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Extrapulmonary Tuberculosis

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Disclosures: None

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Objectives

1) Describe the Epidemiology of Extrapulmonary Tuberculosis (EPTB) in the United States
2) Discuss the pathophysiology of EPTB and risk factors for EPTB
3) Discuss diagnosis and management of EPTB including Pleural, Lymph node, Bone (Potts disease), Central nervous system (CNS), and Genitourinary sites

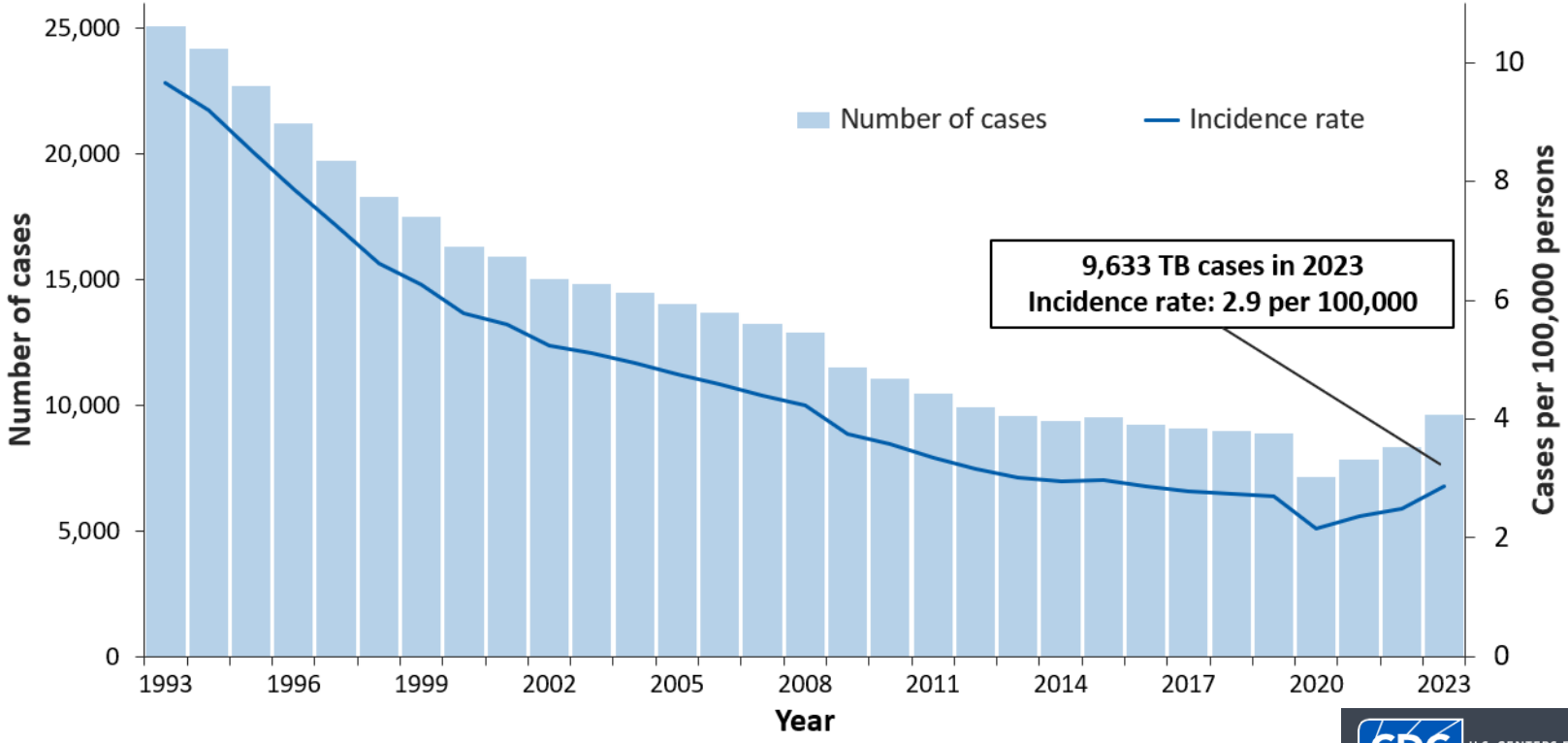
Definitions

- EPTB : TB disease in any organ system other than pulmonary parenchyma
  - Pleural TB is extrapulmonary TB
- Disseminated TB: involvement of at least two noncontiguous body organs, hematogenous /bone marrow

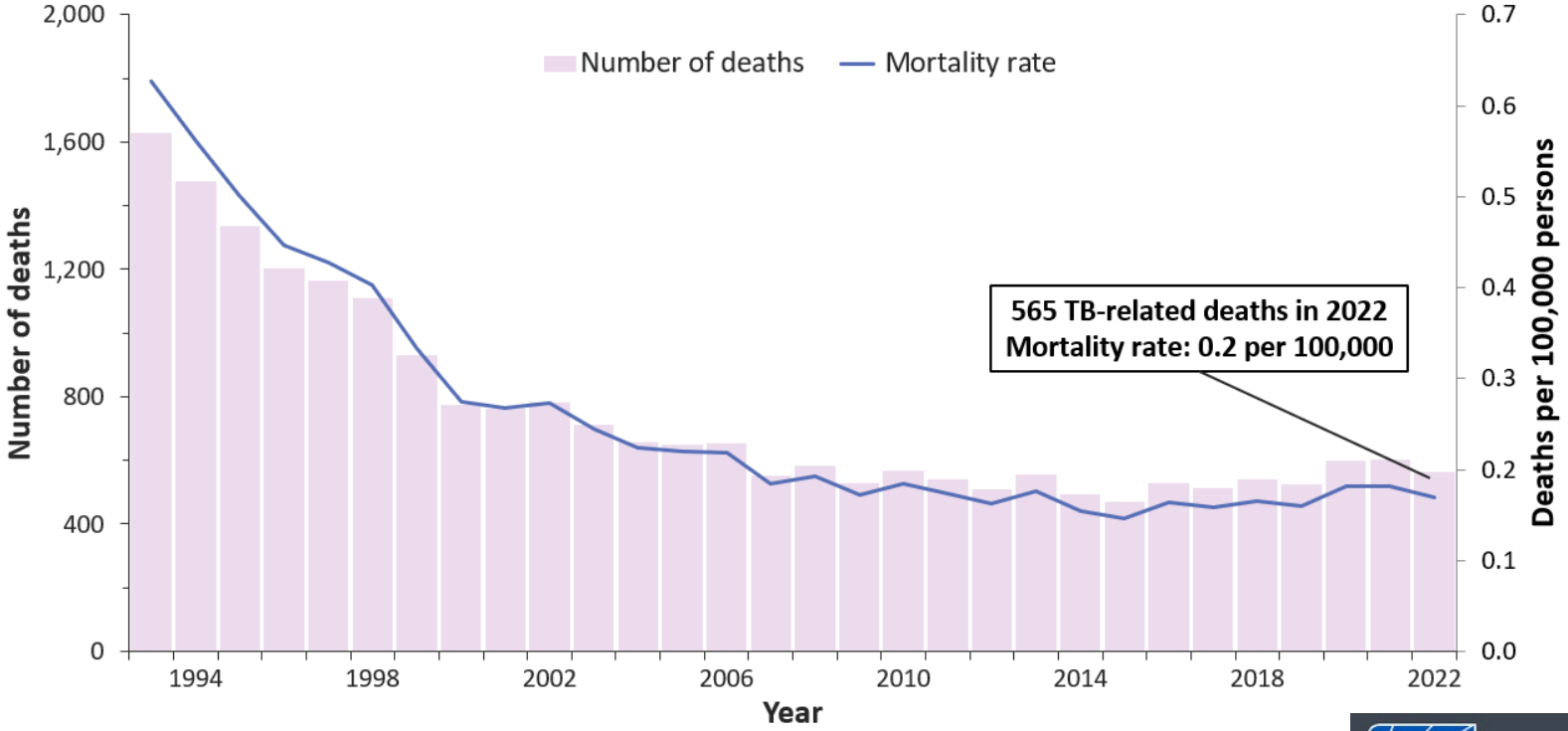
- Miliary is form of hematogenous dissemination and radiographic pattern

