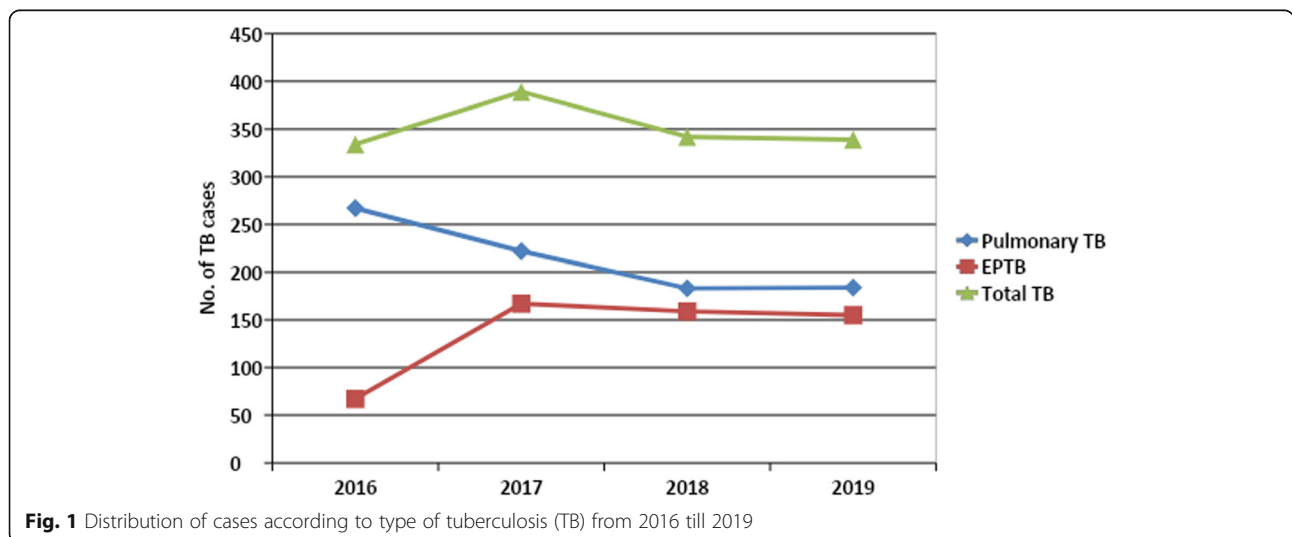
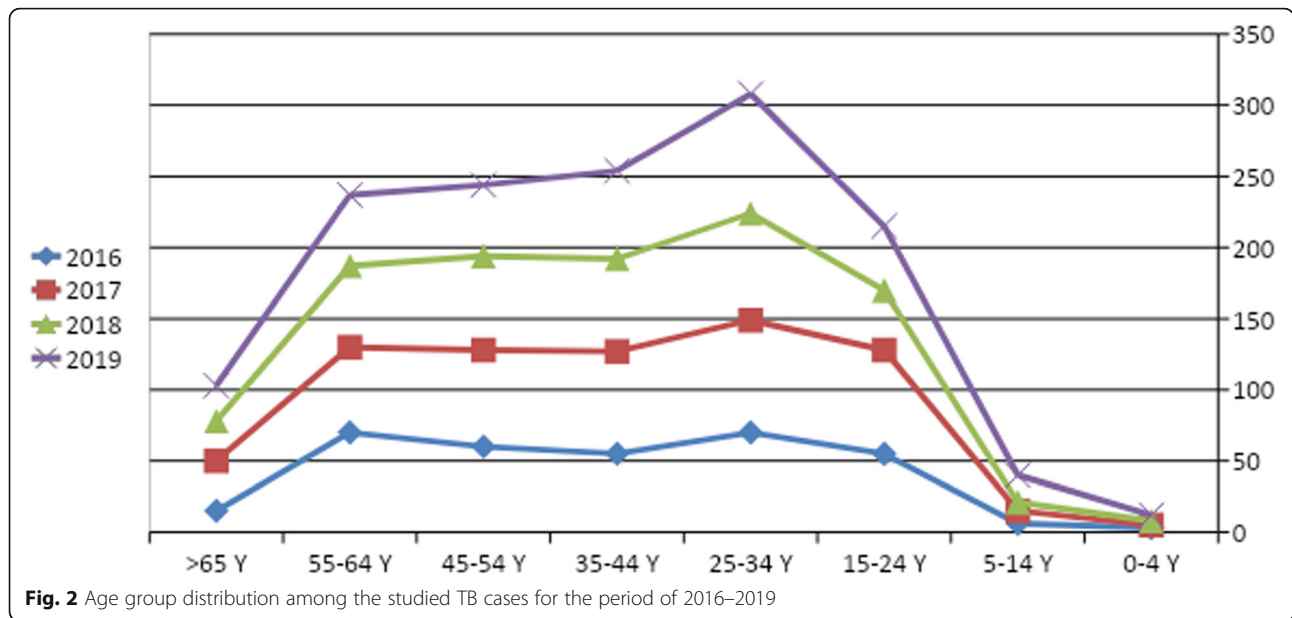


