https://doi.org/10.48047/AFJBS.6.15.2024.5097-5117

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Analysis of Tuberculosis Epidemiology and Prevalence in the Ras-El-Oued Region, Algeria

BENCHEIKH DALILA 1, DJARBOUAI AFAF[1],KHENNOUF SEDDIK[2], Dahamna SALIHA[2]

[1*] Department of Biochemistry and Microbiology, Faculty of Sciences, University of M'sila, University Pole, Road Bourdj Bou Arreiridj, M'sila 28000, Algeria.*https://orcid.org/0000-0003-0992-2987*

[2] *Laboratory of phytotherapy applied to chronic diseases. Department of of Animal Biology and Physiologyhttps://orcid.org/0000-0003-0992-2987*

****Corresponding Author***: *E-mail: dalila.bencheikh@univ-msila.dz*

Volume 6, Issue 15, Sep 2024

Received: 15 July 2024

Accepted: 25 Aug 2024

Published: 05 Sep 2024

doi: 10.48047/AFJBS.6.15.2024.5097-5117

Abstract

Tuberculosis remains a significant cause of morbidity and mortality globally, despite concerted health policy efforts in Algeria. In recent years, there has been a concerning rise in the incidence of both pulmonary and extra-pulmonary tuberculosis. Our study, conducted at the SCTMR laboratory in Ras-El-Oued, spanned the years 2018 (137 samples) and 2019 (76 samples).The most affected demographic comprised young adults aged between 15 and 65 years, with women being disproportionately affected. Clinical presentation often includes symptoms such as fever, cough, weight loss, fatigue/weakness, night sweats, and anorexia. Treatment primarily involved anti-tuberculosis drugs, including Isoniazid, Rifampicin, and Pyrazinamid, known for their anti-bacillary activity. Microscopic examination was employed as the primary diagnostic technique for tuberculosis detection. In 2018, the study recorded a cure rate of 49.4%, completion of treatment (without control culture) at 42.9%, and mortality at 7.8%. Regarding specific manifestations, over 35.4% of cases of lymph node TB exhibited fibrous scar-pleural squeal with axillary diameter within the range of]15mm; 20mm], while pleural TB accounted for 11.1% of cases with axillary diameter less than 15mm. The mortality rate for lymph node TB was 1.2%.

Enhanced understanding of tuberculosis and its treatment is pivotal in promoting adherence to screening among contacts and fostering better compliance with treatment regimens. This approach is crucial for reducing the risk of tuberculosis development, both on an individual level and from a public health perspective.
Key words: Pulmonary tuberculosis, extra-pulmonary

Introduction

Tuberculosis (TB), a highly contagious disease with significant morbidity and mortality, is particularly prevalent among immunocompromised patients, including those with cancer (Hung et al., 2022). The World Health Organization (WHO) estimates that over 1.9 billion people, roughly one-third of the global population, are infected with tuberculosis (Pichard and Minta, 2000).

Tuberculosis is primarily transmitted from person to person through the air, with Mycobacterium tuberculosis (the tubercle bacillus) being the causative agent. It can affect any organ in the body, though pulmonary tuberculosis is the most common manifestation, while extrapulmonary tuberculosis is less frequent. It's important to note that only pulmonary tuberculosis is contagious (Ait-Khaled and Donald, 2003).

Annually, there are over 10 million new active cases of tuberculosis worldwide, many of which are infectious, resulting in an annual mortality rate of 3 million (Pichard and Minta, 2000).

More than 95% of tuberculosis cases and over 98% of tuberculosis-related deaths occur in African countries. Sub-Saharan Africa, which accounted for 11% of the world's population in 2002, reported 2% of all tuberculosis cases and 26% of contagious pulmonary tuberculosis cases in the same year. The estimated incidence of contagious tuberculosis globally is 63 per 100,000 inhabitants on average, while in sub-Saharan Africa, it reaches 149 per 100,000 inhabitants. Despite the existence of effective measures such as chemotherapy and vaccination, tuberculosis remains a significant public health challenge worldwide (Boulahbal and Chaulet, 2004).

The aim of this study was to examine the distribution of tuberculosis and its various types, as well as treatment methods. Given the importance of understanding tuberculosis incidence in the Ras-El-Oued region, the study sought to explore the knowledge and attitudes toward tuberculosis and their impact on treatment adherence.

I.Materials and methods

I.1. TB data collection: survey study

The survey was conducted at the Laboratory of SCTMR in Ras-El-Oued, during the period from March 5, 2021, to May 24, 2021, utilizing annual reports and the registry of cultures and cases detected during the years 2018 and 2019. The distribution was analyzed according to age(between 15 and 65 years and over), sex, and type of tuberculosis.

The screening techniques employed were Direct Examination after Ziehl-Neelsen staining for pulmonary samples and Culture after decontamination for extra-pulmonary samples.

I.2.Statistical Study:

The statistical analysis was carried out using IBM SPSS Statistics (version 26). All results are presented as percentages for qualitative variables (such as gender) and as mean ± standard deviation for quantitative variables. Comparisons between two means were conducted using the Student's t-test, while comparisons between several means were performed using analysis of variance (ANOVA)

II.Results and discussion

II.1. Distribution

In 2018, there were 137 new cases of tuberculosis reported; 44 of the cases involved women and 93 involved men. In contrast, there are 76 instances of tuberculosis in 2019; these individuals are older than 65. From one year to the next, the number of screenings conducted gradually decreased (from 64.32% to 35.68%), as seen in Tables 1, 2, and figure 1.

