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SYSTEMATIC REVIEW

Bronchiectasis Among Adult First Nations Indigenous People - A Scoping Review

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Abstract: ***Background*:** Among First Nations adults living in OECD nations bronchiectasis appears at a particularly heightened rate, due to high childhood incidence, and high prevalence of associated risk factors. To date, however, the extent of the bronchiectasis disease burden among adult First Nations people has not been formally assessed.

***Methods*:** Two databases (Pubmed and Scopus) were reviewed for English literature published from January 2000 to March 2022 pertaining to bronchiectasis among adult First Nations indigenous people residing in OECD nations. All studies that reported on prevalence, incidence, or outcomes (*i.e.*, hospitalisations, mortality) directly associated with bronchiectasis were included. Studies that did not provide indigenous specific, bronchiectasis specific data, or were paediatric studies were excluded. Participant numbers and demographics, bronchiectasis prevalence or incidence, respiratory comorbidities and outcomes including mortality, hospitalisations or univariate or multivariate modelling to describe the risk of bronchiectasis and outcomes were tabulated.

***Results*:** Twenty-five studies were included, drawn from Australia (n=16), New Zealand (n=7) and North America (n=1), with most studies (n=21) reporting on referred populations. A median number of participants was 241 (range 31 to 1765) (excluding nationwide hospitalisation datasets (n=3)) with a mean age of 48.4 years, and 55% females. The hospital admission rate for bronchiectasis was 3.5x to 5x higher among Māori compared to non-Māori New Zealanders, and 5x higher in indigenous compared to non-indigenous Australians. Mortality ranged from 10 to 56% on follow-up.

***Conclusion*:** Bronchiectasis disease burden is higher among adult First Nations indigenous populations, presenting earlier with high mortality and hospitalisation rate. Further studies are required to address this inequality.

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1. INTRODUCTION

Chronic respiratory disorders are highly prevalent among First Nations Indigenous people (henceforth respectfully represented as First Nations/Indigenous people/population/patients) worldwide with up to one in three self-reporting some form of chronic respiratory disease, contributing significantly to the disparities in health compared to non-Indigenous people [1, 2]. Bronchiectasis is a chronic respiratory condition that is characterised by recurrent respiratory infection and bronchial airway inflammation leading to irreversible dilatation of bronchi/bronchioles [3]. Pathogenesis of bronchiectasis is complex and multifactorial, however persistent and recurrent lower respiratory tract infections are known to predispose to this condition [4, 5]. The clinical manifestation of bronchiectasis includes chronic cough and mucous production while a definitive diagnosis of bronchiectasis is established *via* a chest high-resolution computed tomography scan (HRCT) [6, 7]. The high incidence of lower respiratory tract infections (LRTI's) in infancy/childhood among indigenous people is implicated in the development of bronchiectasis and its manifestations in adult life [8-12]. Moreover, the social determinants of health such as household overcrowding, economic disadvantage, indoor air pollution and geographical isolation [13-15], which are commonly

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experienced by indigenous populations further account for the marked disparities noted to exist between indigenous and non-indigenous peoples in the prevalence of bronchiectasis [16, 17]. Previous studies have demonstrated that among various paediatric indigenous groups such as the Alaskan Natives, the Pacific Islander and New Zealander (NZ) Māori communities, there is a significantly higher prevalence of bronchiectasis than their non-indigenous counterparts [18-21]. In the Australian context, the incidence of bronchiectasis in the central Australian indigenous paediatric population is reported to be significantly higher than the non-indigenous population [10]. However, paediatric studies can tell only half of the story, as adult-onset bronchiectasis is also common for the same aforementioned reasons, in conjunction with the development of other chronic respiratory disorders (*i.e*., chronic obstructive pulmonary disease (COPD)) and the use of tobacco or other inhaled drugs. Yet literature pertaining to bronchiectasis in the adult indigenous population is sparse. Hence, this review endeavours to outline the current literature evidence on bronchiectasis among adult indigenous people living in the English-speaking Organisation for Economic Co-operation and Development (OECD) countries.

2. METHODS

We assessed peer-reviewed English language literature published from January 2000 to March 2022 pertaining to bronchiectasis among First Nations indigenous people residing in the OECD nations. We searched Pubmed and Scopus utilising the following search terms; Pubmed search term: Bronchiectasis AND (first nations OR Native OR indigenous OR Aboriginal OR Maori OR Inuit OR Sami) AND Adult): Scopus search term: TITLE-ABS-KEY (bronchiectasis AND ((first AND nations) OR native OR indigenous OR aboriginal OR maori OR inuit OR sami) AND adult) with the most recent search conducted until March 2022.

2.1. Inclusion and Exclusion Criteria

Studies were included if they reported specifically on adult indigenous prevalence, incidence or outcomes (hospitalisations or mortality) directly resulting from bronchiectasis. References from studies that had their full text reviewed but did not meet inclusion criteria were searched in order to identify any missed literature, with resultant abstracts reviewed utilising the same inclusion criteria above. Studies were excluded if they did not report on the adult prevalence, incidence or outcomes of bronchiectasis, or did not contain delineated data for indigenous participants.

2.2. Screening and Data Collation

Records were screened and reviewed by two authors independently (TH and SH) with final inclusions reviewed by the third author (SH). Data from included studies were extracted independently by TH and SH utilising Table **1** as a guideline and collated. Data collected included: Location of the study, the population from which recruitment occurred, sex, age and smoking status, prevalence or incidence of bronchiectasis in the cohort, the proportion of indigenous participants if the study included indigenous and non-indigenous, lung function values by spirometry, respiratory comorbidities, sputum cultures, hospitalisations and mortality. In cases of missing data, no further attempts were made to seek this, and affected areas were marked clearly in Table **1**. Statistics were presented in their original form (*i.e*. mean and standard error, or median and interquartile range), although percentage values of bronchiectasis frequency or proportion of females were calculated from the indigenous cohort where possible in studies which included indigenous and non-indigenous participants, and labelled thus in Table **1**. In total 25 studies were identified and included of which 1 (4%) was based in Alaska (USA), 17 (68%) were based in Australia, 6 (24%) in New Zealand and 1 (4%) covered both Australia and New Zealand (Fig. **1** and Table **1**). Ethical approval was not required for this study, as the information included in this review consisted of previously published studies/reports.

3. RESULTS

3.1. Bronchiectasis among Alaskan and Mainland Native Americans

No studies could be identified that reported on the adult prevalence or incidence of bronchiectasis among the Alaskan indigenous population, though it has been reported that 45% of Alaska's bronchiectasis cases occur in the Yukon Kuskokwin delta, where the majority of the population is Alaskan indigenous [17-19, 44]. However, a single study was identified that followed a cohort of 31 Alaskan indigenous children diagnosed with bronchiectasis into adulthood [11]. The majority (66%) had a comorbid concomitant other respiratory condition diagnosed with 13% reporting concurrent chronic obstructive pulmonary disease (COPD) and 10% Cor Pulmonale. Tobacco use was prevalent (83%), as were respiratory symptoms (54%) contributing to respiratory impairment (13%). Bronchiectasis in this cohort was diagnosed at a median of 4.5 years of age, and the majority (66%) demonstrated the persistence of respiratory symptoms into adulthood [11].