Fig. 1 Distribution of cases according to type of tuberculosis (TB) from 2016 till 2019



epidemiology of the disease, so the standard system for recording and reporting the number of cases detected by NTPs and outcome of treatment is mandatory [7, 8].

Sharkia Governorate is the 3rd most populous of the governorates of Egypt [5]. So studying the pattern of tuberculosis in Sharkia Governorate is an important step and is a good help to assess the epidemiology of the disease in Egypt and to evaluate the effectiveness of TB control program.

This retrospective study was done on the period from January 2016 to December 2019 to identify the pattern of TB infection among diagnosed patients with TB registered at Sharkia Governorate Chest Hospitals. A total of 1404 patients were diagnosed as either pulmonary TB or EPTB.

The highest frequency of cases was during the year 2017 and the lowest frequency was during the year 2016. There was a decline in the total number of cases in 2018 and 2019 after sharp increase of total cases in 2017. This may be due to a decreased overall incidence and prevalence of TB in Egypt over the last few years according to the World Health Organization TB report in 2016 [9]. There was a decrease in TB prevalence rate in Egypt from 30/100,000 of the population in 2008 to 25/100,000 population in 2014 [4, 9]. These results were in

accordance with other studies [6, 10, 11] which also reported decreased counts of TB cases over time.

In this study, there was a male predominance among patients diagnosed with TB. Also, the higher numbers of affected patients were of reproductive age and lower numbers from extremes of age. Similar results were shown by another study by El-Shabrawy and El-Shafei at Sharkia Governorate [12]. Also, a study by Ibrahim and Elhelbawy at Menoufia Governorate [13] reported that 61.8% of the studied TB patients was in the active productive age (30–60) and 78.9% were men. Sobh et al.

Table 3 Distribution of the types of new pulmonary tuberculosis (PTB) in the study population

Type of PTB	Frequency (N = 740)	%
Smear positive	620	83.8%
Smear negative	120	16.2%

Table 4 Distribution of cases according to type of tuberculosis (TB) at Sharkia

District	Pulmonary TB (N = 848)		^a EPTB (N = 556)		Total TB cases (N = 1404)	
	N	%	N	%	N	%
Zagazig	160	18.9	156	28	316	22.5
Abo hamad	67	7.9	41	7.4	108	7.7
Abo Keber	52	6.1	28	5	80	5.7
Al hosenia	66	7.8	21	3.8	87	6.2
Belbes	126	14.9	89	16.0	215	15.3
DiarbNegrn	67	7.9	41	7.4	108	7.7
Fakous	95	11.2	46	8.3	141	10.0
KafrSakr	44	5.2	16	2.9	60	4.3
Mina El Kamh	86	10.1	70	12.6	156	11.1
Hehya	38	4.5	19	3.4	56	4.0
MashtolElsoke	27	3.2	19	3.4	45	3.2
Al-Ibrahemia	20	2.3	10	1.8	32	2.3

^aEPTB extra pulmonary TB

Table 5 Distribution of extra pulmonary tuberculosis (EPTB) cases according to the organ affected

EPTB organ affected	Frequency (N = 556)	%
Pleural effusion	86	15.5
LN	168	30.2
Urinary	17	3.1
Bones	158	28.4
Meningitis	31	5.6
Intestinal	37	6.6
Genital	20	3.6
Other	39	7

reported similar results in Aswan, Egypt [10]. Male predominance among notified TB may be due to differences in exposure as males have more social contacts, risk of infection, and progression of infection to disease due to sex differences in addition to other risk factors for TB such as alcohol abuse and smoking. Moreover, men are more active and liable to stress which may decrease their immunity [14]. On the contrary to our results, different studies [15, 16] found women predominance compared with men.

