Improving outcome and care of Pediatric Bronchiectasis in Port Moresby General Hospital

Dr. Vanessa Binene (MMED II)

Supervisors: Prof. T Duke and Dr. R Marcus

MMED 2 Research Project

Used with permission

OUTLINE:

- Introduction
- Aim and Objectives
- Methods
- Results
- Discussion and Conclusion
- Recommendation
- References

INTRODUCTION

- The European Respiratory Society (ERS) defines childhood Bronchiectasis as

"An umbrella term for a clinical syndrome of recurrent or persistent wet/productive cough, airway infection and inflammation, and abnormal bronchial dilatation on chest computed tomography (CT) scans"

- 3rd most common chronic airway disorder. Yet it remains under recognized and neglected[1]

- The development of Bronchiectasis is mainly due to chronic inflammation of the lower respiratory tract. It has been demonstrated that Recurrent Pneumonia early in life is a major risk factor for BE.[5]

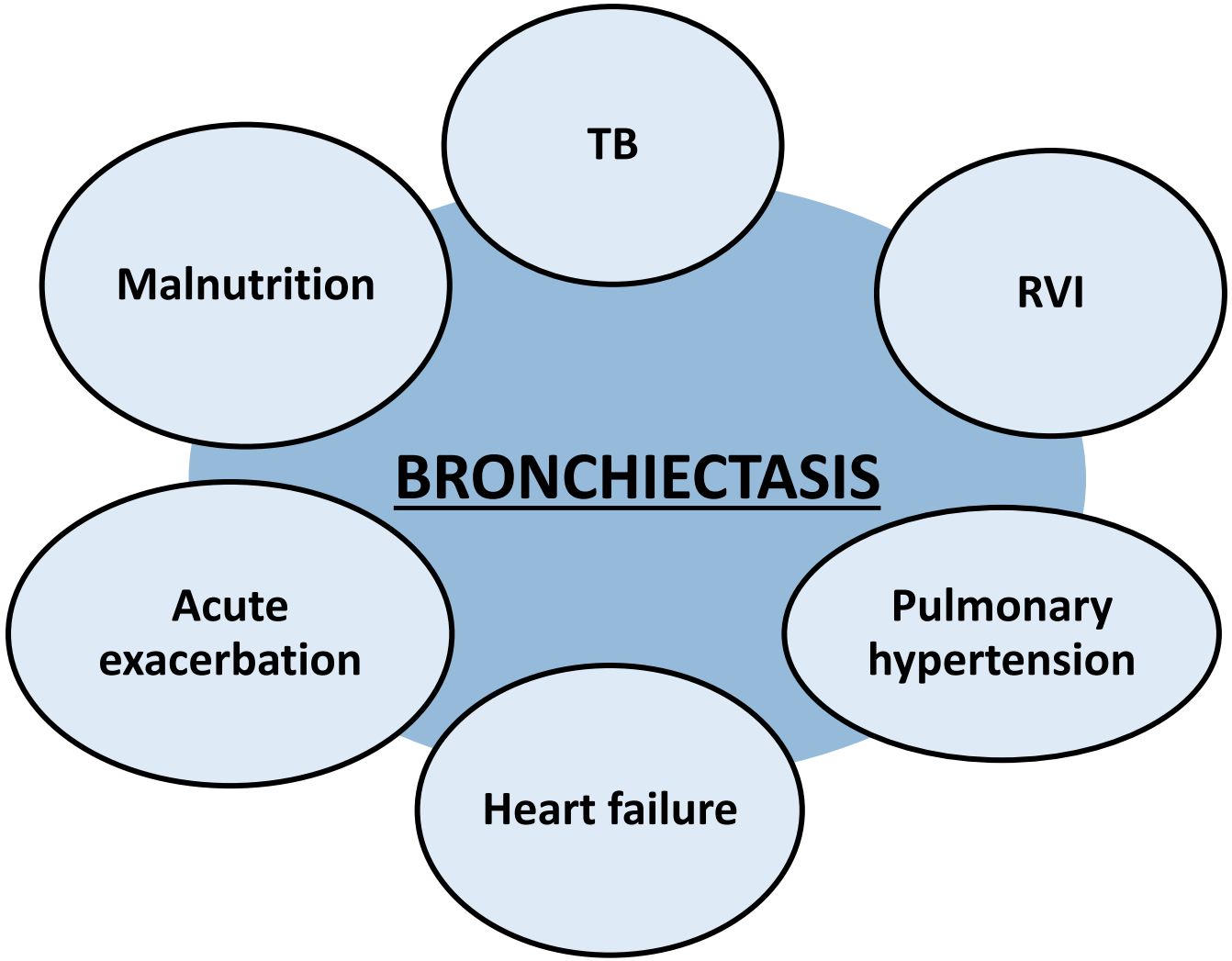
- In developing countries, Pulmonary TB is the common cause of Bronchiectasis in children. Others include, higher bacterial loads, HIV co-infection, indoor air pollution and a reduced vaccine cover.[2]

[1] A.B Chang ERS, et al 2024 [5] Patria MF et al. Italian Journal of Pediatrics (2016) [2] Duke T, et al Arch. Dis Child 2017

INTRODUCTION: Poor Quality of Life (QoL)

Poor Quality of Life from:

- ✓ Frequent acute exacerbations and admissions
- ✓ Multiple comorbidities with complications
- ✓ An overwhelming pill burden.
- ✓ Possible premature death in early adult life.



