2004 chronic obstructive pulmonary disease with and without bronchiectasis in Aboriginal Australians

A comparative study

Heraganahally, Subash S.; Wasgewatta, Sanjiwika ; McNamara, Kelly; Mingi, Joy; Mehra, Sumit ; Eisemberg, Carla C. ; Maguire, Graeme

Published in:
Internal Medicine Journal

DOI:
10.1111/imj.14718

Published: 01/12/2020

Document Version
Peer reviewed version

Title Page

Chronic obstructive pulmonary disease with and without bronchiectasis in Aboriginal Australians – a comparative study

Subash S Heraganahally [1,2,3,4], Sanjiwika L Wasgewatta [1], Kelly McNamara [1,2,,3], Joy J Mingi [4,5], Sumit Mehra [1,6], Carla C. Eisemberg [7] , Graeme Maguire [8]

Department of Respiratory and Sleep Medicine, Royal Darwin Hospital, Darwin, Northern Territory, Australia [1]

Flinders University - College of Medicine and Public Health, Adelaide, South Australia, Australia [2]

Northern Territory Medical School, Charles Darwin University, Darwin, Australia [3]

Darwin Respiratory and Sleep Health, Darwin private Hospital, Darwin, Northern Territory, Australia [4]

Department of Public Health, Charles Darwin University, Darwin, Australia [5]

Department of Respiratory and Sleep Medicine, Flinders Medical Centre, Adelaide, South Australia, Australia [6]

Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin. Northern Territory, Australia [7]

Department of General Internal Medicine – Western Health, Victoria, Australia [8]

Footscray Hospital, Gordon St, Footscray, Victoria, Australia [8]

Sunshine Hospital, Furlong Road, St Albans,, Victoria, Australia. Australia [8]

Corresponding author:

Dr Subash Heraganahally

Director, Department of Respiratory and Sleep Medicine.

Royal Darwin Hospital, 105, Rocklands Drive, Tiwi, Darwin, NT, Australia.

Phone: 0061-8-89228888. 0061-8-89206306, Fax – 0061-8-89206309

Email: hssubhashcmc@hotmail.com, Subash.heraganahally@nt.gov.au

Conflicts of interest:

All authors declare no conflicts of interest.

Funding: Nil to declare

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/imj.14718

Abstract:

Aims: In this retrospective study we evaluated the demographic and clinical characteristic of adult Aboriginal Australian patients with a clinical diagnosis of COPD with and without bronchiectasis from the remote communities of the Northern Territory of Australia.

Method: Clinical records were reviewed to extract information on demographics, respiratory and medical co-morbid conditions, COPD directed treatment, hospital admission frequency and exacerbations. Chest radiology were reviewed to evaluate the presence or absence of bronchiectasis. Spirometry results, sputum culture and cardiac investigations were also recorded.

Results: Of the 767 patients assessed in the remote community respiratory outreach clinics 380 (49%) patients had a clinical diagnosis of COPD. Chest X-Ray and CT scan were available to evaluate the presence of bronchiectasis in 258 patients. Of the 258/380 patients 176/258 (68.2%) were diagnosed to have COPD alone and 82/258 (31.8%) had bronchiectasis along with COPD. The mean age was 56 and 59 years among patients with and without bronchiectasis respectively and 57 % were males with bronchiectasis. Patients with bronchiectasis had lower BMI (22v24), frequent hospital admissions (2.0vs1.5/year) and productive cough (32.1v28.9%). Spirometry showed 77% had FEV_1/FVC ratio < 0.7. In 81% and 75% of patients with and without bronchiectasis the FEV1/FVC ratio was < 0.7 and the mean FEV_1 was 39% and 43 % respectively.

Conclusion: About 32% of Aboriginal Australians had co-existent bronchiectasis with COPD Lower BMI, productive cough, frequent hospital admission and marginally more severe reduction in lung function was noted among patients with COPD and bronchiectasis compared to those with COPD in isolation.

Keywords: Aboriginal; Bronchiectasis; COPD; Indigenous; Spirometry.

Short Title: COPD with and without bronchiectasis in Aboriginal Australians

Abbreviations:

COPD: Chronic obstructive pulmonary disease

NT: Northern Territory of Australia

TEHS; Top End Heath Service

BMI: Body Mass Index

PFT: Pulmonary function test

CT scan: Computed tomography

LTOT: long term oxygen therapy

FEV1: Forced expiratory volume in one second

FVC: Forced vital capacity

NTM: Non tuberculous mycobacterium

PHT: Pulmonary artery hypertension

LV: Left ventricle

RHF: Right heart failure

SABA: Short acting Beta agonist

LABA: Long acting Beta agonist

LAMA: Long acting Muscarinic antagonist

ICS: Inhaled corticosteroids

SOB: Shortness of breath

OSA: Obstructive sleep apnoea

PHT: Pulmonary artery hypertension

ChT2RF: chronic type 2 respiratory failure

HTN: Hypertension

T2DM: Type 2 diabetes mellitus

CAD: Coronary artery disease

CRF: Chronic renal failure

NCFB: non–Cystic Fibrosis bronchiectasis

Chronic obstructive pulmonary disease in Australian Aboriginal patients with and without Bronchiectasis – a comparative study