- Paucibacillary : low bacterial burden

TB Cases and Incidence Rates, United States, 1993–2023



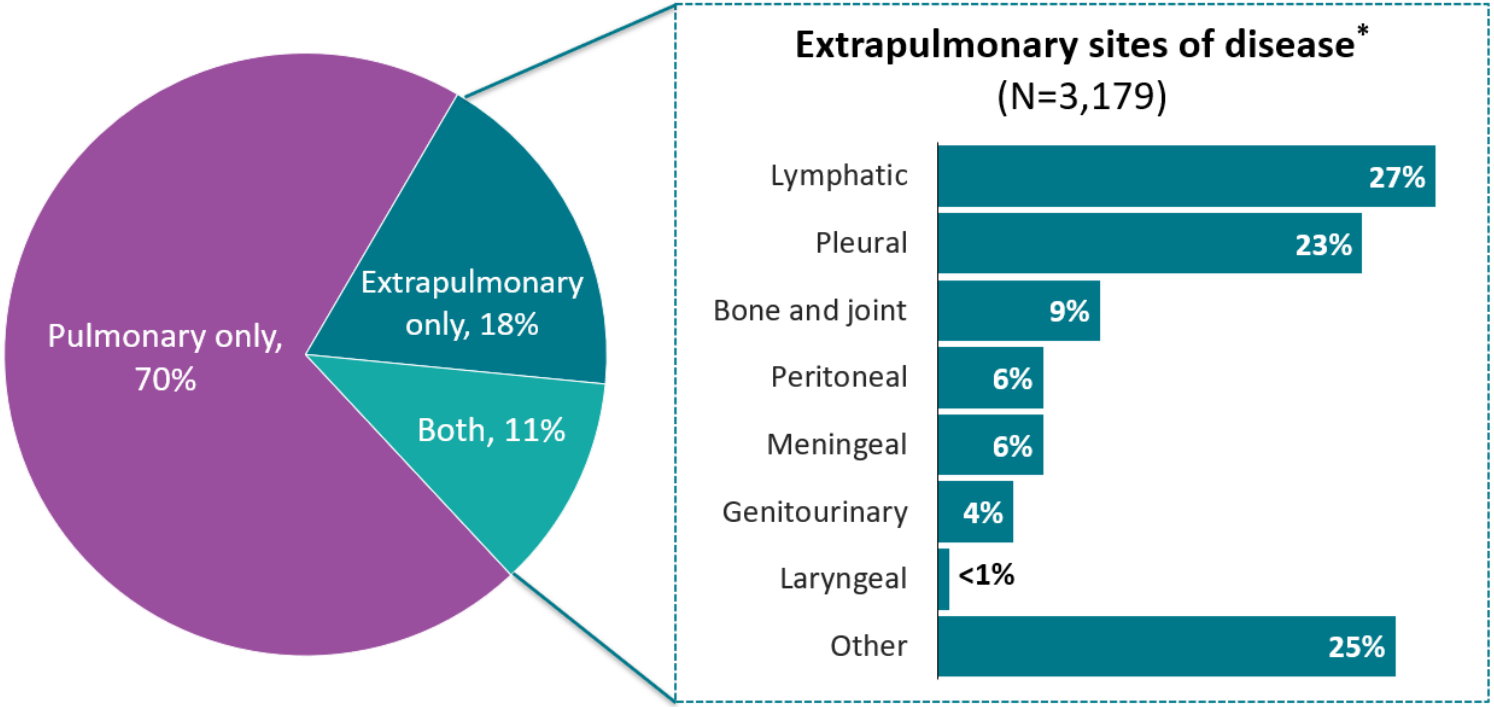
TB-Related Deaths* and Mortality Rates, United States, 1993–2022



*National Vital Statistics System Underlying Cause of Death (based on deaths reported through 2022)

CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

Percentage of TB Cases by Site of Disease, United States, 2023



*Persons might have more than one extrapulmonary site of disease.

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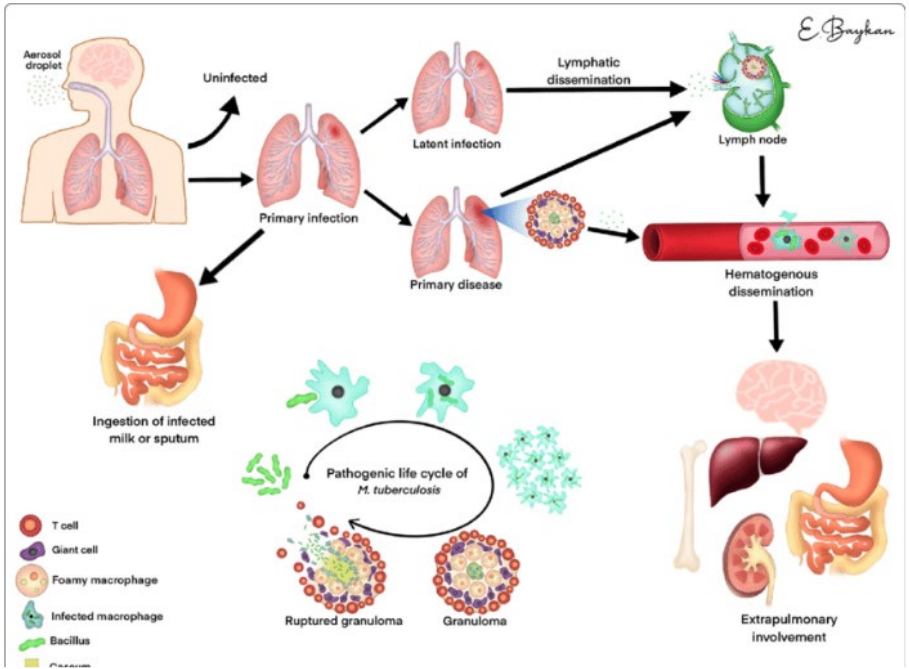
Pathophysiology of TB

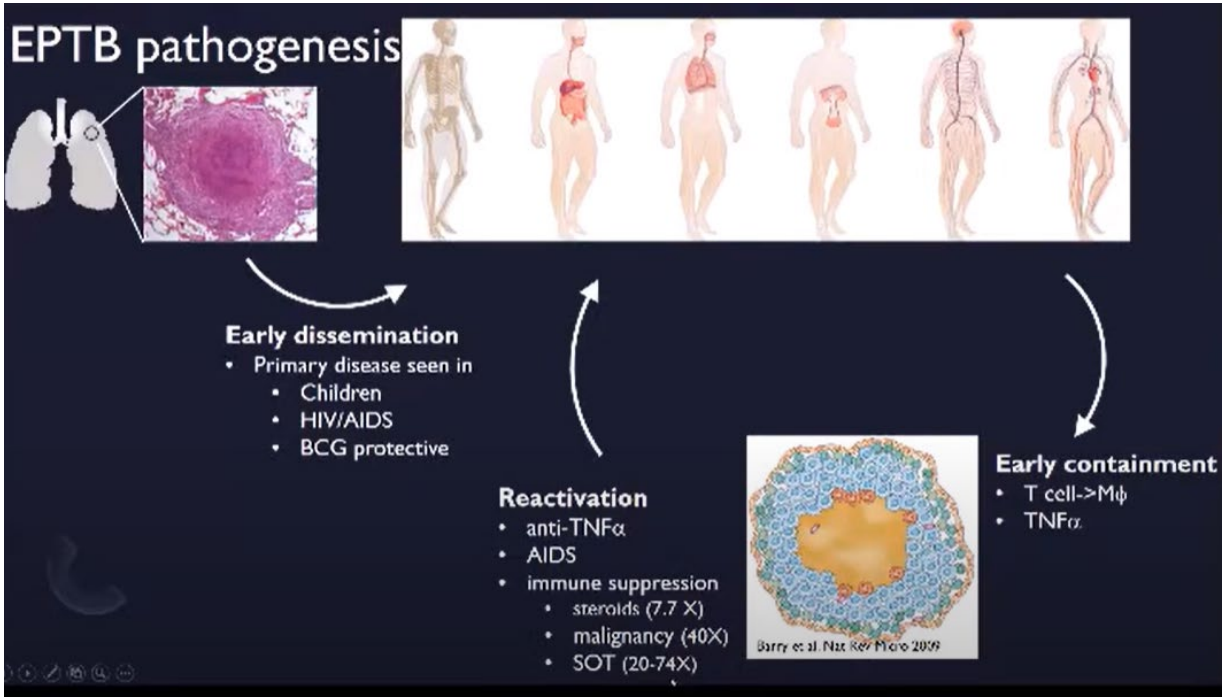


Pathogenic life cycle and extrapulmonary dissemination of M. tuberculosis

- Inhaled /Inspired to reach the alveoli
- Phagocytosed by alveolar macrophages into lysosomes
- some bacilli multiple and enter lymph nodes/blood stream
- Body's immune system usually intervenes to halt multiplication and prevent spread