[11] *Eralp EE et al. BMC Pulmonary Medicine (2020) 20:172*

INTRODUCTION: Bronchiectasis Disease Burden

- **PMGH: In 2022 & 2023**

  2022: 23 patients had 36 admissions .10 died, CFR 43.5%

  2023: 28 patients had 43 admissions. 6 died, a CFR 21.4%

  Average of 28.5 days length of hospital stay

- Bronchiectasis management requires a multi disciplinary approach.

- A debilitating respiratory illness that weighs on the patient, family, and health care system at a substantial economic cost. [1]

[1] *A.B Chang ERS, et al 2024*

AIM AND OBJECTIVES

AIM:

To improve the diagnosis and management of Pediatric Bronchiectasis in PMGH

OBJECTIVES:

- Assess the current disease burden, diagnosis and management of Pediatric Bronchiectasis patients admitted to Port Moresby General Hospital
- Identify common risk factors that predisposes patients to repeated Acute Lower Respiratory Tract infections, eventually leading to Bronchiectasis

METHODS

Study Design	Descriptive Cohort Study
Study Period	July 2022 to July 2024
Study Site	Port Moresby General Hospital: Wards and Clinic
Study Population	All patients admitted with Bronchiectasis during study period
Study size	39 patients
Exclusion Criteria	Patients with liver pathology, cystic fibrosis, CHD and RHD

- **Ethics consent and permission:**

From UPNG, SMHS and PMGH as well as consents from participant's parents

METHODS

Data Collection Tools
Questionnaires: Demography and management Forms: Exercise tolerance test and Peak flow meter daily diary Salbutamol puffers, spacers and pulse oximeters Peak Flow Meter Notebook
Data Collection Method: Collected by researcher with Patient and Parents
Sampling : As admitted or diagnosed
Statistic analyzed with : Microsoft Excel

SOURCE: Ample medica.com

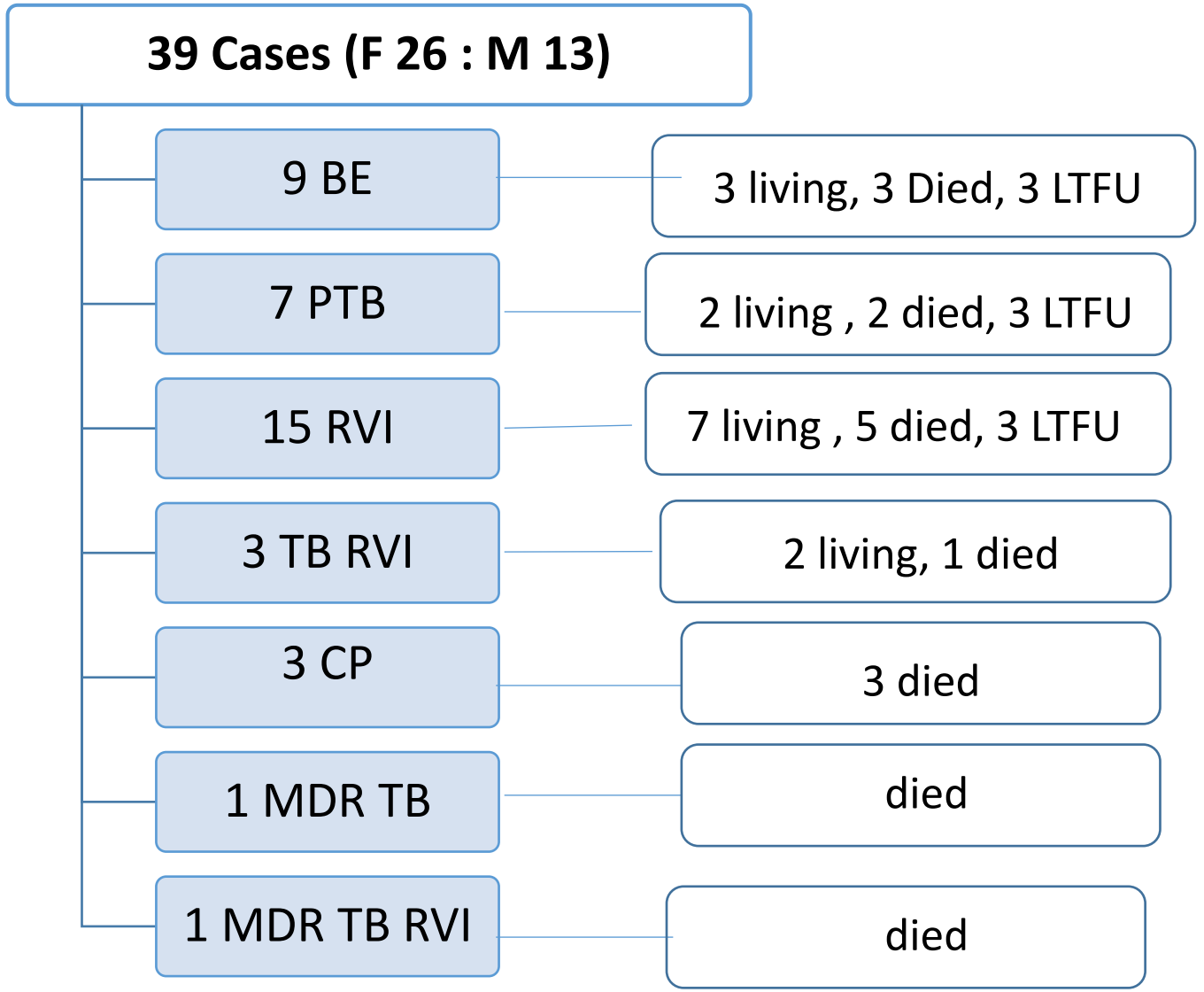
RESULTS:

