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Assessment of Infection Incidence with Tuberculosis and its Relation with Covid-19 Pandemic

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Abstract

Despite the decreasing mortality rate due to the Tuberculosis (TB) infection, the diseases incidence remains a serious health problem. The current investigation was conducted in Basrah Province, Iraq, and involved the analysis of Tuberculosis patients data provided by the Asthma and Allergy Centre in Basrah, which was recorded during the years 2017–2021. Results detected that the ages of (15-24) and (25-34) years, sex males, Al-Zubair region, in addition to PTB, are important parameters contributes to raising the TB incidence in Basrah Province. However, during the Covid-19 period (2020-2021), there was a noticeable decrease in the number of TB cases recorded in the centre.

Introduction

In 2023, the mortality from Tuberculosis (TB) was 1.25 million people, involving 161,000 HIV individuals. Once being surpassed by Coronavirus (COVID-19) for three years, the TB is likely reverting to being the world's largest infectious agent-related death cause. In addition, it was the main cause of fatalities from resistance to antibiotics and the greatest cause of death for people who had HIV. About 10.8 million individuals, consisting 6.0 million men, 3.6 million women, and 1.3 million children, suffered tuberculosis globally in 2023. TB affects individuals of all ages and in all countries. TB can be cured and prevented. The multi-drug-resistant TB (MDR-TB) persists as threat to health security and an emergency in public health. Only two out of five of (MDR-TB) individuals have medication treatment in 2023. Since 2000, about 79 million people have been saved through TB combat attributed to the global efforts, and among the United Nations health targets of its Sustainable Development Goals (SDGs) is the eliminating of TB epidemic in 2030 [1].

The World Health Organization (WHO) country office in China is informed in December 31, 2019, of pneumonial several cases of unknown etiology, with breath shortness and fever

occurring in Wuhan. In January 10, 2020, start to refer to the outbreak causing disease in Wuhan, WHO begins using the "2019 Novel Coronavirus" phrase or "2019-nCoV". On its website, the U.S. Centers for Disease Control and prevention (CDC) published the information about that outbreak which caused by the SARS CoV-2 virus [2]. Patients with tuberculosis usually possess underlying comorbidities and pulmonary damage, rendering them susceptible to more severe manifestations of COVID-19. Tuberculosis and COVID-19 symptoms may overlap, including cough and fever. This may not only induce diagnostic ambiguity but also exacerbate the stigmatization of tuberculosis patients, particularly in low and middle-income countries, due to the apprehension surrounding COVID-19 [3].

The number of the TB incidence notifications during the COVID-19 pandemic decreased significantly (by 29%) in Eswatini after accounting for time-varying and other parameters (seasonality autocorrelation, time trend, and heteroscedasticity). The significant decline in tuberculosis case notifications during the COVID-19 pandemic may be attributed to two potential explanations, one probability is that a decline in tuberculosis cases may be attributed to diminished case detection and public apprehension regarding healthcare access. Otherwise, there may have been a genuine decrease in the TB infections attributable to public health restrictions [4]. In Samsun province, Turkey, the tuberculosis incidence, examinations number, and the contact examinations number significantly decreased in the COVID-19 pandemic first year in comparison with the previous year. The reduction in tuberculosis patients predominantly occurred during the initial three months when the COVID-19 restrictions and measures were stringent. Thus, the COVID-19 pandemic adversely impacted the healthcare institutions engagement with TB patients and the management of TB control [5]. Globally, tuberculosis notifications decreased significantly in 2020 relative to 2019 (-18%), with only a partial rebound in 2021 [6].

