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RESEARCH ARTICLE

THE ROLE OF RADIOGRAPHY IN THE DIAGNOSIS OF PLEUROPULMONARY TUBERCULOSIS IN THE RADIOLOGY DEPARTMENT OF THE REFERRAL HEALTH CENTER IN BAMAKO'S 6TH DISTRICT

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Abstract

Pleuropulmonary tuberculosis is a contagious disease caused by Mycobacterium tuberculosis. Chest X-rays are an essential tool for diagnostic evaluation. The objective of this study was to assess the role of chest X-rays in the diagnosis of pleuropulmonary tuberculosis in the radiology department of the referral health center in Bamako's 6th district. This was a cross-sectional study conducted from January 1, 2024, to July 31, 2025. The study included all patients admitted for chest X-rays who presented radiographic findings suggestive of tuberculosis and whose diagnosis was confirmed by laboratory testing. Data were analyzed using SPSS software. Patient confidentiality and anonymity were ensured. Patient participation was voluntary, and consent was obtained from the parents or guardians of patients under 18 years of age. In total, we identified 136 subjects who met the inclusion criteria out of 2,861 chest X-rays performed in the department, representing a prevalence of 4.75%. The 25–34 age group accounted for 31.6%. Males were predominant in 75% of cases. Signs of bacillary infiltration were noted in 98.5%. The main radiological abnormalities observed were alveolar opacity in 80.1%, followed by interstitial opacity (69.1%) and cavities/tuberculomas in 25.7% of cases.

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The lesions were bilateral in 71.3% of cases, with a predominance of multilobar involvement in 72.1% of patients. Our results show that pleuropulmonary tuberculosis remains common. Diagnosis is based on clinical and laboratory findings, but chest X-rays provide a clear picture of the extent of the lesions.

Introduction:-

Tuberculosis (TB) is an infectious and contagious disease caused by *Mycobacterium tuberculosis*, also known as Koch's bacillus (BK). It can affect almost any organ, but the pulmonary form remains the most common and the most contagious. Transmission occurs primarily between people, via the air, from patients who are bacilliferous [1]. Standard chest X-ray is an X-ray imaging modality and serves as the first-line examination for evaluating pleuropulmonary lesions. It allows for the detection of suggestive pulmonary abnormalities and guides the patient toward bacteriological tests for confirmation [1]. However, pulmonary tuberculosis remains a major public health problem, particularly in low-resource countries where its determinants are strongly linked to adverse socioeconomic conditions [2]. According to the World Health Organization (WHO), 10.8 million people contracted tuberculosis in 2023, including approximately 6 million men, 3.6 million women, and 1.3 million children. That same year, the disease caused approximately 1.25 million deaths, including 161,000 among patients living with HIV [2]. In Europe, it remains a significant public health issue, with more than 16,600 new cases and 33,520 relapse cases in 2023 [3]. In West Africa, it continues to have a significant impact. In Côte d'Ivoire, the 2021 WHO report indicates an incidence of 128 cases per 100,000 inhabitants for all forms of tuberculosis [4].

In Mali, according to the 2024 report from the Sectoral Unit for the Fight Against AIDS, Tuberculosis, and Viral Hepatitis (CSLS-TBH), there were 6,007 cases of bacteriologically confirmed pulmonary tuberculosis, representing a 4.4% increase compared to 2023. The mortality rate was 6% [5]. A previous study on the role of medical imaging in the diagnosis of chest tuberculosis at the Point G University Hospital found a prevalence of 4.57% of suspected chest tuberculosis on computed tomography (CT) in 2021 [6]. The radiographic manifestations of pulmonary tuberculosis are variable and sometimes misleading. It is characterized by alveolar consolidation, cavitary changes, and pleural effusion. During the primary phase of tuberculosis infection, chest X-rays remain normal in more than 15% of patients [7]. Sequelae are dominated by more or less retractile interstitial infiltrates, residual cavities, and fibro-nodular opacities [8].

Early diagnosis and appropriate management of smear-positive patients are essential to limit transmission, reduce complications, and prevent deaths related to the disease. Although the diagnosis of tuberculosis is primarily confirmed through bacteriological methods (direct microscopy, culture, molecular tests) or histology, imaging plays a crucial role in the initial evaluation and follow-up of patients. It is in this context that we initiated this study to improve the management of pleuropulmonary tuberculosis. The objective of the study was to investigate the role of radiography in the diagnosis of pleuropulmonary tuberculosis in the radiology department of the referral health center in Bamako's 6th district.

Materials and Methods:-

This study was conducted in the radiology department of the referral health center in Commune VI of Bamako. It was a cross-sectional study conducted from January 1, 2024, to July 31, 2025. The study included all patients referred to the department for a chest X-ray who presented with lesions suggestive of pulmonary tuberculosis and whose diagnosis was confirmed by bacteriological testing. Sampling was consecutive. Data were entered and analyzed using SPSS version 23.0. Patient participation was voluntary, and consent was obtained from the parents or guardians of patients under 18 years of age. Patient confidentiality and anonymity were guaranteed. The examinations were performed using a STEPHANIX bone-lung X-ray machine and a SIEMENS mobile X-ray table.

Results:-

In total, we identified 136 cases of pulmonary tuberculosis among 2,861 chest X-rays performed in the department, representing a prevalence of 4.75%.

Sociodemographic Characteristics:-

In this study, male patients accounted for 75% of cases. The 25–34 age group accounted for 31.6% of patients, with a mean age of 36.2 ± 15 years. They were merchants in 19.9% of cases. More than half of the patients lived in urban areas, representing 69.1% of cases.