When categorized by sex, we observe that there is a disparity between the numbers of the two sexes, there was a significantly higher incidence ($p < 0.001$) of TB in the females (female predominance: 67.9% in 2019 and 64.5% in 2018), resulting in a sex ratio of 1.81% for the year 2019 and a sex ratio of 3.02% for the year 2018.

Table1 .Sex distribution in 2018

Sex of patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Men	44	32.1	32.1	32.1
	Women	93	67.9	67.9	100.0
	Total	137	100.0	100.0	

Table2 .Sex distribution in 2019

Sex of patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Men	27	35.5	35.5	35.5
	Women	49	64.5	64.5	100.0
	Total	76	100.0	100.0	

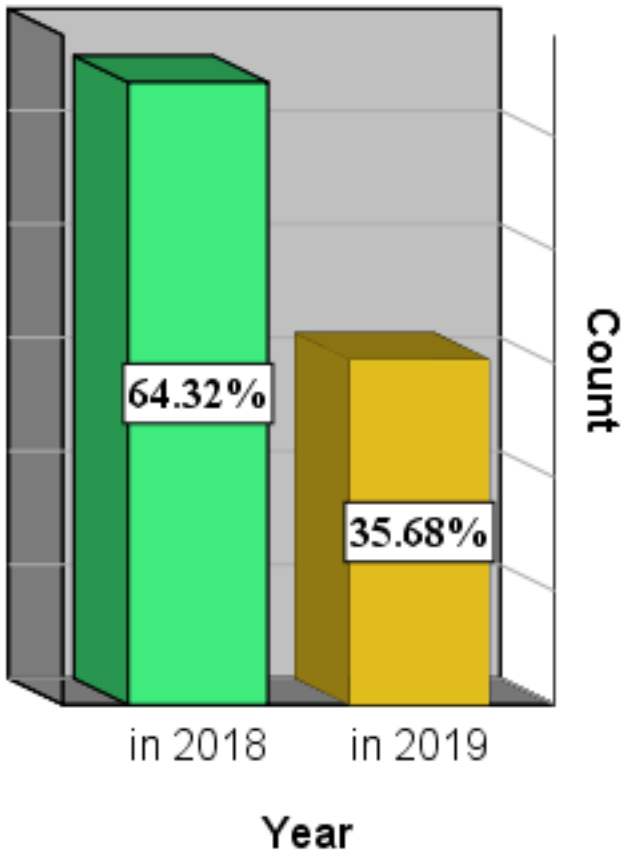

Figure 1: Distribution according to the number of cases recorded in 2018 and 2019.

One study has found that 1,758 cases of tuberculosis were reported in Île-de-France in 2015, 1809 in 2016 and 1,927 in 2017 (Mathieu, 2019). There is therefore an increase it may be favored by various factors (poverty, social inequalities, housing overcrowding, malnutrition, drug addiction, limited access to health care...).

Tuberculosis is a disease that affects men in two-thirds of cases and occurs in about 75% of cases and in the economically productive age group (15-50 years) (Lepeuple *et al*., 1970).

II.2. Anti-tuberculosis drugs

The steady increase in the different types of drug-resistant tuberculosis in many parts of the world is a matter of great concern, particularly as treatment outcomes are frequently unfavourable. The cost of treatment and of treatment support, including the provision of direct observation of second-

line drug intake and of support for periods of up to 24 months, is high, and adverse drug events are frequent. The first priority should therefore always be to ensure an effective tuberculosis programme so that resistance is prevented (Riitta *et al*.,2019).

Anti-tuberculosis drugs currently numbering fifteen have unequal anti-bacillary activity. Major antibiotics include Isoniazid (H) and Rifampicin(R), followed by Streptomycin, Ethambutol(E). Among the minor antibiotics, or secondary antibiotics are Kanamycin, Viomycin….

These are available in fixed-dose combinations that may contain two, three or four tuberculosis drugs (Table3), as follows:

•Rifampicin with isoniazid (RH);

• Rifampicin with isoniazid and pyrazinamide (RHZ);

• Rifampicin with isoniazid and ethambutol (RHE);

• Rifampicin with isoniazid, pyrazinamide and ethambutol (RHZE). (Riitta *et al*, 2019)

Table 3: Recommended daily dosages of tuberculosis: anti-tuberculosis drugs

DCI	**Speciality**	**Administration way**	**Dosage Average/day**
Isoniazid(INH)	Rimifon®	Oral	5 mg/kg/j (< 300
Rifampicin	Rifadine®	Oral/IV	mg)
INH + Rifampicin	Riniazide®	Oral	8 à 15mg/kg/day
	Rifinah®	Oral	0,45 to 0,6g
Ethambutol	Etambutol®	Oral	2spoon
			20 à 25mg/kg/day
			(hospital)
Pyrazinamid	Pyrazinamide®	Oral	20 to 30 mg/kg/day
Streptomycin	Streptomycine®	IM/IV	0,5 g to 1,5g

Rifabutin	Mycobutin®	Oral	300 to 600 mg

According to Jedat *et al* (2015), the clinical symptoms of tuberculosis include cough, anorexia, fever, sputum production, hemoptysis, and night sweats. Riitta *et al* (2019) also suggested that TB symptoms may manifest as cough, weight loss, fever, and night sweats.