3.2. Bronchiectasis in Canadian First Nations Indigenous People

Similar to the American indigenous people, there is a dearth of literature regarding bronchiectasis among Canadian First Nations people. No studies were identified that reported on adult Canadian First Nations patients, and only a single study reported on Canadian First Nations children [45].

3.3. Bronchiectasis in Scandinavian and Northern European First Nations People

Similar to the North American indigenous people, there is a dearth of literature regarding bronchiectasis among Northern European indigenous people. No studies were identified that reported the bronchiectasis burden of adult Sami people.

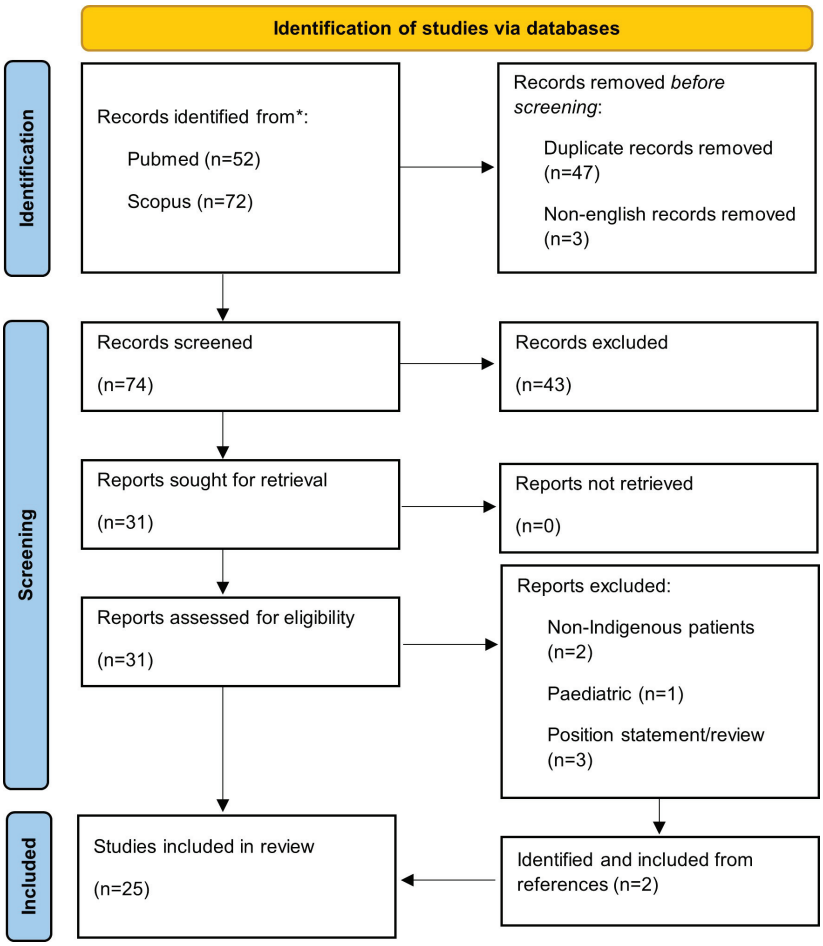

Fig. (1). PRISMA flow-chart of included studies.

Table 1. Data collated from included studies relevant to bronchiectasis among first nations adults.

References	Location	Recruitment	Participant Details	Lung Function	Respiratory Comorbidities	Sputum Cultures	Excerpt of Major Outcomes
[11]	Alaskan Yukon Kuskokwin Delta	Follow-up of YK Delta adults with childhood bronchiectasis diagnosis (n=31)	Bronchiectasis: 100% Age median 30 (range 20-40) Sex not reported. Ever smoker 83% (n=24)	NR	Asthma 66% (n=19) COPD 13% (n=4) Cor pulmonale 10% (n=3)	NR	Mortality (all-cause) 13% (n=4), of which 50% (n=2) respiratory related. Severe pulmonary impairment in 13% (n=4), Symptomatic impairment in 35% (n=11), Rarely symptomatic in 19% (n=6), Asymptomatic in 23% (n=7).
[21]	Auckland	Retrospective review of adult outpatients at Auckland District Health Board with a diagnosis of Bronchi-ectasis (n=437)	Bronchiectasis 100% Māori 14% Pacific Islander 23% Age, sex and smoking status not reported for Māori or PI patients separately. Total co-hort: Age median 65 (range 17-94), Female 66% (n=288) Ever smoker 36% (n=158)	Māori: FEV_1 (%) 58.9 (19)* FVC (%) 70.6 (18)* Pacific Islander: FEV_1 (%) 52 (20)* FVC (%) 65.4 (19)*	NR	Sputum cultures were not reported by ethnicity, though authors report no significant difference by ethnicity. A total of 92% (n=400) of patients had sputum available. *P. Aeruginosa* 20% *S. Aureus* 6%	Presence of P. Aeruginosa associated with reduced lung function values FEV_1 mean 54% *vs*. 63% FVC mean 66% *vs*. 72% 74% (n=322) of patients had multiple lung function measures to assess decline over time. Changes not reported by ethnicity. Change in FEV_1 (ml/year) median 0.03 (range -94, 29.4) Change in FVC (ml/year) median 13.7 (range -217.9, 37.9) Change in FEV_1/FVC (%/year) median -0.006 (range -0.336, 0.192)

(Table 1) contd...