- 39 Cases (26 Female: 13 Male)
- Median Age (years): 9 IQR(5-12)

Outcome:

- 41% (16) Died
- 36% (14) Regular patients
- 23% (9) Loss to follow-up (LTFU)

- Case fatality Rate: 41% (2022-2023)



RESULTS: Diagnosis

Median Admissions per year	**2 IQR(1-3)**
Median Outpatient management per year	**0 IQR(0-2)**
Median Length of hospital stay (days)	**92 IQR (10-168)**
Reason of presentation: Worsening dyspnea Worsening cough	 **36 (92%)** **3 (8%)**
Median Oxygen Saturation (%) Median Respiratory rate (per min)	**82 IQR (64-88)** **54 IQR (38-64)**
Clinical Features: Clubbing Chest deformity Heart failure signs Pulmonary hypertension	 **32 (82%)** **23 (59%)** **24 (61.5%)** **24 (61.5%)**
Chest x-ray CT scan Sputum tests	**36 (92%)** **4 (10.3%)** **17 (43.6%)**

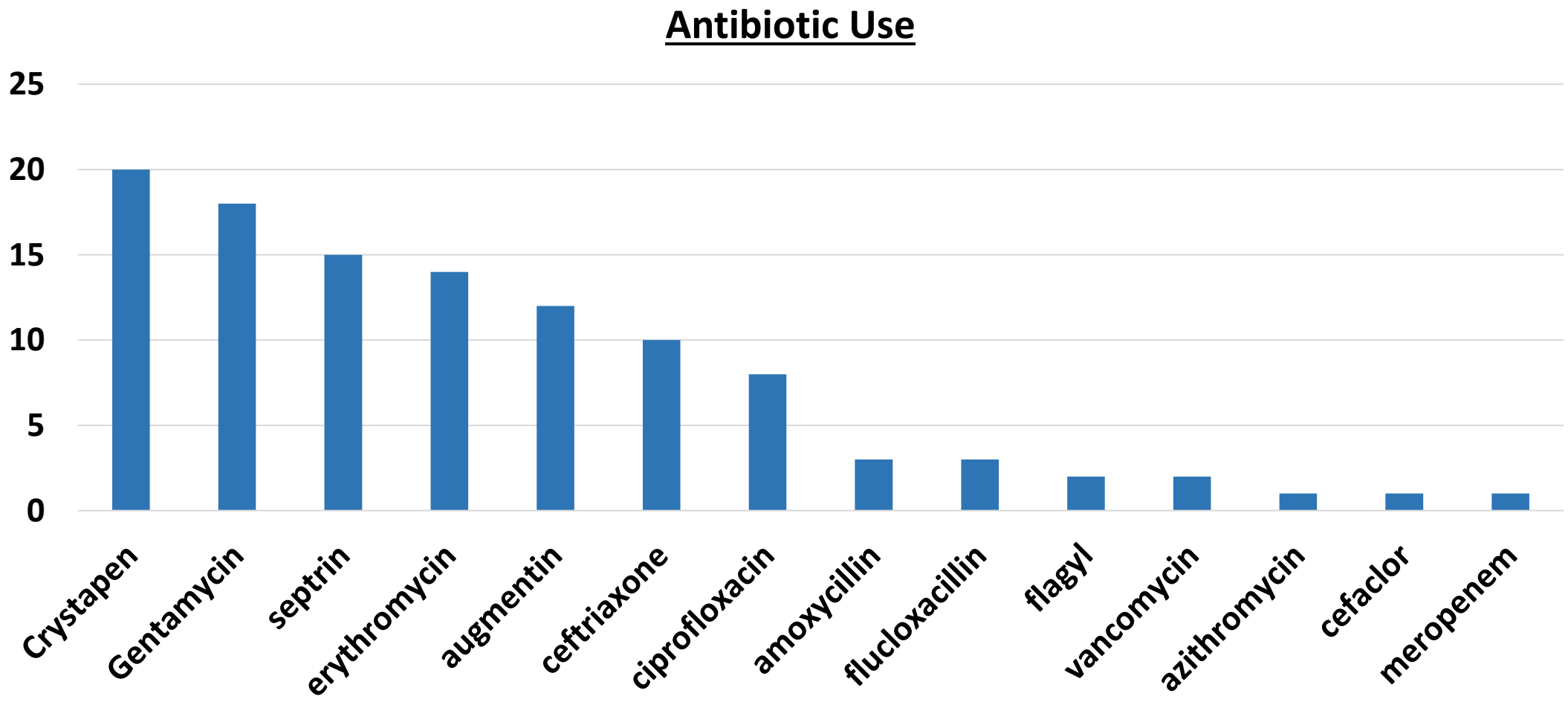
RESULTS: Risk Factors

Incomplete vaccination	**20(51.3%)**
Weaned less than 6 months	**29 (74.4%)**
Poor nutrition	**25 (64%)**
Passive smokers	**35 (89.7%)**
Outdoor fuel burning (kitchen)	**32 (82%)**
Unsupervised home delivery	**9 (23%)**
Bottle fed	**18 (46.2%)**
Literate parents/care givers	**18 (46.2%)**

Results: Management

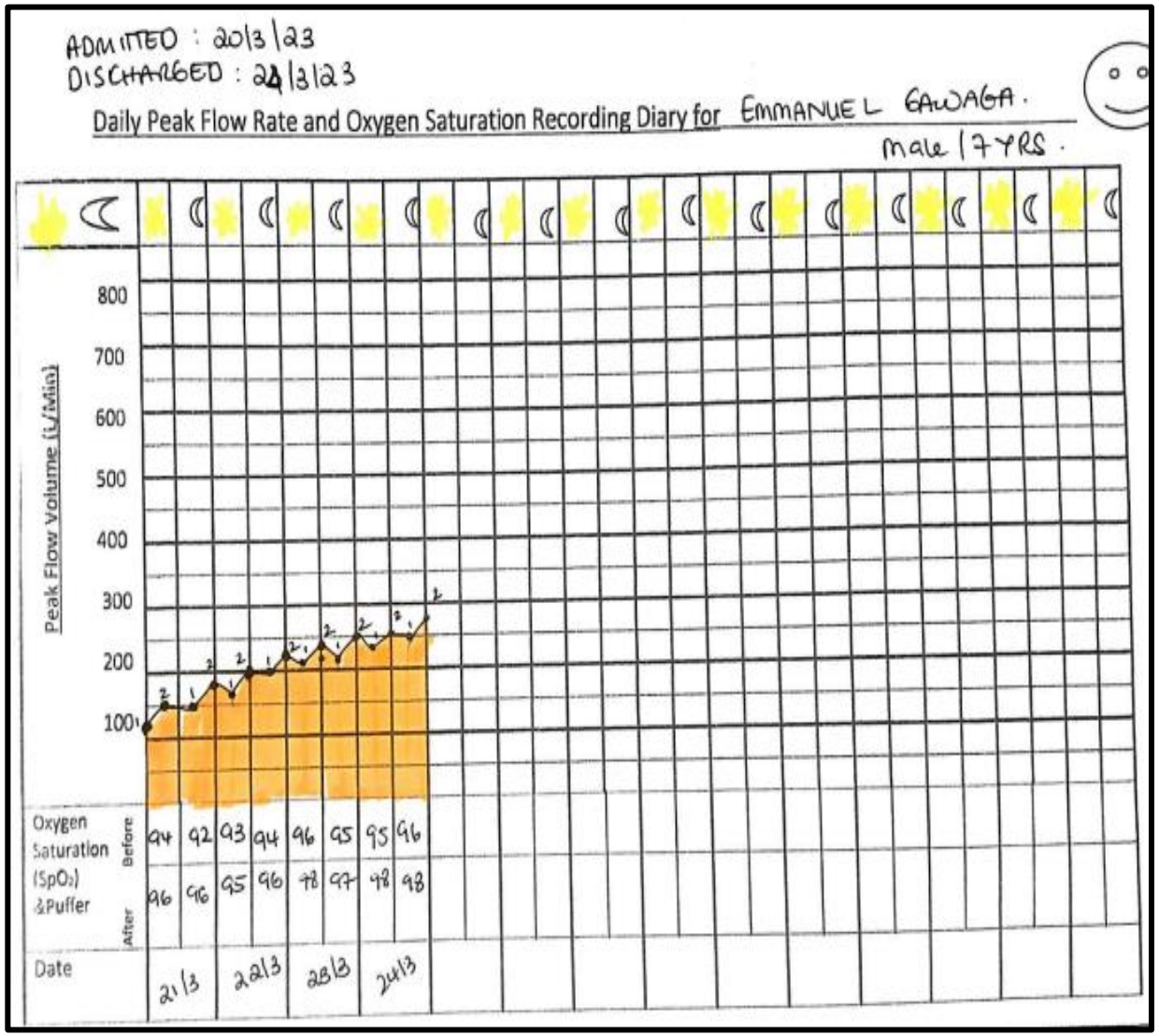
In hospital Acute exacerbation	**38.5%(15)**
Salbutamol use	**82% (32)**
Puffer use at home	**18% (7)**
<u>Physiotherapy</u> Inpatient Review Clinic review	 **59%(23)** **0**
Flow meter use	**33.3% (13)**
Daily diary use	**25.6%(10)**
Oxygen therapy at home	**12.8%(5)**
Prophylaxis use	**43.6% (17)**