In India, the nation's tuberculosis notification ratio underwent a notable modification between 2019 and 2021. In 2020, all states documented a reduction in reported cases of tuberculosis, both private and public. Only a limited number of private tuberculosis notifications remain unaccounted for in the country. In April 2020, notifications reached their lowest point, having commenced a decline in February 2020. In May 2020, the notification trend improved as states initiated advanced programs such as the Integrated TB COVID Case Search and Active Case Finding (ACF). The notification of tuberculosis cases has markedly declined attributable to the ongoing pandemic, resulting in implications for the diseases insidious transmission within households and communities [7]. Locally, a study was carried in Iraq, Nineveh [8], investigated TB incidence before and after COVID-19 pandemic outbreak; showed that the rate of infection decreased from 37 cases / 100,000 people in 1993 to 4 cases/ 100,000 people in 2021, attributed the significant and gradual decrease to vaccinations and rising health awareness, rural and urban residents, in addition to the spread of COVID-19.

Current research attempted to assess the different parameters impact on the TB infections incidence in Basrah Province between 2017 and 2021 before and after COVID-19 pandemic, included the investigation of pandemic impact on the cases incidence records.

Methodology

The records of the Allergy diseases and Asthma Centre in Basrah, in accordance with an official health permit, provided us with data on cases related to age groups, sex, site of infection, and patients' residence between years 2017 and 2021.

Statistical analysis

Statistically, the data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 program (general liner model), at a probability level of $P \leq 0.05$ and Paleontological Statistics (PAST) version 1.34 at a probability level of $P \leq 0.01$ and 0.05.

Results and Discussion:

The incidence of tuberculosis with some influencing parameters

Current study included data on 2302 infections documented for five years. The findings revealed that the infection rates varied over the course of five years, depending on the age groups. The highest number of infections, 114, occurred in the age of 25-34 years in 2017, while the lowest number, 13, occurred in the age of ≤4 years in 2020 and 2021. However, the most frequent infections occurred in the age of 15-24 years in 2018, 2019, and 2021, with 107, 81, and 75 cases, respectively. Despite the variation in all years for all age groups, there was no significance at the probability ($p \leq 0.05$), whereas at the 0.01 level, the correlation is significant between years and the sum of infections, and at the 0.05 level between the ages and the sum of infections, as demonstrated in Table1 a, b and Fig.1.

Table 1a: The incidence of infections according to age group.

Years / Age Group	2017	2018	2019	2020	2021
=4	26	21	14	13	13
5-14	38	31	31	19	20
15-24	106	107	81	55	75
25-34	114	96	80	67	61
35-44	93	70	60	50	62
45-54	78	82	74	42	50
54-64	91	61	47	37	37
65+	89	73	62	39	37
Grand Total	635	541	449	322	355

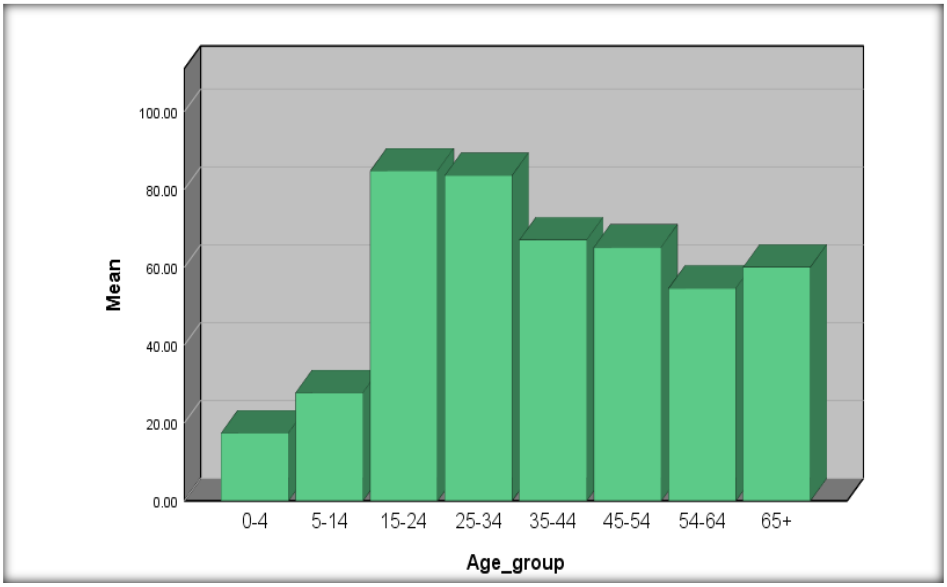

Fig. 1: The Means of infections by age group.