Baykan *et al. Insights into Imaging* (2022) 13:39
https://doi.org/10.1186/s13244-022-01172-0

EPTB Pathogenesis



EPTB Risk factors for US population

- 2 Major US studies
  - Rieder et al in 1990
  - Peto et al in 2009

→

- **Female**
- Born outside of United States
- Belonging to racial and ethnic minorities
- **HIV**
- Immunosuppression
  - Tissue allografts
- **End stage renal disease (ESRD)**

EPTB Risk factors for US population

Open Forum Infectious Diseases

MAJOR ARTICLE

IDSA Infectious Diseases Society of America | hivma hiv medicine association | OXFORD

Risk Factors for Extrapulmonary Tuberculosis Among US Veterans, 1990–2022

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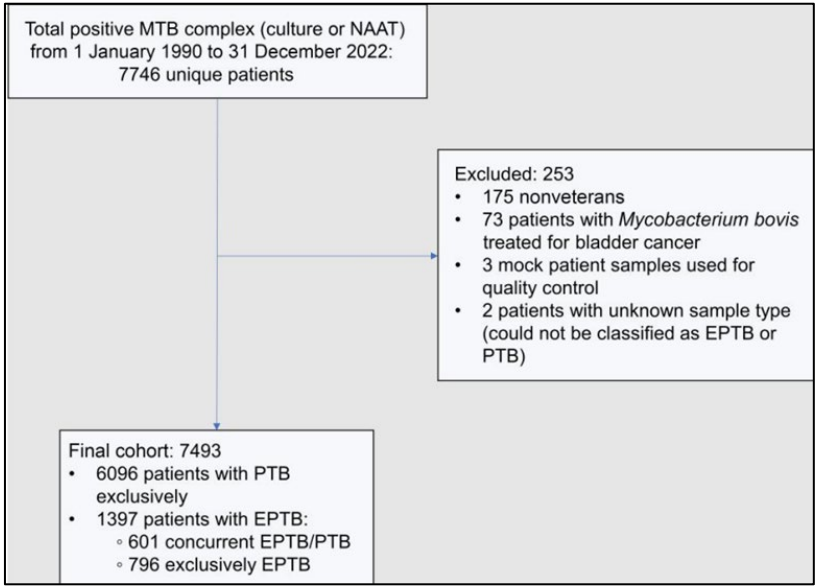

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EPTB Risk factors for US population

Table 2. Characteristics of US Veterans With Extrapulmonary Tuberculosis (EPTB) Exclusively or Any EPTB, Compared With Pulmonary Tuberculosis Exclusively, 1990–2022 (N = 7493)

Characteristic	PTB Exclusively, No. (%)[a] (n = 6096)	EPTB Exclusively, No. (%)[a] (n = 796)	*P* Value[b]	Any EPTB, No. (%)[a,c] (n = 1397)	*P* Value[b]
Age, mean; median (IQR), y	58.7; 58 (20)	58.9; 59 (24)	.75[d]	56.7; 55 (23)	<.001[d,e]
Sex					
Male	6041 (99.1)	779 (97.9)	.001[e]	1375 (98.4)	.02[e]
Female	55 (.9)	17 (2.6)		22 (1.6)	
Race/ethnicity					
Hispanic/Latino	260 (4.3)	43 (5.4)	<.001[e]	62 (4.4)	<.001[e]
Non-Hispanic white	1544 (25.3)	130 (16.3)		217 (15.5)	
Non-Hispanic black	1535 (25.2)	263 (33.0)		422 (30.2)	
Non-Hispanic Asian	91 (1.5)	12 (1.3)		17 (1.2)	
Non-Hispanic AI/AN or NH/OPI	56 (0.9)	9 (1.1)		14 (1.0)	
Unknown	2610 (42.8)	339 (42.6)		665 (47.6)	
Residence type					
Urban	4652 (76.3)	639 (80.3)	.03[e,f]	1133 (81.1)	<.001[e]
Rural	1423 (23.3)	154 (19.3)		257 (18.4)	
Unknown	21 (0.3)	3 (0.4)		7 (0.5)	
Birth country					
United States	5789 (95.0)	762 (95.7)	.11	1331 (95.3)	.10
Other country	222 (3.6)	30 (3.8)		56 (4.0)	
Unknown	85 (1.4)	4 (0.5)		10 (0.7)	
Period of military service[g]					
World War I or II	1257 (20.6)	188 (23.6)	<.001[e]	267 (19.1)	.03[e]
Vietnam War	3436 (56.4)	418 (52.5)		826 (59.1)	
Korean conflict	1173 (19.2)	133 (16.7)		234 (16.8)	
Gulf War	209 (3.4)	50 (6.3)		63 (4.5)	
Other or unknown	21 (0.3)	7 (0.9)		7 (0.5)	
Area deprivation index					
Group 1 (lowest disadvantage)	2004 (32.9)	279 (35.1)	.20	517 (37.0)	.007[e]
Group 2 (highest disadvantage)	3906 (64.1)	500 (62.8)		842 (60.3)	
Not coded	186 (3.1)	17 (2.1)		38 (2.7)	
Antimicrobial susceptibility					
MDR	69 (1.1)	7 (0.9)	.14	13 (0.9)	.62
Not MDR	4591 (75.3)	577 (72.5)		1067 (76.4)	
Not tested	1436 (23.6)	212 (26.6)		317 (22.7)	
Tuberculosis risk factors					
Alcohol dependence	1744 (28.6)	151 (19.0)	<.001[e]	323 (23.1)	<.001[e]
Head/neck carcinoma	253 (4.2)	23 (2.9)	.09	40 (2.9)	.02[e]
Diabetes mellitus	1332 (21.9)	218 (27.4)	<.001[e]	347 (24.8)	.02[e]
Hepatitis C	873 (14.3)	109 (13.7)	.63	225 (16.1)	.09
HIV infection	340 (5.6)	74 (9.3)	<.001[e]	188 (13.5)	<.001[e]
Homelessness	1124 (18.4)	89 (11.2)	<.001[e]	206 (14.7)	.001[e]
Incarceration	258 (4.2)	18 (2.3)	.008[e]	46 (3.3)	.11
Malnutrition/low BMI	417 (6.8)	42 (5.3)	.10	83 (5.9)	.22
Nicotine dependence	2426 (39.8)	195 (24.5)	<.001[e]	400 (28.6)	<.001[e]
Organ transplant	10 (0.2)	2 (0.3)	.64[f]	3 (0.2)	.72[f]
Silicosis	20 (0.3)	1 (0.1)	.50[f]	3 (0.2)	.79[f]
Severe kidney disease	459 (7.5)	96 (12.1)	.001[e]	159 (11.4)	<.001[e]
Substance abuse disorder	1059 (17.4)	99 (12.4)	.001[e]	219 (15.7)	.13
Outcomes					
Hospitalization within 30 d of MTB sample	1662 (27.3)	231 (29.0)	.30	427 (30.6)	.01[e]
LOS, mean; median (IQR)	7.0; 0 (4)	7.2; 0 (5)	.50[d]	7.9; 0 (6)	.058[d]
Death after tuberculosis diagnosis					
Within 30 d	467 (7.7)	113 (14.2)	<.001[e]	164 (11.7)	<.001[e]
Within 90 d	754 (12.2)	171 (21.5)	<.001[e]	277 (19.8)	<.001[e]
Within 365 d	1245 (20.4)	239 (30.0)	<.001[e]	402 (28.8)	<.001[e]

EPTB: Challenges of Early Diagnosis

- Need to have clinical suspicion with atypical presentation
- Acquire tissue/pathology
  - Clinical samples not easily accessible always
- Paucibacillary
  - Decreasing sensitivity of diagnostic tests

Fig 1. Kaplan–Meier curve of patient delays by gender of respondents.