II.3. Bacillary Status

The most commonly utilized technique for detecting tuberculosis bacilli is microscopic examination, as it enables the identification of highly contagious tuberculosis patients, facilitating the prompt initiation of treatment for cases with positive microscopy results.

II.4. According to the Type of Sampling

In 2019, the proportion of pulmonary samples (5.3%) was minimal compared to extrapulmonary samples (88.2%) as shown in Table 4. Concerning 2018, 60.3% for TB lymph node where men were more affected (12.41%); 25.7% among TB pulmonary and 1.5% TB pleural whereas TB extrapulmonary was with 11.8% in which 12.41% were women (Table 5, figure3).

Table 4: Tuberculosis cases recorded in 2018 and 2019

Year	**2018**					**2019**		
Type of TB	**TB pulmonary**	**TB extra-pulmonary**	**TB milliary**	**TB** lymph node	**TB pleural**	**TB pulmonary**	**TB extra-pulmonary**	**TB milliary**
	25.7%	11.8%	7%	60.3%	1.5%	5.3%	88.2%	6.6%

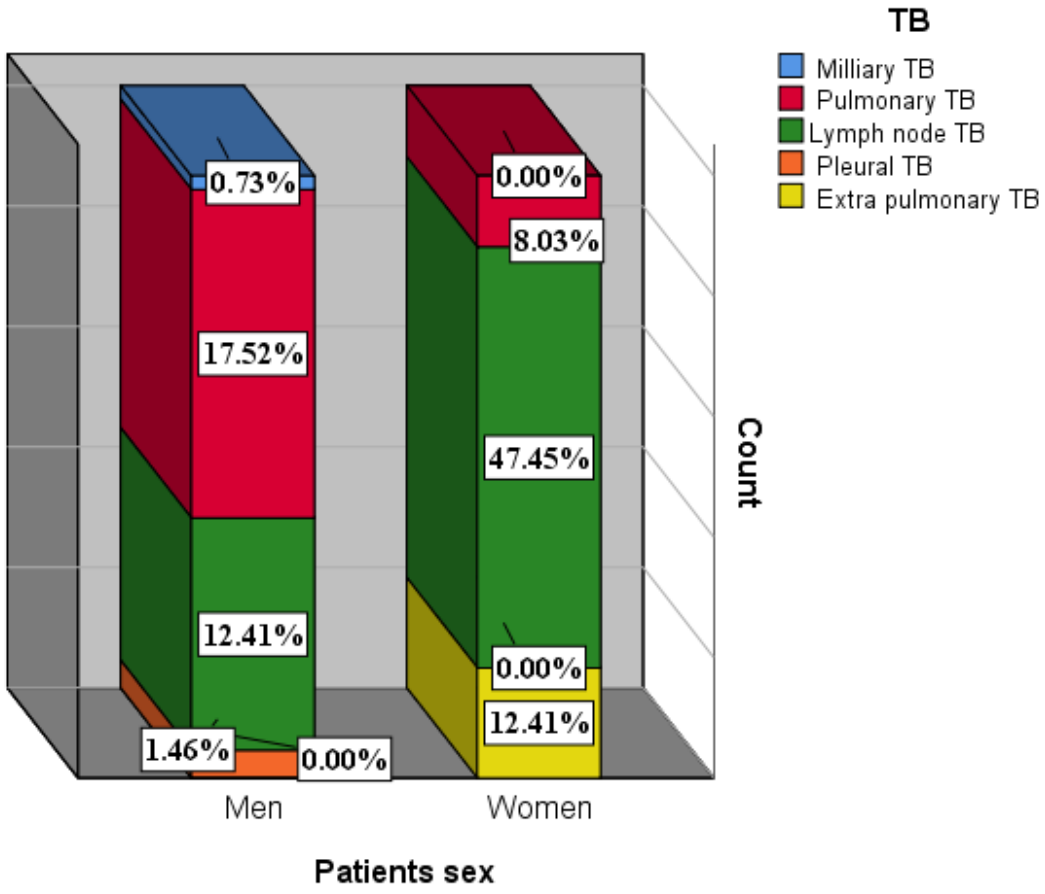

Figure2. Distribution of TB types according to sex in 2018

Table5. Different TB types in 2019

TB types

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pulmonary TB	5	6.6	6.6	6.6
	Extrapulmonary TB	47	61.8	61.8	68.4
	Milliary TB	24	31.6	31.6	100.0

