Original Article

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Incidence of Registered Tuberculosis in Nineveh Governorate: A Case Study

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ABSTRACT

Background: After data has been sorted, statistical analysis is used to compare them. Statistical analysis was used to compare tuberculosis data from two different and distinct years in order to determine the extent of the development of this disease. **Aim**: This study aims to estimate the annual incidence of registered tuberculosis cases in the Nineveh Governorate before and after the (COVID-19) pandemic outbreak. These injuries were compared with data on this disease recorded in Iraq, the neighboring countries, and the world. To investigate the personal characteristics and fate of the diagnosed patients was yet another aim. **Patients and methods**: Data on 654 and 249 patients diagnosed with tuberculosis, registered in the Specialized Chest Disease Center in Nineveh for 1993 and 2021, respectively, were collected. Data for the year 1993 were recorded in a complete form for statistical analysis, while data for the year 2021 were recorded on the computer. **Results**: Despite the governorate's population growth, the infection rate decreased from 37 cases per 100,000 people in 1993 to 4 cases per 100,000 people in 2021. In contrast, the incidence of extrapulmonary tuberculosis increased from 25% to 33% between 1993 and 2021, based on the number of recorded cases. In 1993, the age group (25–45) was the most affected, and the rate of infection in urban areas was 81% in 2021, with the rest of the rates being close. **Conclusions**: This study concluded that the results are consistent with Iraqi and global statistics, as there has been a significant and gradual decrease in injuries recently compared with previous years. This was attributed to vaccinations and rising health awareness among all age groups, as well as rural and urban residents, as well as the spread of COVID-19.

Keywords: extrapulmonary, incidence, Nineveh, pulmonary, tuberculosis

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INTRODUCTION

Tuberculosis is still a major scourge of mankind mainly in the developing parts of the world,[1,2] but it also remains an important problem in many technologically advanced countries. It holds an important position among the 21 communicable diseases and is considered the third-priority problem in the eastern Mediterranean region. It occupies the ninth rank in the list of causes of death in the same region. Tuberculosis is one of the deadliest infectious diseases around the world, with infections affecting nearly 10 million people annually and resulting in approximately 1.5 million deaths,[3-5] and this percentage may increase during the pandemic over the years.[6] Tuberculosis morbidity is calculated in countries where there is a well-established recording system, but in other countries, the information is incomplete because of the lack of standard criteria for diagnosing

and reporting. There was a decrease in the incidence of tuberculosis in the following years, as the rate of infection in 2008 reached 3/10.000 throughout Iraq.[7] In Africa and Asia, the incidence rate is around 250/100.000 population, while the prevalence rate is about two times that for the incidence. Drug-resistant tuberculosis remains a public health concern. The most serious concern is resistance to isoniazid and rifampicin, the two most effective first-line drugs; resistance to both drugs is defined as multidrug-resistant tuberculosis (MDR-TB). In 2012, according to the WHO, the number of MDR-TB patients is estimated to be 450,000. The heaviest burden of MDR-TB followed by 24 other countries is on China, India, and the Russian Federation.[8] While the number of people worldwide detected with rapid diagnostic tests rose by more than 40% to 94,000 in 2012, three in four cases of MDR-TB remain diagnosed without the diagnosis. Of more concern is that approximately 16,000 cases of MDR-TB reported in 2012 to the WHO were not dealt with, and longer waiting lists became more and more a problem. In 2011, there were approximately 310,000 cases of MDR-TB among patients with pulmonary tuberculosis worldwide, and tuberculosis was one of the top 10 main causes of mortality.[9] In addition, lack of service capacity and human resource shortages in many countries are the blocks to achieving high cure rates.[8] Difficult living conditions in poor neighborhoods lead to the widespread transmission of pulmonary tuberculosis due to weak social, cultural, and economic interactions. The most important reason for this is the lack of healthy home necessities in terms of population density, lighting, ventilation, humidity, and lighting. The lack of health education in these societies, such as not closing the mouth when coughing, spitting anywhere, and being ashamed to visit health centers, leads to the spread of tuberculosis in those neighborhoods.[10] Most researchers specializing in pulmonary tuberculosis recommend the establishment of specialized hospitals for this purpose.[11] Indeed, since 1967 Iraq has specialized hospitals and health centers for it in Nineveh.

