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Primary Tuberculous Mastitis: Diagnostic Dilemmas In Radiological Imaging

Aeimen Khalid[1], Muhammad Ahmad Mukhtar[2], Rubina Mukhtar[3]
[1]Department of Emergency Medicine, York District Hospital, York, UK
[2]Department of Internal Medicine, York District Hospital, York, UK
[3]Departmentof Breast Imaging and Radiology, MINAR Cancer Hospital, Multan, Pakistan
[1]aeimen5@gmail.com, [2]mahmadmukhtar17@gmail.com,
[3]binamukhtar2@gmail.com

Abstract– *Breast tuberculosis (TB), or tuberculous mastitis (TM), is a rare form of extra pulmonary tuberculosis caused by Mycobacterium tuberculosis. Although TB is prevalent worldwide, especially in developing countries, involvement of the breast is uncommon. TM can be primary, with localized breast involvement, or secondary, spreading from other sites. This retrospective observational study reviewed 25 cases of primary TM diagnosed between June 2023 and December 2024. The mean age was 33.91 years, and only 12.5% were lactating women. The common presentations were a painless unilateral breast lump without systemic symptoms like fever, night sweats or weight loss. Other presentations included chronic and repeated afebrile abscesses. Most imaging findings on mammography and ultrasound consisted of irregular, ill-defined heterogeneous masses, often mimicking malignancy. Lesion sizes varied significantly, and sinus formation or fistulous tracts were present in 64% of cases. All lesions were categorized as BIRADS 4 with a wide range of probability for breast cancer. Despite, negative results for acid-fast bacilli (AFB) and Mycobacterium tuberculosis (MTB) on microbiological tests–possibly due to technical limitations or atypical strains– histopathological analysis revealed chronic granulomatous mastitis (GM) in 72% of cases, thereby confirming the diagnosis. GM with caseous necrosis and Langhans giant cells was consistent with TB. In conclusion, breast TB is a rare but challenging entity to diagnose on radiological imaging due to its ability to mimic carcinoma. Clinicians must maintain a high index of suspicion, especially in endemic areas, and rely on histopathology for definitive diagnosis– particularly if PCR and microbiology are both negative–to ensure appropriate management, which is medical in most cases, with surgical intervention reserved for abscess drainage.*

Keywords– *Breast Cancer, Breast Imaging, Chronic Mastitis, Granulomatous Mastitis, Tuberculosis, Tuberculous Mastitis*

I. INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis, primarily affecting the lungs, though other organs are susceptible to infection. Tuberculosis (TB) is one of the most widespread infections in the world. In 2018, WHO reported ten million new TB cases, the vast majority of them are in developing countries[1]. Despite being one of the most widespread infections globally, tuberculosis of the breast, also known as tuberculous mastitis (TM), is an extremely rare manifestation. The frequency, presentation patterns, and clinical characteristics of breast tuberculosis remain poorly known[2]. Tuberculosis breast remained an uncommon disease even when pulmonary disease was common. TM remains uncommon even in endemic regions with a prevalence of 0.025% to 0.1% among surgically treated breast diseases[3]. Varied presentations have been reported on mammography as diffuse, nodular, sclerosing and simulating carcinoma. In different series, 30-43% cases were misreported as carcinoma on mammography. Tuberculous mastitis First described by Sir Astley Cooper in 1829 [4]. TM diagnosis is challenging as it can simulate many other pathologies especially breast cancer. TM is not commonly seen in medical practice and is seldom seen in male patients[5].

In highly endemic countries such as Morocco, anti-tubercular therapy is initiated even if acid fast bacilli are absent. However, a biopsy should be performed if sarcoidosis, fungal infection, or coexisting malignancy is suspected. There is no specific treatment guideline to TM. Anti-tubercular chemotherapy is administrated for 6–18 months depending on the case. Surgery can be performed if there is no response to medical treatment[3] Although, tuberculosis of the breast is considered a disease of the developing world, a steady increase is also seen in the developed countries probably because of the migration of infected population from endemic zones and increasing number of immunocompromised patients. Not

much is known about the frequency and mode of presentation[6]. Little data is available on the prevalence of primary breast tuberculosis (TB) in Pakistan. Pakistan ranks among the high-burden countries for TB, with prevalence, incidence, and mortality rates per 100,000 populations estimated at 348, 276, and 34, respectively. One study reported that Asia, including countries like India and Pakistan, accounts for approximately 67.9% of the global tuberculosis burden[7]. Although TB is widespread, breast involvement whether primary or secondary is considered a rare manifestation. Interestingly, some local studies indicate that primary breast TB may be more prevalent than secondary forms, with one study reporting 63.3% of cases as primary. Key challenges in controlling tuberculosis in Pakistan include limited community participation, insufficient collaboration with the private healthcare sector, a growing incidence of multidrug-resistant (MDR) TB, and a recent surge in HIV infections among injection drug users, who are at significantly higher risk of developing TB[8].