Table 1b: Correlations between Years, ages and sum of infections

		Year of infection	Age of patient	TB infection
Year of infection	Pearson Correlation	1	.000	-.495-**
	Sig. (2-tailed)		1.000	.001
	N	40	40	40
Age of patient	Pearson Correlation	.000	1	.350*
	Sig. (2-tailed)	1.000		.027
	N	40	40	40
TB infection	Pearson Correlation	-.495-**	.350*	1
	Sig. (2-tailed)	.001	.027	
	N	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

In terms of sex, the highest recorded number was 331 males in 2017, and the lowest was 190 in 2020, whereas females recorded 304, 132 in 2017, 2020 respectively. Additionally, the most frequent heights included in the years 2017, 2020, and 2021 were males, accounting for 331, 190, and 208 cases, respectively, as shown in Table 3, Fig. 3. Statistically, there are no significance between them at the probability level (P≤0.05), whereas, at the 0.01 level, the

correlation is significant between years and the sum of infections of both sexes, as demonstrated in Fig. 2, and Table 2a and b.

Table 2a: The incidence of infections according to sex

Years Sex	2017	2018	2019	2020	2021
Female	304	280	226	132	147
Male	331	261	223	190	208
Grand total	635	541	449	322	355

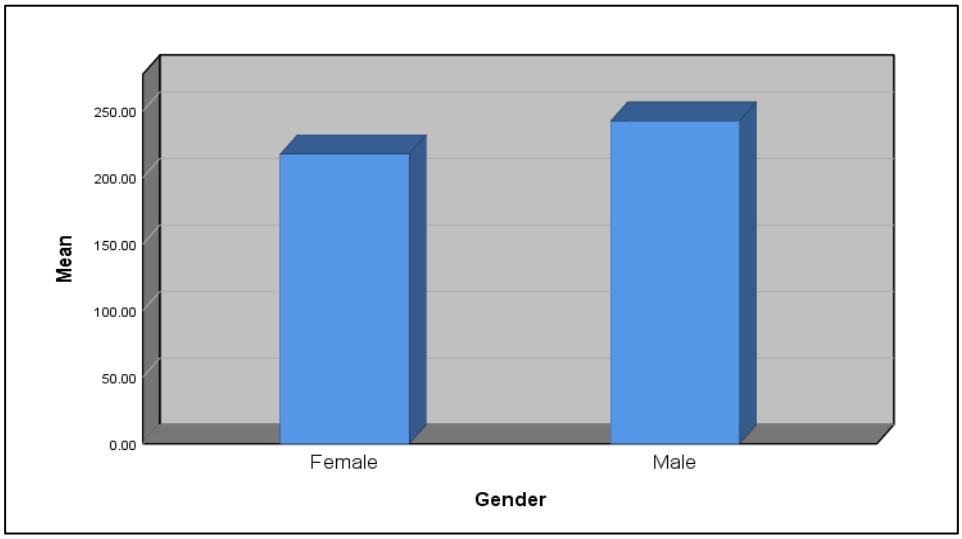

Fig. 2: The means variations of infections according to sex

Table 2b: Correlations between years and sum of TB infections for male and female

		Year of infection	Female	Male
Year of infection	Pearson Correlation	1	-.948-**	-.897-**
	Sig. (2-tailed)		.000	.000
	N	40	40	40
Female	Pearson Correlation	-.948-**	1	.904**
	Sig. (2-tailed)	.000		.000
	N	40	40	40
Male	Pearson Correlation	-.897-**	.904**	1
	Sig. (2-tailed)	.000	.000	
	N	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

The young ages (15-24 and 25-34) were among the age groups more affected [9] in Basrah province.