This study aims to measure the incidence rate of tuberculosis in Nineveh Governorate for a number of years to facilitate forwarding recommendations to improve the prevention of this disease. The specific objectives are to estimate the incidence of registered pulmonary and extrapulmonary tuberculosis in Nineveh for a year and to examine the trend in the incidence over the previous three years and compare it with subsequent years based on the data of a study.[9]

Calculate the ratio of the number of pulmonary tuberculosis to the patients having extrapulmonary tuberculosis and the specific site among them. Ascertain the personal characteristics of the newly diagnosed such as age, sex, residence, material status, employment, and defaults. The secondary objectives determine the frequency of tuberculosis according to the diagnostic method, the frequency of smear conversation, and the patient status at the end of the treatment period.

MATERIALS AND METHODS

All cases diagnosed and registered as tuberculosis in the specialized center for chest diseases in Nineveh Governorate during the year 1993 constitute the sample as a case for this study. The information collected included name, age sex, occupation, material status, number of contacts, residence, type, and site of tuberculosis.

For this study, the treatment schedules given to the patients by the center were grouped into three categories:

1. Regimen 1: Patients who received the following drugs: isoniazid, and rifampicin for nine months, supplemented by streptomycin during the first two months
2. Regimen 2: Patients who received isoniazid and ethambutol for nine months supplemented by streptomycin during the first two months
3. Regimen 3: Patients who received other combinations of drugs detected by the individual patient's needs and response to drug and also directed to a great extent by the availability of the drug itself

The data for the year 1993 was collected by researchers by reviewing paper records. The data obtained was very accurate and detailed, while the electronic data obtained for the year 2021 was less detailed. Eleven types of external tuberculosis were reported in 1993, while the data in 2021 included only 7 types.

RESULTS

According to the study, 654 newly diagnosed tuberculosis cases were documented in a specialized care center in Nineveh Governorate in 1993 while 249 tuberculosis cases were documented in 2021. In 1993, the number represented the incidence rate of 37 per 100.000 population. The pulmonary tuberculosis rate was 27, and the extrapulmonary rate was 9 per 100.000 population. The patients suffering from a combination of pulmonary and extrapulmonary accounted for 0.63 per 100.000 population. In 2021, with the increase in population, as the population of Nineveh Governorate reached about 4 million,[12] the incidence of tuberculosis decreased to 4 per 100,000 people for pulmonary tuberculosis and 2 per 100,000 people for extrapulmonary tuberculosis.

DISCUSSION

Tuberculosis has a direct and indirect relationship with other diseases and epidemics, and tuberculosis patients are impacted by these diseases and epidemics. The mortality rate of HIV-infected tuberculosis patients has increased significantly as compared to those who are not infected, especially in those with extrapulmonary tuberculosis.[13]

Outside the lungs, the lymph nodes and skeleton are the most vulnerable parts of the human body to tuberculosis infection. Because imaging tests and clinical signs are difficult to obtain in these areas, diagnosing this disease is difficult.[14] Extrapulmonary tuberculosis is more drug-resistant than pulmonary tuberculosis; hence, it should be treated with more effective regimens and drug sensitivity tests.[15] In comparison with the rest of the world, the rate of extrapulmonary tuberculosis in the Nineveh Governorate is low. The rate of skeletal TB in China, for example, is 41.1%,[15] but it is just 26.2% in Nineveh. The lymph nodes had the highest proportion of extrapulmonary tuberculosis, followed by the bones, according to the findings of the study, while the percentages of the other types were substantially lower (Table 1). The highest rate in 2021 was also in the lymph nodes, followed by pleural effusion and then bones and meninges (Table 1). The focus in this study was on extrapulmonary tuberculosis because it is more resistant to treatment than pulmonary tuberculosis, and the diagnosis process is also difficult.