Introduction:

Chronic obstructive pulmonary disease (COPD) is a major causes of morbidity and mortality globally [1-5]. Co-occurrence of bronchiectasis with COPD is increasingly recognised and its prevalence rates have been reported to range from 4% to 72% [6-9]. When COPD and bronchiectasis co-exists it may lead to worsening respiratory symptoms, frequent exacerbations, deterioration in lung function and also higher morbidity and mortality [10-13). The burden of chronic health conditions, including COPD, is higher in the Aboriginal Australian population (compared to non-Aboriginal population) and more so in those living in remote and regional communities [14-17]. Moreover, the presence of bronchiectasis in both adults and children is also increasingly recognised as a significant problem for Aboriginal Australians, especially those living in the regional and remote communities of the Northern Territory (NT) of Australia [18-20]. Previous studies have shown that Aboriginal Australian

patients living in the regional and remote communities of the NT have higher smoking rates, reduced lung function on spirometry and higher co-occurrence of COPD and bronchiectasis [21]. Despite evidence to suggest a higher proportion of COPD and bronchiectasis in Aboriginal Australians living in the NT there is paucity of information regarding the demographic and clinical characteristics of Aboriginal Australians with co-existent COPD and bronchiectasis and if this differs to those with COPD alone.

While the majority of the Indigenous Australians (Aboriginal Australian and Torres Strait Islander peoples) in Australia live in New South Wales (31%) and Queensland (29%), they make up less than 5% of those states' population. However, in the NT approximately 25 - 30% of the population are Indigenous Australians with the vast majority of these begin Aboriginal Australians, the highest proportion among all Australian jurisdictions. The population profile is spread over vast geographical area and 81% of the Aboriginal Australians in the NT live in remote or very remote areas [22]. The NT Aboriginal Australian population living with COPD and bronchiectasis is a unique and poorly understood patient population. Therefore, in this retrospective study we aimed to describe clinical and demographic information relating to adult Aboriginal Australians living with COPD, with and without co-existent bronchiectasis, who resided in regional and remote communities.

Method:

Background and Setting: This is a five-year retrospective study (2012 – 2016) of NT adult Aboriginal Australian patients living in regional and remote communities who were identified to have a clinical diagnosis of COPD and were referred to the Top End Heath Service (TEHS)

specialist respiratory outreach service. The patients were referred to the respiratory specialist outreach service by primary community medical practitioners. This service is based at the Royal Darwin Hospital and visits an average of about 20 remote communities each year at a frequency of one to three times per year. The average population in each community varies from 200 to 2000 with the majority of patients reviewed being Aboriginal Australians. The Top End Health service (TEHS) map is illustrated in Figure 1. As per the local ethical guidelines the details of the regional and remote communities are not detailed or identified in this study.

Study participants: For this study, the patients were considered to have a diagnosis of COPD on clinical grounds as assessed and documented in the patients clinical records by the specialist respiratory physician and the respiratory outreach team. The clinical parameters considered in the diagnosis of COPD included, smoking history, environmental smoke exposure, symptoms of shortness of breath, chronic cough, wheezing and physical examination consistent with COPD. Patients were excluded from the study if the clinical parameters were not consistent or documented in the clinical records for patients to have a diagnosis of COPD. Lung function results/criteria were not used as a diagnostic marker for COPD, as there is no established normative predictive value that is currently established for Aboriginal Australians of the NT [23]. Only patients who had either chest X-Ray or CT scan available to evaluate the presence or absence of bronchiectasis as per the reporting radiologist were included in the study. Chest CT scan results were considered to provide a definitive diagnosis for the presence of bronchiectasis when available. Patients whose chest radiology (X-Ray or CT scan) were not available to confirm the diagnosis of bronchiectasis were excluded from the analysis.

Clinical parameters: Clinical details were extracted form patients' medical records that included demographics, smoking status, Body Mass Index (BMI), COPD directed therapy and other medical co-morbidities. The relevant investigations for this study included, pulmonary function tests (PFT), sputum culture results and cardiac investigations when available. Only spirometry study quality graded as either A to B or C as per the discretion of the respiratory physician for session quality, were included to assess the severity. As there are no well-established normal predicted values for Australian Aboriginals, no ethnic correctional factor for spirometry testing was used. All lung function tests were performed according to the standard published protocol and as described in a recent report from our center [23]. Hospital records were also reviewed for exacerbation of COPD/bronchiectasis, admission frequency and mortality. Exacerbations were defined as either presentation to community health center or to hospital emergency department with acute worsening of respiratory symptoms. All individual parameters were analysed as per medical records entries. The numbers of available information of each individual data are shown in respective areas in the results section when appropriate.