References	Location	Recruitment	Participant Details	Lung Function	Respiratory Comorbidities	Sputum Cultures	Excerpt of Major Outcomes
[22]	New Zealand	Literature review and review of hospitalisations and cause of death.	NR	NR	NR	NR	Māori Bronchiectasis hospitalisations rate per 100,000 by age group, 2003-2005. 15-24: 17.1 (13.1, 22.3)[b] 25-44: 28.4 (24.1, 33.5)[b] 45-64: 102.4 (90.6, 115.6)[b] 65+: 187.8 (157, 224.7)[b] Total (all ages) 41.7 (38.8, 44.8)[b] Rate ratio *vs*. non-Māori 15-24: 4.76 (2.70, 8.38)[b] 25-44: 4.89 (3.63, 6.60)[b] 45-64: 5.91 (4.91, 7.13)[b] 65+: 3.47 (2.83, 4.25)[b] Total (all ages) 3.6 (3.19, 4.08)[b] Māori Bronchiectasis mortality rate per 100,000 by age group, 2000-2004. 15-24: 0.2 (0, 1.3)[b] 25-44: 1.6 (1, 2.8)[b] 45-64: 4.6 (3, 7.3)[b] 65+: 28 (19.5, 40.2)[b] Total (all ages) 2.1 (1.6, 2.7)[b] Rate ratio *vs*. non-Māori 15-24: NR 25-44: 11.57 (4.67, 28.66)[b] 45-64: 7.17 (3.97, 12.95)[b] 65+: 5.63 (3.76, 8.44)[b] Total (all ages) 6.7 (4.88, 9.21)[b]
[23]	Auckland	Review of hospital records of patients aged >15 with a hospitalisation for primary bronchiectasis exacerbation, and had confirmation of bronchiectasis (n=152)	Bronchiectasis 100% Māori 27% (n=41) Pacific Islander 43% (n=66) Age, sex and smoking status not reported for Māori or PI patients separately. Total cohort: Age 61 (53, 74)^ Female 59% (n=90) Ever smoker 47% (n=72) Current 14% (n=21) Former 39% (n=51)	NR	Comorbidities not reported by ethnicity. COPD 25% Asthma 20% Rhinosinusitis 19% GORD 8%	Sputum not reported by ethnicity. *H. Influenzae* 23% (n=34) *P. Aeruginosa* 14% (n=21) *S. Pneumoniae* 3% (n=4) Other 22% (n=33)	All-cause mortality odds in a fully adjusted model (Odds ratio (95% CI)) Male sex 1.5 (0.6, 3.8) Age (10 years) 1.4 (1, 2) Ethnicity (reference European/other) Māori 0.6 (0.2, 1.9) Pacific Islander 0.4 (0.1, 1.2) Deprivation index (8-10 *vs*. 1-7) 11 (2, 61) Long term oxygen user 5.9 (1.7, 2.1) Readmission within 12 months 1.5 (0.6, 3.7)
24	New Zealand	Nationwide dataset of publicly funded hospital admissions with principal clinical diagnosis of Bronchiectasis, and length of stay <90 days (n=5459 admissions)	Bronchiectasis 100% Māori 26% (n=1448) Pacific Islander 20% (n=1095) Age, sex and smoking status not reported for Māori or PI patients separately. Age overview provided in figures. Overall cohort, females 62% (n=3402)	NR	NR	NR	Average length of hospital stay Māori 5.78 (5.51, 6.05)[b] Pacific Islander 5.60 (5.26, 5.94)[b] Age-adjusted admission rate *vs*. European/other ethnicity Māori 54.3 (rate ratio 4.93) Pacific Islander 100 (rate ratio 9.09)

(Table 1) contd...

References	Location	Recruitment	Participant Details	Lung Function	Respiratory Comorbidities	Sputum Cultures	Excerpt of Major Outcomes
[25]	New Zealand	Review of data from New Zealand Health Survey, pharmaceutical prescriptions, hospitalisations and mortality datasets.	NA	NA	NA	NA	Prevalence of Bronchiectasis in 2012 for the whole population was 99.6/100,000. Māori prevalence 128.8/100,000 Pacific Islander prevalence is 228.8/100,000. Hospitalisation rate in 2013 (age adjusted and with age grouping) and rate ratio *vs*. non- Māori/Pacific Islander/Asian Māori total 66.4 (57.6, 75.2)[b] (RR 3.67 (3.41, 3.96)[b]) 15-29: 30.5 (23, 38.1)[b] 30-64: 38.6 (33.1, 44.2)[b] 65+: 236.1 (142.6, 329.7)[b] Pacific Islander total 115.4 (95.7, 135.1)[b] (RR 6.38 (5.82, 6.99)[b]) 15-29: 23.5 (11.1, 35.9)[b] 30-64: 64.1 (48.4, 79.8)[b] 65+: 430.2 (138.7, 721.7)[b]
[26]	New Zealand	Review of adult patients (>16 years) enrolled to the New Zealand CVID (Common variable immunodeficiency disorders) study (n=107)	Bronchiectasis 47% (n=50) Māori 30% (n=15) Age, sex and smoking status not reported by ethnicity. Bronchiectasis cohort: Age 52.7 (14.8)* Female 64% (n=32)	NR	NR	NR	Higher proportion of Māori in the bronchiectasis group (30% *vs*. 7%). Bronchiectasis group had higher mortality at a younger age. 20% (n=10) *vs*. 5.3% (n=3) and 50.4 (17.4)* *vs*. 66.3 (5.5)*
[27]	Central AU, Victoria AU, Auckland NZ	Adult (≥15) patients from three hospitals with a discharge diagnosis of Bronchiectasis between 2004-2008 were retrospectively followed from 2009-2013 (n=406)	Bronchiectasis 100% Indigenous Australian 21% (n=85) Māori 18% (n=72) Pacific Islander 21% (n=85) Māori and Pacific Islanders (MPI) combined in analysis. Indigenous Australian: Age 43.7 (12.3)* Female 42% Ever smoked 68% MPI: Age 58.2 (15.2)* Female 52% Ever smoked 62%	54% Indigenous Australians had spirometry available FEV_1 (%) 30 (20-37)^ FVC (%) 41 (32-48)^ FEV_1/FVC 60 (45-71)^ 54% MPI had spirometry available FEV_1 (%) 42 (31-56)^ FVC (%) 57 (49-69)^ FEV_1/FVC 62 (54-70)^	NR	89% Indigenous Australian had sputum available. Any of *S. Pneumonia, H. influenzae* or M. Catarrhalis present and no other - 36% *P. aeruginosa* 33% Methicillin susceptible *S. Aureus* 9% Non-multi resistant MRSA 13% MRSA 1% Klebsiella species 18% *A. Fumigatus* 4% 85% had mycobacteria available MAC 4.2% Non MAC 15% 66% IA had sputum available. Any of *S. Pneumonia, H. influenzae* or M. Catarrhalis present and no other - 49% *P. aeruginosa* 28% Methicillin susceptible *S. Aureus* 3% non-multi resistant MRSA 0% MRSA 1% Klebsiella species 3% *A. Fumigatus* 10% 30% had mycobacteria available MAC 0% Non MAC 0%	FACED score Indigenous Australian Mild - 75% Moderate - 25% Severe - 0% FACED score MPI Mild - 57% Moderate - 41% Severe - 3% Mortality (5 year) Indigenous Australian All cause 42% (n=36) Age of death 50.1 (41.8, 54.6)^ Respiratory 33% (n=28) Age of death 48.8 (36.4, 52.9)^ Mortality (5 year) MPI All cause 34% (n=53) Age of death 70.8 (60.4, 76.6)^ Respiratory 24% (n=37) Age of death 69.1 (58.3, 75.4)^ Respiratory-related mortality in Indigenous *vs* non-Indigenous Australians (unadjusted) HR 2.3 (95% CI 1.3, 3.9) Any hospital admission over 5 years follow up Indigenous Australians 80% MPI 63% Hospital admissions over 5 years follow up (number/person year) Indigenous Australians 2.9 (2.7, 3.1)[b] MPI 0.7 (0.6, 0.8)[b] Length of stay (days/person year) Indigenous Australians 16.9 (16.4, 17.3)[b] MPI 4.1 (4.0, 4.3)[b]

(Table 1) contd...