Young people tend to be more active and interact with others at work and other places, compared to toddler and elder individuals. Additionally, smoking may contribute to the spread of infections.

Furthermore, males in Basrah are more likely to work outside than females. Our findings align with [10] that men are more likely to be affected than females. In addition, a study of cross-sectional descriptive was done in Iraq [11], of the 65,102 TB cases that were reported between 2011 and 2018, more men than women had Pulmonary Tuberculosis (PTB), but the opposite was true for Extra Pulmonary Tuberculosis (EPTB). However, a Brazilian study, Fernandes et al. [12] suggested that the age at which infection of TB increases most is different in females in comparison with males. The widespread use of the Bacillus Calmette Guerin (BCG) vaccine beginning in childhood may be the reason for the low incidence of tuberculosis in children under the age of 15 [10].

Additionally, PTB (lung inside) infections reached 357 cases in 2017, whereas EP (lung outside) recorded the lowest infections, 134 in 2021. Moreover, PTB showed the highest frequency in the years 2017, 2018, 2020, and 2021, with 357, 286, 174, and 221 cases, respectively. However, no significance between them at the probability level of ($P \leq 0.05$), whereas at the 0.01 level, the correlation is significant between years and the sum of infections for both infection sites, as illustrated in Table 3a , b and Fig. 3

Table 3a: The prevalence of tuberculosis by infection site

Years / **Infection site**	**2017**	**2018**	**2019**	**2020**	**2021**
EP (Lung outside)	278	255	229	148	134
PTB (Lung inside)	357	286	220	174	221
Grand Total	635	541	449	322	355

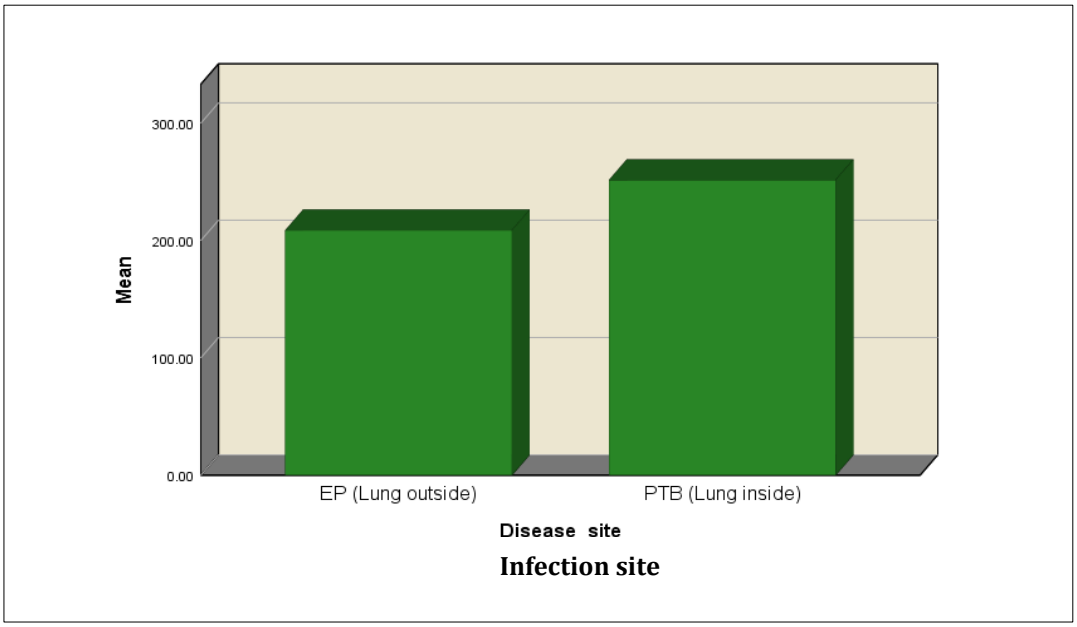

Fig. 3: Means according to tuberculosis infection site

Table 3b: Correlations between years and infection site

		EP	PTB
Years of infection	Pearson Correlation	1	-.856-**
	Sig. (2-tailed)		.002
	N	10	10
Years of infection	Pearson Correlation	-.856-**	1
	Sig. (2-tailed)	.002	
	N	10	10

**. Correlation is significant at the 0.01 level (2-tailed).

Previous studies [9 -11] generally indicated that PTB was more prevalent than EP. The individuals with a prior TB history, and elderly women, are at an elevated risk of developing extrapulmonary tuberculosis [13].