Statistical considerations: The study was analysed to provide information on comparisons between patients who had COPD without bronchiectasis and patients who had COPD with bronchiectasis. Statistical analyses were conducted using STATA 15. We used t-test to compare means and chi-squared test to compare proportions in the two groups. For all analysis a two-sided P value less than 0.05 was considered to be statistically significant.

Ethical consideration: This study was approved by the Human Research Ethics Committee of the NT Department of Health/TEHS and Menzies School of Health Research. (Reference No: HREC 2017-2957)

Results: Of the 767 patients referred to specialist outreach respiratory service during the study period 49% (n = 380) patients had a clinical diagnosis of COPD. Chest X-Ray (n 119), CT scan (n 31) or both X-Ray and CT scan (n 108) results were available to assess for the presence or absence of bronchiectasis in 258 patients and the subsequently report results refer only to these patients. Of the 258 patients 176/258 (68.2%) were classified as having COPD without bronchiectasis and 82/258 (31.8%) were classified as having COPD with bronchiectasis. The demographic characteristic, weight, BMI, smoking status and mortality data of the study COPD patients stratified with and without bronchiectasis are detailed in table 1. The BMI were significantly different between groups, patients with bronchiectasis on average had a BMI 2.17 points lower than patients without bronchiectasis. Smoking status was slightly higher in patients with a diagnosis of COPD alone, as well as overall mortality.

Yearly hospital admission frequency and exacerbations, respiratory symptoms, other respiratory conditions and medical comorbidities among patients with and without bronchiectasis are shown in table 2. Although not statistically significant, symptoms of shortness of breath was more commonly noted in patients with COPD alone and productive cough was noted in patients when bronchiectasis co-existed. Pulmonary hypertension, obstructive sleep apnoea and type 2 respiratory failure was noted more commonly among patients with COPD alone, however again this was not statistically significant. Hospital admissions were noted be more common among patients with underlying bronchiectasis and was statistically significant. Pharmacotherapy for COPD specific management and long term oxygen therapy (LTOT) are shown in table 3.

Spirometry data, bronchodilator response, sputum culture, and echocardiogram results are shown in table 4. Out of 206 spirometry results available for review only 122 were considered suitable for analysis and 77% had FEV_1/FVC ratio lower than 0.7. In 81% and 75% of patients with and without bronchiectasis had FEV_1/FVC ratio lower than 0.7. The mean FEV_1 was noted to be 39% and 43 % of predicted value among patients with and without bronchiectasis respectively, indicating moderate to severe airflow obstruction in both groups. Although not statistically significant, spirometry values were noted to be marginally worse among patients when bronchiectasis co-existed. Cardiac abnormalities were noted more frequently among patients with COPD alone, however the numbers were small. Sputum culture results showed *Pseudomonas* and *Haemophilus influenzae* were the most commonly cultured bacteria in both groups. Non Tuberculous Mycobacterium (NTM) was infrequently noted in this study participants. In relation to pharmacotherapy for COPD specific management, salbutamol as short acting bronchodilator (SABA), tiotropium as long-acting muscarinic antagonists (LAMA), salmeterol as a long acting beta agonists (LABA) and fluticasone as inhaled corticosteroid use (ICS) were noted to be the most commonly used therapy in both groups.

Discussion: This study outlines for the first time the demographic and clinical profile of adult patients diagnosed to have COPD with and without co-existent bronchiectasis in Aboriginal Australian patients living in the remote and regional communities of NT. In our study, 32% of the patients with a clinical diagnosis of COPD also have bronchiectasis. Our study also shows that these patients with COPD and bronchiectasis have a lower BMI, more frequent hospital admission, are more likely to have a productive cough and have slightly more severe lung function abnormalities compared to patients with COPD in isolation.

Previous studies have shown that COPD and bronchiectasis are highly prevalent in Aboriginal Australian population, especially among those living in the regional and remote communities [17-21]. Our study adds to the sparse information in the literature regarding the clinical characteristics of Aboriginal Australian living with COPD and co-exist bronchiectasis. Furthermore, COPD is considered to be the second most common etiological factor contributing to bronchiectasis in adults [6]. Although it is more than likely that underlying COPD would be the etiological factor for bronchiectasis in some of our study cohort, we could not rule out other environmental, congenital, immunological or childhood infections.

Earlier published literature suggest that Aboriginal Australians living in the regional and remote communities also have lower lung function values on spirometry [23]. Whether this is innate or relates to under-diagnosis of COPD and bronchiectasis also remains unclear. This current study also showed that patients with underlying bronchiectasis along with COPD to have marginally worse lung function abnormalities than when COPD existed alone. This is in line with similar results from earlier studies [24]. More recently use of inhaled corticosteroids has been linked to higher lower respiratory tract infection rates [25]. In our study we noted a significant number patients with bronchiectasis were on inhaled fluticasone. It is beyond the scope of this study to determine if high-dose inhaled steroid increased exacerbation rates in this study population but the high level of co-existent bronchiectasis in this setting should limit their use to only those patients with COPD who fail earlier therapies.