Mori and Leung [17] stated that in Africa the age group of 15–44 years comprises about 74% of the population, whereas in the United States it is only 24%; therefore, in high prevalence settings, TB affects the most productive age groups which necessitates more attention in TB control programs targeting those age groups. That

Table 6 Distribution of tuberculosis cases according to history of anti-tuberculosis drugs

Tuberculosis cases	Frequency (N = 1404)	%
New	1265	90.1%
Relapse	90	6.4%
Treatment failure	9	0.7%
Treatment after interruption	40	2.8%
Total	1404	100%

may be explained by higher prevalence of smoking behavior in this active age group in our society, poverty, malnutrition, physical, mental, and occupational stress are contributing factors for increased incidence [14].

In accordance to our results, many previous studies [10, 11, 16, 18, 19] reported a higher percentage of PTB compared to EPTB. On the other hand, other studies [15, 20] reported a nearly equal percentage of PTB cases and EPTB cases.

The majority of the newly diagnosed pulmonary TB cases (83.8% of them) were smear-positive sputum (Table 3). Nearly similar results were reported by Sobh et al. [10] who concluded that majority of PTB cases were sputum smear-positive (82.5%). In contrary to Wani et al. [16] who reported only 23% of the cases were smear-positive and Shabana et al. [14] who reported a high percentage of sputum negative cases (26.2%).

The current study showed that the most common affected extra pulmonary site was lymph nodes (30.2%)

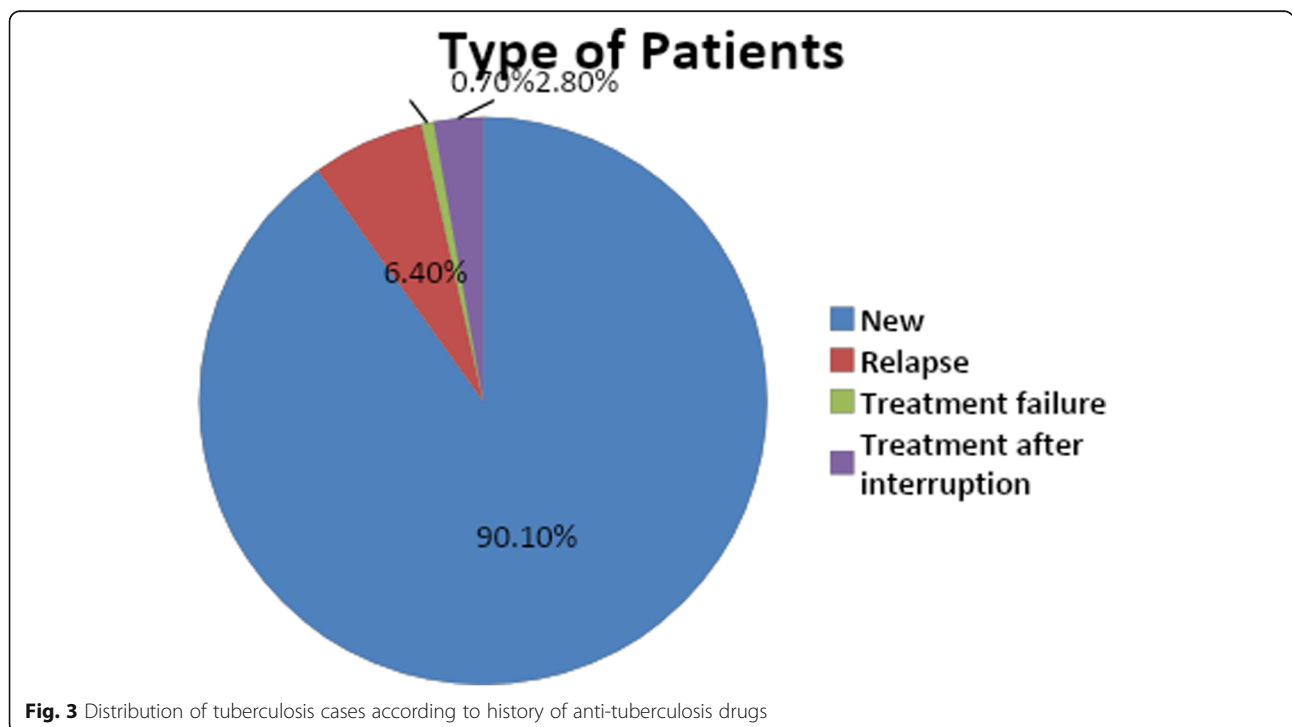


Table 7 Distribution of type of tuberculosis cases according to history of anti-tuberculosis drugs