II. MATERIALS AND METHODS

A. Study design and Duration

This retrospective observational study was conducted from June 2023 to December 2024.

B. Study Location

Study was conducted at the breast imaging department of the Atomic Energy Cancer Hospital MINAR, Multan, Pakistan. This is the only fully equipped breast imaging department in public sector with encatchment area of whole Southern Punjab populated up to the 110 million thus giving geographical diversity.

C. Inclusion Criteria

Female patients enrolled with presenting complaints of breast lumps, discharging sinuses, non-healing ulcers, or cold abscesses suspected clinically were subjected to diagnostic work up for tuberculosis. AFB, culture and histopathology were done. All patients diagnosed to be primary tuberculous mastitis in origin were included in the study. Breast tuberculosis was classified as primary when no evidence of tuberculosis was detected elsewhere in the body, and as secondary when systemic involvement was identified.

D. Exclusion Criteria

Patients with histopathological diagnoses of carcinoma or other inflammatory diseases other than Tuberculosis of the breast were excluded from the study. Patients with history of TB of other organs were excluded from the study.

Study size was based on the number of all patients registered during the study period with diagnosis of tuberculous mastitis.

E. Ethical Considerations

Approval from the appropriate regulatory bodies and ethics committee was secured before initiating data collection. It is a retrospective observation study so written or verbal consent from participants was not required. However, all personal data were handled with strict confidentiality, adhering to the standards set by the Institutional Review Board (IRB).

III. RESULTS

Data were systematically collected using a structured research performa developed for this study. Statistical analysis was performed using SPSS version 26 to evaluate the demography and imaging morphology including type and pattern of presentation, laterality, site of involvement, diagnostic investigations, and surgical interventions.

A. Diagnostic Performance

Initial diagnostic workup included a thorough clinical history and physical examination of both breasts and axillary lymph nodes. Laboratory investigations involved complete blood count (CBC), erythrocyte sedimentation rate (ESR), and culture staining for Acid-Fast Bacilli (AFB). All patients were subjected to breast imaging including ultrasonography and mammography depending upon age and clinical indications. Ultrasound was performed in young and lactating patients while Mammography was taken as modality of choice in elder patients above the age of 35 years. Both mammography and ultrasound were interpreted by a consultant radiologist.

Age range of patients was 19 to 67 years. Mean age was 33.91years with STD of ±10.17 years. Only 12.5% (3/24) were lactating.

Among the 25 patients included in the study, 3 (12.5%) were lactating while 21 (87.5%) were non-lactating. Commonest presentation was lump in breast without history of fever or signs and symptoms of inflammation including fever pain, redness or tenderness. Demographic Features are shown in Table 01. Lumps were characterized on mammography and High-Resolution ultrasound. Majority were revealed on mammography as ill-defined irregular heterogeneous masses mimicking breast carcinoma. Disseminated Form lesion was the most common feature. Other features were nodular or sclerosing. Figure 01 & 02. Ultrasound imaging consistently showed irregular, heterogeneous lesions with or without tracks to skin, with or without cystic areas or thick-walled abscesses. Figure 03 & 04.

The size of the lesions varied considerably, with the largest measuring 11 cm by 11 cm and the smallest measuring 6 mm by 11 mm. Track to skin, in the form of fistula or sinus, was identified in 16 cases (64%). All lesions were categorized as BIRADS 4, keeping breast carcinoma as differential. Imaging morphology is summarized in Table 02.

All cases were tested for acid-fast bacilli (AFB) and Mycobacterium tuberculosis (MTB) and were found negative. Common causes of negative microbiology include insufficient sample quantity, poor staining or reading techniques, and the presence of other bacteria that may overshadow mycobacterium during culture. But as all cases tested negative for acid-fast bacilli (AFB) and Mycobacterium tuberculosis (MTB), so might be considered either mutant strain of AFB or poor technique.

Histopathological analysis revealed that chronic granulomatous mastitis (GM) was the most common diagnosis, present in 18 cases, with an additional case diagnosed as acute on chronic GM, bringing the total GM cases to 19 out of 24 (79.2%). The remaining 6 cases were diagnosed as chronic mastitis. Histopathological findings summarized in table 03.

