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Language and racial disparities in treatment initiation for patients with pulmonary non-tuberculous mycobacteria

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Abstract

Objective Disparities in testing and treatment of pulmonary nontuberculous mycobacteria (P-NTM) warrant further investigation into language and race's impact on treatment initiation. The objective of the study is to compare the length of treatment initiation for P-NTM patients assessed in the pulmonary and infectious diseases clinics through language and race.

Results The cohort included 63 patients; 28 patients received treatment, and 35 patients did not receive treatment. According to the IDSA/ATS guidelines for diagnosis of pulmonary NTM, 55% of patients met all three categories, 40% of patients did not fulfill all three categories and 5% of patient charts were inconclusive. Charts were considered inconclusive if a comprehensive NTM evaluation was not conducted, such as no CT imaging, only one culture sent, or lost to follow up.

Keywords Non-tuberculous mycobacteria, Pulmonary, Health disparities

Introduction

The diagnosis of P-NTM is challenging due to its heterogeneous clinical presentation with non-specific symptoms such as cough and weight loss and the need for multi-modal diagnostics including radiology and microbiology [1, 2]. The IDSA/ATS guidelines are used by many clinicians to determine treatment timeline [3]. Timely diagnosis reduces the burden of recurring antibiotics and prevents progression of disease [4, 5]. Elderly people, people who smoke, and people with structural lung abnormalities are at increased risk for P-NTM [6]. Racially and ethnically minoritized people, including people who are Black and Asian, are also at increased risk for P-NTM infections [7, 8]. Health disparities in testing and treatment for P-NTM have been identified [7, 9]. There is broad literature on how non-English speaking patients face delays in lung-related care and worse health outcomes [10, 11], but limited data exist about the impact of language on treatment for P-NTM.

Materials and methods

Tufts Medical Center located in Chinatown Boston serves surrounding communities as the primary healthcare provider [12]. The IRB approved waiver of consent for a retrospective cohort study. Electronic medical records were queried for patients with a NTM positive

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respiratory culture between August 2021 to July 2022 that were seen in the infectious disease and pulmonary clinics. Patient charts were included if they had a positive NTM sample and were evaluated by pulmonary and/or infectious diseases clinicians and excluded if they had no positive NTM sample and charts are incomplete. Demographic, clinical, microbiological, radiological, and treatment data were collected by the research team (OA and SA). Patient charts were evaluated using IDSA/ATS guidelines for the diagnosis of P-NTM. The two outcomes of interest were (1) receiving NTM treatment and (2) time from first evaluation visit to initiation of NTM treatment. The indicator of interest was race and language (individually and grouped as a composite indicator). Pearsons χ^2 test and multivariate Cox proportional hazard models were used to analyze outcomes. Kaplan-Meier curves were stratified by race, language, and a variable representing a combination of the two to visualize gaps in time to treatment across these categories. Data were analyzed using Stata 17.

Results

Our cohort included 63 patients; 28 patients received treatment, and 35 patients did not receive treatment (Table 1A). According to the IDSA/ATS guidelines for diagnosis of pulmonary NTM; 57% of patients met all three categories, 40% of patients did not fulfill all three categories, and 3% of patient charts were inconclusive. Charts were considered inconclusive if a comprehensive NTM evaluation was not conducted, such as no CT imaging, only one culture sent, or lost to follow up. Note, some individuals received treatment despite not meeting guidelines. In some cases, clinicians consider factors such as the patient's symptoms, medical history, and overall clinical presentation when making treatment decisions. White patients were more likely to receive treatment than patients of other racial groups ($p = 0.016$) (Table 1B). No Black patients evaluated for P-NTM in the clinic received treatment due to watchful waiting or patient had a concomitant disease that needed treatment first. White patients and English-speakers received treatment earlier

Table 1A Demographic and treatment related characteristics of patients with pulmonary NTM

	Total	Yes*	No**	*p*-value
	N = 63	*N* = 28	*N* = 35	
Race				0.016
White	33 (52%)	19 (68%)	14 (40%)	
African American	4 (6%)	0 (0%)	4 (11%)	
Asian	24 (38%)	7 (25%)	17 (49%)	
Unknown race	2 (3%)	2 (7%)	0 (0%)	
Ethnicity				0.45
Hispanic	2 (3%)	1 (4%)	1 (3%)	
Non-Hispanic	59 (94%)	25 (89%)	34 (97%)	
No Answer	2 (3%)	2 (7%)	0 (0%)	
Gender				0.87
Male	30 (48%)	13 (46%)	17 (49%)	
Female	33 (52%)	15 (54%)	18 (51%)	
Language				0.13
English	39 (62%)	21 (75%)	18 (51%)	
Spanish	1 (2%)	0 (0%)	1 (3%)	
Mandarin/Cantonese	23 (37%)	7 (25%)	16 (46%)	
Smoking Status				0.098
Active Smoker	3 (5%)	0 (0%)	3 (9%)	
Former Smoker	37 (59%)	20 (71%)	17 (49%)	
Never smoked	23 (37%)	8 (29%)	15 (43%)	
Reasons for not initiating treatment				
Watchful waiting			21 (60%)	
Provider deferred treatment			6 (17%)	
Concomitant disease treated first			1 (3%)	
Improvement in CT and symptoms			1 (3%)	
Declined treatment			1 (3%)	
Lost to follow up			5 (14%)	