References	Location	Recruitment	Participant Details	Lung Function	Respiratory Comorbidities	Sputum Cultures	Excerpt of Major Outcomes
[28]	TEHS	Retrospective review of remote Indigenous Australian patients who presented to a respiratory outreach clinic (2012-2016) (n=767) and had a clinical diagnosis of COPD (n=380) and had either chest CT or Xray (n=258).	Bronchiectasis 32% (n=82) Bronchiectasis patients: Age 56.63 (12.62)* Female 43% (n=35) Ever smoker 84% (n=66) Current 60% (n=47) Former 24% (n=19)	45% (n=35) had spirometry recorded FEV_1 (%) 39.03 (16.71)* FVC (%) 53.92 (16.63)* FEV_1/FVC 0.56 (0.12)*	Asthma 33% (n=27) OSA 7% (n=6) PHTN 5% (n=4) Lung cancer 4% (n=3) T2RF 1% (n=1)	49% (n=40) patients had cultures available. *P. Aeruginosa* 23% (n=9) *H. Influenzae* 10% (n=4) *S. Aureus* 0% (n=0) *S. Pneumoniae* 3% (n=1) *Aspergillus* 5% (n=2) NTM 3% (n=1) Nil 10% (n=4)	Mortality (all cause) 10% (n=8) Hospitalisations/year median 2 (IQR 1-3)
[29]	TEHS	Retrospective review of remote Indigenous Australian patients who presented to a respiratory outreach clinic (2012-2016) (n=767) and had a clinical diagnosis of COPD (n=380)	Bronchiectasis 50% (n=187) Age, sex and smoking status were not reported for BE patients separately. Total cohort: Age mean 57.26 (13.21)* Female 56% (n=212) Ever smoker 93% (n=344) Current 67% (n=246) Former 27% (n=98)	Not reported for Bronchiectasis patients separately.	Not reported for Bronchiectasis patients separately.	Not reported for Bronchiectasis patients separately.	Estimated prevalence of bronchiectasis within 12 remote communities ranged from 0.2% to 2.4%
[30]	TEHS	Retrospective review of patients with the previous diagnosis of bronchiectasis presenting to respiratory health service (2012-2017), or Royal Darwin Hospital (2016-2017) (n=388), of whom 66% (n=258) were Indigenous	Bronchiectasis 100% Age median 54 (44-64)^ Female 60% (n=153) Ever smoker 74% (n=189) Current 52% (n=133) Former 22% (n=56)	FEV_1 (%) 33 (26-50)^ FVC (%) 49 (39-63)^ FEV_1/FVC 0.59 (0.47-0.72)^	COPD 65% (n=167) Asthma 17% (n=44) Haemoptysis 16% (n=42) Cor Pulmonale 12% (n=31) NTM 7% (n=19) OSA 9% (n=22) T2RF 6% (n=15) Pulmonary embolism 3% (n=8) Lung cancer 1% (n=3)	*H. Influenzae* 47% (n=122) *P. aeruginosa* 22% (n=56) *S. Pneumoniae* 26% (n=67) Candida 53 (21%) *M. Catarrhalis* 17% (n=44) Aspergillus 7% (n=18) *S. Aureus* 9% (n=22) Stenotrophomonas 5% (n=14) *B. Pseudomallei* 5% (n=13)	Mortality (all-cause) 4% (n=11) Age of death median 60 years (IQR 42-67) FACED score: Mild 51% (n=28) Moderate 42% (n=23) Severe 7% (n=4) Number of patients with an exacerbation in the past year was 29% (n=74). A number of patients hospitalised in the past year 36% (n=93). Hospitalisations/year median 1 (IQR 1-2)
[31]	TEHS	Retrospective review of database of Indigenous patients who presented to the respiratory clinic (2012-2020), and had a chest CT performed (n=402)	Bronchiectasis 23% (n=91) Age, sex and smoking status not reported for bronchiectasis patients separately. Total cohort: Age mean 53.5 (45.7, 61.9)[b] Female 59% (n=237) Ever smoker 87% (n=304/351) Current 48% (n=170) Former 38% (n=134)	NR	COAD 55% (n=47) (of patients with multiple CT abnormalities)	NR	Multivariate logistic regression model reporting ORs (95% CI) for the presence of bronchiectasis. Male sex 1.77 (0.99, 3.14) Age (per year) 0.99 (0.96, 1.01) BMI category (normal BMI reference) Underweight 1.21 (0.54, 2.68) Overweight 0.55 (0.25, 1.2) Obese 0.48 (0.22, 1.03) Smoking category (non-smoker reference) Former smoker 1.66 (0.63, 4.4) Current smoker 0.86 (0.33, 2.25) Geography (Outer Regional reference) Very remote residence 2.31 (1.12, 4.76)

(Table 1) contd...

References	Location	Recruitment	Participant Details	Lung Function	Respiratory Comorbidities	Sputum Cultures	Excerpt of Major Outcomes
[32]	TEHS	Retrospective review of regional and remote patients presenting to the respiratory clinic (n=444) of whom 79% (n=352) were Indigenous.	Bronchiectasis 29% (n=102) Age, sex and smoking status not reported for bronchiectasis patients separately. Age mean 53.8 (13.7)* Female 58% (n=203) Ever smoker 86% (n=299/346) Current 53% (n=185) Former 32% (n=114)	NR	Not reported for Bronchiectasis patients separately.	NR	Univariate logistic regression model reporting HRs (95% CI) for the presence of bronchiectasis. Indigenous status 2.53 (1.05, 6.10) Male sex 0.76 (0.47, 1.22) Age (years) 1.00 (0.98, 1.01) Smoking category (non-smoker reference) Former smoker 1.56 (0.75, 3.26) Current smoker 0.72 (0.35, 1.48)
[33]	TEHS	Retrospective review of the database of Indigenous patients who presented to the respiratory clinic, and had a chest CT showing either no abnormality, COPD and or Bronchiectasis and acceptable spirometry (n=212)	Bronchiectasis 19% (n=75) (53% had Bronchiectasis alone, 47% had Bronchiectasis +COPD) Bronchiectasis alone cohort: Age 53.1 (49.2, 57.1)[b] Female 58% (n=23) Ever smoker 88% (n=35) Current smoker 40% (n=16) Former smoker 48% (n=19)	Bronchiectasis alone cohort: FEV_1 (%) 48.08 (42.47, 53.68)[b] FVC (%) 54.25 (49.69, 58.81)[b] FEV_1/FVC 0.69 (0.65, 0.74)[b]	COPD 47% (n=35)	NR	Compared to patients with no CT abnormality, after adjusting for age, sex, BMI and smoking status, Bronchiectasis alone patients had significantly reduced spirometry values. FEV_1 (%) -12.1 (-19.45, -4.74)[b] FVC (%) -10.6 (-16.92, -4.27)[b] FEV_1/FVC -0.05 (-0.1, 0.01)[b]
[34]	TEHS	Retrospective review of database of Indigenous patients who presented to respiratory clinic, and had a chest CT performed and at least 2 acceptable spirometries (n=115)	Bronchiectasis 22% (n=25) Age, sex and smoking status not reported for bronchiectasis patients separately. Total cohort: Age (first LFT) 50.4 (48.3, 52.5)[b] Female 50% (n=58) Ever smoker 90% (n=103) Current smoker 54% (n=62) Former smoker 36% (n=41)	Not reported for Bronchiectasis patients separately.	COPD 52% (n=13)	NR	All outcomes combined into Chronic Airway Disease, thus bronchiectasis is not reported separately.
[35]	Queensland	Retrospective cohort study of adults referred to Indigenous respiratory outreach care (IROC) (n=1765)	Indigenous 63% (n=1117) Bronchiectasis 4% (n=39). Age, sex and smoking status were not reported for Bronchiectasis patients separately. Indigenous cohort: Age 55 (45-64)^ Female 62% (n=689) Ever smoker 77% (n=804/1044) Current 46% (n=477) Former 31% (n=327)	Not reported for Bronchiectasis patients separately.	Not reported for Bronchiectasis patients separately.	NR	Patients with bronchiectasis (including non-Indigenous for n=70) had reduced Z-scores for FEV_1, FVC and FEV_1/FVC but not DLCO. FEV_1: -0.44 (-0.76, -0.12)[b] FVC: -0.44 (-0.77, -0.12)[b] FEV_1/FVC: -0.32 (-0.68, 0.03)[b] DLCO: -0.1 (-0.53, 0.33)[b] Bronchiectasis patients with multiple visits in 12 months showed no significant changes in Z-scores over time (reported as ml change / year) FEV_1: 0.13 (-0.08, 0.35)[b] FVC: 0.35 (-0.01, 0.72)[b] FEV_1/FVC: 0.16 (-0.12, 0.44)[b] DLCO: 0.22 (-0.36, 0.79)[b]