Table 1. Distribution of patients by sociodemographic characteristics

sociodemographic characteristics	(n =136 cases)	%
Gender		
Male	102	75.0
Female	34	25.0
Age group (years)		
0 – 14	5	3.7
15 – 24	29	21.3
25 – 34	43	31.6
35 – 44	22	16.2
45 – 54	12	8.8
55 – 64	16	11.8
≥ 65	9	6.6
Occupation		
Retailer / Salesperson	27	19.9
Housewife	17	12.5
Student	20	14.7
Farmer / Rancher	12	8.8
Driver	10	7.4
Laborer / Craftsman	24	17.6
Senior citizen	10	7.4
Marabout	4	2.9
Other	12	8.8
Place of residence		
Rural area	2	1.5
Semi-urban area	40	29.4
Urban area	94	69.1

Clinical data:-

The majority of patients had no prior medical history, accounting for 69.9% of cases. A history of tuberculosis was reported in 16.9% of patients. Clinical findings were dominated by signs of bacterial infection in 98.5% of cases and chronic cough lasting more than 15 days in 92.6% of cases.

Table 2. Distribution of patients based on clinical data

	(n =136 cases)	%
Medical history		
None	95	69.9
Tuberculosis	23	16.9
Hypertension	5	3.7
Diabetes	3	2.2
Asthma	2	1.5
HIV	1	0.7
Hypertension + Diabetes	2	1.5
Asthma + Tuberculosis	1	0.7
Diabetes + Tuberculosis	1	0.7
HIV + Tuberculosis	3	2.2
Clinical findings		
Signs of bacterial infection	134	98.5
Chronic cough lasting more than 15 days	126	92.6
Chest pain	106	77.9
Hemoptysis	15	11.0
Shortness of breath	63	46.3

Signs of bacterial infection: Evening fever, night sweats, weight loss, weakness.

Radiographic Findings:-

The most commonly observed radiographic abnormalities were alveolar opacity in 80.1% of cases, followed by interstitial opacity (69.1%) and cavitation/tuberculoma in 25.7% of cases. The lesions were bilateral in 71.3% of cases, with a predominance of multilobar involvement in 72.1% of patients.

Table 3. Distribution of patients based on radiographic data.

	(n =136 cases)	%
Radiographic findings		
Alveolar opacity	109	80.1
Interstitial opacity	94	69.1
Cavity / Tuberculoma	35	25.7
Miliary	23	16.9
Pleurisy	12	8.8
Location of lesions		
Affected side		
Right lung	29	21.3
Left lung	10	7.4
Bilateral involvement	97	71.3
Affected lobe		
Apical lobe	33	24.3
Middle lobe	19	14.0
Basal lobe	4	2.1
Multilobar	98	72.1

Bacteriological data:-

The acid-fast bacilli (AFB) test was positive in 65.4% of patients. Among the 47 patients with AFB-negative sputum, GeneXpert testing was requested and returned positive results in 100% of cases.

Table 4. Distribution of patients by bacteriological test

Bacteriological tests	N	%
BAAR	(n =136)	
Positive	89	65,4
Negative	47	34,6
GeneXpert	n=47	
Positive	47	100,0
Negative	0	

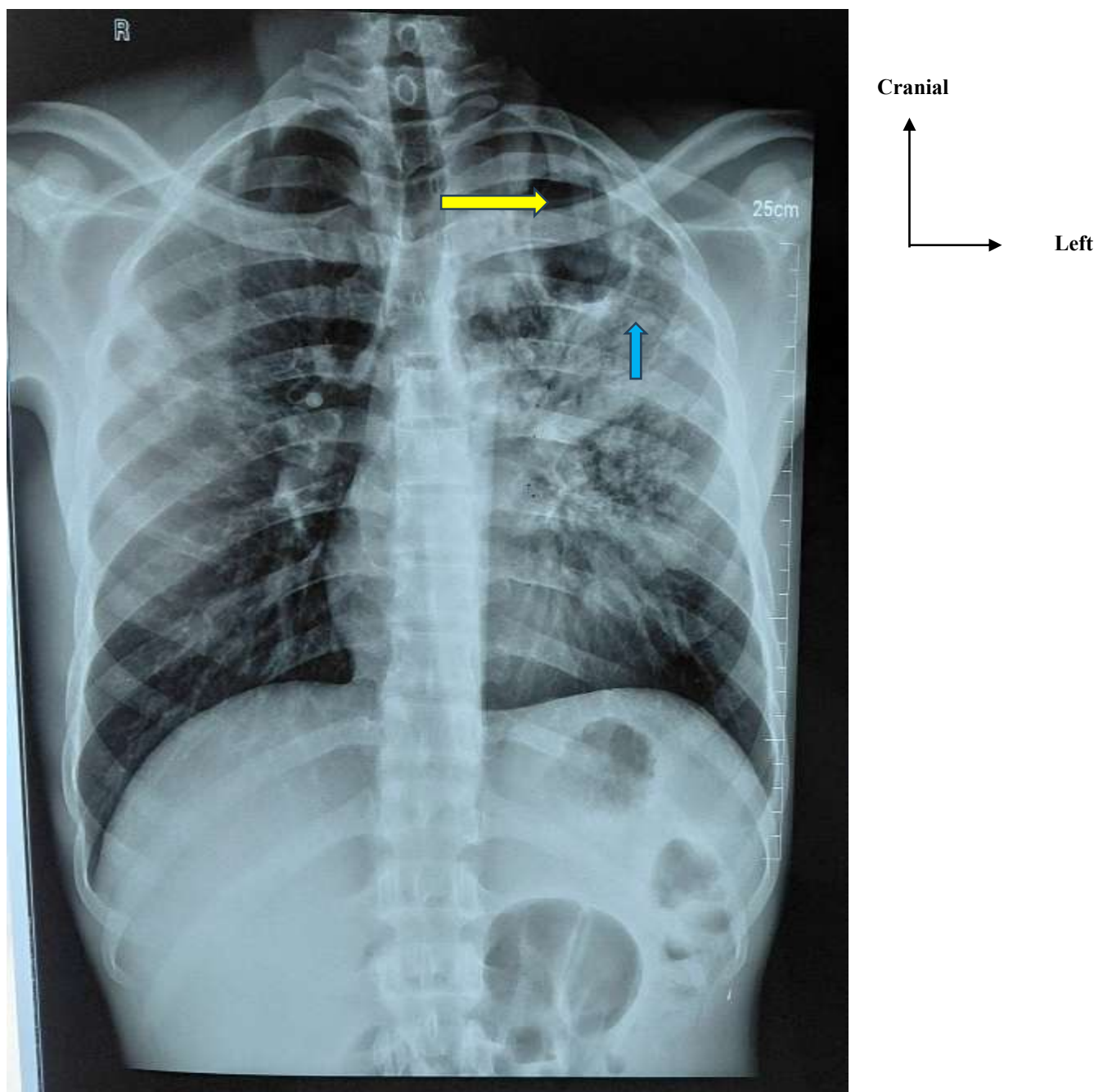


Figure 1. Anteroposterior chest X-ray showing a left apical cystic lesion suggestive of pulmonary tuberculosis.