Tuberculosis cases	Pulmonary TB		EPTB	
	Frequency	%	Frequency	%
New	740	87.3%	525	94.4%
Relapse	60	7.1%	30	5.4%
Treatment failure	9	1.1%	0	0.0%
Treatment after interruption	39	4.6%	1	0.18%
Total	848	100%	556	100%

followed by bones (28.4%), and then pleura (Table 5). Similar studies reported [6, 10, 16] that lymph node TB was the most common form of EPTB but followed by pleura. Also, El Bouhy et al. [21] reported that lymphatic TB constituted the largest group (29.13%) of EPTB cases followed by genitourinary (22.82%). Ige et al. [11] reported in his study that TB meningitis is the most common extra pulmonary site followed by TB spine and then lymph node.

The most common diagnosed cases were new ones (87.3% of PTB and 94.4% of EPTB). Relapsed cases were 6.4% of total cases. These results are consistent with previous studies [10, 12, 14, 19, 22] which found that new cases represented the highest percentage of cases attending for treatment. This may be explained by tight NTP application and good follow-up for patients. These results were not consistent with Wani et al. [16] who reported that 20% of cases were defaulters. Also, Ige and Akindele [23] reported retreatment PTB was frequent at their referral center.

The current study showed that about 1% of cases were drug resistant. Resistance to rifampin and MDR decreased throughout the study period from 2016 to 2019 (Table 8). The spread of MDR-TB can only be prevented by rapid identification of these cases and treatment with a combination of effective drugs. The first important step in achieving this goal is that microbiological laboratories become able to perform reliable and rapid drug susceptibility tests to both first and second line anti-TB drugs [24].

In this study, HIV testing was done for about 25% of the studied TB cases, and 12 of them were HIV-positive (Table 9). Tuberculosis Control Guidelines Egypt, 2017

Table 8 Distribution of drug resistance among the studied cases

Drug resistance	Frequency (N = 15 cases)*				
	Total	2016	2017	2018	2019
Rifampin	10	4	3	2	1
MDR	5	2	2	1	0

About 1% of total TB cases

Table 9 Distribution of cases who do HIV test during 2016-2019 at Sharkia governorate

HIV test	Frequency (N = 354 cases) ^a				
	Total	2016	2017	2018	2019
HIV test	354	87	84	115	68
Positive HIV results	12	1	6	3	2
HIV rate	3.4%	1.1%	7.1%	2.6%	2.9%

^a25.2% of total TB cases

reported that in the year 2013 (1,467) TB patients were tested for HIV (17%). Positive rate among those tested with a rapid test is estimated to be 3% from this report. At least one-third of the 34 million people living with HIV worldwide are infected with TB. Persons co-infected with TB and HIV are 21-34 times more likely to develop active TB disease than persons without HIV.- HIV testing and counseling for all patients known or suspected to have TB were recommended [4].

The unavailability of clinical data, radiologic, and other laboratory investigations are limitations of this study.

Conclusions

Pulmonary smear-positive and new cases were the most common among the studied cases of tuberculosis. Productive age groups represented large percentage of the recorded cases of tuberculosis and this necessitates more attention in TB control programs targeting those age groups. A high percentage of lymph node and bones TB cases recorded in this study and previous studies require more research towards discovering risk factors.

Abbreviations

TB: Tuberculosis; HIV: Human immunodeficiency virus; AIDS: Acquired immunodeficiency syndrome; MOHP: Ministry of Health and Population; PTB: Pulmonary tuberculosis; EPTB: Extra pulmonary tuberculosis; NTP: National Tuberculosis Program; MDR: Multiple drug resistance

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Authors' contributions

MAE (El-Shabrawy): conception, data acquisition, manuscript review, supervision. DAL: design of the work, data acquisition, analysis, interpretation of data. MWS: sample analysis, data analysis, manuscript preparation. MSH: sample analysis, statistical analysis, interpretation of data. AAA: design of the work, data acquisition, analysis, interpretation of data. MAE (El-Shafei): sample analysis, methodology. MEA: conception, sample analysis, interpretation of data, manuscript preparation. All authors have read and approved the manuscript.

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Availability of data and materials

All the data of the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Institutional Review Board of the Faculty of Human Medicine, Zagazig University (Approval number: 6059). Administrative approval was also obtained from the Ministry of Health and Population.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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