There was a steady increase in the number of cases of tuberculosis in the following years, and it almost tripled within three years; then there was stabilization and decline in the number of cases until it reached a close number in 13 years.[9] The increase in cases continued from 1990 until 1996; then there was relative stability until 1999, and there was a slowdown in incidences until 2007, and the incidences began to increase for the following years. It is clear from the foregoing that tuberculosis infections take a sinusoidal waveform, as is the case with most infectious diseases.

The infection rate in this study was 46% for males and 54% for females in 1993 and approximately the same rate in 2021 (Fig. 1A), while the percentage became higher in males relative to females in subsequent years, reaching 52.5% for males and 47.5% for females in 2010 .[9] The reason for this may be attributed to the possibility of an increase in the number of incidences in males due to the conditions of economic blockade during that period and the increase in the rate of mixing between the sick and the healthy due to the working conditions that forced males to work for long hours.

According to the statistics derived from the Specialist Health Center for Tuberculosis Treatment in Mosul in 1993, the percentage of infected people in urban and rural areas is approximately equivalent. In urban areas, the incidence rate was 49%, while in rural areas, it was 51%. Extrapulmonary tuberculosis is substantially more common in rural areas than in urban areas in most countries, including China.[15] In 2021, the rate of infections in the urban area increased significantly compared with the rural (Fig. 1B) area, and the decrease in rural residents visiting the health centers was due to the spread of COVID-19.

To show the incidence of infection for different age groups, data in 1993 were taken to note this distribution. The infection rate in females reached its highest levels for those aged between 25 and 45 years, and the second rate was for those aged between 45 and 65 years, while the percentage for males for these two age groups was lower than for females (Fig. 2A). The reason for this may be attributed to the fact that the ratio of the number of females to males in these age groups is greater in general and reaches more than 0.1% (Fig. 2B).[16]

The decline in infection cases over the years is consistent with the results of global statistics published by the (OWD) website (Fig. 3A).[17] The reason for the decline in the incidence is attributed to many reasons, including the increase in health awareness of individuals, the increase

in receiving the vaccine, especially among children (Fig. 3B), and the development of treatments over these years. The significant decrease in cases recorded following the spread of Covid-19 is due to a decrease in patients in the Specialist Health Center for Tuberculosis Treatment in Mosul and an increase in their number in Covid-19 treatment centers. Iraq was ranked second among the neighboring countries in the proportion of deaths due to tuberculosis after Saudi Arabia (Fig. 3C); however, the death rate in Iraq decreased from 15% in 1993 to less than 4% in 2019 (Fig. 3D).

Table 1: Extrapulmonary patients according to the site of lesion—Nineveh Governorate

	1993		2021	
Sites	**No.**	**%**	**No.**	**%**
Lymph nodes	75	45.7	42	51.2
Bone	43	26.2	8	9.7
Peritoneum	14	8.5	4	4.9
Kidney	8	4.9	3	3.7
Meninges	6	3.7	6	7.3
Uterus	6	3.7	1	1.2
Pericardium	4	2.4	-	-
Abscess	3	1.8	-	-
Pharynx	2	1.2	-	-
Skin	2	1.2	-	-
Testis	1	0.6	-	-
Pleural effusion	-	-	15	18.3
Breast	-	-	1	1.2
Others	-	-	2	2.4
Total	164	100	82	100