An anteroposterior chest X-ray of a 28-year-old patient referred for a chronic cough lasting 3 months showing a left apical oval-shaped cavity with a regular, thin wall (yellow arrow) associated with ipsilateral pulmonary alveolar opacities (blue arrow), the appearance of which is consistent with pulmonary tuberculosis.

The sputum smear test (acid-fast bacilli) performed on the same patient was positive.

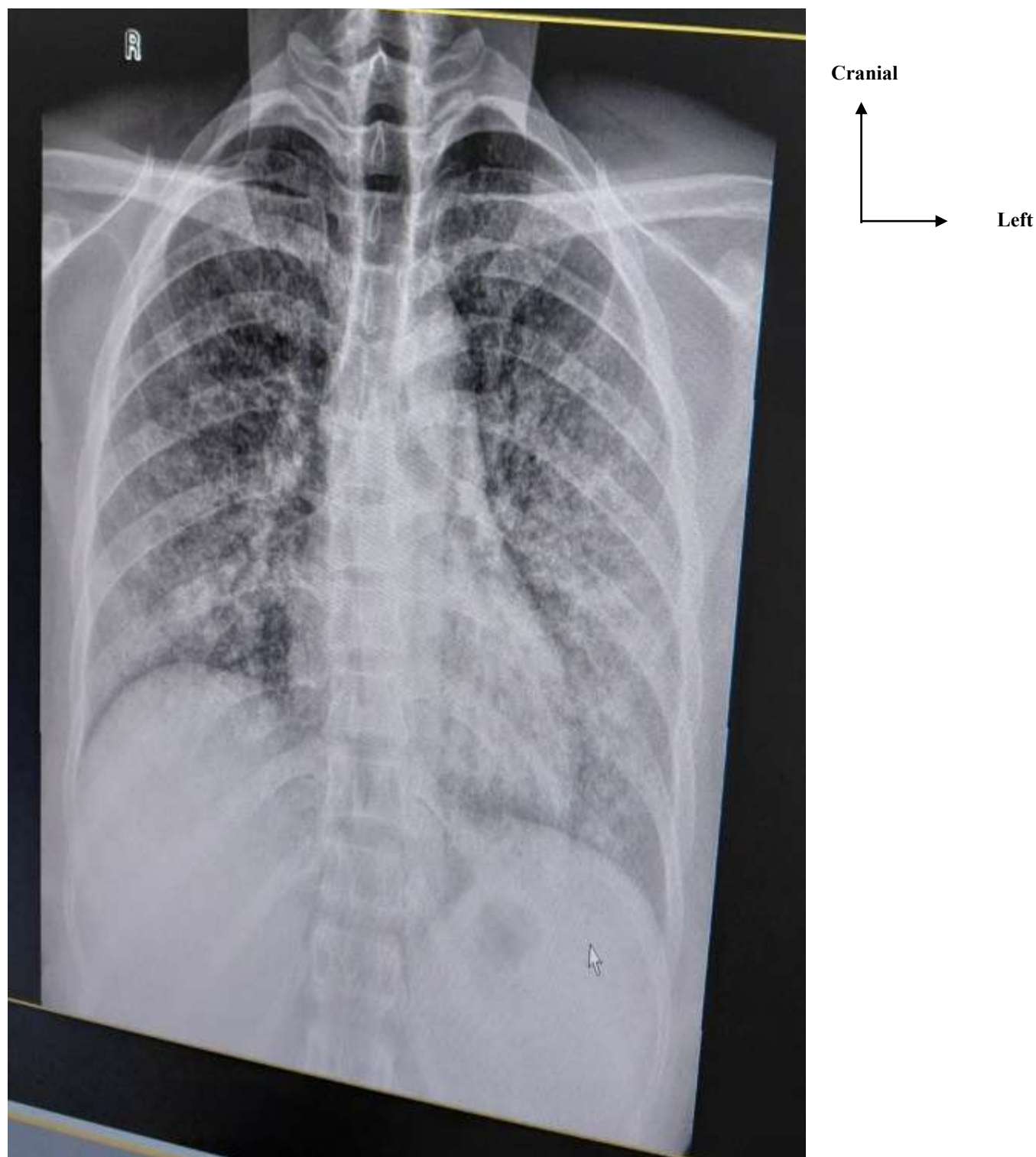


Figure 2. Anteroposterior chest X-ray showing diffuse bilateral micronodular pulmonary opacities suggestive of tuberculous miliary disease.

A 34-year-old patient referred for a productive cough, in whom an upright frontal chest X-ray revealed: diffuse bilateral pulmonary micronodular opacities suggestive of miliary tuberculosis. The sputum smear test (for acid-fast bacilli) performed on the same patient was positive.