Total	76	100.0	100.0	

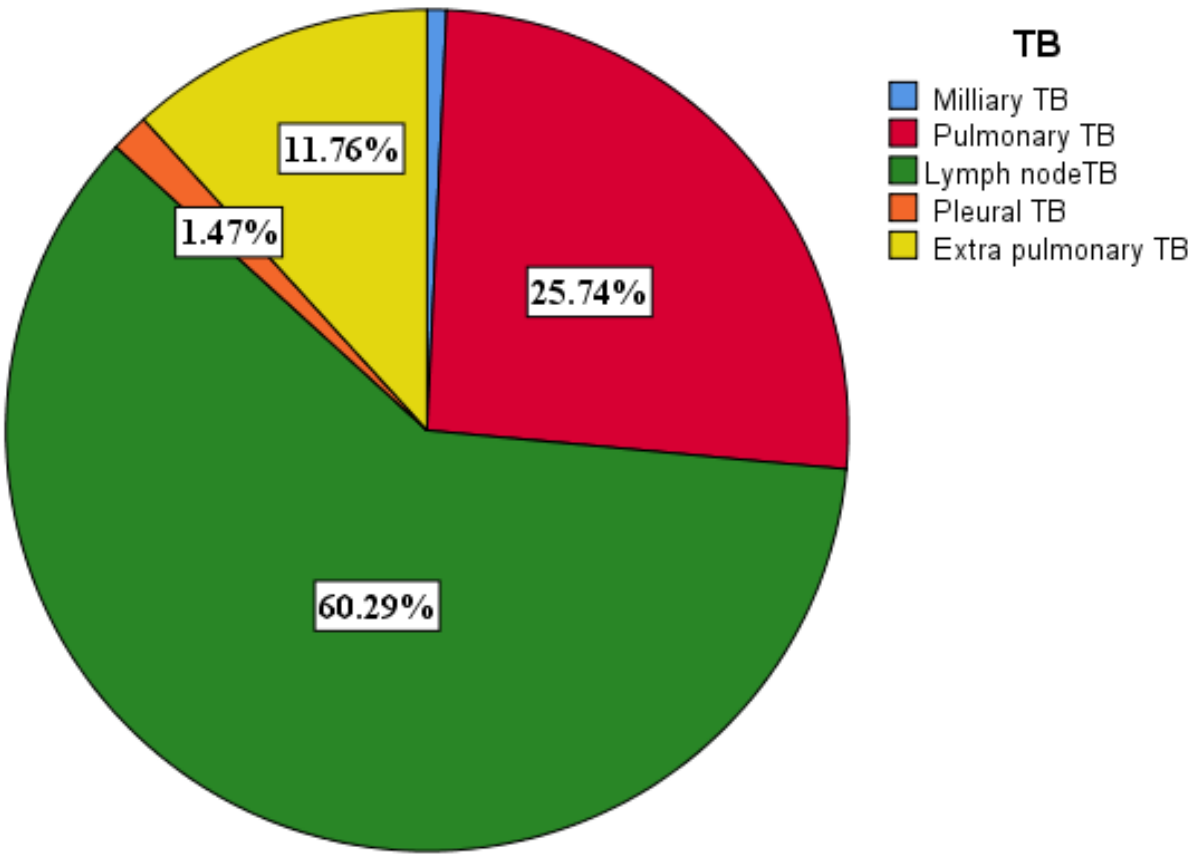

Figure3. Percentage of type of TB in 2018

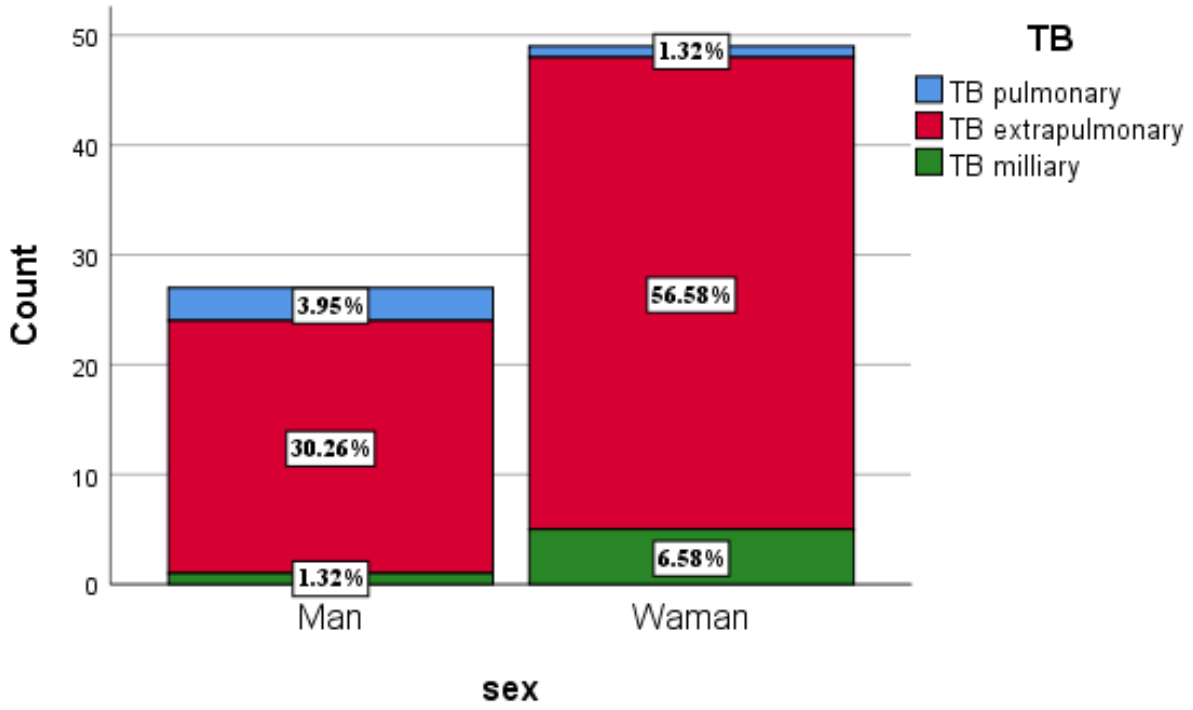

Figure4. Distribution of TB types according to sex in2019

From Figure 2, and figure 4, it is evident that the highest percentage of the total sample consisted of females, accounting for 47.45% of cases with lymph node TB, while males comprised 12.41% of the total sample. In terms of pulmonary TB, males represented 17.52% of the total sample, followed by females at 8.03%, and 12.41% for extrapulmonary TB. Regarding miliary TB, the highest percentage was observed in males, accounting for 0.73% of the total sample, followed by pleural TB with 1.46% of the total sample.

II.5. According to microscopic examination:

Following microscopic examination, the results are presented in Table 6, focusing on the presence or absence of Acid-Fast Bacilli (ARB) rather than specific mycobacterial species such as tuberculosis or leprosy bacilli.

Failure is defined as either a patient whose sputum remains positive for bacteriological examination throughout treatment until the fifth or sixth month, or becomes positive again at these

time points after a transient negative result. Additionally, it includes patients who interrupt their treatment for at least 2 months after starting chemotherapy and subsequently test smear positive.