Otherwise, the residence location revealed that the highest infections number was at Al-Zubair region, with 164 cases in 2017, while Al-Diar had the lowest, with just 7 cases in both 2020 and 2021. Al-Zubair also appeared with the highest frequency of infections in 2017, 2018, and 2019, with 164, 137, and 79 cases, respectively, with no significance at the probability level of ($P \leq 0.05$), whereas at the same probability level, the correlation is significant between years and the sum of infections for all residence locations, as shown in Table 4a, b and Fig. 4.

Table 4a: The incidence of infections per residence location

Years	2017	2018	2019	2020	2021
Sector					
Abi-lkhaseeb	42	38	35	27	27
Basrah1	86	88	75	67	78
Basrah2	85	79	62	46	47
Basrah3	82	59	52	33	45
Al-Dier	16	16	17	7	7
Al-Zubair	164	137	79	63	62
Al-Qurna	41	29	34	14	19
Al-Mdaina	41	34	27	24	23
Al-Hartha	42	34	46	26	34
Shatt-el Arab	36	27	22	15	13
Total	635	541	449	322	355

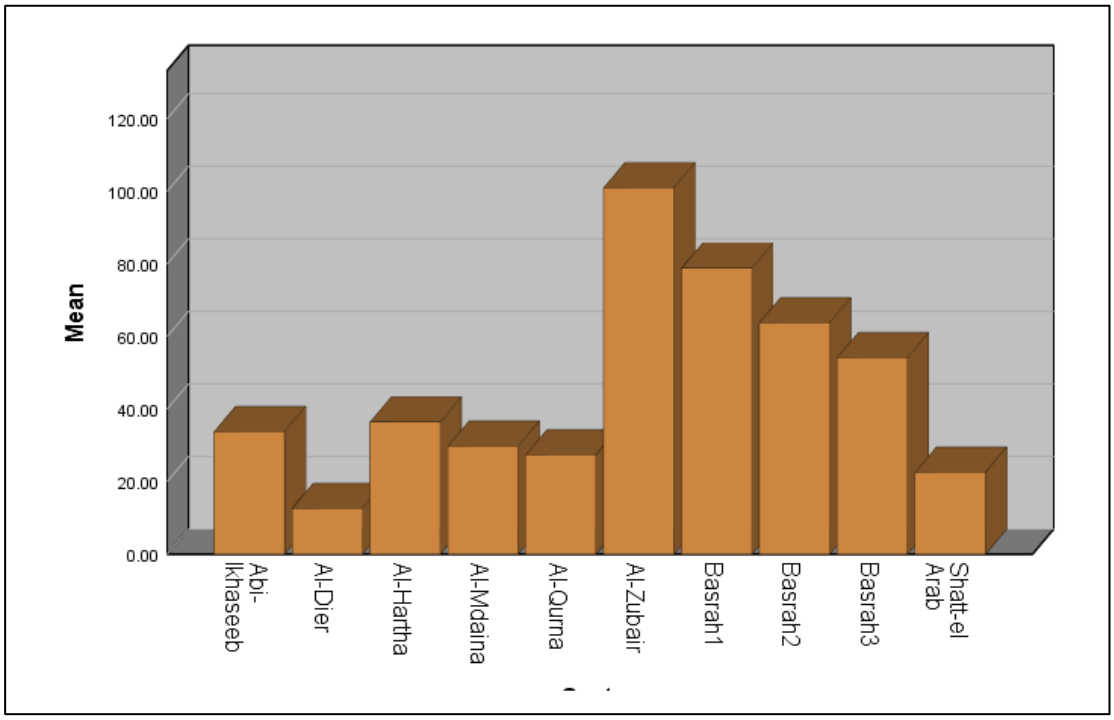

Fig. 4: Means of infections per patients residence location

Table 4b: Correlations between years and residence locations

		Year	Infections
Year	Pearson Correlation	1	-.331-*
	Sig. (2-tailed)		.020
	N	49	49
Infections	Pearson Correlation	-.331-*	1
	Sig. (2-tailed)	.020	
	N	49	49

*. Correlation is significant at the 0.05 level (2-tailed).