Breast involvement was evenly distributed, with 11 cases affecting the right breast, 11 the left breast, and 1 case presenting bilaterally.All patients received standard anti-tuberculosis therapy (ATT) for a duration of one year. Surgical management was reserved for procedures such as aspiration of cold abscesses, wide excision biopsies, excision of sinuses and non-healing ulcers, and incision and drainage with biopsy of thick-walled abscess cavities.

TABLE I DEMOGRAPHIC FEATURES N= 25

Sr. No.	**Feature**		**Number of Patients**	**Percentage**
1	Age	<35 years	19	75%
		>35 years	6	25%
2	Married		23	95.8%
3	Lactation		03	12.5%
4	Laterality	Left breast	12	48%
		Right breast	12	48%
		Bilateral	01	4%

TABLE II IMAGING MORPHOLOGY

Sr. No.	**Morphology**		**Number of Patients**	**Percentage**
	Mammography	**On HR USG**		
1	Nodular Form	Thick-walled Abscess with or without septations	3	12%

2	Disseminated Form	Ill-defined heterogeneous solitary or multiple lesions with track to skin and or multiple cystic areas	16	64%
3	Sclerosing Form	Ill-defined irregular heterogeneous lesions	06	24%
4	Total		25	100

TABLE III HISTOPATHOLOGY

Sr. No.	Histopathology	Number	Percentage
1	Chronic Granulomatous Mastitis	18	72%
2	Chronic Mastitis	6	24%
3	Acute on Chronic GM	1	4%
	Total	**25**	**100**

Figure 01: Mammography image showing Nodular sclerosis of left breast

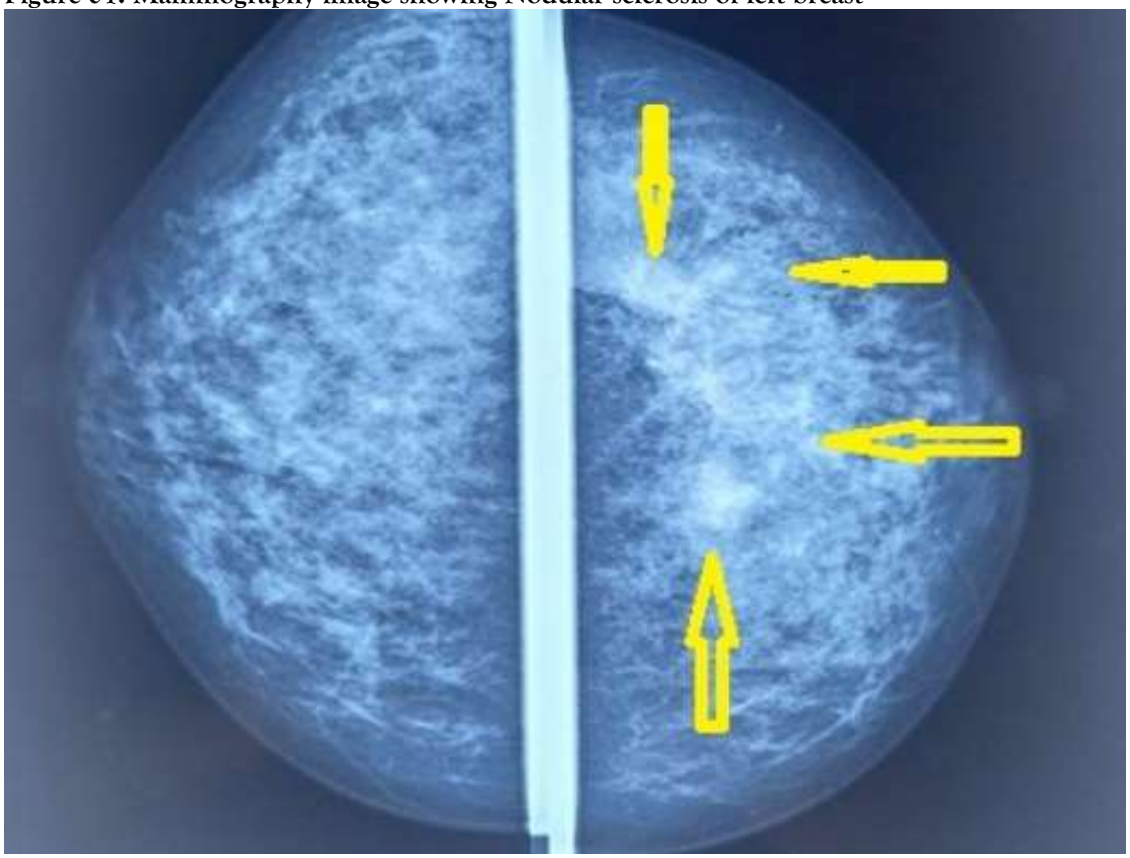

Figure 02: Mammography image showing ill-defined disseminated opacity of right breast—The most common feature of PTM