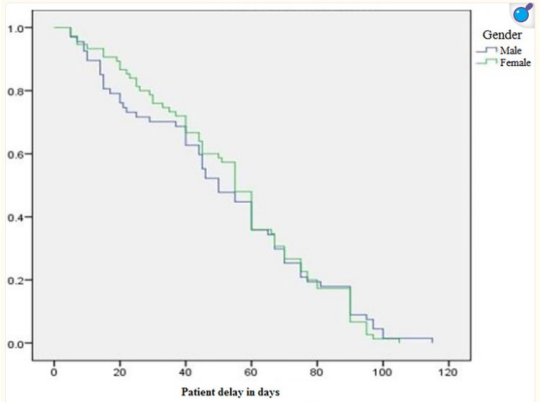
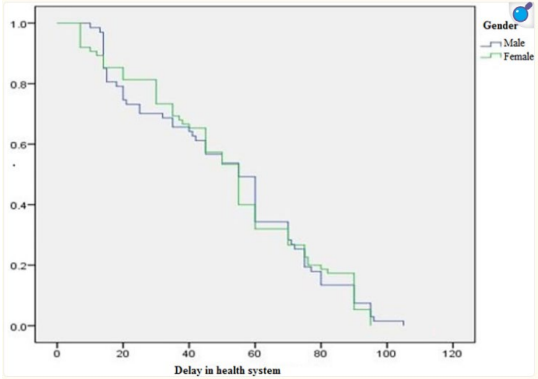


Fig 2. Kaplan–Meier curve of health system delays by gender of study participants.



Knowledge of symptoms and delays in diagnosis of extrapulmonary tuberculosis patients in North Shewa zone, Ethiopia

Awraris Hailu Bilchut [1,#], Alemayehu Gonie Mekonnen [2,*,#], Tigist Abetew Assen [1,#]

Editor: Frederick Quinn[3]

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PMCID: PMC9202887 PMID: 35709224

Case 1

79-year-old male from Vietnam, with history of HTN, asthma, Hep C S/P treatment with chronic cough (> 3months), dyspnea since March 2025. Sputum smears and cultures were negative (X3). Had a thoracentesis in May 2025 and pleural fluid was smear negative but grew +MTB on culture. Started on TB medications in June 2025 after sent to LHD.

Pleural TB

Pathophysiology

- Rupture of subpleural caseous focus/granuloma into the pleural space
- Delayed hypersensitivity reaction to M.tb in pleural space resulting in inflammation/pleuritis

Clinical Manifestations

- Acute or subacute
- Cough (nonproductive)
- Chest pain
- Fever
- Shortness of breath
- Might vary in HIV patients (weight loss, night sweats etc)

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Pleural TB

Imaging Findings

Rutgers

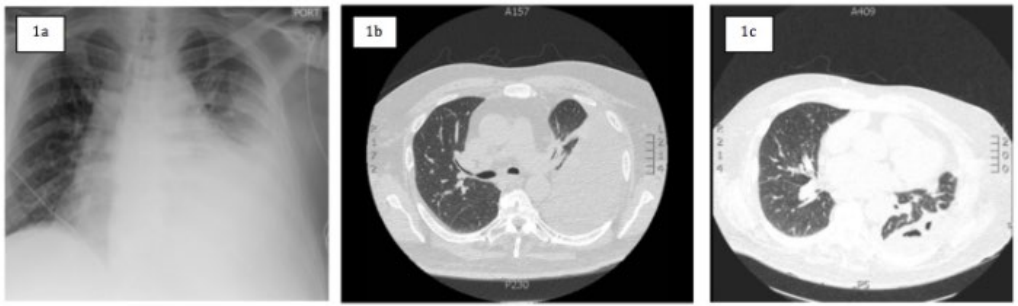

Figure 1. a) Chest X-Ray at presentation to our institution demonstrating a large left-sided pleural effusion. Figure 1b) Chest CT prior to chest tube placement demonstrating large left-sided pleural effusion. Figure 1c) Chest CT several days after chest tube placement demonstrating a partially loculated residual pleural effusion.

Brown Hospital Medicine
Lipman K, Lin C, Kennelly M, Patel S. The Diagnostic Challenges of Pleural Tuberculosis: A Case Report. *Brown Hospital Medicine*. 2024;3(1). doi:10.56305/001c.91176

Pleural TB

Diagnosis

- PPD/IGRA
- Imaging for effusion
- Pleural Fluid analysis
  - Exudate
  - Lymphocytic predominance mostly unless very early presentation
  - Adenosine deaminase (ADA)>40
  - NAAT/PCR
    - Xpert MTB/RIF
  - Pleural fluid stain/culture
- Pleural biopsy

Treatment

- Treated like pulmonary TB
- 6 months usually
- No evidence to support role for adjunctive steroids

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Pleural TB Clinical Pearl

- Without treatment TB pleuritis/effusion likely to resolve spontaneously in months
- However, majority will develop active TB within years indicating importance of diagnosis and treatment of pleural TB

Think of Pleural TB in the setting of TB infection (+ IGRA/TST), exudative pleural effusion with lymphocyte predominance…..

Case 2

40 year old lady from Honduras referred to LHD after + IGRA in Jan 2025. CXR was normal. Lost to follow up.

Had a mammogram outside and had some concerns leading to a diagnostic workup– with Ultrasound of Left breast.

US --multiple prominent /enlarged lymph nodes in L axilla
U guided biopsy with “suppurative inflammation/necrotic debris/ consistent with abscess”.

Seen in March 2025 at which time complained of fever, night sweats, weight loss and started on RIPE/B6

Culture from biopsy + for Mtb

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TB Lymphadenitis

Pathophysiology

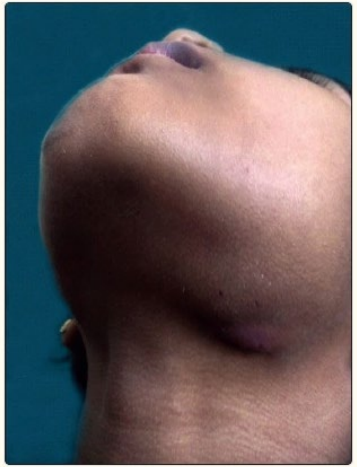
- Oral route (drinking unpasteurized milk – *M bovis*)
- Hematogenous seeding

Diagnosis

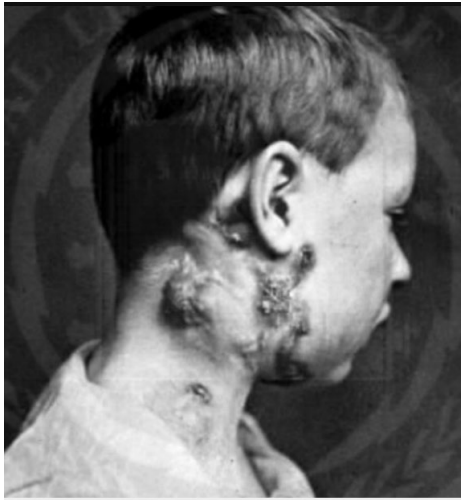
Usually a tissue diagnosis/culture from aspirate, biopsy, surgical, histology, pathology

Treatment

Like Pulmonary disease (usually 6 months)



Articles from Journal of International Oral Health : JIOH are provided here courtesy of International Society of Preventive and Community Dentistry



Historical photo demonstrating advanced scrofula (an older term for tuberculous lymphadenitis).