Presence of bronchiectasis is considered to be an independent risk factor for all-cause mortality in patients with COPD and the morbidity and mortality significantly increases among patients with bronchiectasis and associated COPD [12,24,26,27]. Given the marked life expectancy

disparity between Aboriginal and non-Indigenous Australians [28] determining whether this is also the case in this setting should be a priority.

The clinical manifestation among COPD patients with and without bronchiectasis could be similar. However, certain clinical features may be helpful in differentiating patients with bronchiectasis in primary care setting, as the approach to the management of the two condition are different. Our findings would suggest that in this setting a significant smoking history associated with symptoms of predominant dyspnoea without frequent mucous hypersecretion (productive chronic cough) may be more consistent with a diagnosis of isolated COPD while the presence of frequent exacerbations and chronic productive cough should raise the suspicion of COPD with co-existent bronchiectasis. This finding is in line with that of earlier studies [29]. The increasing availability of CT scanning facilities in smaller regional centres in NT and in other parts of Australia should encourage early referral for definitive diagnosis of bronchiectasis when this is suspected. Early diagnosis and management of airway disease among patient with and without bronchiectasis may give rise to reduction in the mortality and morbidity in this population [30.31].

While diagnosing bronchiectasis in the setting of COPD should be encouraged, the limited treatment options for this condition to prevent exacerbations and disease progression should be appreciated. Effective airway clearance and pulmonary rehabilitation remain a cornerstone of bronchiectasis management [32-36]. However lack of easy accessibility to physiotherapy services for Aboriginal Australians living in regional and remote communities can be a barrier.

We are likely to see high morbidity and mortality in this population with bronchiectasis and COPD until effective disease specific management strategies are can be implemented and are accessible for Aboriginal Australians living in regional and remote communities. Early priorities should be increasing clinical suspicion in the primary health care workforce. Moreover, the provision of a dedicated physiotherapy service focusing on airway clearance and pulmonary rehabilitation need to be considered. Further studies may be useful in exploring disease specific management approaches to improve quality of life and reduce disability and preventable healthcare, including hospital utilisation.

Limitation of the study: The results of this study should be viewed with caution as the study participants included were those referred to specialist respiratory service and the results may not be representative of the entire remote and regional NT Aboriginal Australian population. Being a retrospective study, given only routinely collected health care data were utilised this would have potentially under or overestimated the differences seen in this study. Given many study participants only had chest X-Ray to confirm the presence or absence of bronchiectasis, this is likely to have underestimated the true prevalence of bronchiectasis in study participants. However, this also may indicate that people living in remote communities, in line with those in many urban centres may not have access to appropriate investigations. Furthermore, lack of normative reference values for lung function in Aboriginal Australian population the diagnosis of airway disease (COPD) was relied on the clinical grounds. This also highlights the desperate need for further research in formulating normative reference lung function values among Aboriginal Australian population.

Conclusion: This study demonstrated that 32% of Aboriginal Australians referred to remote specialist outreach service in the regional and remote communities of the NT had co-existent bronchiectasis along with COPD. Lower BMI, productive cough, frequent hospital admission and marginally more severe reduction in lung function was noted among these patients with bronchiectasis and COPD compared to those with COPD in isolation.

Acknowledgment: We thank respiratory technologist from Darwin respiratory and sleep health, especially Ms Charmain Beatriz Atos in conducting lung function tests for patients in the remote communities. We also sincerely thank the Aboriginal community health care workers and respiratory clinical nurse consultants Mrs Claire Kerslake, Mrs Siji Issac at the Royal Darwin hospital for their support in co-ordinating respiratory specialist outreach service.

Reference:

1. Quaderi SA, Hurst JR. The unmet global burden of COPD. Glob Health Epidemiol Genom. 2018; 3: e4. doi: 10.1017/gheg.2018.1.
2. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012; 380:2095-128.
3. Pesce G. Mortality rates for chronic lower respiratory diseases in Italy from 1979 to 2010: an age-period-cohort analysis. ERJ open research. 2016;2:00093-2015.

4. Viegi G, Scognamiglio A, Baldacci S, Pistelli F, Carrozzi L. Epidemiology of chronic obstructive pulmonary disease (COPD). Respiration; international review of thoracic diseases. 2001;68:4-19.
5. Burney PG, Patel J, Newson R, Minelli C, Naghavi M. Global and regional trends in COPD mortality, 1990-2010. The European respiratory journal. 2015; 45:1239-47.
6. Lonni S, Chalmers JD , Goeminne PC , McDonnell MJ , Dimakou K, Soyza AD, *et al*. Etiology of Non–Cystic Fibrosis Bronchiectasis in Adults and Its Correlation to Disease Severity. Ann Am Thorac Soc. 2015;12:1764–1770.
7. McShane PJ, Naureckas ET, Tino G, Strek ME. Non–Cystic Fibrosis Bronchiectasis. Am J Respir Crit Care Med. 2013;188:647–656.
8. Martínez-García MÁ, Soler-Cataluña JJ, Donat Sanz Y, Catalán Serra P, Agramunt Lerma M, Ballestín Vicente J, Perpiñá-Tordera M. Factors associated with bronchiectasis in patients with COPD. Chest. 2011; 140:1130-1137. doi: 10.1378/chest.10-1758.
9. Martinez-Garcia MA, Miravitlles M. Bronchiectasis in COPD patients: more than a comorbidity?. International Journal of COPD. 2017:12 1401–1411.
10. Martínez-García MA, de la Rosa Carrillo D, Soler-Cataluña JJ, Donat-Sanz Y, Serra PC, Lerma MA, Ballestín J, Sánchez IV, Selma Ferrer MJ, Dalfo AR, Valdecillos MB. Prognostic value of bronchiectasis in patients with moderate-to-severe chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 2013; 187:823-31. doi: 10.1164/rccm.201208-1518OC.