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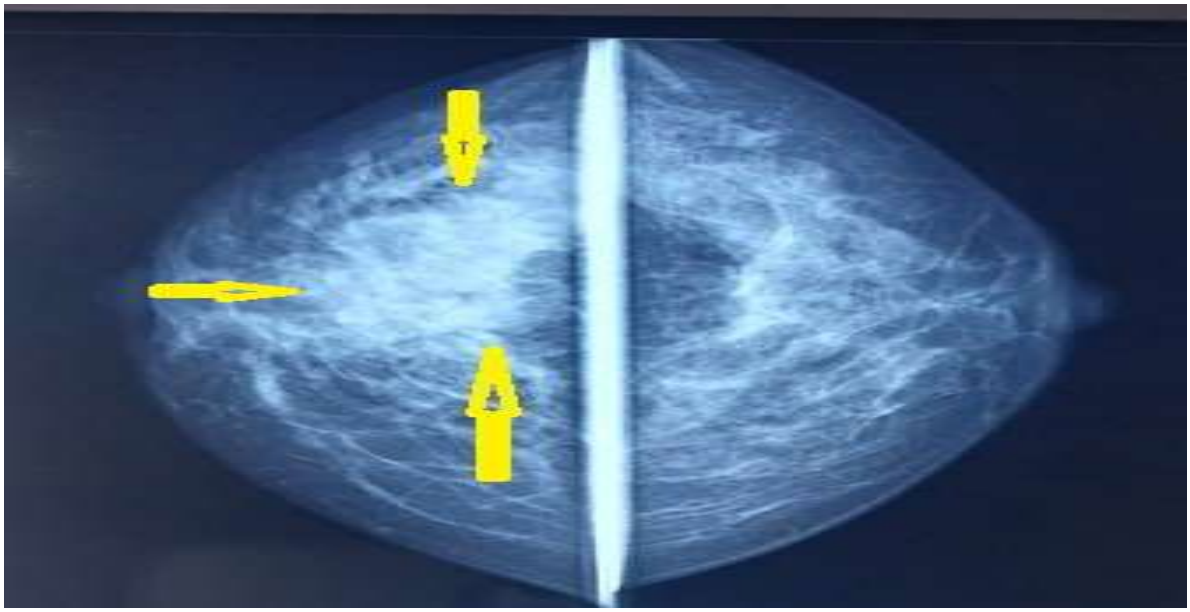
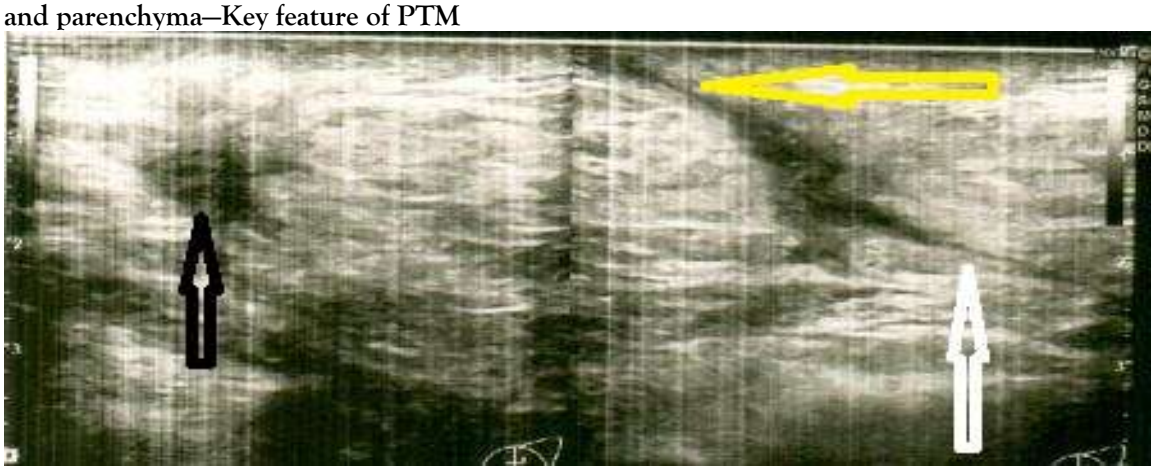


Figure 03: HR USG showing ill-defined irregular heterogeneous lesion

Figure 04: HR-USG showing ill-defined irregular hypoechoic lesion in left breast making tacks to skin and parenchyma—Key feature of PTM



IV. DISCUSSION

Among communicable diseases, TB is the second leading cause of death worldwide [2]. The incidence of tuberculosis is rising worldwide and rare manifestations of the past are seen more often nowadays [9].