Author: Scrofula of the neck. From: Bramwell, Byrom Edinburgh, Constable, 1893 Atlas of Clinical Medicine. Source: National Library of Medicine, National Institutes of Health, USA.

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TB Lymphadenitis

Analysis of the histopathological findings of lymph node biopsies at a tertiary care centre

Table 1: Diagnosis of lymph node biopsies.

Diagnosis	Count	%	Male	Female	Ratio
Tuberculous lymphadenitis	305	65.03	100	205	1:2
Cancer	83	17.70	39	44	1:1.1
Reactive	68	14.50	27	41	1:1.5
Bacterial infection	7	1.49	1	6	1:6
Histiocytic necrotizing lymphadenitis	5	1.07	2	3	1:1
Cat scratch	1	0.21	1	0	1:0
Total	469		170 (36.25)	299 (63.75)	1:1.7

Importance of a good physical Exam /imaging when appropriate to assess for lymphadenopathy

Table 2: Diagnosis of lymph node biopsies based on location.

Location	Count (%)	Tubercul-ous lympha-denitis (%)	Cancer (%)	Reactive (%)	Bacterial infection (%)	Histiocytic necrotizing lymphadenitis (%)	Cat scratch (%)
Cervical	316 (67.38)	225 (47.97)	39 (8.32)	44 (9.38)	4 (0.85)	5 (1.07)	0 (0.00)
Axillary	69 (14.71)	30 (6.4)	19 (4.05)	16 (3.41)	2 (0.43)	0 (0.00)	1 (0.21)
Neck	28 (5.97)	15 (3.2)	6 (1.28)	7 (1.49)	0 (0.00)	0 (0.00)	0 (0.00)
Inguinal/ groin	26 (5.54)	11 (2.35)	14 (2.99)	0 (0.00)	1 (0.21)	0 (0.00)	0 (0.00)
Abdomen	26 (5.54)	20 (4.26)	5 (1.07)	1 (0.21)	0 (0.00)	0 (0.00)	0 (0.00)
Chest thorax	4 (0.85)	4 (0.85)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Total	469	305 (65.03)	83 (17.70)	68 (14.50)	7 (1.49)	5 (1.07)	1 (0.21)

International Surgery Journal
Shah B et al. Int Surg J. 2023 Feb;10(2):231-234

TB Lymphadenitis Clinical Pearl

- Painless lesion
- Epidemiology is helpful
- Good physical exam
- Appropriate referrals for tissue-based diagnosis/cultures

Not uncommon for the lesion to enlarge, fluctuate in size/drain/new nodules

This does not mean that therapy is ineffective

Need to counsel patient and care team regarding this

Case 3

71-year-old HIV negative lady from Bolivia with Rheumatoid Arthritis (remote hx of methotrexate), Diabetes, with back/hip pain for months.

-11/8 MRI of pelvis: Destructive process involving the left SI joint with erosion of adjacent sacral wing and ileum demonstrating ring enhancement of this process, similar ring enhancing large fluid collection and gluteus maximus in close proximity to SI joint, these findings strongly suggestive of septic arthritis with adjacent large abscess and gluteus on the left, associated left iliac and inguinal adenopathy.

Sputum smears and cultures negative
11/2024 Gluteal abscess aspirate: No growth for aerobic and anaerobic bacteria
11/2024 Left SI joint aspirate: no growth for aerobic and anaerobic bacteria

Treated with Daptomycin + Ertapenem for a month

Case 3

- not improving on broad spectrum antibiotics
- MRI with 4.7 X 3.2 X 5.7 cm L sacroiliac joint abscess with osteomyelitis , improved gluteal abscess 7.4 x 5.5 x 3.0 cm in comparison to 11/8/24 MRI

- Underwent SI L biopsy and cultures sent for AFB (+ for M tb) and pathology + for granuloma

- RIPE started >1.5 months after presentation . Prior to this had rounds of PO antibiotics and then IV antibiotics

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Musculoskeletal TB

Pathophysiology
Hematogenous dissemination
Possibly also direct trauma

Clinical Manifestations
Bone/Joint Pain, erythema, soft tissue swelling, abscess

Diagnosis
Aspirated culture/tissue based, histology, pathology
Surgical bone culture and histology

Table 3 Localization of bone and joint tuberculosis

References:	Mateo [45]	Enache [18]	Houshian [31]	Davies [14]
Localization (%)				
Spine	64	0[a]	49	36
Knee	8	11	7	11
Ankle	8	8	0	8
Elbow-arm	2	11	5	5
Wrist-hand	6	26	4	11
Hip	0	10	6	9
Rib	2	26	2	1
Sternoclavicular	6	0	3	2
Sacroiliac	9	0	0	4
Foot	0	0	5	3
Tibia	0	0	2	2
Trochanter-femur	6	10	5	2
Others	0	5	3	5

[a] The low incidence of spinal tuberculosis is explained by the fact that vertebral osteomyelitis is usually treated in specialized referral centers in the country of the study

Eur Spine J (2013) 22 (Suppl 4):S556–S566

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Spinal Tuberculosis Clinical

Table 2 Clinical, analytical data and outcome of patients with spinal tuberculosis

Country:	France [52]	Spain [10]	Taiwan [72]	France [47]	USA [58]	UK [37]	Turkey [67]	Spain [20]	Turkey [66]	Saudi Arabia [2]
Year:	1999	2004	2010	2006	1995	2009	2001	2002	2007	2001
No. of cases:	103	78	58	24	20	17	694	14	13	69
Age (mean)	41 (17–84)	48 (14–84)	68 (36–86)	61	49	29	32	58	68	53 (15–80)
Sex (men %)	67	51	60	38	80	47	50	64	69	54
% immigrants	68	5	–	29	50	92	–	–	–	–
Underlying disease (%)										
HIV	0	15	0	0	25	–	–	7	0	–
Immunosuppression	6	8	5	8	–	–	–	–	–	–
Diabetes	1	11	18	8	–	–	–	13	23	–
Chronic renal failure	2	0	18	0	–	–	–	0	30	–
Clinical features										
Previous tuberculosis	–	–	–	25	–	–	–	43	–	7
Time to diagnosis (months)	4	6	2	4	3	7	–	–	4	–
Pain (%)	97	83	100	100	100	86	–	100	100	84
Fever (%)	32	35	16	36	–	35	1.4	7	77	32
Constitutional symptoms (%)	40	36	8	36	35	–	–	–	–	–
Neurological symptoms (%)	50	45	53	–	50	6	67	64	61	28
Spinal deformity (%)	–	35	–	–	55	–	57	50	50	17
Tuberculin test (+) (%)	–	83	–	91	95	–	–	50	–	–
Extraspinal involvement (%)	20	–	44	–	35	47	5	50	–	–
Pulmonary involvement (%)	15	28	32	–	65	35	2.3	23	–	–

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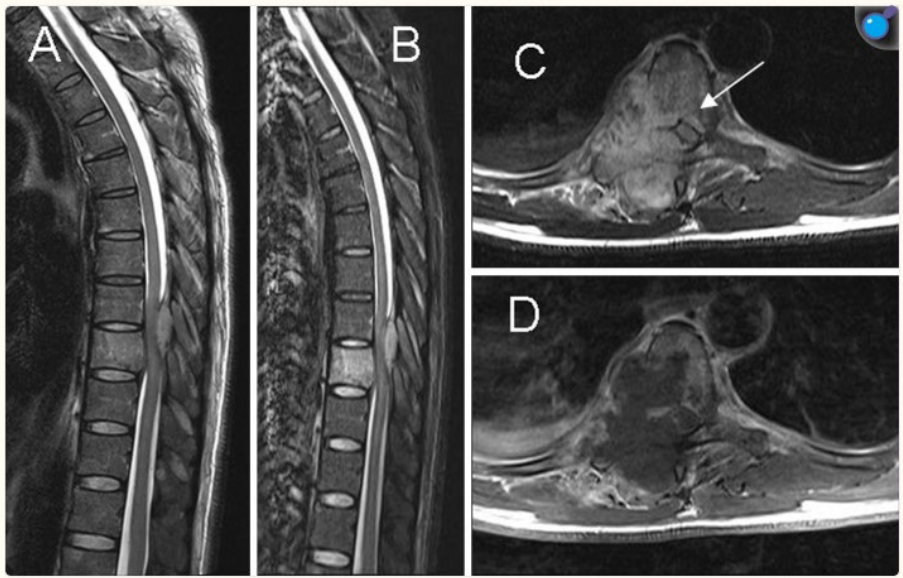
Pott's Disease