(Table 1) contd...

References	Location	Recruitment	Participant Details	Lung Function	Respiratory Comorbidities	Sputum Cultures	Excerpt of Major Outcomes
[36]	Kimberley	Retrospective review of adult (>=15 years) patients with a history of bronchiectasis presenting to hospital with respiratory illness (n=32)	Bronchiectasis 100% Indigenous 72% (n=23) Age, sex and smoking status not reported for Indigenous patients separately. Total cohort: Age 49.9 (43.3, 56.5)[b] Female 42% (n=13) Ever smoker 82% (n=18/22)	16% (n=5) of the whole cohort had spirometry recorded - only FEV_1. FEV_1 (%) 49 (36, 62)^	NR	78% (n=25) of the whole cohort had sputum cultures. *H. influenzae* 56% (n=14) *P. aeruginosa* 40% (n=10) *S. Pneumoniae* 16% (n=4)	5-year mortality in Indigenous patients 26% (6/23). Age at death 33 (26.75-62.25)^
[16]	Central Australia	Retrospective review of adult patients admitted to Alice Springs Hospital with a discharge diagnosis of bronchiectasis (n=61)	Bronchiectasis 100% Indigenous 97% (n=59) Age, sex and smoking status were not reported for Indigenous patients separately. Age 42 (15)* Female 48% (n=29) Ever smoker 61% (n=37) Current 44% (n=27) Former 16% (n=19)	21% (n=13) of the whole cohort had spirometry recorded. FEV_1 (%) 36 (11)* FVC (%) 47 (11.7)*	COPD 5% (n=3, of which 1 was Indigenous)	77% (n=47) of the whole cohort had sputum cultures. *H. Influenzae* 81% (n=38) *p. aeruginosa* 26% (n=12) *S. Pneumoniae* 19% (n=9) *K. Pneumoniae* 9% (n=4) *S. Aureus* 9% (n=4) *K. Ozaenae* 6% (n=3) *M. Catarrhalis* 6% (n=3) E. Coli 4% (n=2) *Stenotrophomonas* 2% (n=1) *Maltophilia* 2% (n=1) *M. Morganii* 2% (n=1) MAC 2% (n=1)	Mortality (all cause) during study period 13% (n=8). Respiratory mortality during study period 12% (n=7).
[37]	Central Australia	Retrospective review of adult (>15) Indigenous patients with positive HTLV-1 infection (n=1451)	Age, sex and smoking status were not reported for Bronchiectasis patients separately, but split by HTLV-1 status. HTLV-1 positive (n=507): Bronchiectasis 17% (n=81) Age 47.1 (38.7, 57.4)^ Female 50% (n=266) HTLV-1 Negative (n=944): Bronchiectasis 7% (n=61) Age 43.5 (32.9, 55.3)^ Female 54% (n=537)	NR	NR	NR	Mortality (all cause) 23% (n=338) Age at death (HTLV-1 positive) 56.9 (46.2, 63.9)^ Age at death (HTLV-1 negative) 53.2 (44.4, 62.5)^ In the multivariate model, Bronchiectasis is associated with mortality outcome. HR 2.07 (95% CI 1.45, 2.98)
[38]	Central Australia	Retrospective review of adult Indigenous patients (≥15 years) admitted to Alice Springs Hospital with a discharge diagnosis of bronchiectasis (n=122) and serostatus of HTLV-1 known (n=89)	Bronchiectasis 100% Age at Bronchiectasis diagnosis by HTLV-1 serostatus: Seropositive 42 (35-56)^ Seronegative 51 (48-62)^ Total cohort: Female 46% (n=41) Ever smoker 44% (n=39)	22 seropositive and 14 seronegative patients had spirometry recorded. Seropositive: FEV_1 (L) 1 (0.83-1.46)^ FVC (L) 1.68 (1.12, 2.03)^ Seronegative: FEV_1 (L) 1.23 (0.9-1.33)^ FVC (L) 1.59 (1.36-2.10)^	Asthma 28% (n=25) COPD 37% (n=33) Chronic Resp. Failure 27% (n=24) Haemoptysis 18% (n=16) Cor Pulmonale 12% (n=11)	Out of the patients with positive sputum cultures: H. influenzae 49% S. pneumoniae 22% P. aeruginosa 12% Enteric organisms 6% S. aureus 5%	Mortality (all cause) 24% (n=21) Mortality (bronchiectasis related) 17% (n=15) Age at death: HTLV-1 Seropositive 44.5 (2.9)[a] HTLV-1 Seronegative 41.2 (8.7)[a]

(Table 1) contd...