The results indicate that microscopy-positive pulmonary tuberculosis (TBM+) is the most common form at 85.7%, followed by microscopy-negative pulmonary tuberculosis (TBM-) at 5.7%, and relapse in 5.7% of cases (figure5). There were no reported cases of treatment failure (Table 6). According to Jedat *et al*. (2015), treatment outcomes are favorable in 50% of cases with a negative culture at 6 months, with outcomes unknown in 45% of cases, non-compliance with treatment in 2.5% of cases, and relapse in 2.5% of cases.

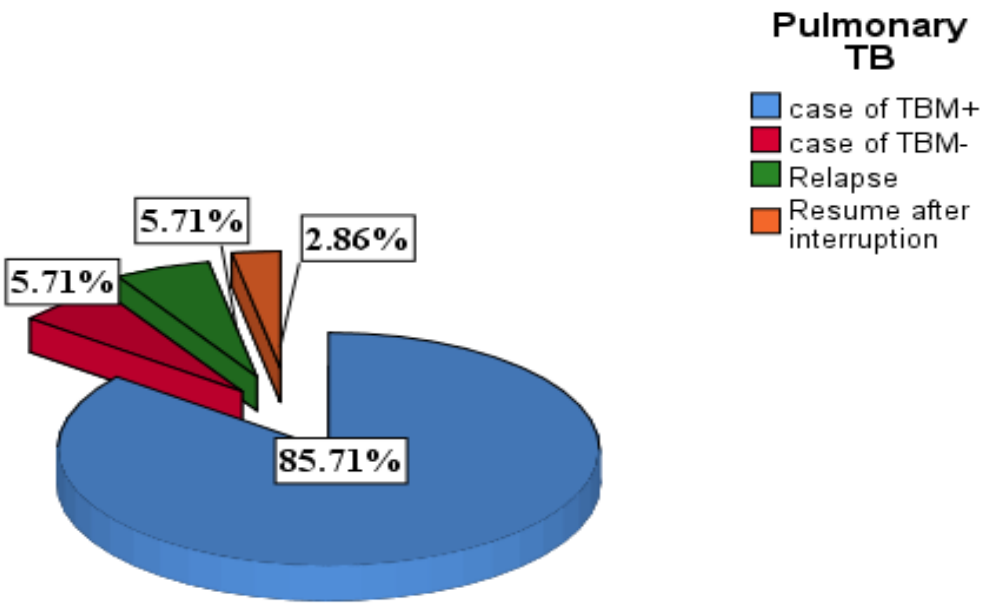

Figure5. The results of treatment cases recorded in 2019

In microscopy-positive pulmonary tuberculosis cases, individuals categorized as "lost to follow-up" are those who interrupted their treatment and were subsequently not seen by health services at the end of the standard treatment period. In our study, this group accounted for 48.28% of cases.

Death is defined as the occurrence of mortality during treatment, regardless of the cause. This outcome was observed in 5.17% of cases.

In our study, microscopy-negative pulmonary tuberculosis constituted 50% of the treatment cases. This category comprised both complete treatments without control and cases resulting in loss of life, each accounting for the same percentage.

Table6. Microscopic examination of TB pulmonary recorded in 2019.