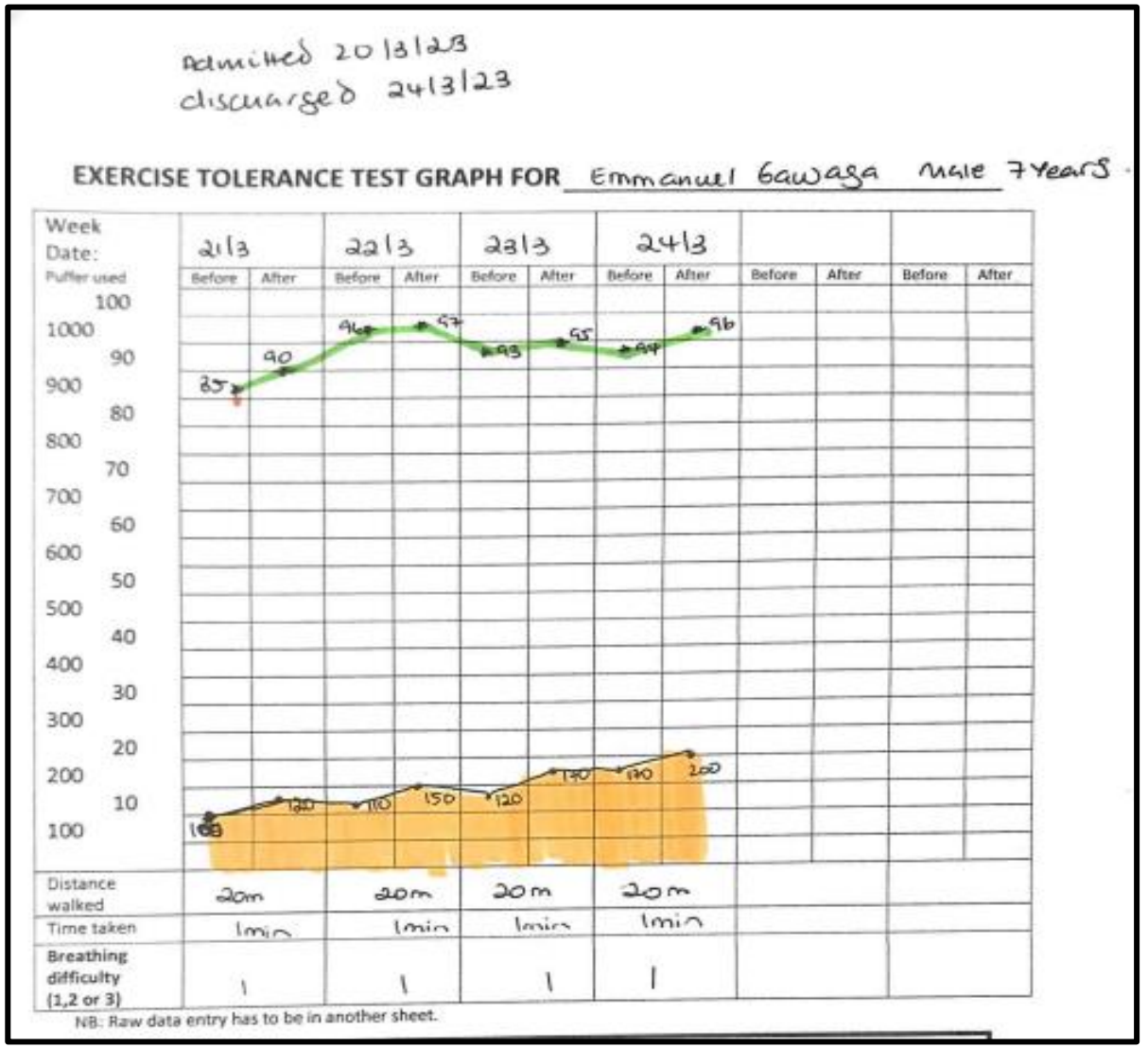
Results: Management



- 17 sputum tests, 11 had growths. Common Klebsiella pneumoniae, Pseudomonas aeruginosa Mostly sensitive to ciprofloxacin, then Septrin and Meropenem