11. Gatheral T, Neelam N, Sansom B, Lai D, Nair A, Vlahos I, Baker EH COPD-related Bronchiectasis; Independent Impact on Disease Course and Outcomes, COPD: Journal of Chronic Obstructive Pulmonary Disease. 2014;6:605-614, DOI: 10.3109/15412555.2014.922174.
12. Mao B, Lu HW, Li MH, Fan LC, Yang JW, Miao XY, Xu JF. The existence of bronchiectasis predicts worse prognosis in patients with COPD. Sci. Rep. 2015; 5: 10961; doi: 10.1038/srep10961.
13. Patel IS , Vlahos I, Wilkinson TMA , Lloyd-Owen SJ , Donaldson GC , Wilks M , Reznek RH , Wedzicha JA. Bronchiectasis, Exacerbation Indices, and Inflammation in Chronic Obstructive Pulmonary Disease Am J Respir Crit Care Med. 2004;170:400–407.
14. Thomas DP, Condon JR, Anderson IP, Li SQ, Halpin S, Cunningham J, Guthridge SL. Long-term trends in Indigenous deaths from chronic diseases in the Northern Territory: a foot on the brake, a foot on the accelerator. The Medical journal of Australia. 2006;185:145-9.
15. Vos T, Barker B, Begg S, Stanley L, Lopez AD. Burden of disease and injury in Aboriginal and Torres Strait Islander Peoples: the Indigenous health gap. International journal of epidemiology. 2009; 38:470-7.
16. Andreasyan K, Hoy WE. Patterns of mortality in Indigenous adults in the Northern Territory, 1998-2003: are people living in more remote areas worse off? Med J Aust. 2009; 190:307-11.

17. Toelle BG, Xuan W, Bird TE, Abramson MJ, Atkinson DN, Burton DL, et al. Respiratory symptoms and illness in older Australians: the Burden of Obstructive Lung Disease (BOLD) study. Med J Aust. 2013; 198:144-8. doi: 10.5694/mja11.11640.
18. Blackall SR, Hong JB, King P, Wong C, Einsiedel L, Rémond MGW, Woods C, Maguire GP. Bronchiectasis in indigenous and non-indigenous residents of Australia and New Zealand Respirology. 2018; 23: 743–749, doi: 10.1111/resp.13280.
19. Chang AB, Grimwood K, Mulholland EK, Torzillo PJ. Bronchiectasis in indigenous children in remote Australian communities. Med J Aust. 2002; 177: 200-204.
20. Steinforta DP, Bradya S, Weisingerb HS, Einsiedela L. Bronchiectasis in Central Australia: A young face to an old disease. Respiratory Medicine. 2008; 102: 574–578.
21. Kruavit, A, Fox M, Pearson R, Heraganahally S. Chronic respiratory disease in the regional and remote population of the northern territory top end: A perspective from the specialist respiratory outreach service. Aust J Rural Health. 2017; 25: 275–284.
22. Australian Bureau of Statistics. Estimates of Aboriginal and Torres Strait Islander Australians. ABS, Canberra, Australia 2016.
23. Schubert J, Kruavit A, Mehra S, Wasgewatta S, Chang AB, Heraganahally S. Prevalence and nature of lung function abnormalities among indigenous Australians referred to specialist respiratory outreach clinics in the Northern Territory. Int Med J;2019:49:217–224://doi.org/10.1111/imj.14112.

24. Du Q, Jin J, Liu X, Sun Y. Bronchiectasis as a Comorbidity of Chronic Obstructive Pulmonary Disease: A Systematic Review and Meta-Analysis. PLoS One. 2016; 15:11:doi: 10.1371/journal.pone.0150532.

25. Kew KM, Seniukovich A. Inhaled steroids and risk of pneumonia for chronic obstructive pulmonary disease. Cochrane Database of Systematic Reviews 2014, Issue 3. Art. No.: CD010115. DOI: 10.1002/14651858.CD010115.pub2.

26. Goeminne PC, Nawrot TS, Ruttens D, Seys S, Dupont LJ. Mortality in non-cystic fibrosis bronchiectasis: a prospective cohort analysis. Respir Med. 2014;108:287-96. doi: 10.1016/j.rmed.2013.12.015.