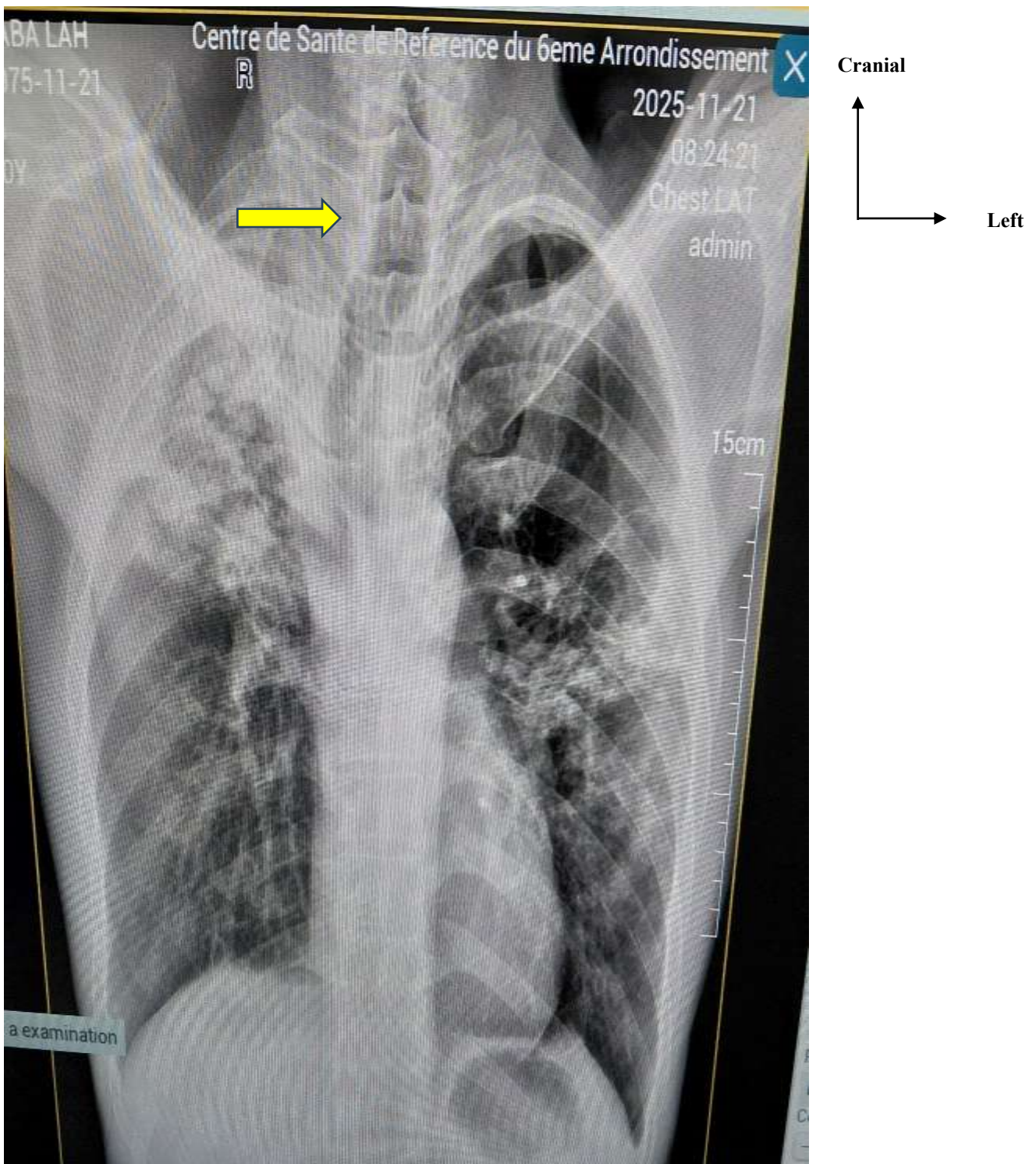


Figure 3. Anteroposterior chest X-ray showing a retractile opacity in the right upper lobe, suggestive of pulmonary tuberculosis.

Anteroposterior chest X-ray of a 50-year-old patient referred for suspected tuberculosis: a retractile opacity in the right upper lobe (indicated by the yellow arrow) associated with a consolidation occupying the upper two-thirds of the left lung field, all of which is consistent with pulmonary tuberculosis. The BAAR (Acid-Fast Bacillus) sputum smear performed on the same patient was positive.

