

Epidemiology of Tuberculosis Cases with End Stage Renal Disease, California, 2010

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End Stage Renal Disease (ESRD)

- ❑ **Projections for U.S. from 2005 to 2020¹**
 - 41% increase in incident cases from 107,000 to 151,000
 - 60% increase in prevalent cases from 485,000 to 785,000

- ❑ **Substantial burden of infections²**

- ❑ **Preventing infections among ESRD patients is priority for U.S. Department of Health & Human Services³**

1) http://www.usrds.org/2007/pres/GILBERTSON_ASN_PRESENTATION_11_2_07_tmp.swf

2) USRDS, USRDS 2012 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States, NIH, NIDDK, Bethesda, MD, 2012. http://www.usrds.org/2012/pdf/v2_ch3_12.pdf

3) US Department of Health and Human Services. National Action Plan to Prevent Healthcare-Associated Infections: Roadmap to Elimination. Washington, DC, 2012. http://www.hhs.gov/ash/initiatives/hai/end_stage_renal_disease.pdf

Epidemiology of Tuberculosis (TB) and ESRD in Low TB Burden Countries

- ❑ Compared to rates of TB in general population, ESRD patients
 - 6-25 fold increased rate¹⁻⁴
- ❑ ESRD variable collected as part of TB surveillance in California starting during 2010
- ❑ Few studies used TB surveillance data
 - Compare risk factors among TB cases with ESRD and non-ESRD⁴
 - Describe TB genotypes among cases with ESRD

1) Chia S. *Int J Tuberc Lung Dis* 1998;2(12):989-991.

2) Simon TA. *Infect Control Hosp Epidemiol* 1999;20(9):607-609.

3) Ahmed AT. *Int J Tuberc Lung Dis* 2004;8(3):341-345.

4) Dobler CC. *Plos One* 2012;6(12):e29563.

Objectives

- ❑ Calculate incidence rates for TB cases with ESRD and non-ESRD
- ❑ Compare demographic and clinic characteristics, and describe treatment outcomes by ESRD status
- ❑ Describe TB genotypes and assess for frequency of recent transmission among cases with ESRD

Methods: Source of Data

- **Data on TB cases obtained from:**
 - Report of Verified Case of Tuberculosis (RVCT), California, 2010
 - TB Genotyping Information Management System, California, 2010

- **Data used to calculate TB incidence obtained from:**
 - United States Renal Data System Renal Data Extraction and Referencing System, 2010
 - California Department of Finance, 2010

Method: Statistical Analysis

- ❑ **Poisson regression used to calculate rate ratios and 95% confidence intervals (95% C.I.)**
- ❑ **TB cases with ESRD were compared to cases with non-ESRD**
 - Chi-square or Fisher's exact test
 - Wilcoxon rank-sum test
- ❑ **Logistic regression used to assess demographic and clinical factors**
 - TB cases with ESRD compared to cases with non-ESRD

Rates of TB Cases per 100,000 population with ESRD and non-ESRD

Category	ESRD (N = 83)	Non-ESRD (N = 2244)	Rate Ratio ^a (95% C.I.)
California	116.7	6.0	19.3 (15.5, 24.1)
Age group, years			
0-4	0	2.2	0
5-14	0	0.9	0
15-24	0	3.8	0
25-44	77.7	6.4	12.2 (6.3, 23.5)
45-64	86.4	7.7	11.3 (7.7, 16.5)
≥ 65	180.0	12.9	13.9 (10.3, 18.7)
Sex			
Females	107.3	5.0	21.0 (15.0, 29.3)
Males	123.7	7.2	17.2 (13.0, 22.9)
Race			
White	60.8	4.7	13.0 (9.0, 18.8)
Black	18.7	6.6	2.9 (0.7, 11.5)
Asian	424.5	21.6	19.7 (14.8, 26.2)
Native American	0	4.4	0
Hispanic	101.3	6.0	16.7 (11.4, 24.6)

a. Rate ratio calculated as rate of TB among ESRD divided by rate of TB among non-ESRD.

Comparison of Demographic Characteristics among TB Cases by ESRD Status

Characteristics	ESRD (N = 83)	Non-ESRD (N = 2244)	P-value
Median age, years (IQR)	67 (56, 76)	49 (32, 65)	< 0.01
Foreign-born ^a	78 (95.1%)	1735 (77.9%)	< 0.01
Arrived in US > 5 years	71 (91.0%)	1266 (72.9%)	< 0.01
Philippines	25 (32.1%)	339 (19.5%)	< 0.01
Long-term care facility resident ^{a,b}	11 (13.3%)	48 (2.1%)	< 0.01
Excessive alcohol use ^{a,b,c}	1 (1.3%)	169 (7.7%)	0.03

Note: IQR: interquartile range.

- a. Due to missing values the denominator used to calculate percentages is different from what is listed in each column.
- b. Resident at the time of TB diagnosis.
- c. Use within the past year.

