

Session: P081 Tuberculosis: populations and patients

Category: 2a. Tuberculosis and other mycobacterial infections

25 April 2017, 12:30 - 13:30
P1656

A retrospective case-control study of ante- versus post-mortem tuberculosis diagnoses in North West England: characterizing an underserved group

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Background: To meet the goals of the End TB Strategy, high-resource, low-burden countries like England need to target underserved TB-affected groups. Patients diagnosed with TB post-mortem are underserved, in that opportunities for TB treatment, timely contact tracing and prevention of TB transmission may have been missed. TB cases diagnosed post-mortem are a small proportion of cases in England but have not previously been studied. We aimed to identify risk factors for post-mortem TB diagnosis in North West England.

Material/methods: Using data from 27/03/2012 to 28/06/2016, we conducted a population-based, retrospective case-control study. All participants were microbiologically- or clinically-confirmed TB cases from North West England, an area with a population of over 7 million people and high rates of urban poverty. Cases were defined as people diagnosed with TB post-mortem and controls those diagnosed ante-mortem. Data was collected from the national Enhanced TB Surveillance system and supplemented with North West TB multi-disciplinary team TB Cohort Audit data. Patient data included socio-demographic and economic factors, type of TB (extrapulmonary, pulmonary, smear positivity, and radiographic findings), and Enhanced Case Management (ECM) level. ECM is a locally developed tool to identify underserved patients with social and/or clinical risk factors to plan and provide them with enhanced TB care and social support. ECM ranges from “No ECM Required” to “ECM Level 3” in which the patient may have difficult social circumstances (including homelessness, alcohol/drug misuse, or language barriers) and require directly-observed therapy and/or enhanced multi-disciplinary team support. Cases were compared with controls using chi-squared tests for proportions and Student’s t test for means.

Results: 3021 patients were identified, including 48 cases and 2973 controls. Compared to controls, cases were more likely to be older (65 [95%CI=59-71] versus 42 [41-43] years), White British (54% [38-70%] versus 27% [25-28%]) and UK-born (59% [43-76%] versus 34% [33-36%]); to have smear negative pulmonary TB (64% [50-78%] versus 27% [26-29%]); and to not require ECM (85% [75-96%] versus 43% [41-45%] No ECM Required, Table). No differences in poverty level between cases and controls were identified.

Conclusions: This study characterised a previously unidentified group of underserved patients whose TB diagnosis had been missed but who did not meet criteria for ECM. Clinicians should be alert to the risk of undiagnosed TB in older, white, UK-born people – a group with comparatively low incident TB rates – in whom there are clinical or radiological signs compatible with TB but negative sputum smears. Further work is planned to conduct a retrospective case-note review of this cohort to establish if missed TB diagnoses were associated with other relevant respiratory comorbidities (including chronic lung disease or lung carcinoma).

Table: Comparison of cases (n=48) and controls (n=2973).

Variable	Cases (post-mortem diagnosis) % (95 CI)	Controls (ante-mortem diagnosis) % (95%CI)	P value*
Patients	48 (1.6)	2973 (98.4)	-
Age; mean (95%CI)	65 (59-71)	42 (41-43)	<0.0001
Sex; male	69 (55-82)	58 (56-59)	0.1
Ethnicity			
White	54 (38-70)	27 (25-28)	0.0001
Chinese/other	10 (3-19)	8 (7-9)	0.6
Indian subcontinent	29 (15-44)	52 (50-54)	0.003
Black Afro-Caribbean	7 (0-15)	14 (13-15)	0.2
UK born	59 (43-76)	34 (33-36)	0.002
Poverty level			
1 (Most poor)	63 (49-78)	61 (59-63)	0.8
2	15 (4.4-26)	17 (16-19)	0.7
3	11 (1.5-20)	9.4 (8.4-11)	0.7
4	8.7 (2.4-17)	6.4 (5.5-7.3)	0.5
5 (Least poor)	2.2 (0-6.6)	5.8 (4.9-6.6)	0.3
ECM level			
No ECM required	85 (75-96)	43 (41-45)	<0.0001
ECM Level 1	8.3 (2.2-16)	31 (29-32)	0.0008
ECM Level 2	2.1 (0-6.3)	14 (13-16)	0.02
ECM Level 3	4.2 (0-10)	12 (11-13)	0.1
Unemployed	6 (13)	378 (13)	0.9
TB			
EPTB	67 (53-80)	43 (42-45)	0.001
Smear+ PTB	9 (2.3-17)	20 (18-21)	0.05
Smear- PTB	64 (50-78)	27 (26-29)	<0.0001
PTB and compatible CXR	77 (50-103)	95 (94-96)	0.004

Compatible CXR" = pulmonary TB with compatible chest radiograph; EPTB = extra-pulmonary TB; PTB = pulmonary TB. *P values are differences between cases and controls by t-test (age) and chi-squared test (all other variables)