Note: Data are presented as median (IQR) continuous measures and number (%) for categorical measures

*Received treatment **No treatment received

Table 1B Demographic and treatment related characteristics of patients who met ATS/IDSA criteria for NTM-PD treatment

	Total	Yes*	No**	*p*-value
	N = 36	*N* = 22	*N* = 14	
Race:				0.01
White	21 (58%)	15 (68%)	6 (43%)	
African American	2 (6%)	0 (0%)	2 (14%)	
Asian	11 (30%)	5 (22%)	6 (43%)	
Unknown	2 (6%)	2 (10%)	0 (0%)	
Language:				0.64
English	26 (72%)	17 (61%)	9 (64%)	
Spanish	0 (0%)	0 (0%)	0 (0%)	
Mandarin/Cantonese	10 (28%)	5 (18%)	5 (36%)	
Days between first evaluation visit with pulmonary to initiation of treatment		56 (14–309)		
Days between first collected sample to initiation of treatment		77 (36–366)		
Age at time of treatment		65 (60–69)		

Note: Data are presented as median (IQR) continuous measures and number (%) for categorical measures

*Received treatment **No treatment received

for P-NTM compared to Asian patients, Black patients, and non-English speakers (Fig. 1a-c). Cox proportional hazards models did not find statistically significant differences between time until treatment and race, language, and a combination variable when controlling for co-variates (Supplemental Tables). However, there was a non-significant association between non-White race and slower treatment initiation (HR = 0.28, $p < 0.1$) (Table 2a, b and c).

Although this is a small cohort, it is the only study to our knowledge that investigates health disparities in NTM treatment based on language. Race is a social construct; we are not suggesting that race is a marker of physiological or biological differences. Racial and ethnic disparities in pulmonary care have been reported. Previous work has identified racial differences in the incidence of NTM disease that also less likely stem from biological or genetic differences and more likely reflect geographic differences and different cultural and socioeconomic associations with smoking [13]. Furthermore, people who have limited English proficiency are less likely to be referred to pulmonology than people who speak English [14]. The root of health disparities is not in race, but in structural racism [15].

Discussion

The differences in outcomes by race and language reflect the disparate barriers patients from ethnically and racially minoritized communities face in the healthcare system. As the medication regimen has associated side-effects and the duration of treatment exceeds twelve months, initiation of P-NTM treatment often takes several visits and coordination of bronchoscopies, CT scans, and sputum samples. Most states mandate access to and the use of professional interpreters for patients with limited English proficiency, but compliance is suboptimal [16, 17]. Tufts Medical Center offers face-to-face, phone/video, and American Sign Language interpretation and translator services on all inpatient floors. In addition, navigating the healthcare system, including prior-authorizations and discussions with hospital staff is more challenging for patients who do not speak English [18].

There is no national system of evaluating the health equity of NTM care. The 2020 guidelines for the treatment of NTM comments on health equity as a consideration for the development of treatment guidelines [3]. However, there is no mention in the clinical practice guidelines about the importance of programs examining the processes for evaluation and treatment of NTM with a specific focus on the experiences of racially and ethnically minoritized populations or people who face barriers to communicating in English. Annals of American Thoracic Society published a 2017 article about respiratory health equity in the US, but NTM was not discussed [19]. With increased awareness of insidious impacts of structural racism leading to disparate health outcomes, the time is right for broadening the scope of previous health equity evaluations to include pulmonary diseases like NTM.

Limitations

We would like to acknowledge the limitations of this study, especially the small size of the cohort and the single center retrospective study design. We were unable to fully describe the nuances in each patient's case which could have led to delays in care, as the process of NTM evaluation, and treatment is heterogeneous. Associations between variables may not have been significant