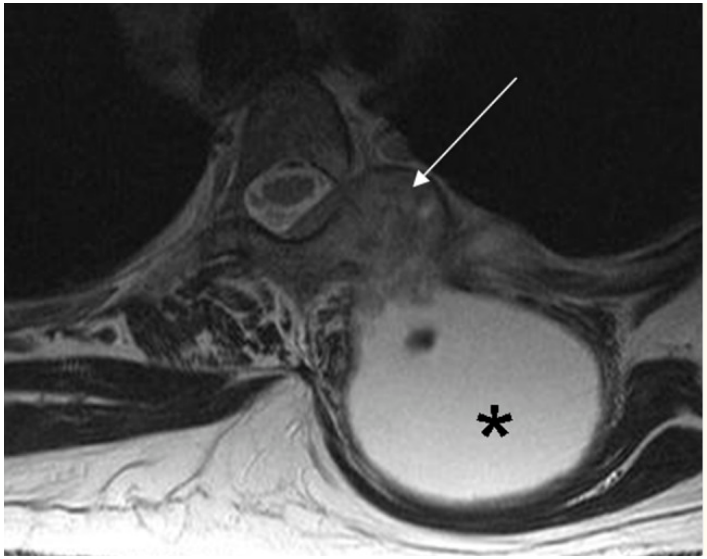
Sagittal T1-postcontrast weighted and STIR imaging show signs of advanced cervical infection with a large prevertebral abscess (*thin arrow*) and early skip lesion with epidural enhancement involving T6 and T7 levels (*thick arrow*)

Eur Spine J. 2013 Jun;22 Suppl 4(Suppl 4):567-78.

Pott's Disease



Paradiskal pattern. **a**, **b** Sagittal T2-weighted imaging and STIR show hyperintense signal in the T9 vertebral body, suggesting bone marrow edema. **c**, **d** Axial T2- and T1-postcontrast weighted imaging show paradiskal involvement and infection spreading to the epidural space (*arrow*) with spinal cord compression



Posterior pattern. Axial T2-weighted imaging shows a large cold abscess (*asterisk*) located in soft tissues and associated bone infection involving vertebral arch and costovertebral joint (*arrow*)

Eur Spine J. 2013 Jun;22 Suppl 4(Suppl 4):567-78.

Musculoskeletal TB

Medical Treatment

- Longer duration than pulmonary TB
  - 9-12 months in straight forward cases without resistances, hardware etc
  - Longer regimens 12-18 months
    - Rifampin less regimen
    - Hardware association

Surgical Treatment

- Usually indicated for neurological deficits
  - relief of cord compression
  - recurrence of neurologic deficits;
  - instability of the spine
- Situations
  - there is poor response to chemotherapy
  - ongoing infection or ongoing deterioration
- Children with vertebrae affected in thoracic spine , kyphosis is likely to progress with growth

Musculoskeletal TB Clinical Pearls

- Indolent presentation
- “Cold abscess” vs “Hot abscess”
- Delayed culture/tissue diagnosis
- Needs a high index of suspicion to send for correct cultures to avoid delayed diagnosis
- Timely detection and treatment needed to prevent permanent damage and disability
- Radiographic findings lag behind clinical response and not the sole decision driver
- Drug interactions with Rifamycin and Pain medications
  - Rifampin can cause increased metabolism of narcotics

Case 4

67-year-old male with history of Hepatitis B, hypertension, gout, L ureteral mass S/P stenting with recurrent fevers, hematuria. Diagnosed with pyelonephritis and treated with rounds of antibiotics in the preceding months. Imaging with renal and bladder abnormalities led to biopsy of renal pelvis and bladder wall subsequently.

Micro/Pathology
Urine AFB culture *M.Tuberculosis* complex DNA by PCR
Renal Pelvis granulomatous inflammation
Urinary bladder wall granulomatous inflammation

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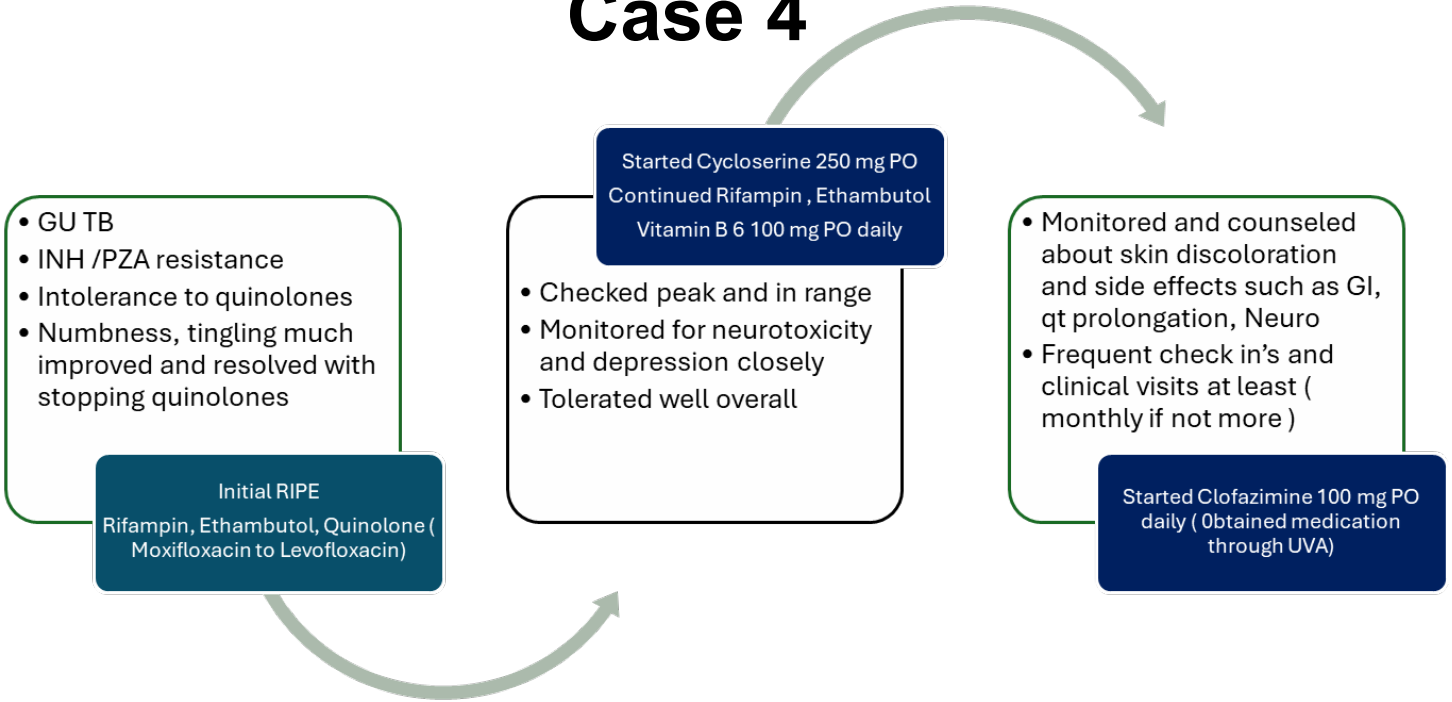
Case 4