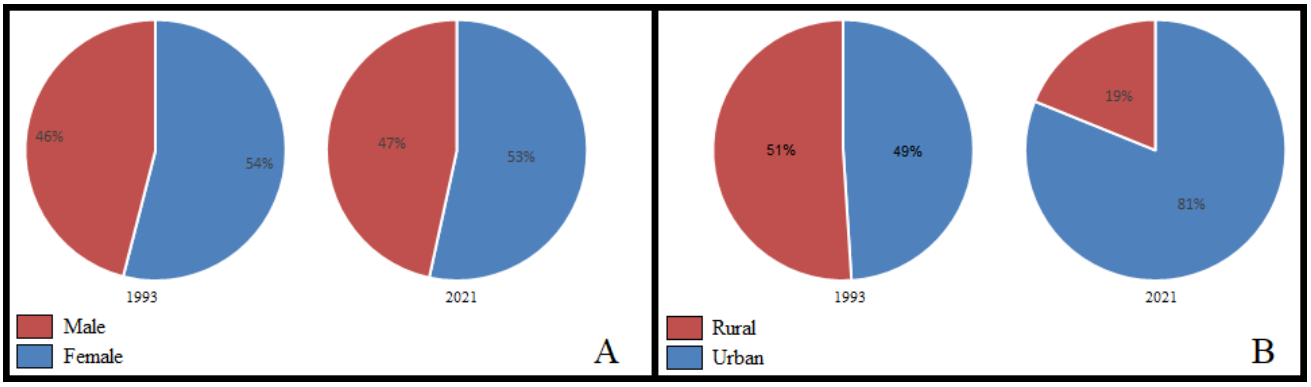

Figure 1: Statistical correlation of tuberculosis in Nineveh Governorate between (A) male and female and (B) rural and urban

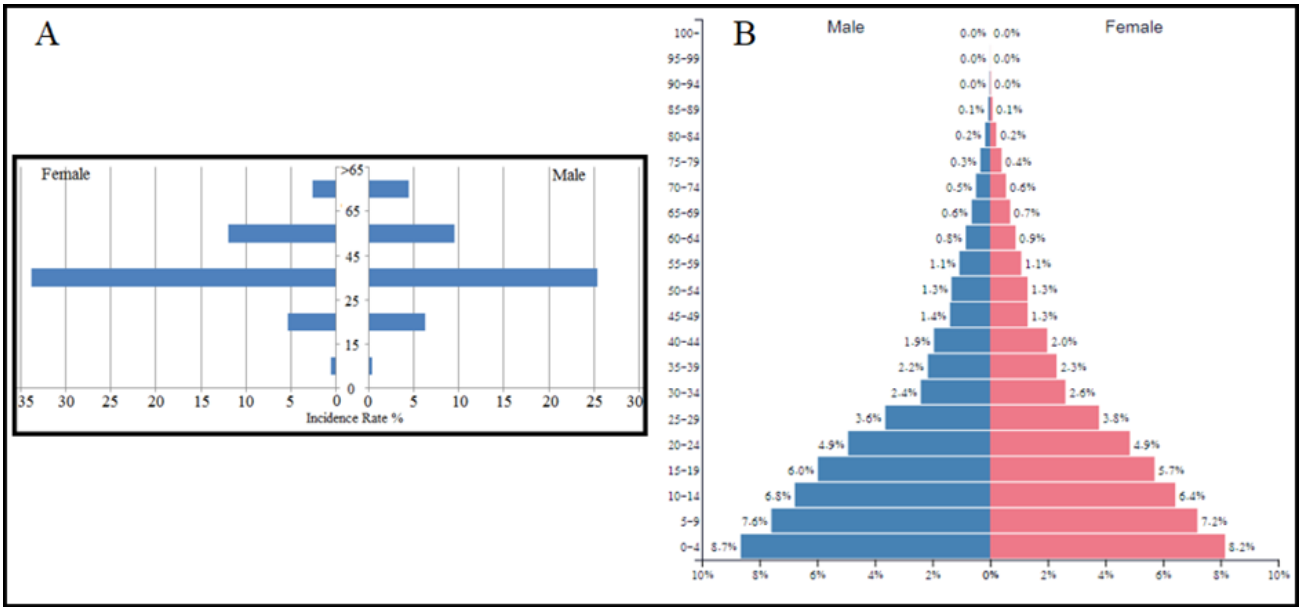

Figure 2: Data of 1993. (A) The incidence rate of females and males according to the age groups. (B) The population pyramids of the Iraq in 1993 (www.populationpyramid.net).