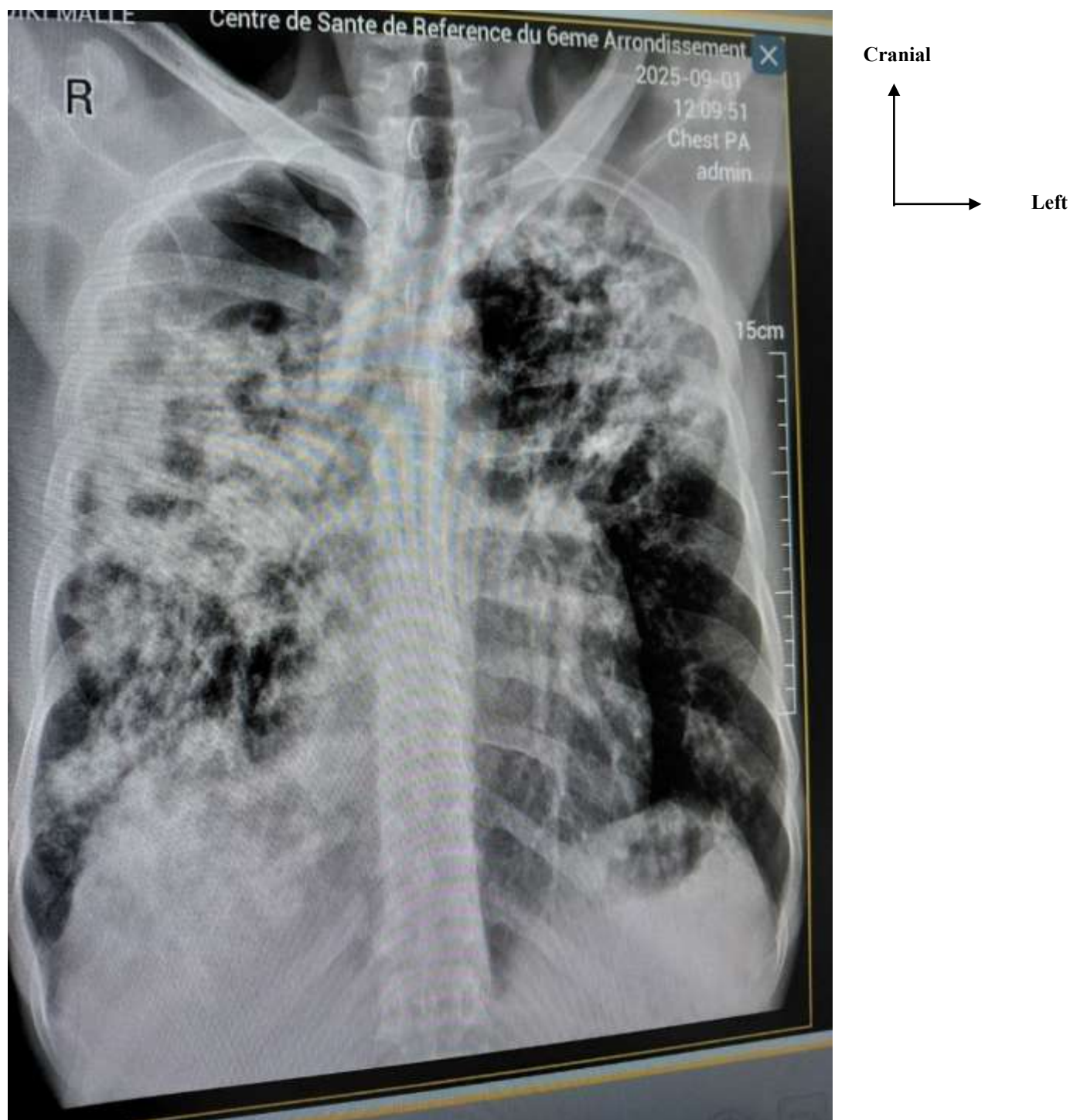


Figure 4. Anteroposterior chest X-ray showing diffuse reticular-micronodular opacity suggestive of pulmonary tuberculosis.

A 44-year-old patient referred for chronic cough; an anteroposterior chest X-ray taken in the upright position reveals: Diffuse reticular-micronodular opacity occupying the upper two-thirds of the right lung field and the upper lobe of the left lung field, associated with septal thickening and thickening of the bronchial walls. The sputum smear test (for acid-fast bacilli) performed on the same patient was positive.

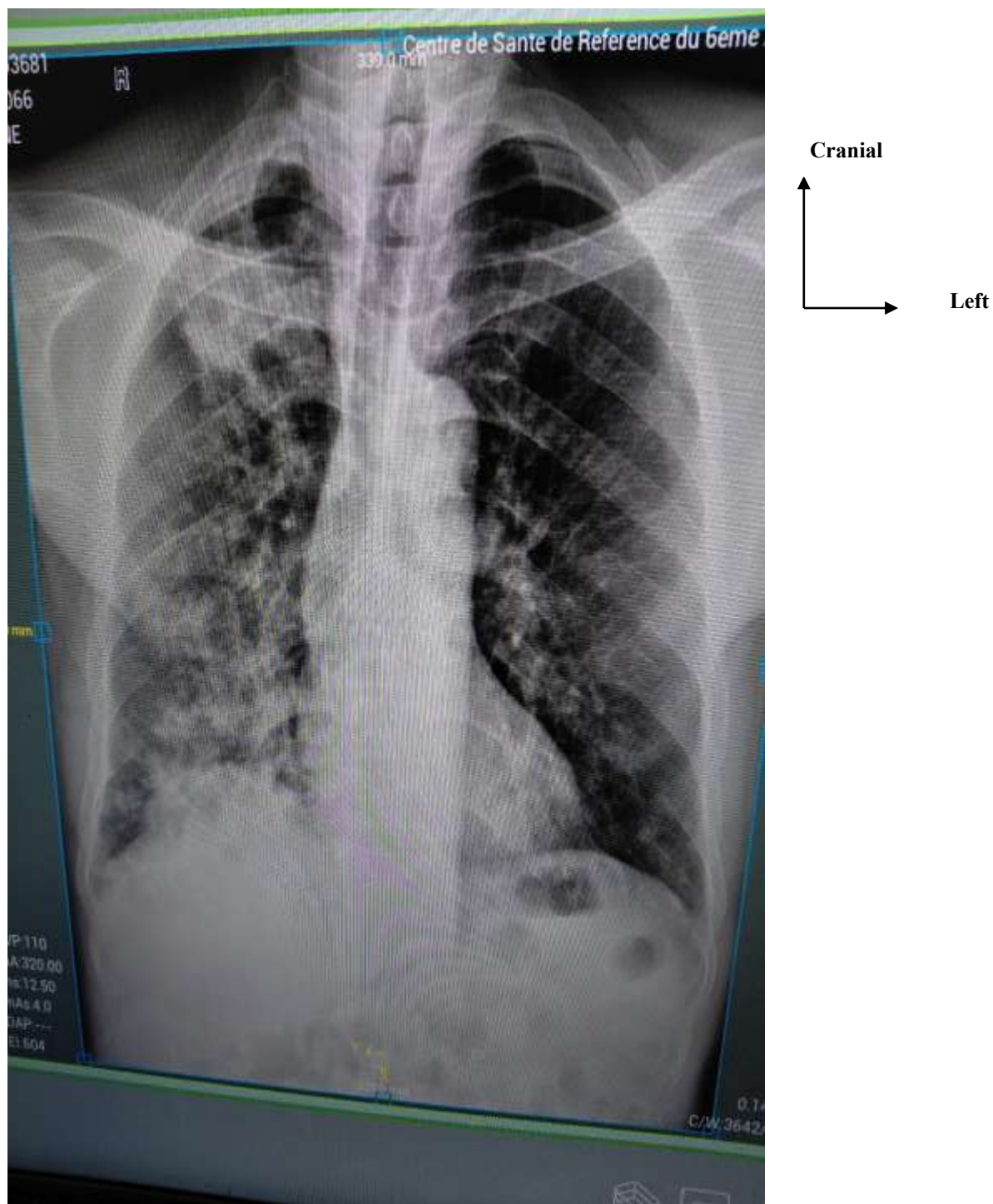


Figure 5. Anterior-posterior chest X-ray showing a rounded apicoventral opacity suggestive of pulmonary tuberculosis.