Results: Daily peak flow rate diary and exercise tolerance test example

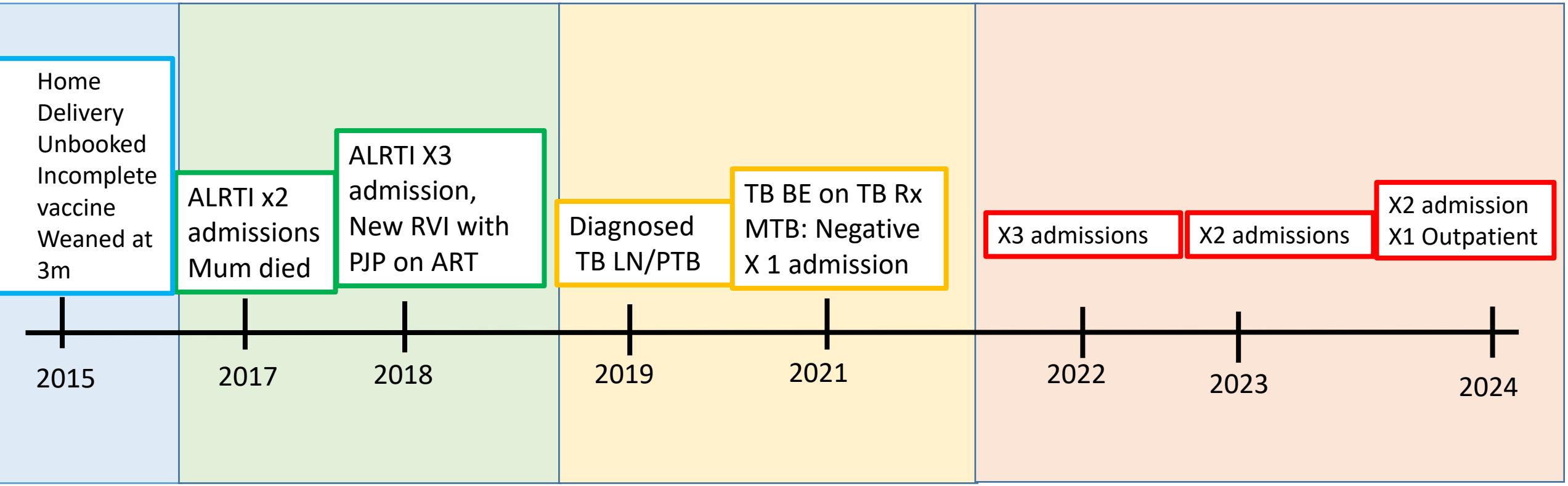




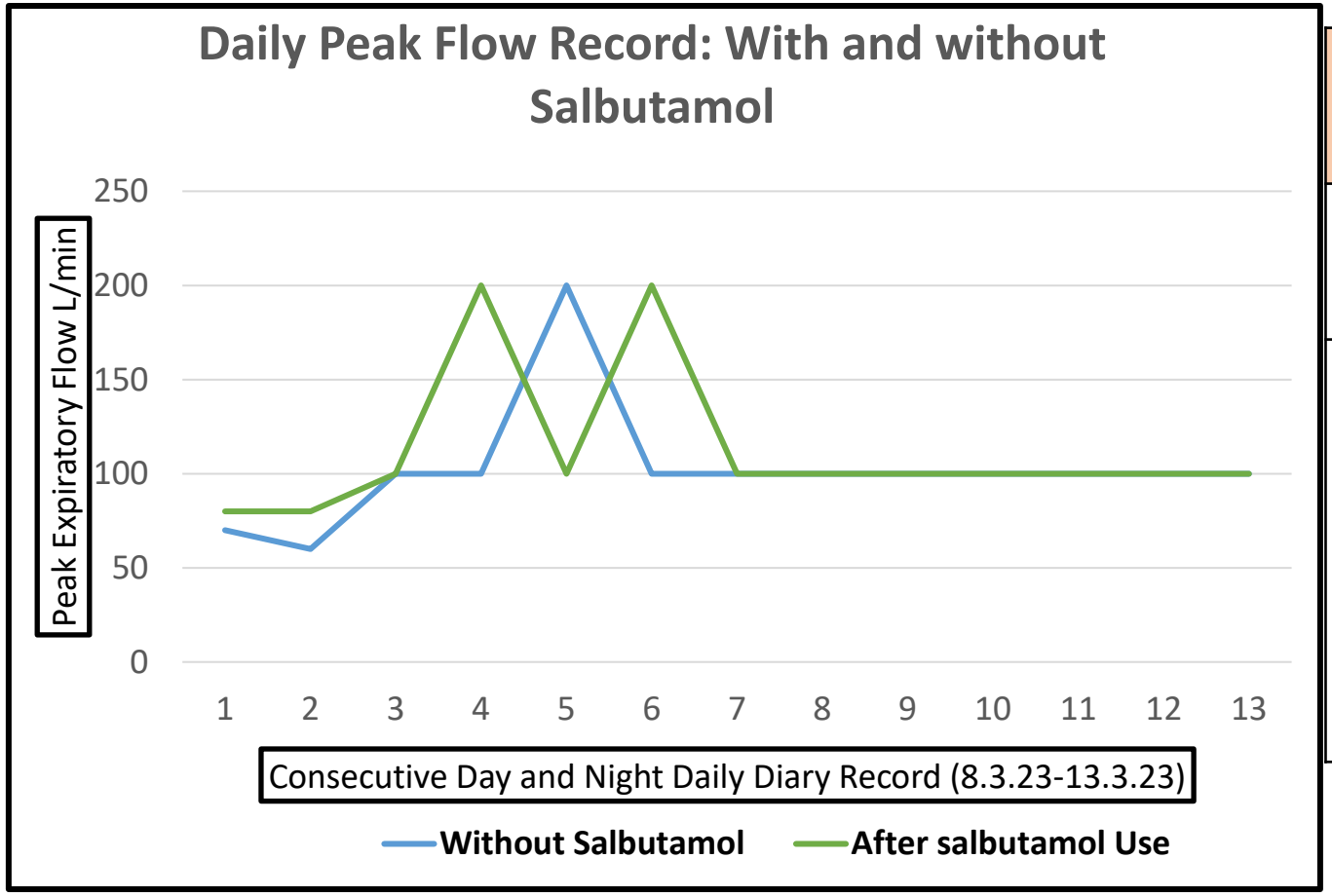
SOURCE: Bronchiectasis Project

Clinical Vignette: HK M/8yrs old

Post TB BE on ART, anti-HF and sildenafil, Puffer and Erythromycin



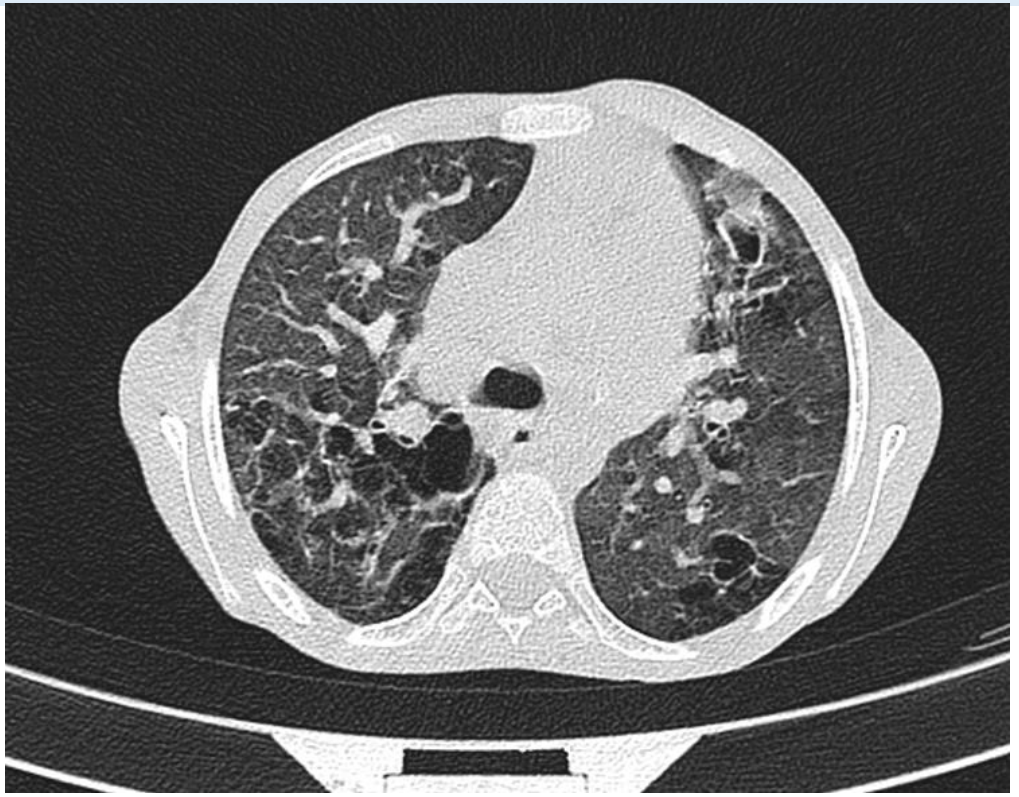
Clinical Vignette: HK M/8yrs old- Interventions



EXERCISE TOLERANCE TEST : 20 meter walk in 2 min		
	Without Puffer	With Puffer
SpO_2	89%	90%
PR	130/min	124/min
RR	34	32
Peak Flow Meter	80	90
Breathing difficulty grade	3	3

Clinical Vignette: Message from this case study

Chest X-ray of HK M/8



Chest CT of HK M/8

- Honey combing lesions seen on Chest X-ray is a sign of late stage Bronchiectasis.[11]
- Interventions at a later stage can help in patients outcome especially with an individually tailored action plan management

[11] *BMC Pulmonary Medicine (2020)*

DISCUSSION: Disease burden

•. Being more aware of Bronchiectasis and its management, has shown a reduction in the number of deaths. As there is a reduction in Case fatality rate (CFR) in 2023 compared to 2022.