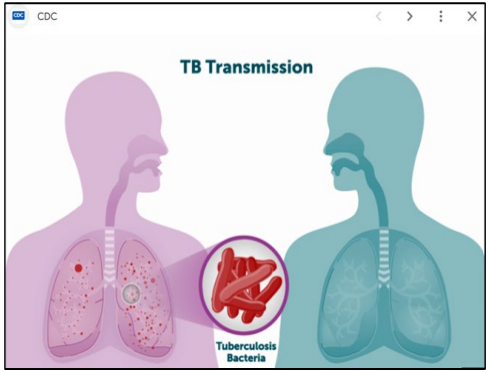


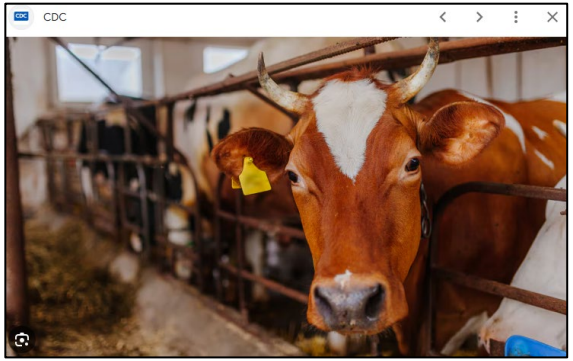
Recommended Duration was 9-12 months given complicated course, resistance and risk for relapse

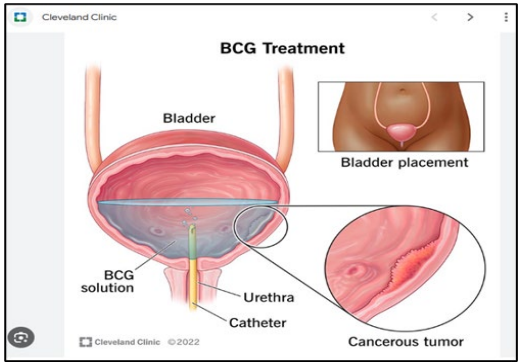
He completed close to 11 months therapy and wanted to travel to Philippines

He and his family were counseled extensively about risk for relapse and symptoms to monitor for

Genitourinary Tuberculosis Routes of Exposure







One Health. 2020 Aug 11;10:100156. doi: 10.1016/j.onehlt.2020.100156

Risk factors of tuberculosis in human and its association with cattle TB in Nepal: A one health approach

Tulsi Ram Gompo [a,*], Asmita Shrestha [b], Eliza Ranjit [c], Bhanu Gautam [d], Khim Ale [d], Swoyam Shrestha [c], Diker Dev Bhatta [a]

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PMCID: PMC7582213 PMID: 33117873

Genitourinary Clinical Presentation

Common
- Dysuria
- Urinary hesitancy
- Urinary frequency
- Gross hematuria (about 10%)
- Microhematuria (about 50%)

Uncommon
- Fever
- Weight loss
- Night sweats

Other Findings
- Infertility
- Bladder stenosis , stricture, vesicoureteral reflex, hydroureteronephrosis
- Penile nodules
- Increased PSA, or Ca 125
- Abnormal UA, sterile pyuria

Case Report

Tuberculosis at Vulva and Vagina

Pranom Buppasiri MD*,
Teerayut Temtanakitpaisan MD*, Woraluk Somboonporn MD*

* Department of Obstetrics and Gynecology, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

J Med Assoc Thai 2010; 93 (5): 613-5
Full text. e-Journal: http://www.mat.orth/journal

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Genitourinary Tuberculosis Diagnostic Tools

- Microscopic Urinalysis for AFB: + results in up to 90% of renal TB but not diagnostic as it will also appear + for nontuberculous mycobacteria
  - If adequate bacteria present, specificity 97%, sensitivity 42-52%
- Molecular Testing: PCR is faster, detects even if few bacilli, not FDA approved for non pulmonary , sensitivity 80-90%
- Culture: gold standard, sensitivity 65%, specificity 100%
- Additional value with histology, pathology from tissue showing granuloma and AFB stains

CXR: In general, 50% or more of patients with genitourinary TB will have negative CXR

US: masses, wall thickness, vesicoureteral reflux, scarring, adhesions, granulomas,

CT: cortical masses, granulomas, calcifications throughout urinary tract, urinary strictures, bladder wall thickening, mucosal ulcers

Other Modalities:

- MRI
- Cystoscopy and ureteroscopy
- Hysterosalpingography
- IV Pyelogram

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Genitourinary Tuberculosis Treatment

Mainstay is medical treatment : Same as pulmonary treatment with modifications based on resistances etc

Surgical treatment : needed in obstructive uropathy

- Abscess formation
- Hydronephrosis
- Infertility due to stricture formation of the fallopian tubes or vas deferens
- Intractable urinary symptoms such as "thimble" bladder
- Need for a tissue sample (biopsy) for diagnostic purposes
- Kidney failure with obstructive uropathy, especially if progressive and unresponsive to pharmacotherapy
- Nonfunctioning kidneys with symptoms not relieved by medical therapy
- Persistent symptoms unresponsive to medical treatment, such as pain or bleeding
- Recurrent endometrial tuberculosis or uterine bleeding resistant to medical therapy
- Strictures of the urethra resulting in voiding dysfunction
- Suspicion of an underlying malignancy

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Genitourinary TB Clinical Pearls

- Cure rates are lower for drug resistant strains
- Lifetime risk of relapse has been reported as high as 22%, which is higher than pulmonary *Mtb* disease

- Latency period of up to 20 years or more between primary infection and evidence of GU disease
- Cause of infertility in especially developing countries

CNS TB

Pathophysiology

- Hematogenous dissemination
- Deep seated tubercular granulamotous foci
- Contiguous spread from vertebral osteomyelitis
- Latent infection reactivation

- Meningitis (**most common form**)
- Tuberculoma
- Spinal Arachnoiditis

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CNS TB

Diagnostic features of tuberculous meningitis

Clinical
fever and headache (for more than 14 days)
vomiting
altered sensorium or focal neurological deficit
CSF
pleocytosis (more than 20 cells, more than 60% lymphocytes)
increased proteins (more than 100 mg/dl)
low sugar (less than 60% of corresponding blood sugar)
India ink studies and microscopy for malignant cells should be negative
Imaging
exudates in basal cisterns or in sylvian fissure hydrocephalus infarcts (basal ganglionic)
gyral enhancement
tuberculoma formation
Evidence of tuberculosis elsewhere

Basal cistern/meninges enhancement
Hydrocephalus
Parenchymal enhancement
Cerebral infarct
Focal findings
Edema

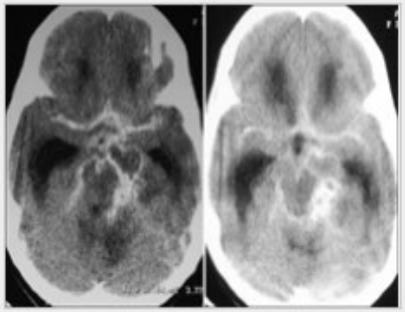

Figure 1: Contrast-enhanced computed tomography reveals the thick basilar exudate with the "spider leg" appearance

Neurology India 64(2):p 219227, March-April 2016.

African Health Sciences Vol 11 No 1 March 2011

CNS TB

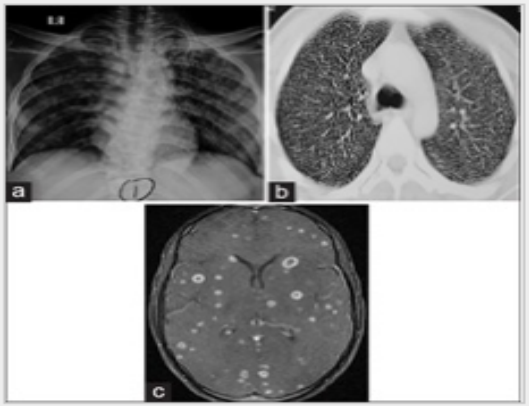

Figure 5: Roentgenogram of the chest (a) and contrast-enhanced computed tomography of the thorax (b) depict the miliary shadowing observed in a patient having definite tuberculous meningitis. Axial T1-weighted fat-suppressed spoiled gradient-echo (SPGR) gadolinium (GAD)-enhanced magnetic resonance image of the brain (c) shows multiple tuberculomas of various sizes involving different parts of the brain parenchyma

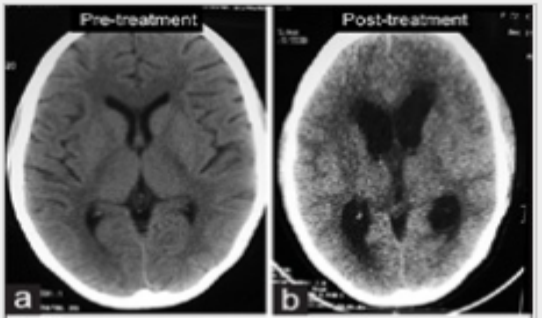

Figure 9: Computed tomography of the brain of two patients with definite tuberculous meningitis depicts the occurrence of hydrocephalus, as part of paradoxical reaction, in week 5 and week 6 after the initiation of anti-tuberculous treatment (a and b: Patient 1, c and d: Patient 2)

Neurology India 64(2):p 219-227, March–April 2016.