Anterior-posterior chest X-ray of a 28-year-old patient referred for cough, with a family history of tuberculosis: demonstration of a rounded apico-ventral opacity on the right side associated with diffuse reticular opacity in the remainder of the ipsilateral lung field. The sputum smear test (for acid-fast bacilli) performed on the same patient was positive.

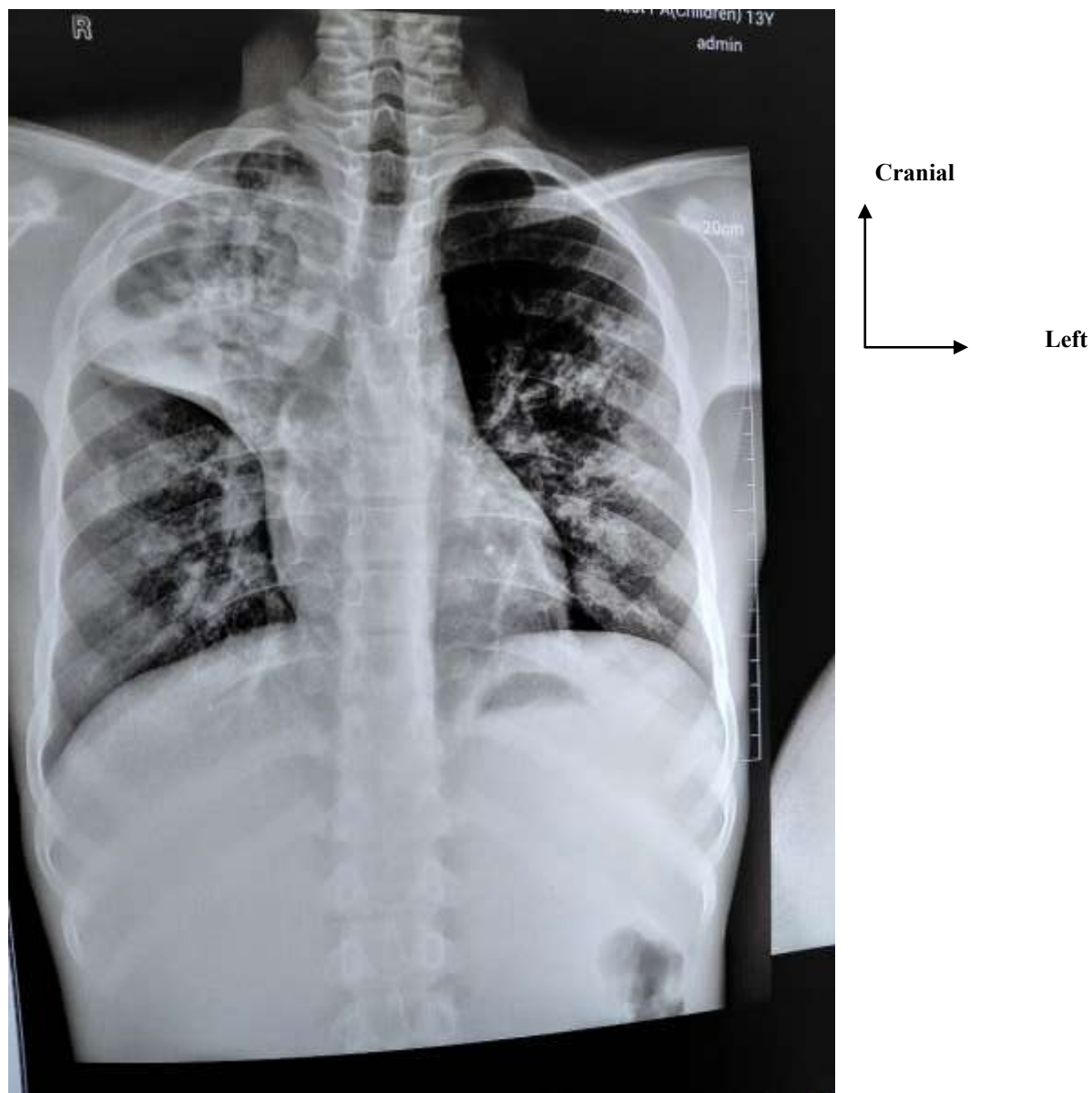


Figure 6. Anteroposterior chest X-ray showing a patchy opacity confined to the right upper lobe, suggestive of pulmonary tuberculosis.

Anteroposterior chest X-ray of a 13-year-old patient referred for cough and chest pain showing inhomogeneous opacities, well-defined in the right upper lobe, with sharp and regular borders. These are accompanied by multiple diffuse micronodular lesions throughout the remaining lung fields. The sputum smear test (acid-fast bacilli) performed on the same patient was positive.