27. Chung WS, Lin CL. Acute respiratory events in patients with bronchiectasis-COPD overlap syndrome: A population-based cohort study. Respir Med. 2018;140:6-10. doi: 10.1016/j.rmed.2018.05.008. Epub 2018 May 16.

28. Deaths in Australia, Life expectancy - Australian Institute of Health and welfare 2019. https://www.aihw.gov.au/reports/life-expectancy-death/deaths/.../life-expectancy.

29. Hurst JR, Elborn JS, De Soyza A; BRONCH-UK Consortium. COPD–bronchiectasis overlap syndrome. Eur Respir J. 2015;45:310-3. doi: 10.1183/09031936.00170014.28.

30. Polverino E, Dimakou K, Hurst J, Martinez-Garcia MA, Miravitlles M, Paggiaro P, Shteinberg M, Aliberti S, Chalmers JD. The overlap between bronchiectasis and chronic airway diseases: state of the art and future directions. Eur Respir J. 2018;15:52. doi: 10.1183/13993003.00328-2018.

31. Poh TY, Mac Aogáin M, Chan AK, Yii AC, Yong VF, Tiew PY, Koh MS, Chotirmall SH. Understanding COPD-overlap syndromes. Expert Rev Respir Med. 2017;11:285-298. doi: 10.1080/17476348.2017.1305895.
32. Visser1 SK, Bye P, Morgan L. Management of bronchiectasis in adults. Med J Aust. 2018;209:177-183.
33. Maguire G. Bronchiectasis A guide for primary care. Australian family physician 2012;41:841-850.
34. Chang AB, Keith Grimwood K, Maguire G, King PK, Morris PS, Torzillo PJ. Management of bronchiectasis and chronic suppurative lung disease in Indigenous children and adults from rural and remote Australian communities. Med J Aust. 2008; 189: 386-393. || doi: 10.5694/j.1326-5377.2008.tb02085.x.
35. Murray MP, Pentland JL, Hill AT. A randomised crossover trial of chest physiotherapy in non-cystic fibrosis bronchiectasis. Eur Respir J 2009; 34: 1086–1092. DOI: 10.1183/09031936.00055509
36. Lee AL, Hill CJ, McDonald CF, Holland AE. Pulmonary Rehabilitation in Individuals With Non–Cystic Fibrosis Bronchiectasis: A Systematic Review Archives of Physical Medicine and Rehabilitation 2017;98: 774-782.e1. DOI.org/10.1016/j.apmr.2016.05.017

Table 1.

Demography		Without Bronchiectasis	With Bronchiectasis	Overall
Total, n (%)		176 (68.22%)	82 (31.78%)	258 (100)
Age		59.26 ± 11.68 (n=176)	56.63 ± 12.62 (n=82)	58.43 ± 12.05 (n=258)
Sex (female)		93/176(52.84%)	35/82(42.68%)	128/258(49.61%)
Weight		66.35 ± 17.73 (n = 133)	63.82 ± 19.05 (n = 63)	65.54 ± 18.20 (n = 196)
*BMI		24.73 ± 6.09 (n=128)	22.56 ± 5.45 (n=62)	24.02 ± 5.97 (n=190)
Smoker	Current	109/173(63.01%)	47/78(60.26%)	156/251(62.15%)
	Past	53/173(30.64%)	19/78(24.36%)	72/251(28.69%)
	Never	11/173(6.36%)	12/78(15.38%)	23/251(9.16%)
Packs per year	Current	44.44 ±60.45 (n=41)	31.26 ±14.25 (n=23)	39.7 ±49.54 (n=64)
	Past	47.13 ±31.67 (n=23)	39 ±19.45 (n=8)	45.03 ±29.23 (n=31)
Passive smoking		16/174 (9.20%)	7/78 (8.97%)	23/252 (9.13%)
Patient deceased		21/176 (11.93%)	8/82 (9.76%)	29/258 (11.24%)

Table 1. Showing Demographic and Smoking status in all patients with and without Bronchiectasis
Data are presented as mean ± SD and %

*Statistically significant

Abbreviations: BMI: Body mass index.

Table 2.

Results		Without Bronchiectasis	With Bronchiectasis	All Patients
Exacerbations per year		2 (1 - 3) n = 99	2 (1 - 3) n = 57	2 (1 - 3) n = 156
*Admissions per year		1.5 (1 - 2) n = 86	2 (1 - 3) n = 46	2 (1 - 2.5) n = 132
Symptoms	SOB	137 (79.19%)	60 (74.07%)	197 (77.56%)
	Prod Cough	50 (28.90%)	26 (32.10%)	76 (29.92%)
	Cough	45 (26.01%)	23 (28.40%)	68 (26.77%)
	Wheeze	25 (14.45%)	11 (13.58%)	36 (14.17%)
	(n)	173	81	254
Other respiratory conditions	Asthma	55 (31.61%)	27 (33.33%)	82 (32.16%)
	OSA	17 (9.77%)	6 (7.41%)	23 (9.02%)
	PHT	17 (9.77%)	4 (4.94%)	21 (8.24%)
	Lung Cancer	4 (2.30%)	3 (3.70%)	7 (2.75%)
	ChT2RF	2 (1.15%)	1 (1.23%)	3 (1.18%)
	(n)	174	81	255
Comorbidities	HTN	45 (26.01%)	14 (17.95%)	59 (23.51%)
	T2DM	32 (18.5%)	15 (19.23%)	47 (18.73%)
	CAD	31 (17.92%)	7 (8.97%)	38 (15.14%)
	CRF	30 (17.34%)	12 (15.38%)	42 (16.73%)