Comparison of Clinical Characteristics among TB Cases by ESRD Status

Characteristics	ESRD (N = 83)	Non-ESRD (N = 2244)	P-value
Evaluated for TB because of targeted testing ^a	0 (0%)	43 (1.9%)	0.40
Extrapulmonary site of TB only	29 (34.9%)	480 (21.3%)	< 0.01
Bone and or joint	7 (24.1%)	48 (10.0%)	0.03
Peritoneal	5 (17.2%)	25 (5.2%)	0.02
Diabetes	44 (53.0%)	440 (19.6%)	< 0.01
Immunosuppression, not HIV/AIDS	16 (19.3%)	130 (5.8%)	< 0.01
Post-organ transplantation	3 (3.6%)	10 (0.5%)	0.01
Abnormal chest radiograph ^a	69 (85.2%)	1842 (84.3%)	0.83
Cavitary	3 (4.4%)	357 (19.5%)	< 0.01
Tuberculin skin test positive at TB diagnosis ^a	15 (50.0%)	1086 (80.3%)	< 0.01
Sputum smear positive for acid-fast bacilli ^a	16 (22.9%)	872 (45.2%)	< 0.01

a. Due to missing values the denominator used to calculate percentages is different from what is listed in each column.

Multivariate Analysis of Demographic and Clinical Characteristics among TB Cases by ESRD Status

Variable ^a	Adjusted Odds Ratio ^b	95% C.I.	P-value
Age	1.02	0.99-1.05	0.10
Extrapulmonary site of TB only	2.16	0.87-5.37	0.10
Long-term care facility resident at TB diagnosis	3.48	0.95-12.76	0.06
Tuberculin skin test positive at TB diagnosis	0.40	0.18-0.93	0.03
Sputum smear positive for acid-fast bacilli	0.28	0.09-0.82	0.02
Immunosuppression, not HIV/AIDS	3.71	1.35-10.16	0.01
Diabetes	4.33	1.86-10.14	<0.01

- a. Variables eligible for inclusion in multivariate model had a $P < 0.05$ in bivariate analysis. Candidate variables included in the multivariate logistic regression model, in addition to the ones listed in the table, were : age, foreign-birth, excessive alcohol use, and a cavitory chest x-ray.
- b. Final model was selected using a backward logistic regression strategy with a stay criterion of $P \leq 0.10$ for variables.

Comparison of Treatment Outcomes among TB Cases by ESRD status

Characteristics	ESRD (N = 83)	Non-ESRD (N = 2244)	P-value
Dead at TB diagnosis ^a	6 (7.3%)	45 (2.0%)	0.01
TB therapy stopped due to death ^a	20 (27.0%)	130 (6.2%)	< 0.01
Type of healthcare provider ^a			0.69
Health department	44 (58.7%)	1169 (55.6%)	
Private/other	26 (34.7%)	734 (34.9%)	
Both health department and private/other	5 (6.7%)	199 (9.5%)	
Directly observed therapy ^a			0.22
Self-administered	12 (16.4%)	292 (13.9%)	
Directly observed therapy	42 (57.5%)	1053 (50.2%)	
Both	19 (26.0%)	752 (35.9%)	

Note: IQR: interquartile range.

a. Due to missing values the denominator used to calculate percentages is different from what is listed in each column.

Description of TB Genotypes among Cases with ESRD

- **61 (73.5%) of 83 TB cases with ESRD had genotype reported during 2010**
- **Most common strain lineages**
 - IndoOceanic Manila – 32.8%
 - East Asian – 18.0%
 - EuroAmerican -14.8%

Use of Genotyping to Assess for Transmission among TB Cases with ESRD

- 2 (3.2%) of 61 TB cases with ESRD had same genotype
- Both cases clustered to same county

Limitations

- ❑ **Temporal relationship between TB and ESRD could not be determined using RVCT surveillance data**
- ❑ **Potential underreporting of TB cases with ESRD**
 - Difficult to diagnose as many cases are extrapulmonary
 - First year surveillance conducted with ESRD variable
- ❑ **Use of one year of TB genotyping data may have limited our ability to detect recent transmission among cases with ESRD**

Summary

- ❑ Rates of TB cases substantially higher among ESRD, especially elderly, Asians, and Hispanics
- ❑ TB cases with ESRD more likely to be foreign-born, have extrapulmonary TB only, diabetes, and immunosuppressed
 - Less likely to have positive sputum smear or tuberculin skin test
- ❑ Deaths among TB cases with ESRD more common
- ❑ Most common genotypes among TB cases with ESRD are endemic to foreign countries
 - Few matching genotypes detected among cases

Conclusions

- ❑ **Majority of TB cases with ESRD likely due to reactivation of TB from remote exposure in foreign country**
- ❑ **Increased attention to LTBI screening and treatment may be needed in subset of ESRD patients (i.e., elderly, foreign-born, Asian, diabetic, and immunosuppressed)**
- ❑ **Healthcare providers need to be aware of atypical presentation of TB among ESRD patients**
 - Limited experience may be contributing to delayed diagnosis of TB and to deaths

Next Steps

- ❑ **Analyze genotyping data from 2010-2011 for TB cases with ESRD**
- ❑ **Internal and external feedback**

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Thank You!

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