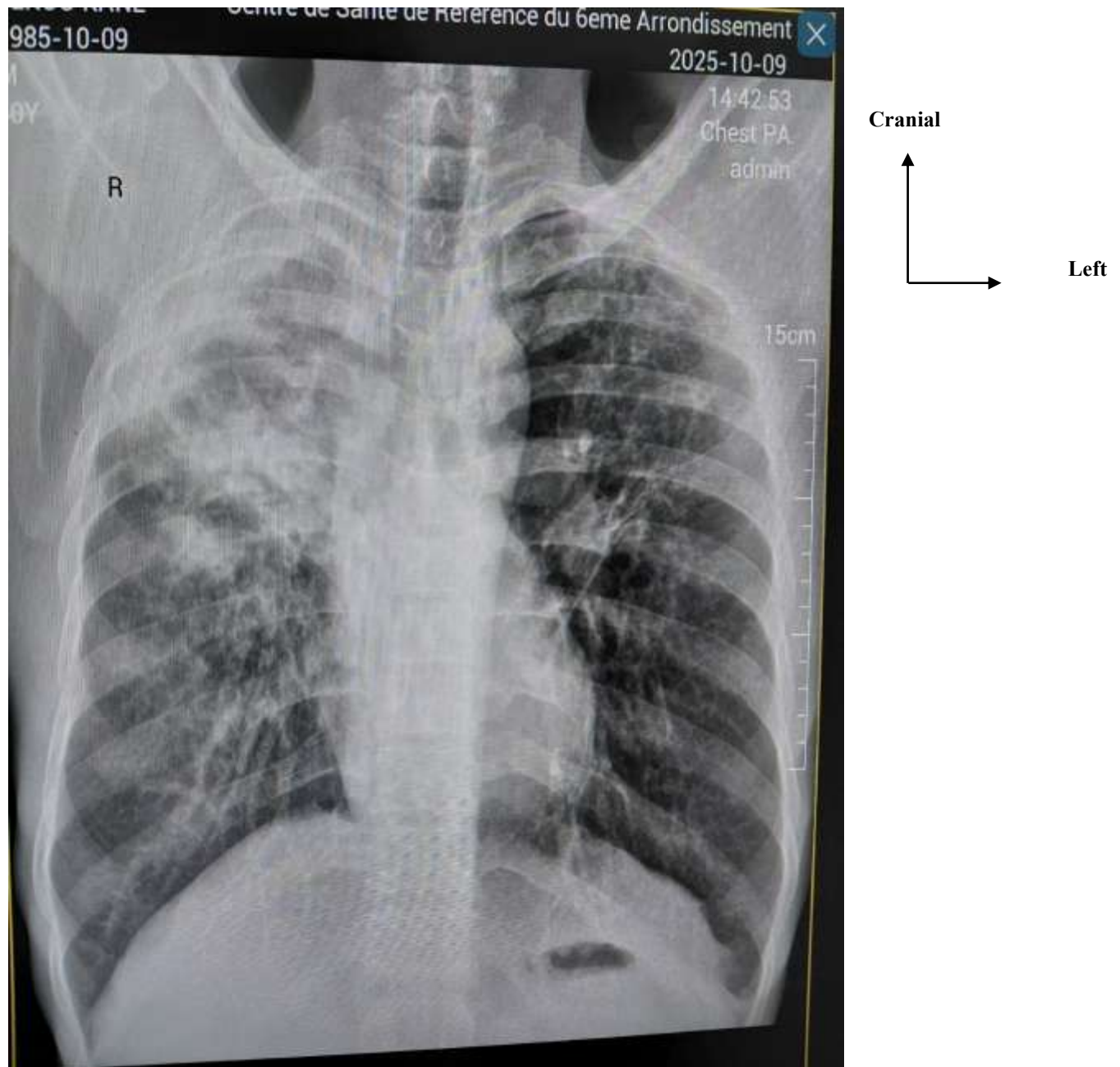


Figure 7. Anteroposterior chest X-ray showing widespread alveolar consolidation in the right upper lobe, suggestive of tuberculous pneumonia.

An anteroposterior chest X-ray of a 40-year-old patient referred for chest pain and chronic productive cough showing foci of well-defined, diffuse alveolar consolidation in the right upper lobe with blurred margins, consistent with tuberculous pneumonia. The acid-fast bacilli (AFB) sputum smear test performed on the same patient was positive.