Pulmonary TB

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Case of TB+	30	36.6	85.7	85.7
	Case of TBM-	2	2.4	5.7	91.4
	Relapse	2	2.4	5.7	97.1
	Resume after interruption	1	1.2	2.9	100.0
	Total	35	42.7	100.0	

II.6. According to lymph node

The nodes of the head and neck are frequently affected by tuberculosis, with tuberculous adenitis (TAA) often resulting from the reactivation of dormant bacilli within these nodes or, less commonly, from direct exposure to the infection (Golden and Vikram, 2005). Among positive cases, lymph node TB accounts for 35.4%, often presenting as fibrous scar-pleural sequences (with axillary diameter of 15 to 20 mm), while pleural TB represents 11.1%, characterized by an absence of pleurisy and axillary diameter less than 15mm. The mortality rate is 1.2% for lymph node TB, with no reported deaths in pleural TB cases (Table 7, figure 6). For cases with axillary diameter greater than 20mm, lymph node TB comprises 25.6%, indicative of productive or newly appearing axillary diameter. Additionally, 1.2% of cases are reported as lost to follow-up.

Table 7. Results of measurement tuberculosis adenitis (ADP) recorded in 2019

Lymph node TB

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ADP less of 15mm	29	35.4	35.4	35.4
	ADP between 15 and 20mm	29	35.4	35.4	70.7
	Death	1	1.2	1.2	72.0
	ADP greater than 20mm	21	25.6	25.6	97.6
	Transferred	1	1.2	1.2	98.8
	Lost sight of	1	1.2	1.2	100.0
	Total	82	100.0	100.0	

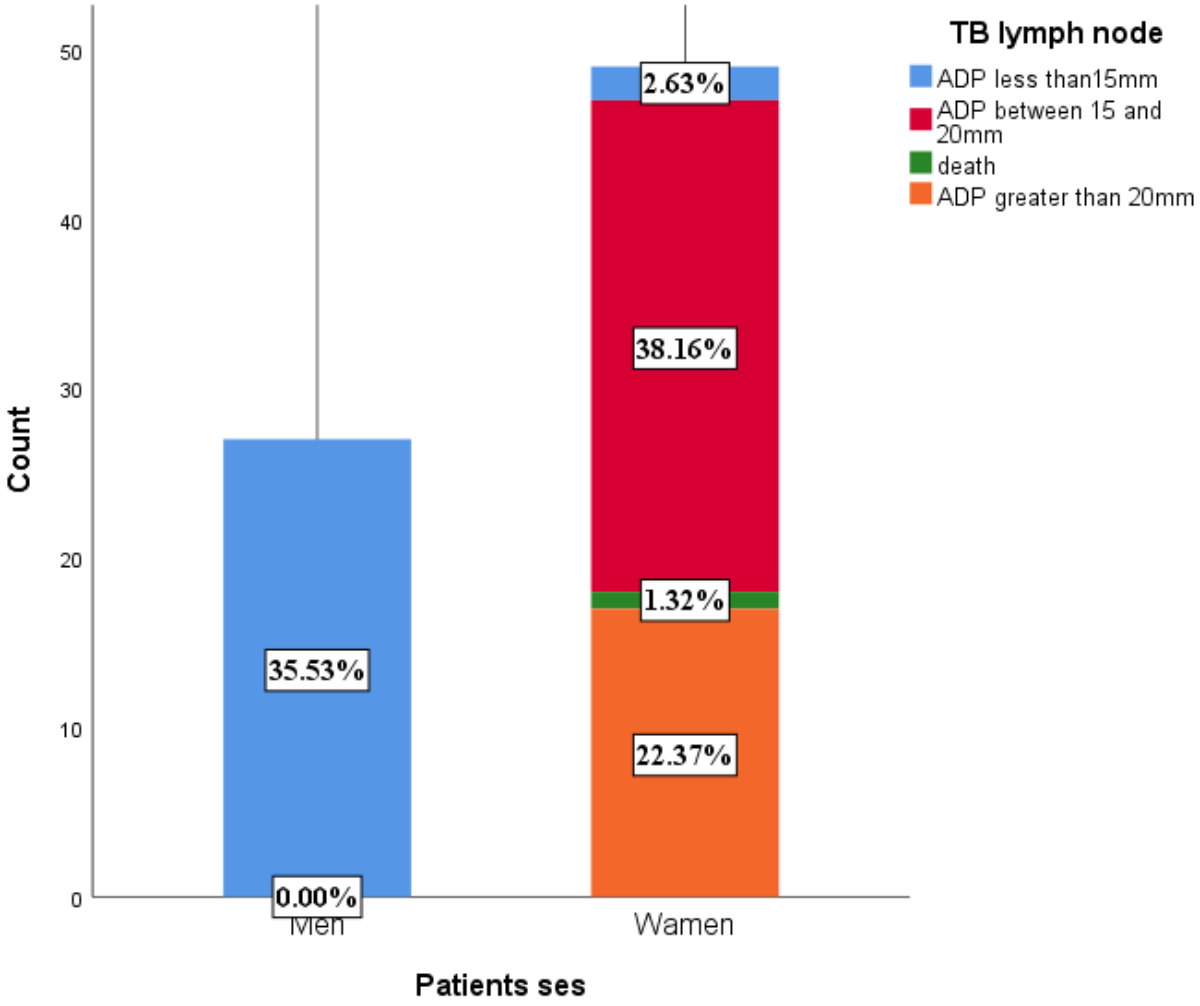

Figure6. The results of Lymph node TB recorded in 2019

II.6.1. Seize of Lymph node

The lymph nodes of the head and neck are frequently affected by tuberculosis. Tuberculosis adenitis (ADP) typically arises from the reactivation of dormant bacilli within these lymph nodes, either more commonly or less frequently following direct exposure to infection (Golden and Vikram, 2005).