We hypothesized that the rising hydrocarbon gases during oil extraction and refining, military waste from wars, the lack of vegetation cover, the breeding of sheep and other livestock, and the high temperatures in Al-Zubair likely increased the risk of infection noticeably in this region. Nevertheless, Issa et al. [9] revealed that the provinces center had the highest percentage of cases.

The current investigation found that, overall, the year 2017 had the highest cases incidence (635), whereas the year 2020 had the lowest (322), as demonstrated by Table5 and Fig. 5.

During years of the study, the highest mean was in 2017 and the lowest in 2020 and 2021, Statistically, there is no significant differences between them at the probability level of ($p \leq 0.05$).

Table 5: The total incidence of infections per years

Years	**Total Infections**
2017	635
2018	541
2019	449
2020	322
2021	355

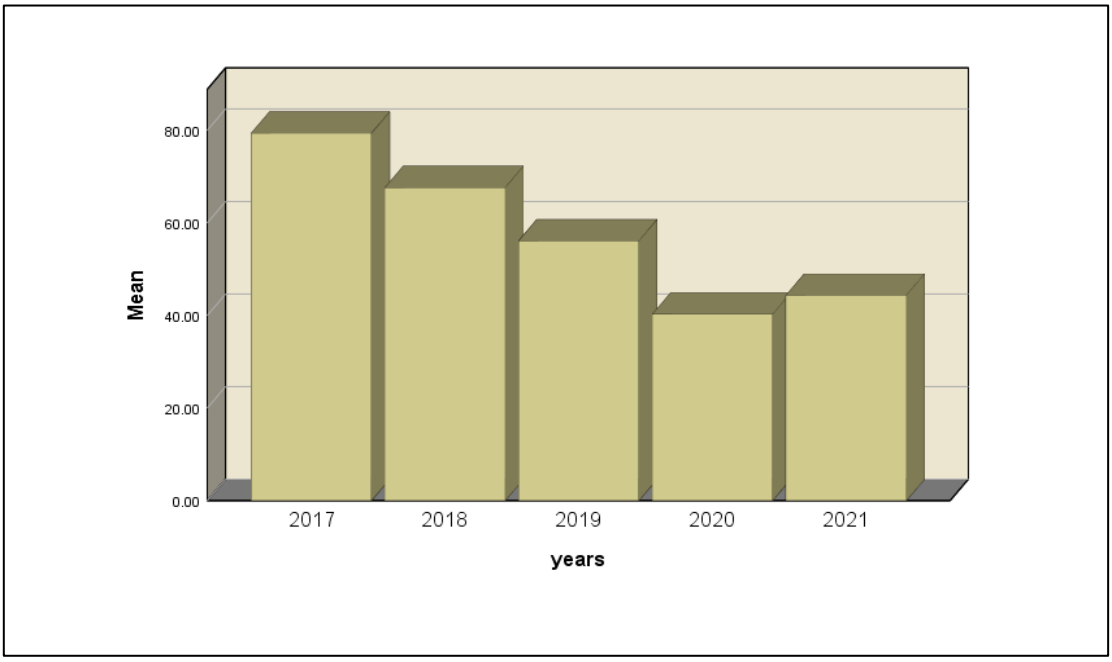

Fig. 5: Means of infections overall the studied years

TB incidence and Covid-19 impact

March 24th is commemorated annually as the World Tuberculosis Day, which globally recognized through various activities, emphasizing the disturbing reality that Mycobacterium tuberculosis, a pathogen particular to humans, remains a persistent threat after millennia of coexistence. The COVID-19 pandemic has presently eclipsed all other global health concerns. This will significantly affect current public health issues in various ways [13].