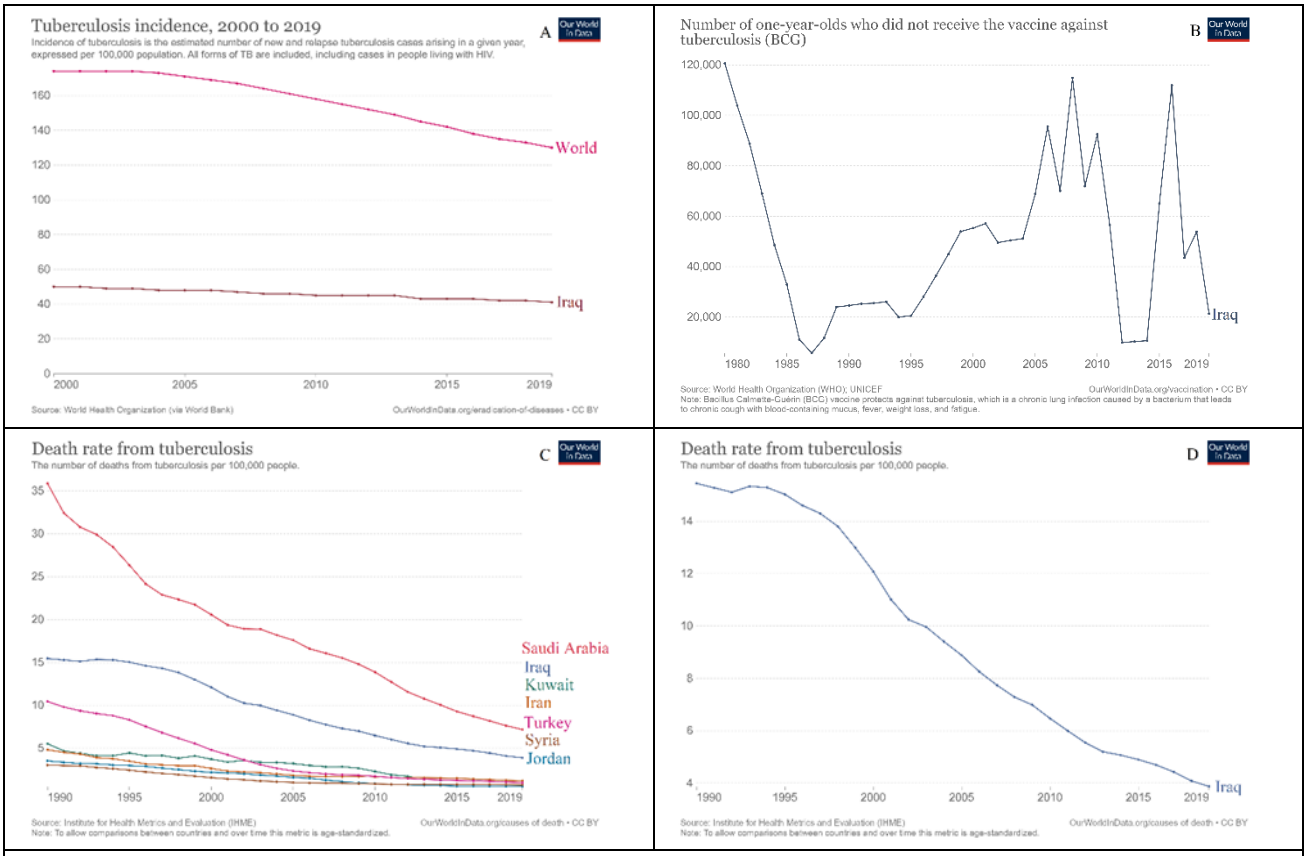

Figure 3: Statistical review of tuberculosis after (OWD) https://ourworldindata.org/

CONCLUSIONS

Tuberculosis cases take a sinusoidal waveform similar to most infectious diseases. It follows from this that the increase in cases results from a lack of health awareness and mixing between patients and healthy people, and with the increase in cases, diagnosis, prevention, and treatment occur, and there is a decrease the cases in the subsequent years, and so on. There is a consistency between the study results and the Iraqi and global statistics, as there has been a significant and gradual decrease in injuries recently compared with previous years. This was attributed to vaccinations and rising health awareness among all age groups, as well as rural and urban residents, as well as the spread of COVID-19. It is recommended to use data-saving software such as Mat lab instead of Excel to record the data of the infected persons, according to the information given in Table 1, as was the case in the paper files used in 1993.

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