Isolated breast tuberculosis is an uncommon condition mostly because the breast is more resistant to infection, making the survival and multiplication of the tubercle bacilli difficult[10],[11].

Breast tuberculosis can be categorized as either primary or secondary. The primary form, in which TB is localized solely in the breast without pulmonary involvement, is exceedingly rare[12],[13]. The secondary form, more commonly encountered, occurs due to the spread from an existing tuberculous focus elsewhere in the body. Various mechanisms of transmission include hematogenous spread, lymphatic dissemination, direct extension from the thoracic wall or axillary lymph nodes and inoculation through skin abrasions or ducts [14]. Although breast TB can affect individuals of any age, it is more prevalent among women of reproductive age, with lactating women being at higher risk due to increased vascularization and ductal dilation, which predispose the breast to infection [9],[15]. Other Risk factors for the disease include multiparty, trauma, immunosuppression, and prior history of suppurative mastitis. In men, tuberculous mastitis is rarely observed [16]. Unilateral TB Mastitis is frequent while both breasts can be affected; bilateral involvement is rare (3%) [10]. 98% (24/25) of our patients had unilateral involvement. Lactating women appear to be at higher risk, probably due to the increased blood supply to the breasts and dilatated ducts,[9] but our study does not show significant relation with lactation as only 12.5% (3/25) patients were lactating at the time of presentation.

A study in 2009 reported 30 cases of primary breast tuberculosis diagnosed over an eight-year period in Pakistan. In contrast, our institution identified 25 cases within just one and half years, suggesting a potential rise in disease burden [2].

Breast tuberculosis can be classified into three radiological forms: nodular, disseminated, and sclerosing. Each presents distinct morphological characteristics on mammography[17]:

- Nodular Form: This is the most common presentation and appears as a well-circumscribed, slow-growing mass. On mammography, it is seen as an oval tumour shadow that closely mimics breast carcinoma, making differentiation difficult. Only 12% (3/25) of our patients presented with this type.
- Disseminated Form: This form is characterized by multiple lesions with sinus formation and extensive breast involvement. Mammographically, it resembles inflammatory breast cancer due to its diffuse nature and widespread involvement. It was the commonest presentation (64%) in our patients.
- Sclerosing Form: More frequently observed in elderly women, this form is associated with excessive fibrosis, resulting in a dense, fibrotic mass that can be mistaken for scirrhous carcinoma. It was second common presentation in our patients that was 24% (6/25).

A. Clinical Presentation

Tuberculous mastitis is usually unilateral, seldom infects male patients and should be considered in immunodeficiency states like HIV infection [18]

1) General Symptoms: Symptoms like fever, malaise, night sweats and weight loss are present in less than 20% of the cases[5]. None of our patients presented with general symptoms.

2) Common Feature:

a. Lump: A painless or pain full breast lump, often found in the central or upper outer quadrant. The lump may be followed by inflammation and abscess formation, skin ulceration and diffuse mastitis.

b. Recurrent inflammation and abscess of the breast that do not respond to surgical drainage and standard antibiotic therapy in young women should raise suspicion.

3) Appearance: The lump is irregular, firm, and may be fixed to the skin, muscle, or chest wall, resembling breast cancer.

4) Additional Signs: Fistula formation may occur, nipple or skin retraction, but breast discharges are uncommon [9],[19].

5) Rare Cases: Tuberculosis can extend to the ribs, leading to a mass with fistulous tracts or bone destruction[20],[21].

6) Primary or Secondary: Can be primary i.e. not associated with TB of other organ or secondary associated with TB of another organ. However, some authors have considered almost all cases of breast tuberculosis to be secondary even if the primary location of the infection remains occult. The rare cases of primary breast tuberculosis are considered being caused by infection of the breast through skin abrasions or through the main ducts of the nipple[9],[10].

Painless lump without general symptoms of fever, weight loss or night sweats was the commonest presentation in our patients.