The incidence of positive cases demonstrates a trend towards lymph node tuberculosis, accounting for 35.4% of cases, often presenting with fibrous scar-pleural squeal (ADP measuring between 15 and 20 mm), whereas pleural tuberculosis constitutes 11.1% of cases with ADP measuring less than 15mm (indicating an absence of pleurisy). Additionally, the mortality rate is 1.2% for lymph node TB, while no deaths have been reported for pleural TB (figure 7).

In cases where ADP measures greater than 20mm, 25.6% are attributed to lymph node TB, indicating productive or newly appearing ADP. Furthermore, the study reports a loss to follow-up rate of 1.2%

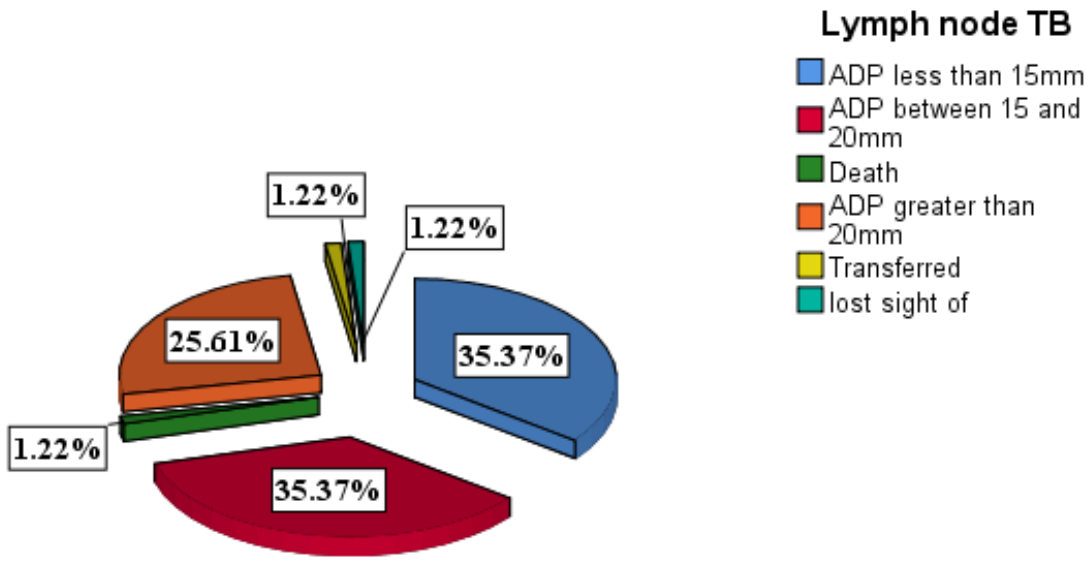

Figure7. ADP measurement of lymph node of TB cases recorded in 2018

Kissi *et al*. (2015) documented 752 cases of cervical lymph node tuberculosis, with a mean age of 25.5 years and a range from 6 months to 71 years. They observed a male predominance, with a sex ratio of 1.6. Pulmonary tuberculosis frequently coexists with lymph node tuberculosis and may serve as its primary source. Priel *et al*. (1994) found pulmonary tuberculosis in 28.8% of patients with tuberculous lymphadenopathy, while Prasad *et al*. (2007) reported a frequency of pulmonary tuberculosis in 24.2% of patients with tuberculosis affecting the head and neck region.

II.7. Treatment results

It is notable that for the year 2018, the treatment outcomes were as follows: a cure rate of 49.4%, completion of treatment (without control culture) at 42.9%, and mortality accounting for 7.8% of the total sample (Table8, figure8).

Table 8: Treatment Outcomes in 2018

Treatment results

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cure	38	48.7	49.4	49.4
	Finished treatment	33	42.3	42.9	92.2
	Death	6	7.7	7.8	100.0
	Total	77	98.7	100.0	
Total		78	100.0		

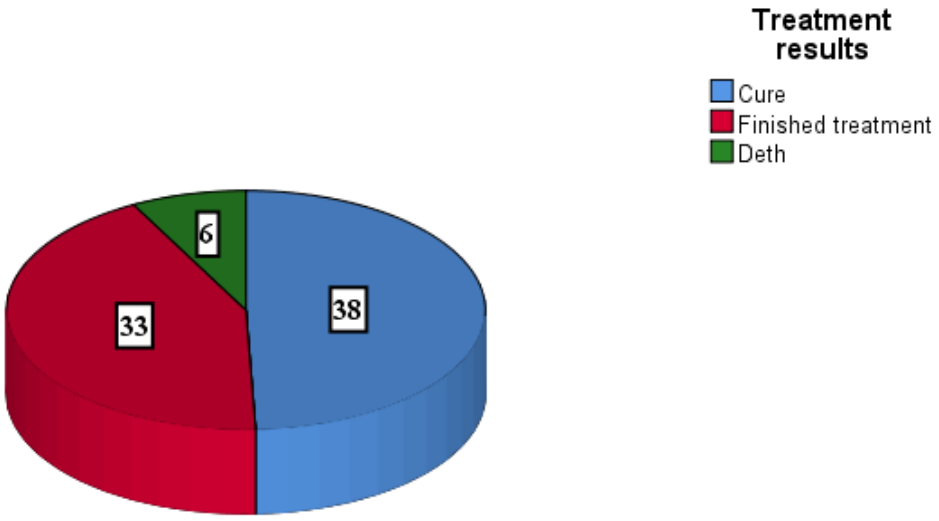

Figure8.Pie of count of outcomes treatment results recorded in 2018.