References	Location	Recruitment	Participant Details	Lung Function	Respiratory Comorbidities	Sputum Cultures	Excerpt of Major Outcomes
[39]	Central Australia	Adult (≥15) Indigenous patients admitted to Alice Springs hospital with an infective exacerbation of bronchiectasis were prospectively enrolled (n=36 cases) and matched to non-Bronchiectasis patients (n=36 controls)	Bronchiectasis 50% Bronchiectasis cohort: Age 43.5 (11.9)[a] Female 31% (n=11) Ever smoker 39% (n=14)	NR	Asthma 17% (n=6) COPD 11% (n=4) Respiratory failure 39% (n=14)	*H. Influenzae* cultures 1 (0-3)^	Mortality (all cause) 56% (n=20) Cause of death identifiable in 85% (n=17) of which 94% (n=16) had a respiratory cause. Age at death 48.4 (12)[a] The multivariate risk ratio for bronchiectasis on mortality: RR 2.71 (1.36-5.39)[b]
[40]	Central Australia	Retrospective review of adult (>15) Indigenous patients with a discharge diagnosis of bronchiectasis (n=154) alongside control patients with no evidence of lower respiratory tract infection (n=686). Bronchiectasis was confirmed *via* HRCT scan in 68% (n=104).	Age, sex and smoking status were not reported for Bronchiectasis patients separately, but split by HTLV-1 status. HTLV-1 absent (n=533): Bronchiectasis 8% (n=45) Age 46.2 (15.3)* Female 43% (n=228) HTLV-1 low load (n=212): Bronchiectasis 17% (n=35) Age 51.6 (13.7)* Female 44% (n=93) HTLV-1 High load (n=95): Bronchiectasis 25% (n=24) Age 51.1 (13.8)* Female 39% (n=37)	NR	Not reported for Bronchiectasis patients separately.	NR	Multivariate logistic regression model reporting ORs (95% CI) for the presence of bronchiectasis among patients positive for HTLV-1. Proviral load (low load reference) High proviral load 2.2 (1.2, 3.7) Age (years) 1.0 (0.98, 1.01) Male sex 1.4 (0.8, 2.6) Residence (urban centre reference) Remote 1.1 (0.5, 2.6) Town camp 1.7 (0.6, 4.4) Ever smoked 0.8 (0.4, 1.5) Harmful alcohol intake 1.6 (0.9, 2.9) Bronchiectasis related mortality 28% (n=29). Age of death 49.5 (15.3)*. In the multivariate model, Bronchiectasis is associated with mortality outcome. HR 3.53 (95% CI 2.29, 5.45) HTLV-1 load associated with bronchiectasis mortality (unadjusted HRs) compared to patients with no HTLV-1 High proviral load 4.73 (2.05, 10.9)[b] Low proviral load 1.44 (1.02, 6.49)[b]
[41]	Central Australia	Prospective enrolment of Indigenous adult (≥18) patients admitted to Alice Springs Hospital with a diagnosis of bronchiectasis and confirmed by HRCT (n=80), matched (1:2) with patients presenting to surgical or medical wards with no LRTI (n=160).	Bronchiectasis 33% (n=80) Bronchiectasis cases: Age at diagnosis - 16% (n=13) diagnosed in childhood (Age 5.3 (4.1)*) 84% (n=67) in adulthood (Age 43.1 (15.4)*) Female 40% (n=32) Ever smoker 64% (n=51)	48% (n=38) had spirometry available, reported by HTLV-1 serostatus. Seropositive (n=21) FEV_1 (%) 38.4 (19.4)* FVC (%) 47.9 (15.9)* FEV_1/FVC 64.5 (15.7)* Seronegative (n=17) FEV_1 (%) 33.2 (13.4)* FVC (%) 43.1 (11.5)* FEV_1/FVC 64.3 (16.8)*	COPD 10% (n=8) Asthma 1% (n=1)	Mean number of pathogen isolates from sputum cultures taken *S. Pneumoniae* 0.54 (1.31) *H. Influenzae* 1.81 (3.59) NTM 8% (n=6)	Previous adult hospital admission for LRTI 61% (n=49) Mortality (all cause) 39% (n=31) Bronchiectasis mortality 35% (n=28) Age at death 50 (36-59)^ In multivariate model, bronchiectasis associated with mortality outcome OR 4.27 (2.04, 8.94)

(Table 1) contd...

References	Location	Recruitment	Participant Details	Lung Function	Respiratory Comorbidities	Sputum Cultures	Excerpt of Major Outcomes
[42]	Central Australia	Cross sectional observation of Indigenous Australian residents aged >2 years from 7 remote communities (n=579, of whom 415 aged >18)	Bronchiectasis 7% (n=22) Age, sex and smoking status not reported for Bronchiectasis patients separately, but by HTLV-1 serostatus. Seropositive male (24% n=98) Age 42.6 (14.7)* Seropositive female (16% n=65) Age 44.6 (14.5)* Seronegative male (22% n=90) Age 32.7 (12)* Seronegative female (39% n=162) Age 40.4 (14.5)* Total cohort: females 55% (n=227) Ever smoker 46% (n=191)	NR	Not reported for Bronchiectasis patients separately.	NR	In multivariate-adjusted model, high HTLV-1 load is associated with bronchiectasis. Low proviral load (uninfected reference) 1.6 (0.49, 6.77) High proviral load (uninfected reference) 14.4 (4.99, 41.69) Age 1.01 (0.98, 1.04) Male sex 0.85 (0.3, 2.38) <10 pack years smoking (non-smoker reference) 0.6 (0.2, 1.84) >=10 pack years smoking (non-smoker reference) 1.17 (0.33, 4.21) Harmful alcohol intake 1.37 (0.55, 3.42)
[43]	Australia	Literature review and review of hospitalisations and cause of death by ICD-10 code. Mortality data from WA, SA, NT and QLD. Hospital separation data Australia-wide.	NA	NA	NA	NA	Age-adjusted Indigenous bronchiectasis mortality rate per 100,000 population for 2002-2004 Males 12 Female 3.6 Total 7.35 Mortality rate ratio *vs* non-Indigenous Australians: 6.2. Hospital separations for bronchiectasis per 1000 population for 2004-2005 Males 0.7595 Females 0.7005 Separation rate ratio *vs*. non Indigenous: 5.0

Note: * Mean (SD)
^ Median (IQR)
[a] Mean (SE)
[b] Mean (95% CI)
Abbreviations: CAD, Chronic Airway Disease; CI, Confidence Interval; COAD, Chronic Obstructive Airways Disease; COPD, Chronic Obstructive Pulmonary Disease; CT, Computerised tomography; GORD, Gastroeosophagal reflux disorder; FEV1, Forced Expiratory Volume in one second; FVC, Forced vital capacity; HR, Hazard Ratio; HRCT, High resolution Computerized Tomography; HTLV-1, Human T-Lymphotropic Virus Type 1; ICD-10, International Classification of Diseases 10th Revision; IQR, Interquartile Range; LRTI, Lower Tract Respiratory Infection; MPI, Māori or Pacific Islander; MPA, Māori, Pacific Islander or Asian Ethnicity; NA, Not available; NR, Not Recorded; NT, Northern Territory; NTM, Non-Tuberculosis Mycobacteria; NZ, New Zealand; OSA, Obstructive Sleep Apnea; PHTN, Pulmonary Hypertension; QLD, Queensland; RR, Rate Ratio; SA, South Australia; SD, Standard Deviation; SE, Standard Error; TEHS, Top End Health Service; T2RF, Type 2 Respiratory Failure; WA, Western Australia.

3.4. Bronchiectasis in New Zealand Māori and Pacific Islanders

In contrast to North American indigenous and European cohorts, in New Zealand, Māori and Pacific Islander adults have a significantly greater presence in the literature relating to bronchiectasis [21-27]. In 2012, the prevalence of bronchiectasis among the New Zealand population was estimated to be 99.6/100,000, however, among the Māori population the prevalence was estimated at 128.8/100,000 and among the Pacific Islander population, 228.8/100,000 [25]. Māori and Pacific islanders are consistently overrepresented in bronchiectasis statistics and accounted for 26% and 20% respectively of bronchiectasis hospitalisations in New Zealand between 2008-2013 despite only representing 14.9% and 7.4% of the population [25, 46]. It appears that in adulthood females may have a slightly higher frequency of bronchiectasis compared to males, representing 52 to 66% of the cohorts identified [22-26], however, sex was only reported by ethnicity in a single study, where females accounted for 52% of the cohort [27].