B. Diagnostic Approach

Various tests are useful in the diagnosis and further evaluation of patients with breast tuberculosis.

1) Mantoux Test:

It does not offer definitive diagnosis, but confirms exposure of the patient to tubercle bacilli.

2) Imaging:

a. Chest X-ray: May show signs of pulmonary tuberculosis or axillary lymph node calcifications.

b. Mammography: Reveals coarse stromal texture, skin thickening, and ill-defined masses, often mimicking malignancy. Mammography is not helpful in young women, due to high density of the breast tissue.

c. Ultrasound: Displays hypoechoic mass in 60% of patients. Other findings could be irregular heterogeneous masses with internal echoes or thick-walled cystic lesions. USG may sometimes identify a fistula or a sinus tract which can be seen in cases of tuberculous mastitis[21].

d. CT & MRI: Abscesses appear on CT as well-defined lesions showing rim-like peripheral contrast enhancement. CT& MRI evaluate the extension of the lesion beyond the breast, principally towards the thoracic wall. In addition, CT may indicate a fistula opening to the pleura, or infected ribs, bone structures, or lung parenchyma. Percutaneous drainage of a deep-seated abscess is possible under CT guidance.

3) Culture and Staining:

a. M. tuberculosis detection by Ziehl Nielsen (ZN) staining or by culture is a gold standard for the diagnosis but culture of M. tuberculosis has limitations due to the delay in obtaining the final result and the possibility of false-negative results in paucibacillary samples[22].

b. Polymerase chain reaction (PCR) is highly sensitive for the diagnosis of breast tuberculosis. Although rarely used, it is recommended in cases with negative culture results or for differential diagnosis between other forms of granulomatous mastitis.

None of our patient was positive for ZN staining or culture. PCR was not conducted because of cost effect.

4) Tissue Sampling:

a. Fine Needle Aspiration Cytology (FNAC): may not be able to detect the responsible pathogen itself but can diagnoses up to 73% of cases by detecting granulomas and necrosis.

b. Histopathology: identifies a chronic granulomatous inflammation with caseous necrosis and Langhans type giant cells, differentiate from other granulomatous diseases like sarcoidosis, fungal infections, and malignancy contributing to diagnosis in the majority of the cases.

We did not perform FNAC. Our 100 % patients were diagnosed on histopathology.

There is no standardized treatment protocol specific to breast TB. However, breast tuberculosis is primarily treated with anti-tubercular chemotherapy for 6 to 18 months, depending on disease severity. Surgical intervention may be necessary in cases of extensive abscess formation or poor response to medical therapy. Given the increasing incidence of tuberculosis worldwide, awareness and early recognition of this rare presentation are crucial, particularly in endemic regions.

Other differentials include fatty necrosis, plasma cell mastitis, peri areolar abscess, idiopathic granulomatous mastitis and infections like actinomycosis and blastomycosis are to be considered [23-25][23-25]. Breast tuberculosis represents a rare disease that should always be suspected when evaluating cases of breast abscesses, fistulae or nodules, with poor response to classical non-tuberculosis antibiotic treatment. Physicians should consider this clinical entity, often mimicking breast cancer.

C. Limitations

This study was conducted within a single institution, so data can be influenced by local demographic, socioeconomic, and healthcare access factors, which may not reflect the diversity of the wider community or national trends. Given these constraints, further multicentre, population-based studies with larger and more diverse cohorts are necessary to accurately determine the true prevalence, risk factors, and long-term outcomes associated with the disease.

V. CONCLUSION

Although primary breast tuberculosis is considered rare globally, this does not appear to be the case in our region. Compared to study in 2009 reported 30 cases over an eight-year period, 25 cases within just one and half years of our study reflect either enhanced diagnostic capabilities and awareness or a genuine rise in disease prevalence. So, Breast tuberculosis remains an important differential diagnosis in women presenting with breast lumps, discharging sinuses, non-healing ulcers, or cold abscesses—especially regions endemic for tuberculosis like ours. Imaging frequently mimicked breast carcinoma, emphasizing the diagnostic challenge. AFB smear and culture can aid in diagnosis; however, in our study, the false negative rate was 100%. This warrants further investigation into potential causes, such as suboptimal techniques or mutant variants that may evade detection by standard methods. However currently, the histopathology proved to be the most reliable method for diagnosis.

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Nil

CONFLICT OF INTEREST

No direct or indirect conflict of interest is guaranteed by authors.

DISCLAIMER

The manuscript has not been submitted or under consideration for publication in any other journal.

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