	Stroke	8 (4.62%)	1 (1.28%)	9 (3.59%)
	(n)	173	78	251

Table 2. Exacerbations and admissions per year, respiratory symptoms, other respiratory conditions, and medical comorbidities among patients with and without Bronchiectasis.

Data are presented as median (IQR) n and n (%)

*Statistically significant

Abbreviations: SOB: Shortness of breath; OSA: Obstructive sleep apnoea; PHT: Pulmonary artery hypertension; ChT2RF: chronic type 2 respiratory failure; HTN: Hypertension; T2DM: Type 2 diabetes mellitus; CAD: Coronary artery disease; CRF: Chronic renal failure

Table 3.

Medication		**Without Bronchiectasis**	**With Bronchiectasis**	**All Patients**
	Salbutamol	141 (81.50%)	64 (78.05%)	205 (80.39%)
SABA	None	32 (18.50%)	18 (21.95%)	50 (19.61%)
	(n)	173	82	255
	Salmeterol	92 (53.18%)	36 (45.00%)	128 (50.59%)
	Eformeterol	7 (4.05%)	3 (3.75%)	10 (3.95%)
	Indcaterol	3 (1.73%)	0 (0%)	3 (1.19%)
LABA	Vilanterol	2 (1.16%)	4 (5.00%)	6/ (2.37%)
	Olodaterol	1 (0.58%)	0 (0%)	1 (0.40%)
	None	68 (39.31%)	37 (46.25%)	105 (41.50%)
	(n)	173	80	253
	Tiotropium	88 (50.87%)	38 (46.34%)	126 (49.41%)
LAMA	Aclidinium	3 (1.73%)	2 (2.44%)	5 (1.96%)
	Umeclidinium	3 (1.73%)	3 (3.66%)	6 (2.35%)

	None	79 (45.66%)	39 (47.56%)	118 (46.27%)
	(n)	173	82	255
ICS	Fluticasone	106 (61.63%)	53 (64.63%)	159 (62.60%)
	Budesonide	10 (5.81%)	4 (4.88%)	14 (5.51%)
	Ciclesonide	1 (0.58%)	0 (0%)	1 (0.39%)
	None	55 (31.98%)	25 (30.49%)	80 (31.5%)
	(n)	172	82	254
LTOT	No	155 (88.57%)	73 (89.02%)	228 (88.72%)
	Yes	20 (11.43%)	9 (10.98%)	29 (11.28%)
	(n)	175	82	257

Table 3 - Pharmacotherapy for COPD specific management and long term oxygen therapy

Data are presented as mean ± SD (n) and n (%)

Abbreviations: SABA: Short acting Beta agonist; LABA: Long acting Beta agonist; LAMA: Long acting Muscarinic antagonist; ICS: Inhaled corticosteroids; LTOT: Long term oxygen therapy

Table 4

Investigations		**Without Bronchiectasis**	**With Bronchiectasis**	**Overall**
Spirometry	FEV_1 /FVC<0.7	64/85(75.29%)	30/37(81.08%)	94/122(77.05%)
	FEV_1/FVC (mean)	0.56 ±0.16	0.56 ±0.12	0.56 ±0.15
	FEV_1 (L)	1.26 ±0.61	1.23 ±0.48	1.25 ±0.58
	FEV_1 (%)	43.34 ±19.21	39.03 ±16.71	42.03 ±18.59
	FVC (L)	2.16 ±0.73	2.18 ±0.64	2.16 ±0.7
	FVC (%)	57.84 ±16.39	53.92 ±16.63	56.67 ±16.56
	(n)	85	37	122
Bronchodilator response		26/101 (25.74%)	20/56 (35.71%)	46/157 (29.30%)

Sputum results	Oropharyngeal flora	37 (48.68%)	21 (52.5%)	58 (50%)
	Pseudomonas	14 (18.42%)	9 (22.5%)	23 (19.83%)
	Haemophilus influenzae	4 (5.26%)	4 (10%)	8 (6.9%)
	Staph aureus	3 (3.95%)	0 (0%)	3 (2.59%)
	S. pneumoniae	3 (3.95%)	1 (2.5%)	4 (3.45%)
	Aspergillus	2 (2.63%)	2 (5%)	4 (3.45%)
	NTM	2 (2.63%)	1 (2.5%)	3 (2.59%)
	Nil	14 (18.42%)	4 (10%)	18 (15.52%)
	(n)	76	40	116
*Eosinophil count		0.31 ± 0.33 (n = 164)	0.22 ± 0.35 (n = 74)	0.28 ± 0.34 (n = 238)
Echocardiogram	Valvular anomalies	17 (32.08%)	7 (25.93%)	24 (30%)
	PHT	8 (15.09%)	4 (14.81%)	12 (15%)
	LV systolic dysfunction	6 (11.32%)	2 (7.41%)	8 (10%)
	RHF	6 (11.32%)	1 (3.7%)	7 (8.75%)
	LV diastolic dysfunction	0 (0%)	1 (3.7%)	1 (1.25%)
	Normal	16 (30.19%)	12 (44.44%)	28 (35%)
	(n)	53	27	80