Conclusion

Tuberculosis, caused by Mycobacterium tuberculosis (also known as the bacillus Koch or BK), is a communicable infectious disease. The results of this study reveal a progressive decrease in the number of samples taken from one year to the next.

This study highlights tuberculosis as a condition characterized by diverse and often interconnected signs, which may vary with factors such as sex, age, HIV infection, and the type of tuberculosis. Recognizing its frequent association underscores the importance of systematically screening for this infection among hospital patients. Such an approach allows for a preliminary and comprehensive understanding of the tuberculosis problem, thereby mitigating the risk of individual TB development and addressing public health concerns effectively.

Knowledgements

This work was supported by the Algerian Ministry of Higher Education and Scientific Research (MESRS) and also by the Laboratory of SCTMR in Ras-El-Oued , Algeria. We express our gratitude to these organizations.

Funding

This research was financially supported by the Ministry of Higher Education and Scientific Research (MESRS), General Directorate of Scientific Research and Technologic Development (DGRSDT)

Conflict of interest

The authors declare no conflict of interest

ADDITIONAL INFORMATION

No additional information is available for this paper.

AUTHOR CONTRIBUTION:

BENCHEIKH Dalila: Supervision ,Conceptualization, Validation; Visualization; Formal analysis; Writing-review & editing, Writing-original draft.

DJARBOUAI Afaf: Data curation; Formal analysis; Investigation; Methodology; Software; Writing-original draft

KHENNOUF Seddik: Project administration; Validation; Visualization; Writing-review & editing

DAHAMNA Saliha: Conceptualization; Visualization; Writing-original draft; Writing-review & editing.

References

Ait-Khaled, N., Enarson, D. A., Stop TB Initiative. (2003). Tuberculosis: a manual for medical students (No. WHO/CDS/TB/99.272). World Health Organization.

Boulahbal, F., Chaulet, P. (2004). La tuberculose en Afrique: Epidémiologie et mesures de lutte. Med Trop, 64(3),224-8.

Golden MP, Vikram HR (2005). Extrapulmonary tuberculosis: an overview. Am Fam Physician. 1;72(9):1761- 8.

Hung CL, Su CC, Ou CY.(2022). Impact of active pulmonary tuberculosis on the prognosis of patients with upper aerodigestive cancers: An 8-year observational study in a nationwide cohort. J Infect Public Health 15 (12) : 1540-1545

Jedat, V., Michaud, C., Receveur, M. C., Malvy, P. P. D., Ouattara, M. D. E., Pistone, T., Receveur, M. C. Capacité de MédecineTropicale. Profil socio-demographique de la tuberculose a Mayotte. Centre Labusquière, université de Bordeaux.,2015.p26

Kissi, M., Nitassi, S., Jahidi, A., Benbouzid, M. A., Bencheikh, R., Erraimi, N., Ammar, H. (2015). La tuberculose ganglionnaire cervicale au Maroc Etude multicentrique. Auteurs,127.

Lepeuple, A., Vivien, J. N., Thibier, R. (1970). Recherches bactériologiques initiales dans un traitement ambulatoire correct. Rev Tub Pneumol, 34, 664-5.

Mathieu, P., Njoya, I. M., Calba, C., Lepoutre, A., Marc, E. (2019). Épidémiologie de la tuberculose en Île-de-France: une augmentation des cas déclarés en 2016 et en 2017. Revue de Biologie Médicale/N, 27 351(74).

Pichard, E., Minta, D. (2000).Maladies infectieuses en Afrique. Brochure, 1, 111-20.

Prasad KC, Sreedharan S, Chakravarthy Y, Prasad SC. (2007). Tuberculosis in the head and neck: experience in India. J Laryngol Otol. Oct;121(10):979-85

Priel IE, Katz AN, DolevE.,(1994). Tuberculous lymphadenitis in a general hospital. Harefuah. Dec 1;127(11):438-40, 504.

Riitta A. Dlodlo, Grania Brigden and Einar Heldal.2019. MANAGEMENT OF TUBERCULOSIS A Guide to Essential Practice.International Union Against Tuberculosis and Lung Disease (The Union) 68, Boulevard Saint Michel, 75006 Paris, France. ISBN: 979-10-91287-27-2.

PaymentReceiptTransactionReference:pay_OvbpxiH6pHAHCR

ThisisapaymentreceiptforyourtransactiononAFJBSPayment

AMOUNTPAID$180.00

ISSUEDTO

kinchas14@gmail.com

+213670177531

PAID ON

11Sep2024

DESCRIPTION	UNITPRICE	QTY	AMOUNT
Amount	$180.00	1	$180.00
	Total		**$180.00**
	AmountPaid		$180.00