For the Māori population, the rate of hospitalisation for bronchiectasis appears to be increasing. From 2003-05 the rate (per 100,000 population) was reported at 41.7, however, in 2013, it was reported at 66.4 [22, 25]. This was true for both the elderly population (65+), 187.8 *vs*. 236.1 (2003-05 and 2013 respectively), and the young adult population 17.1 *vs*. 30.5 (2003-05 15-24 years *vs*. 2013 15-29 years). The hospitalisation rate of Māori and Pacific Islander compared to non-Māori/non-Pacific Islander/non-Asian ethnicity (non-MPA) shows the greatest disparity in rate ratios in young adulthood (15-29 years), with the rate being 13.9 and 10.7 times more among the Māori and Pacific Islander population

(mean rates 30.5, 23.5 and 2.2 respectively) compared to rates of 2.9 and 5.3 times more in the elderly (65+) (mean rates 236.1, 430.2 and 81.3 respectively) [25].

Socioeconomic deprivation (assessed from the NZ deprivation index) appears to affect Māori and Pacific Islanders to a larger extent than non-MPA New Zealanders [23-25]. Comparing the most disadvantaged quintile to the least disadvantaged quintile we see an age-adjusted rate of 95.4 (95% CI 79.9, 110.9) & 34.5 (95% CI 6.8, 62.1) for Māori, 139.8 (95% CI 109.1, 170.5) and 77 (95% CI 13.3, 140.7) for Pacific Islander and 21.9 (17, 26.8) and 14.9 (95% CI 12.1, 17.7) for non-MPA New Zealanders [25].

Mortality rates for bronchiectasis are significantly raised among Māori and Pacific Islanders compared to non-Māori/non-Pacific Islander (non-MPI) New Zealanders. Hospital data from 2003-05 shows the age-adjusted mortality rate ratio of Māori against non-Māori at 6.7 (95% CI 4.88, 9.21) [22], while data from 2006-2011 shows a mortality rate ratio of Māori against non-MPA of 3.94 (95% CI 3.45, 4.5), and Pacific Islander against non-MPA of 8.69 (95% CI 7.61, 9,92) [25]. In one study with a follow-up of bronchiectasis patients, Māori and Pacific Islanders (grouped together) had a 5-year all-cause mortality of 34% (n=53), of which 70% (n=37) were respiratory-related with a median age of death 69.1 years (IQR 58.3, 75.4) [27]. The heightened mortality rate is at least partially due to the socioeconomic status of many in this population, as showcased in one multivariate model incorporating both ethnicity and socioeconomic status which showed increased odds of mortality with increasing deprivation index (OR 11 (95% CI 2, 61)) but not for ethnicity (non-Māori/pacific islander baseline: Māori OR 0.6 (95% CI 0.2, 1.9) and Pacific Islander 0.4 (95% CI 0.1, 1.2)) [23].

3.5. Bronchiectasis in Indigenous Australians

The adult Australian indigenous population is the most represented indigenous group in the bronchiectasis literature [27-43]. Notably, however, the majority of the data comes from cohorts in the Top End of the Northern Territory [28-34], and Central Australia [16, 37-42], with one dataset originating from Queensland [35] and one from northern Western Australia (Kimberley region) [36]. Access to services, environmental conditions such as the presence of bushfires, and housing conditions such as overcrowding can differ significantly for indigenous Australians living between these disparate regions and will differ considerably more for indigenous Australians living in or closer to the major urban centres along the southeast coast of Australia. Data from the Top End suggests that among the adult indigenous population, radiologically proven bronchiectasis prevalence may be present in up to 23% [31]. Adult indigenous patients presenting with bronchiectasis typically reside in rural/remote areas, are younger (mean age 50-55 years) and male, in contrast to non-indigenous Australian bronchiectasis patients who typically reside in urban areas, are older and female [16, 27, 30, 32, 43]. Indigenous patients are often symptomatic, most commonly with shortness of breath and have chronic productive cough [28-30]. Indigenous Australian adult patients with bronchiectasis commonly show bilateral and multi-lobar, lower lobe involvement alongside the concurrent presence of COPD, lung nodules, or masses [31-33]. Lung function appears to be severely impaired, with a restrictive pattern typically the most common [28, 33, 41]. In line with this reduced lung function, the prognosis of bronchiectasis appears to be significantly worse for indigenous Australians, with mortality rates significantly higher than non-indigenous patients [27]. Australia wide the mortality rate of indigenous Australians was reported to be 6.2x that of non-indigenous Australians and the hospital separation rate was 5x higher [43]. Age at death appears to be almost 20 years younger than for other cohorts, occurring at a median of 45-50 years of age [27, 38-41], although the remote Kimberley study reported median age of death of 33 years [36]. It has also been observed that bronchiectasis is one of the predominant conditions for the need for domiciliary oxygen therapy among indigenous patients [47].

Of particular interest, the indigenous population of Central Australia is noted to have endemic levels of Human T-cell leukaemia virus type 1 (HTLV-1), which is a strong, independent risk factor for the development of bronchiectasis [16, 37-42]. A HTLV-1 viral load of $\geq$1000 per 10^5 peripheral blood leukocytes was associated with a 12.4x increase in adjusted odds of bronchiectasis. In addition, an increased risk of bronchiectasis was noted with prior LRTIs, and strongyloidiasis infection [41].

4. DISCUSSION

Evidence in the literature suggests that bronchiectasis is highly prevalent among indigenous people in English-speaking OECD countries. In these populations, recurrent respiratory tract infections, remoteness, and overcrowding predispose to the development of bronchiectasis, especially among children [15, 45, 48-51]. Very few studies have documented the prevalence or incidence of bronchiectasis among the adult indigenous population, however, given the higher prevalence among children, it can be assumed to be similar, if not higher. Top End Northern Australian studies have shown radiologically proven adult indigenous prevalence to be up to 23% [31] or even higher at 50% [28], though these numbers are from a referred population. Better estimates come from New Zealand data which show a population prevalence of 7.9/1000 and 4.2/1000 for Pacific Islanders and Māori, respectively [25]. There are many similarities between the indigenous populations in terms of socioeconomic status, health disparity and lifestyle factors and as such it may be feasible that these rates provide a guide for those in North America, New Zealand and Australia, though there are many unique and distinct characteristics between the populations and environments.