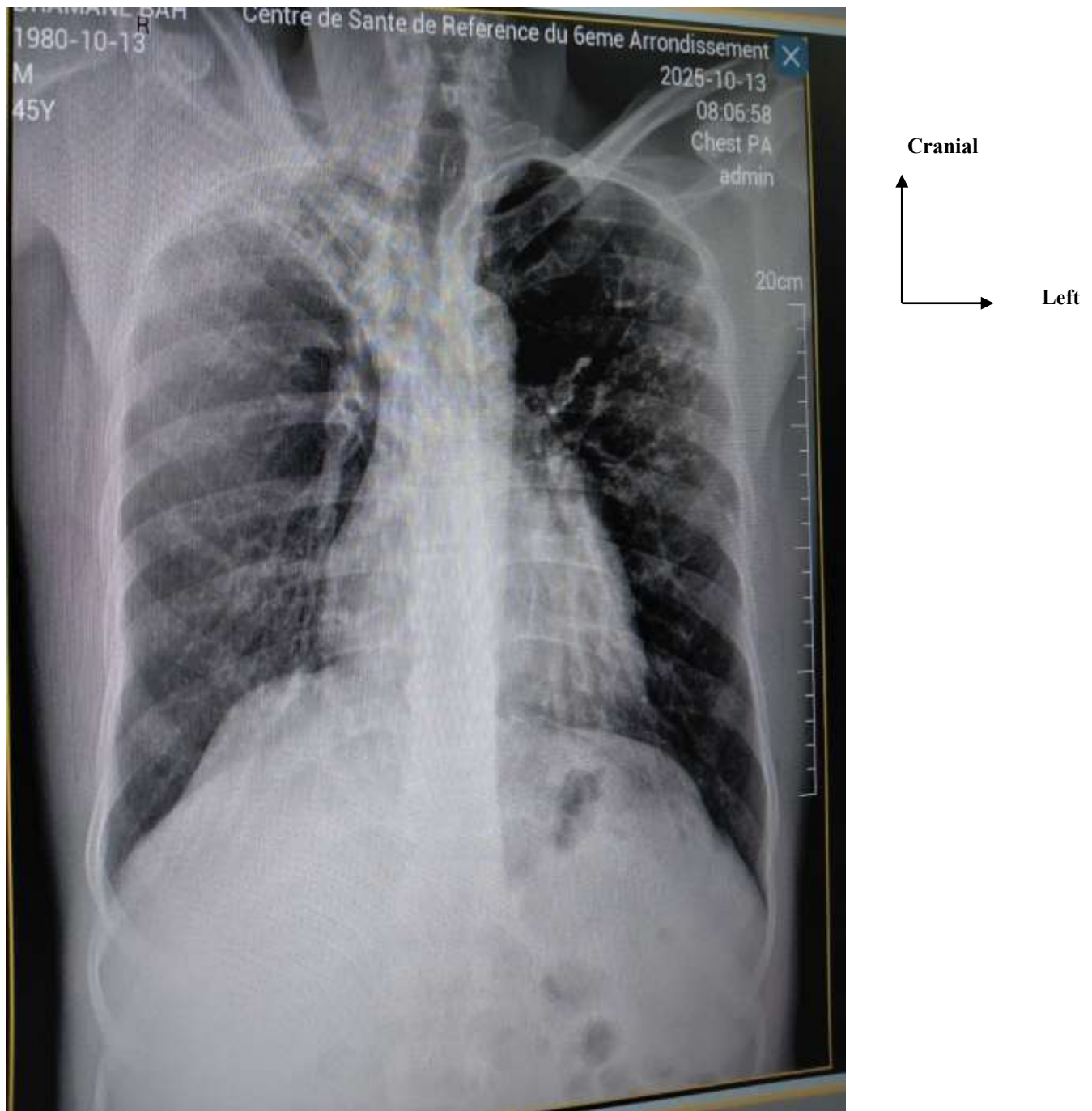


Figure 8. Anterior-posterior chest X-ray showing apical alveolo-interstitial pneumonia suggestive of acute pulmonary tuberculosis.

Mr. YX, age 45, referred to the department for chronic cough; a frontal chest X-ray revealed progressive alveolo-interstitial pneumonia in the right apical region and the posterior segment of the left upper lobe, with findings suggestive of acute pulmonary tuberculosis. The sputum smear test (acid-fast bacilli) performed on the same patient was positive

Discussion:-**Prevalence of pulmonary tuberculosis on chest X-ray:-**

In total, we identified 136 cases of pulmonary tuberculosis among 2,861 chest X-rays performed in the department, representing a prevalence of 4.75%. This proportion is similar to that reported by Diallo M. [9], who found a 5% prevalence of suspected pulmonary tuberculosis on chest X-rays in his study on the epidemiological, clinical, and radiographic profile of pulmonary tuberculosis in adults at the referral health center in Commune V in 2022. Koné A et al. [6] noted a prevalence of 4.57% of suspected pulmonary tuberculosis on computed tomography (CT) in their study on the role of medical imaging in the diagnosis of thoracic tuberculosis at the Point G University Hospital in 2021. Baddan IB.[10] found a prevalence of 9.3% in his study in Marrakech in 2012. This similarity can be explained by the comparable demographic and organizational profiles of the centers (practice of screening radiography and referral of suspected cases to specialized units).

Sociodemographic characteristics:-

In this study, male patients accounted for 75% of cases, with a sex ratio of 3. Kombila et al.[11] reported a rate of 81.8% male patients in their study on the radiological features of smear-positive pulmonary tuberculosis in the pulmonology department of the FANN National University Hospital Center in Senegal in 2018. Koné A et al. [6] reported a sex ratio of 2.2 in their 2021 study. This male predominance could be explained by increased risk factors for tuberculosis transmission among men, such as prolonged exposure to public or crowded places (work, transportation) and risky behaviors (alcoholism, smoking). The 25–34 age group accounted for 31.6% of patients, with a mean age of 36.2 ± 15 years. Ben Saad-Baouab et al.[12] found a mean age of 33 years in their 2019 study on the role of imaging in the management of multidrug-resistant tuberculosis in Tunisia. In the study by Diallo M. [9], the mean age was 35 years. An average age of 37.5 ± 14.9 years was reported by Kombila et al.[11] in Senegal in 2018. This finding confirms the assertion that tuberculosis is a disease that affects young people in the prime of their working lives, with adverse socioeconomic repercussions, and underscores the importance of prevention and screening strategies targeted at this age group [13].

Clinical Findings:-

Clinical findings were dominated by signs of bacterial infection in 98.5% of cases and chronic cough lasting more than 15 days in 92.6% of cases. Sylviane et al. [14] reported persistent respiratory symptoms in 25.5% of patients, dominated by dyspnea and cough in 18.5% of cases, in their study based on the radiographic profile of pleuropulmonary sequelae of tuberculosis at Jamot Hospital in Yaoundé, Cameroon, in 2022. Koné A et al. [6] reported cough in 93.7% of patients. These results are consistent with the data from Ben Saad-Baouab et al. [12] in Tunisia, where the predominant symptoms were cough, followed by sputum production and hemoptysis. These findings demonstrate that cough, often productive, remains the primary clinical indicator for suspected pulmonary tuberculosis, particularly in areas of high endemicity.

Radiographic Findings:-

The most commonly observed radiographic abnormalities were alveolar opacity in 80.1% of cases, followed by interstitial opacity (69.1%) and cavernous lesions/tuberculomas in 25.7% of cases. In the study by Koné A et al. [6], the radiological abnormalities found were alveolar consolidation syndrome (61.64%), cavitary syndrome (50.68%), and pleural effusion syndrome in 47.95% of cases. Kombila et al.[11] reported a rate of 59.1% of patients presenting with cavitary lesions on chest radiography in Senegal in 2018. Infiltrates and nodules were the main lesions found, accounting for 50% of cases in the study by Diallo M [9] at the referral health center in Commune V of Bamako in 2022. Baddan IB.[10] found alveolar syndrome in 62.8%, infiltrative opacities in 51%, and cavitary lesions in 46.5% of cases in his study in Marrakech in 2012. In our series, the lesions were bilateral in 71.3% of cases, with a multilobar distribution in 72.1% of patients. In the study by Kombila et al.[11], radiological lesions were predominantly bilateral in 45.5% of cases and extensive in 71.2% of cases. In the study by Baddan IB.[10], the lesions were bilateral in 62.8% of cases, with a predominance in the right upper lobe in 74.4% of cases and in the left upper lobe in 46.5% of cases. This predominance of lesions in the upper lobes could be explained by higher intra-alveolar oxygen pressure, which is conducive to the growth of Koch's bacilli.

Conclusion:-

Our results show that pulmonary tuberculosis remains a common condition despite all the national measures that have been implemented. Its diagnosis must always be based on an integrated approach combining clinical findings,

imaging, and laboratory tests. Imaging is an essential tool for guiding the diagnosis, evaluating lesions, and guiding patient management.

Conflict of interest:-

The authors of this manuscript declare no conflict of interest.

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