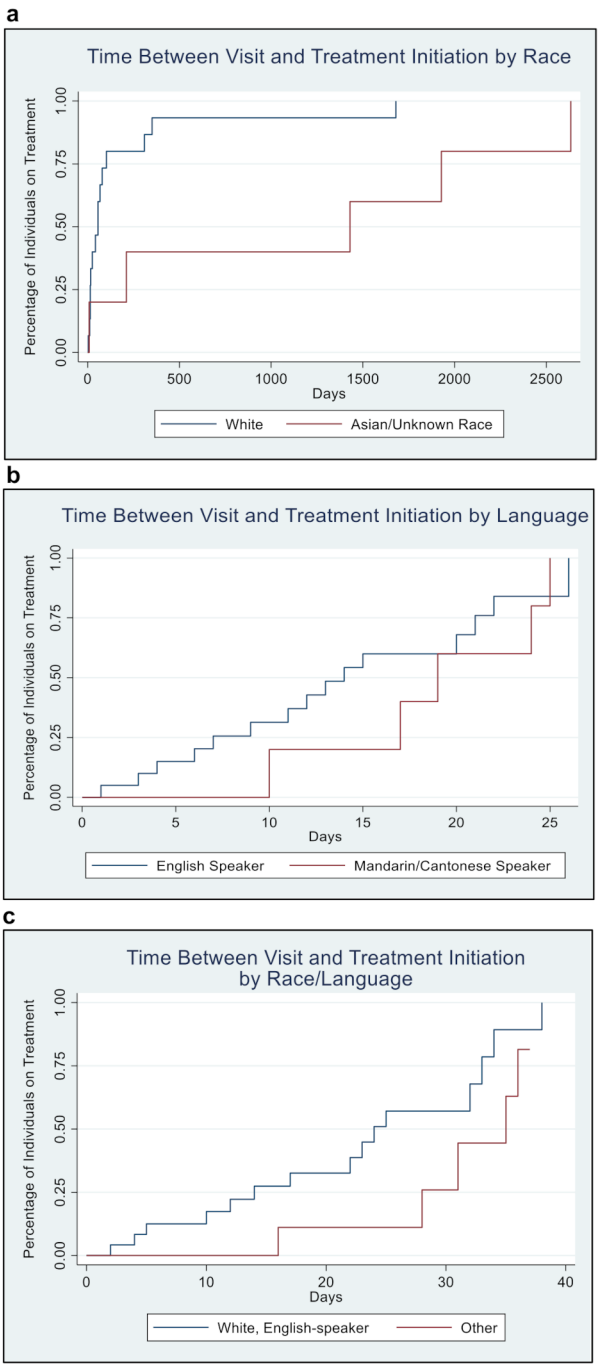

Fig. 1 **(a)** Compares treatment initiation days between first evaluation and White vs. Asian/unknown race patients. **(b)** Compares days between first evaluation and English vs. Mandarin/Cantonese speakers. **(c)** Compares days between white people who speak English to people who are either Black/Asian people (speak all languages) or people who languages other than English

as a result of small sample size, instead of the absence of a relationship between variables. Additionally, certain NTM species are advised to undergo watchful waiting until susceptibilities are known rather than start empirical treatment, which may affect the treatment timeline. We acknowledge the absence of disease severity in our analysis as a limitation. This study focused on identifying individuals who met and did not meet the ATS criteria for treatment which highlighted the racial disparities among the patients. There were only two African Americans in our study sample, there was not enough representation to allow us to draw any relevant conclusions. Despite these limitations, this is the first evaluation of the NTM care cascade with deliberate focus on health equity. We hope our study prompts investigations in larger hospital systems to evaluate the cascade of care for NTM treatment.

Table 2A Cox PH models for time until initiation of treatment (language)

	(1)
	Since First Visit
English	Ref
Other	0.46
	(0.29)
Male	Ref
Female	0.71
	(0.36)
Age at time of treatment	1.01
	(0.02)
Former Smoker	Ref
Never smoked	1.27
	(0.73)
Observations	20

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$

Table 2B Cox PH Models for time until initiation of treatment (race)

	(1)
	Since First Visit
English	Ref
Other	0.46
	(0.29)
Male	Ref
Female	0.71
	(0.36)
Age at time of treatment	1.01
	(0.02)
Former Smoker	Ref
Never smoked	1.27
	(0.73)
Observations	20

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$

Table 2C Cox PH models for time until initiation of treatment (race/language)

	(1)
	Since First Visit
White, English-Speaker	1.00
	(.)
Other	0.46
	(0.29)
Male	1.00
	(.)
Female	0.71
	(0.36)
Age at time of treatment	1.01
	(0.02)
Former Smoker	Ref
Never smoked	1.27
	(0.73)
Observations	20

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$

Author contributions

OA and SA analyzed the data and wrote the main text of the manuscript. LW created the figure, tables, and contributed to the methods section. MA, TV, and AGW reviewed data analysis and main manuscript text. All authors reviewed and approved the final manuscript.

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Data availability

The data collected and analyzed during the current study are not publicly available but are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval and consent waived by the Tufts Medical Center Institutional Review Board. The study was considered exempt as there was no direct patient involvement. The data was not anonymized before use. The study was performed in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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