Among children, the incidence of bronchiectasis has been reported at 1470/100,000 for indigenous Australians [52], 28 and 17.7/100,000 for Pacific Islanders and Māori [20, 25], while the prevalence of bronchiectasis in First Nations Canadians is 2/1000 [45], and among Alaskan indigenous be-

tween 7-18/1000 [49-51]. Differences in the methods of collecting data and identifying bronchiectasis patients play a role in the disparities seen between the populations. The Australian data for example is drawn from samples in Central Australia, where HTLV-1 is endemic [16, 37-42], and very remote communities across the north of Australia [28-36], while the Canadian and Alaskan studies are also drawn from small subsets of the indigenous populations [45, 49, 50]. In each population, however, recurrent respiratory tract infections are common in childhood, which is linked to bronchiectasis. One study reported that the LRTI-associated hospitalization rate for American Indians/Alaskan Native children aged below 5 years was approximately 1.6 times higher than for other United States of America (USA) children [50], while the age-adjusted annual incidence of the pneumococcal disease has been reported to be 74/100,000 among Alaskan Native people compared to 16/100,000 among Alaskan non-native people [53]. Hospitalisations resulting from Respiratory syncytial virus (RSV) bronchiolitis among Canadian First Nations children have been reported at 484/1000 - almost 18 times higher than the general population [54, 55]. In New Zealand, hospitalisations following respiratory infection are twice as high among the indigenous population [56], and the hospitalisation rate for pneumonia is three times higher in Māori and 12 times higher in Pacific Islander people as compared to New Zealanders of European ethnicity [20]. Among remote indigenous Australian children, approximately 6% of primary healthcare visits in the first two years of life reported a respiratory tract infection, with a median of six presentations for upper respiratory and three for lower respiratory infection in the first year of life [57, 58]. The aforementioned higher respiratory infection rates in the indigenous population could be linked to the development of bronchiectasis and manifest in youth and adulthood. Moreover, due to geographical isolation, the limited access to advanced specialised health care needs in remote and rural settings may increase hospitalisation rates among indigenous people [59].

The housing situation for many of the indigenous populations is also a significant issue. Indigenous Australian households show an average size of 3.5 people, however, in remote communities this can substantially increase with up to 29 people in a single house and 48% being classed as 'overcrowded' [60]. In Canadian First Nations, the average occupancy rate has been reported at 6.1 people. This results in a significantly reduced ventilation rate (reported at 5.6L/s pp where the recommended rate is 7.5L/s pp), and heightened concentration of carbon dioxide [45, 61]. Reduced ventilation and overcrowding act synergistically to increase airborne virus concentration and viral transmission, in turn predisposing to bronchiectasis [45, 61].

Among the non-indigenous population bronchiectasis most commonly presents as secondary to cystic fibrosis (CF), whereas indigenous people experience non-CF bronchiectasis [27, 62]. Furthermore, indigenous people appear to experience bronchiectasis significantly earlier in life, with a higher proportion being observed in males [27-30, 32-34, 37-43]. However, the linkage to genetics in the development of bronchiectasis is not well known among the adult indigenous populations [63-65]. Disease severity appears to be greater, with the percent predicted forced expiratory volume in one second (FEV_1) reported at 52% & 59% for Pacific Islander and Māori, respectively (69% for European heritage NZ) [21], and the percent predicted values for forced vital capacity (FVC) are 36% for indigenous Australians [33].

In the recent past, substantial progress has been made in documenting bronchiectasis prevalence, profile and other outcomes, especially among First Nations indigenous children [4, 8-20, 45, 48-52]. However, there is only a handful of published literature on the adult indigenous population to the best of the author's knowledge. Moreover, well-established diagnostic and management guidelines specific to the adult indigenous people are lacking currently. This is despite evidence in the literature dating back to 1958 suggesting that indigenous populations have a higher burden of bronchiectasis [66]. Furthermore, guidelines developed from studies based on adult non-indigenous populations may be irrelevant or meaningless for indigenous people. Recent studies have demonstrated sex differences in lung function parameters in indigenous patients and also the implications and consequences of utilising chronic airway disease severity classification and use of inhaled pharmacotherapy while adopting spirometry reference values established for the Caucasian population [34, 67-71].

In other ethnic populations, including children, bronchiectasis is considered no longer an orphan disease [62, 72]. However, in the adult indigenous context, this still appears to be the case, where bronchiectasis could be considered an orphan disease. The literature reported here shows significant morbidity from bronchiectasis, however, despite the known challenges in healthcare access and utilisation for indigenous populations, no literature has reported on the acceptability, adherence or outcomes of standard treatment models for bronchiectasis. Given the known disparity in bronchiectasis prevalence between indigenous and non-indigenous populations, more research needs to be directed towards how this may be addressed, both in terms of prevention, and management of the condition, in particular in a clinically and culturally relevant manner in order to close the health gap amongst our indigenous people [73].

5. LIMITATION

It is possible some relevant/published literature that the authors were not aware of at the time of writing this paper is not included in this report.

CONCLUSION

This report has highlighted that bronchiectasis is highly prevalent among both children and adult indigenous populations and needs to be viewed as a potentially endemic disease in many indigenous contexts. Further research is warranted in the adult indigenous population to widen our understanding and knowledge in an effort, not only to reduce the morbidity and mortality secondary to bronchiectasis, but also in health care utilisation and cost [26]. Moreover, cul-

turally and clinically indigenous specific diagnosis and management guidelines are required.

AUTHORS CONTRIBUTION

All authors made substantial contributions to the conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

LIST OF ABBREVIATIONS

CAD	=	Chronic Airway Disease
CF	=	Cystic Fibrosis
CI	=	Confidence Interval
COAD	=	Chronic Obstructive Airways Disease
COPD	=	Chronic Obstructive Pulmonary Diseases
CT	=	Computerised Tomography
FEV_1	=	Forced Expiratory Volume in One Second
FVC	=	Forced Vital Capacity
GORD	=	Gastroeosophagal Reflux Disorder
HR	=	Hazard Ratio
HRCT	=	High Resolution Computerized Tomography
HTLV	=	Human T-cell Leukaemia Virus
ICD-10	=	International Classification of Diseases 10th Revision
IQR	=	Interquartile Range
LRTI's	=	Lower Respiratory Tract Infections
MPA	=	Māori Pacific Islander or Asian Ethnicity
MPI	=	Māori or Pacific Islander
non-MPA	=	non-Māori/Non-Pacific Islander/Non-Asian Ethnicity
NR	=	Not Recorded
NT	=	Northern Territory
NTM	=	Non-Tuberculosis Mycobacteria
NZ	=	New Zealand
OECD	=	Organisation for Economic Co-operation and Development
OR	=	Odds Ratio
OSA	=	Obstructive Sleep Apnea
PHTN	=	Pulmonary Hypertension
QLD	=	Queensland
RR	=	Rate Ratio
SA	=	South Australia
SD	=	Standard Deviation
SE	=	Standard Error
T2RF	=	Type 2 Respiratory Failure
TEHS	=	Top End Health Service
USA	=	United States of America
WA	=	Western Australia

CONSENT FOR PUBLICATION

Not applicable.

STANDARDS OF REPORTING

PRISMA guideline has been followed.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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SUPPLEMENTARY MATERIAL

PRISMA checklist is available as supplementary material on the publisher's website along with the published article.

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