Clinical characteristics and Management of Nontuberculous Mycobacteria Infections in the Finger Lakes Region of Western New York

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Background

- Nontuberculous Myocobacteria (NTM) are ubiquitous in the environment and associated with pulmonary and extrapulmonary infections.
- NTM are not nationally reportable. No studies to date have evaluated the epidemiology of pNTM and eNTM in the Finger Lakes Region of Western New York.
- There has been an increase in referrals to the University of Rochester Medical Center (URMC) Infectious Diseases Clinic for management of NTM.
- In order to establish a regional center for management of NTM, the epidemiology of NTM in the region needs to be evaluated for allocation of resources.

Methods

- This is a retrospective cohort study of all positive NTM isolates between April 1st 2018 and March 31st 2020 at URMC and Rochester Regional Health Laboratories.
- These two healthcare systems serve as the laboratory referral centers for the 9 counties of the finger lakes region.
- The estimated referral area population was 1,192,392 in June 2021.
- **Inclusion Criteria**: All individuals with at least one culture growing NTM during the study period.
- Medical record review wasperformed for data collection of demographic data, microbiologic data, and clinical data (symptoms, specialty referral, treatment).
- Data was censored 6 months before the date of initial sample collection and at death or June 30th 2021.
- Patients were determined to have clinician diagnosed disease if they were treated for NTM or the clinician stated it was disease in the chart as opposed to colonization or a contaminant.

Results

Figure 1 Fingerlakes Referral Region

Table 1 Comorbidities and treatment data

	Pulmonary NTM (N=196)	Extra Pulmonary NTM (N=30)
Age (median)	69	54
Gender		
Female	114 (58%)	11 (37%)
Male	82 (42%)	19 (63%)
Lung Disease (all)	138 (70%)	3 (10%)
Cystic Fibrosis	13 (7%)	N/A
COPD	53 (27%)	N/A
Bronchiectasis	75 (38%)	N/A
Emphysema	38 (19%)	N/A
Heart Disease	32 (16%)	3 (10%)
Gastrointestinal disease	14 (7%)	0 (0%)
GERD	63 (32%)	N/A
Diabetes	33 (17%)	8 (27%)
Chronic kidney disease	12 (6%)	2 (7%)
Neurologic Disease	17 (9%)	2 (7%)
Immunodeficiency (all)	7 (4%)	7 (23%)
HIV CD4 < 200	5 (3%)	4 (11%)
Solid organ transplant	1 (1%)	0 (0%)
Hematologic transplant	1 (1%)	3 (10%)
Malignancy History	41 (20%)	7 (23%)
Solid organ Malignancy	34 (17%)	3 (10%)
Hematologic Malignancy	10 (5%)	4 (13%)
Any tobacco use	108 (55%)	18 (60%)
Clinician diagnosed disease		
Yes	104 (53%)	23 (77%)
No	92 (47%)	7 (23%)
Treated for NTM	69 (35%)	21 (70%)
With susceptibilities	51 (74%)	15 (71%)
Without susceptibilities	18 (26%)	5 (29%)

- Patients with eNTM isolates were younger than patients with pNTM isolates, less likely to have lung disease ($p<0.01$), and more likely to have immunodeficiency ($p<0.01$).
- Patients with eNTM isolates were more likely to have clinician diagnosed disease ($p=0.036$).
- Rate of positive culture was 16.4/100,000 and 2.5/100,000 population for pNTM and eNTM, respectively
- Rate of clinician diagnosed disease was 8.7/100,000 and 1.92/100,000 population for pNTM and eNTM, respectively

Table 2 Mycobacterium species isolated

Organism	Pulmonary NTM	Extrapulmonary NTM
Mycobacterium avium complex	120 (59%)	9 (30%)
Rapidly growing mycobacteria	26 (13%)	12 (40%)
Mycobacterium abscessus	13	1
Mycobacterium chelonae	4	7
Mycobacterium fortuitum	3	2
Mycobacterium mucogenicum	3	0
Other RGM	3	2
Slow growing mycobacteria	58 (28%)	9 (30%)
Mycobacterium gordonae	29	5
Mycobacterium kansasii	7	0
Mycobacterium marinum	0	3
Mycobacterium szulgai	3	0
Mycobacterium xenopi	14	1
Other slow growing NTM	6	0
Total	205	30

- *Mycobacterium avium complex* was the most commonly isolated NTM for both pNTM and eNTM.
- There was one isolate each of other species comprising the Other RGM and and Other slow growing NTM.

Table 3 Referral patterns for NTM

Specialist referral	Pulmonary N=196	Extrapulmonary N=30
Pulmonology	162 (83%)	1 (3%)
Infectious Diseases	66 (34%)	27 (90%)
Surgery	15 (8%)	10 (30%)
Other	1 (1%)	1 (3%)
None	9 (5%)	1 (3%)

- Patients with pNTM isolates were most commonly seen by Pulmonologists.
- Patients with eNTM isolates were most commonly seen by Infectious Diseases.

Table 4 Symptoms reported within 30 days of isolate

Symptoms	Pulmonary N=196	Extrapulmonary N=30
None	18 (9%)	0 (0%)
Fever	26 (13%)	8 (27%)
Night sweats	11 (6%)	2 (7%)
Weight loss	25 (13%)	3 (10%)
Fatigue	40 (20%)	4 (13%)
Dyspnea	93 (47%)	NA
Cough	143 (73%)	NA
Hemoptysis	27 (14%)	NA
Pain at site	NA	18 (60%)
Redness, swelling	NA	18 (60%)
Drainage, pus	NA	12 (40%)

- Patients reported site specific symptoms more than constitutional symptoms.

Conclusion

- Nearly half of pulmonary isolates were not considered reflective of clinical disease and only 35% of patients with pulmonary isolates were treated for pNTM. This reflects the difficulty of determining who truly represents NTM disease and who represents colonization. Resources need to be allocated to provide treatment and monitoring for all patients with NTM.
- The difference in referral patterns for pNTM and eNTM suggest the need for multidisciplinary involvement in establishing a regional center for management of all NTM.
- Despite recommendations for obtaining susceptibilities prior to treatment, many patients were treated empirically suggesting an area for improvement. This may be achieved with a practice dedicated to managing NTM.
- *Mycobacterium avium complex* remains the most commonly isolated NTM among both pulmonary and extrapulmonary isolates followed by *M. gordonae*. However, only one patient with *M. gordonae* was felt to have clinical disease consistent with the finding this organism is often a colonizer or contaminant.
- Curiously, all isolates of *Mycobacterium xenopi* were identified through the Rochester Regional Health Laborities suggesting a possible difference in population between the two systems within the referral base.

Limitations

- This study was retrospective in nature and determination of Clinician diagnosed disease is based on EMR review. This may lead to underrepresentation of disease if it was not specified in the chart.
- Patients who died prior to treatment or were lost to follow up were considered not to have disease or be treated which also may underrepresent clinician diagnosed disease or treatment.