Table 4. Investigations among patients with and without Bronchiectasis

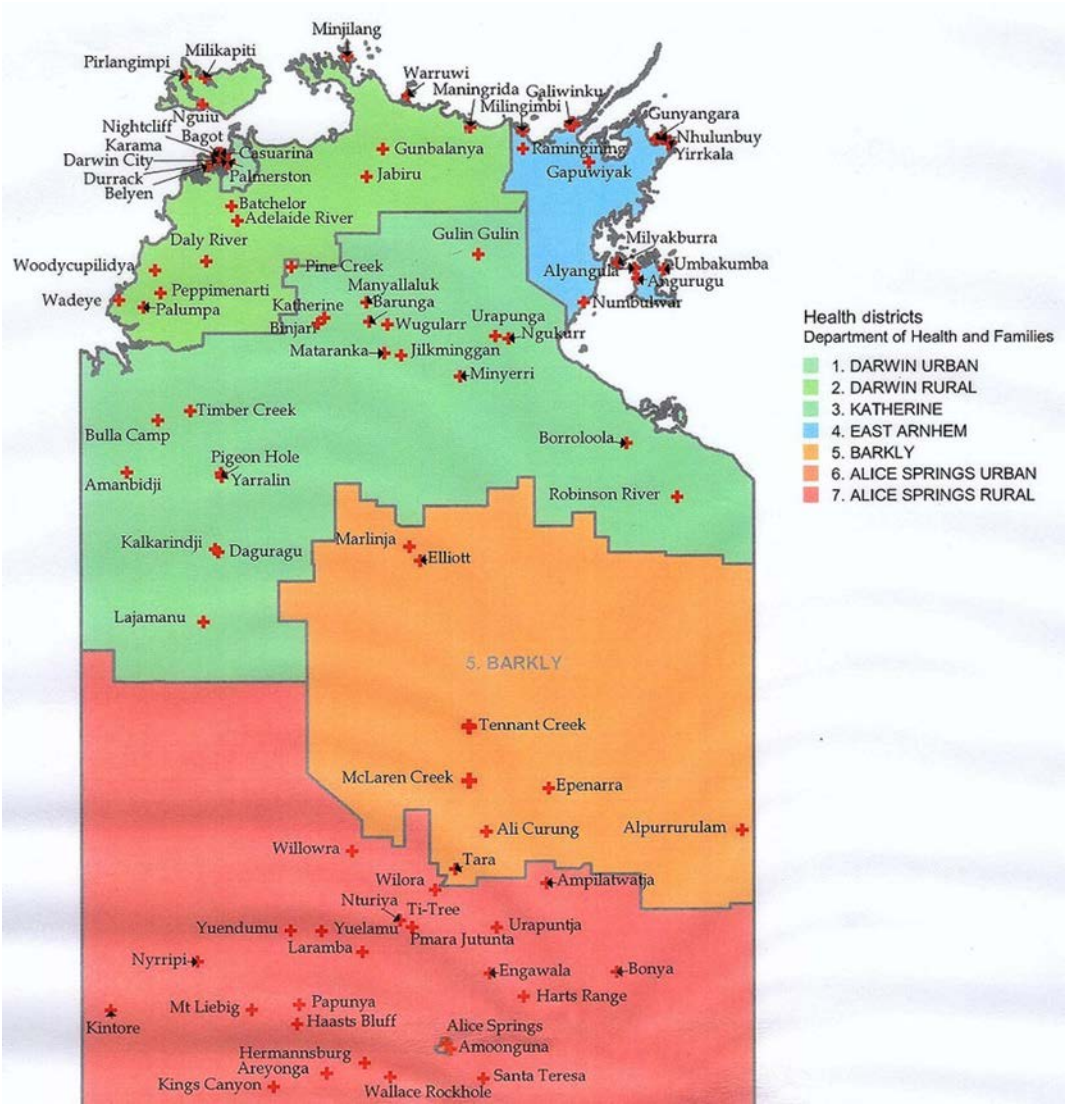
Data are presented as mean ± SD (n) and n (%)

Spirometry data is represented without ethnic correction

*Statistically significant

Abbreviations: FEV_1: Forced expiratory volume in one second; FVC: Forced vital capacity; NTM: Non tuberculous mycobacterium; PHT: Pulmonary artery hypertension; LV: Left ventricle; RHF: Right heart failure

Figure 1



Top End Health Service map, NT. Australia