The current investigation found that, overall, the year 2017 had the highest number of cases (635), while the year 2020 had the lowest number of infections (322). We believe that the COVID-19 pandemics various procedures, such as strict preventive isolation, disinfection, mask wearing, vaccination, widespread antibiotic use such as Azithromycin, and similar symptoms, contributed to the decrease in recorded cases. These factors could lead to a confusing diagnosis or cause patients to avoid the TB clinic.

Several previous studies likely discussed the explanations above; in Kenyan informal settlements; Quaife et al. [14] found that, depending on the comparison matrix of pre-COVID-19, control measures reduced the non-physical contacts by either 63 or 67% and physical contacts by 62%. In 92% of contacts, at least one person wore a mask.

Zhang et al. [15] demonstrated that TB incidence and mortality dropped as soon as the COVID-19 pandemic began, but they hypothesised other reasons for long-term decline. They found that lockdown, masking, and isolation—along with government-organized mass disinfection, particularly in closed and crowded public areas—reduced the risk of TB transmission in China. Hydrogen peroxide, hypochlorous acid, 75% ethanol, disinfectants with chlorine, and others showed effective inactivation of both coronavirus and Mycobacterium tuberculosis.

In Shantou, the results of Su et al. [16] showed that the tuberculosis cases incidence decreased significantly during pandemic in contrast to that prior to it.

Two separate issues—under-reporting and missed or delayed diagnosis of TB—are probably the cause of declines in TB notification. Delayed and missed TB diagnoses may have been caused by fewer opportunities for those who were ill to seek care during "lockdowns" and extended periods of high activity in the primary healthcare clinics [6]. Various other studies in different countries such as Turkey and India [5-7] reported the impact of Covid-19 on the TB recordings decrease.

Conclusion

According to our findings, TB continuous transmission reflected the poor health control management in Basrah, Iraq. Strict isolation and health care during the pandemic assisted to reduce the infection of TB and other infectious diseases.

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تقييم حدوث الاصابة بالتدرن الرئوي وعلاقته بجائحة كورونا –19

وصال عودة الحلفي
قسم الاحياء البحرية، مركز علوم البحار، جامعة البصرة، العراق

معلومات البحث:
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معلومات المؤلف
الايميل:

الخلاصة:
أجريت الدراسة الحالية في محافظة البصرة، العراق، وشملت تحليل بيانات مرضى التدرن المزودة من مركز الربو والحساسية في البصرة والتي تم تسجيلها خلال الاعوام 2017-2021 لمناطق مختلفة من المحافظة. بينت النتائج ان أعلى الإصابات كانت للفئات العمرية (15-24) و (25-34) سنة اذ بلغت 107، 114 إصابة على التوالي. كما سجل جنس الذكور أعلى إصابات وهي 331 إصابة مقارنة بإصابات الإناث التي بلغت 304 إصابة. بينما اظهرت منطقة الزبير المعدل الأعلى للإصابة بين المناطق الأخرى في المحافظة، اذ بلغ عدد الإصابات فيها 164 إصابة، كما أن الاصابة داخل الرئة كانت هي النوع المنتشر، إذ وصلت الى 357 مقارنة بإصابات خارج الرئة التي بلغت278 إصابة. ومن جهة أخرى كان هنالك انخفاضا ملحوظا" في عدد الحالات المسجلة في المركز خلال فترة جائحة كورونا-19 (2020 – 2021) ، اذ تراوحت الاصابات بين 322-355 إصابة خلال هذه الفترة.