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CNS TB

CSF

Opening pressure, Protein Glucose, Cell Differential, AFB smear, AFB and other appropriate cultures, X pert

Diagnostic accuracy of Xpert MTB/RIF Ultra for tuberculous meningitis in HIV-infected adults: a prospective cohort study

Nathan C Bahr [a,b], Edwin Nuwagira [c], Emily E Evans [c], Fiona V Cresswell [d,e], Philip V Bystrom [a], Adolf Byamukama [c], Sarah C Bridge [a,c], Ananta S Bangdiwala [a], David B Meya [a,d], Claudia M Denkinger [f], Conrad Muzoora [c], David R

In 2013, WHO endorsed the Xpert MTB/RIF assay (Cepheid, Sunnyvale, CA, USA) as the preferred initial test to investigate tuberculous meningitis after a systematic review of 13 studies.[6,7,8] The Xpert is cartridge-based fully-automated PCR test. Of three large cohorts, the first reported 67% sensitivity using Xpert in microbiologically proven tuberculous meningitis in HIV-infected South Africans.[9] This study initially tested 1 mL of CSF but later found higher sensitivity (82%; 22 of 27 positive cases) when centrifuging 3 mL of CSF.[9]

The diagnostic performance of GeneXpert MTB/RIF in tuberculosis meningitis: A multicentre accuracy study

Chenyuan Wang [a †], Lina Davies Forsman [b c †], Shanshan Wang [a †], Sainan Wang [a], Ge Shao [a], Haiyan Xiong [a], Ziwei Bao [d ‡], Yi Hu [a ‡]

The diagnostic sensitivity of Xpert was 71.1 % for definite TBM, and 5.5 % for probable/possible TBM. The positive rate of Xpert was improved with cerebrospinal fluid (CSF) increasing volume and was associated with CSF color (yellow). The additional indicators obtained by CART were CSF lactate and glucose and increased the sensitivity to 96.1 % (definite TBM) and 84.6 % (probable/possible TBM).

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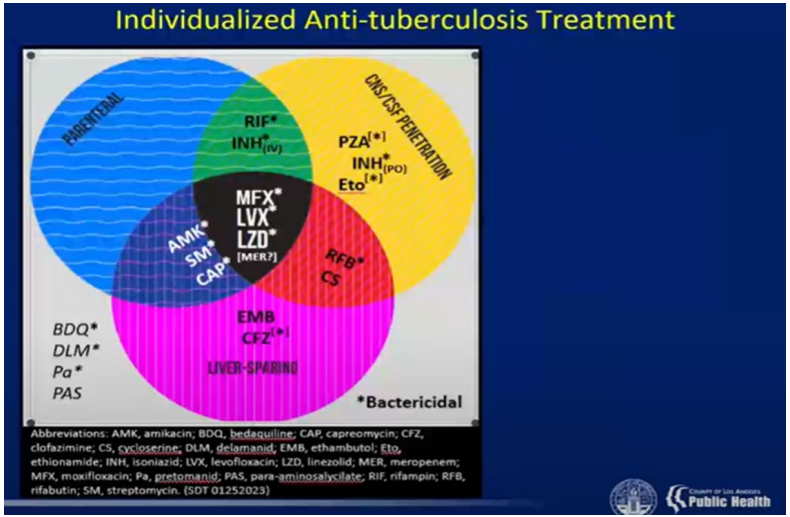
TB Meningitis Treatment

Treatment

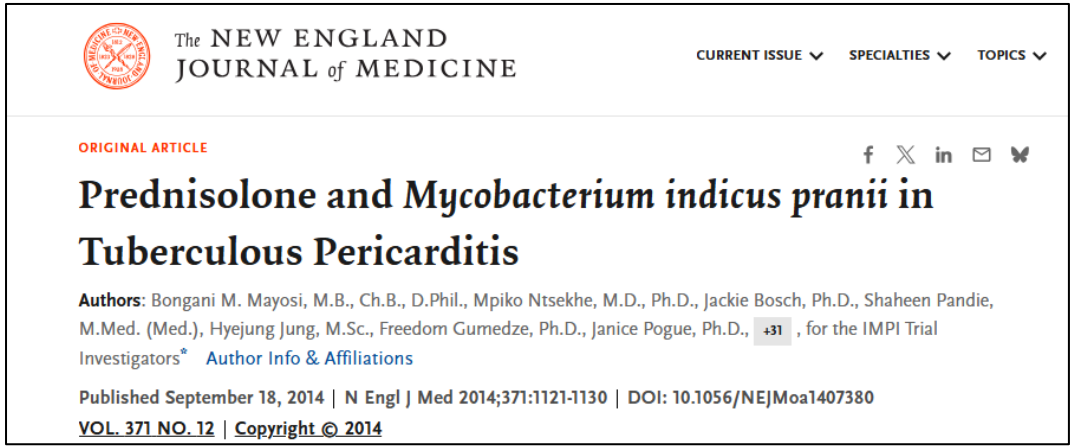
- Timing is crucial !!!! High mortality
- Treatment is longer duration (a year) with good CSF penetrating drugs (9-12 months)
- Steroids – mortality benefit (dexamethasone/prednisolone tapered over 6-8 weeks)
- Repeat LP's



Neurosurgery : hydrocephalus, abscess, paraplegia, complications

Pericardial TB and Steroids

Adjunctive corticosteroids NOT routinely used in tuberculous pericarditis



The NEW ENGLAND JOURNAL of MEDICINE

CURRENT ISSUE SPECIALTIES TOPICS

ORIGINAL ARTICLE

Prednisolone and *Mycobacterium indicus pranii* in Tuberculous Pericarditis

Authors: Bongani M. Mayosi, M.B., Ch.B., D.Phil., Mpiko Ntsekhe, M.D., Ph.D., Jackie Bosch, Ph.D., Shaheen Pandie, M.Med. (Med.), Hyejung Jung, M.Sc., Freedom Gumedze, Ph.D., Janice Pogue, Ph.D., +31 , for the IMPI Trial Investigators* Author Info & Affiliations

Published September 18, 2014 | N Engl J Med 2014;371:1121-1130 | DOI: 10.1056/NEJMoa1407380

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Complications of EPTB

- High mortality for CNS, pericardial disease
- Mobility Complications with musculoskeletal TB
- Infertility in pelvic /GU/Fallopian Tube TB
- Cosmetic effect (cervical lymph node)
- Delayed diagnosis (long latency period such as GU TB)

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Extrapulmonary TB : Draining Lesions

Tuberculosis (*M. tuberculosis*) Extrapulmonary, draining lesion	Airborne + Contact + Standard		Discontinue precautions only when patient is improving clinically, and drainage has ceased or there are 3 consecutive negative cultures of continued drainage [1025, 1026]. Examine for evidence of active pulmonary tuberculosis.

2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings

Last update: September 2024

Take Home Points -- EPTB

- High clinical index of suspicion
- Disease manifestations – insidious onset/overlapping symptoms with other comorbid conditions
- Often Paucibacillary and Diagnostics can be challenging (Tissue diagnosis /delayed diagnosis)
- Treatment likely involves multidisciplinary approach/referrals/consults
  - Surgery in some cases
  - Treatment duration, choice of medications , steroids
  - May need recurrent procedures (LP, thoracentesis, paracentesis etc to monitor disease/symptom control)

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