•BE alone had the same CFR as patients with comorbidities of RVI and TB. Premature death depends on parents care seeking behavior with efficient short and long term management.

•More than half of the study population had risk factors with underlying comorbidities that predisposed them to developing recurrent pneumonia and bronchiectasis.

The presence of chronic cough at 3-4 weeks post- bronchiolitis hospitalization was a risk factor for bronchiectasis, 20 % developed bronchiectasis within 13 months after discharge. [4]

[4] *Pediatr Pulmonol 2016*

DISCUSSION: Diagnosing Bronchiectasis

- Common diagnostic tool: Chest X-ray 92% (36) because of the ease of accessibility.

The chest radiograph should not be used to exclude bronchiectasis. 14 patients with bronchiectasis diagnosed by HRCT, none had evidence on chest radiograph. [5,7]

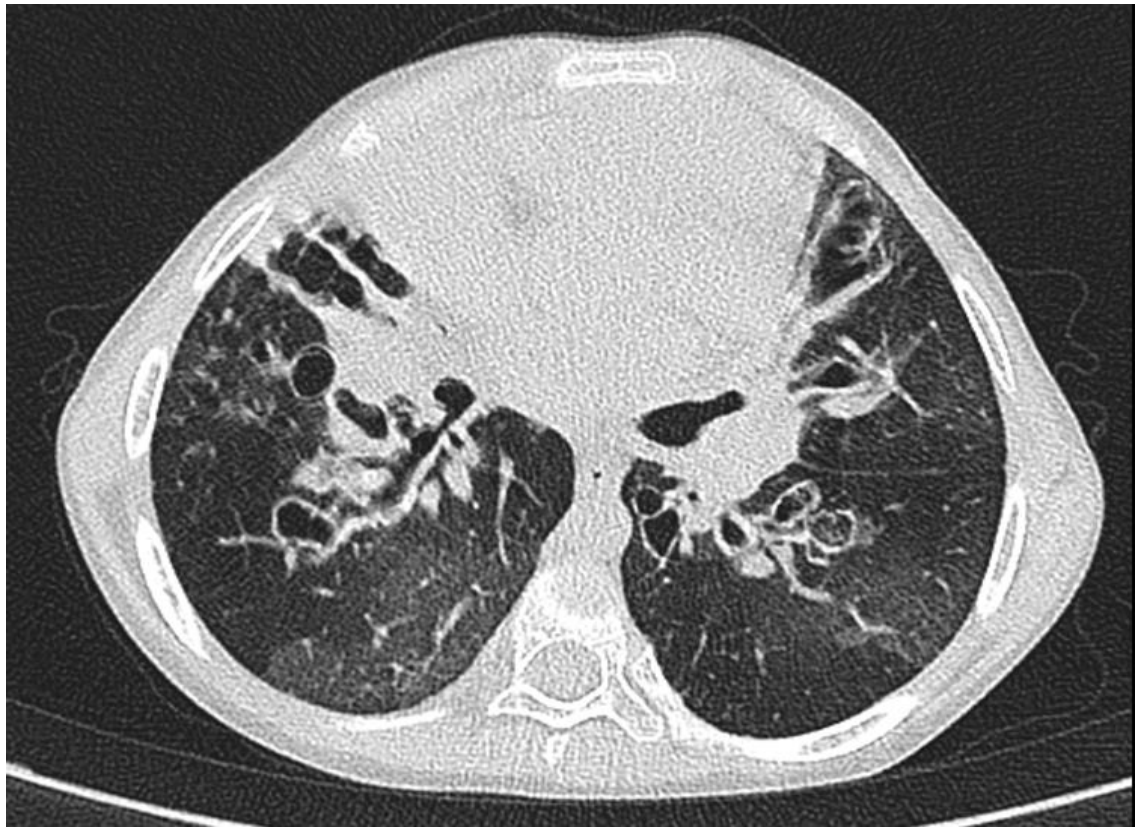
- 4 patients out of the 39 had a CT of the chest done.

It is not commonly used as a diagnostic tool for Bronchiectasis in PMGH and Injector pump unavailable for the 1 year 8 months of the study.

- Sputum tests readily available but used only when there is an acute exacerbation as an inpatient. Antibiotic stewardship starts with doing sputum cultures on admission, preventing antimicrobial resistance and reducing trouble shooting, reducing length of hospital stay

[5]*McGuinness G. et al AJR Am J Roentgenol 1993* [7]*Silverman PM. Et al J Comput Assist Tomogr 1987; 11:52*

Evidence of Bronchiectasis on CT: Early vs. Late



Discussion: Spirometer

CT Scans are not readily available in all provinces, and it is costly.

- All children with suspected or confirmed bronchiectasis should be evaluated with spirometry at diagnosis and with serial measures in follow-up [6]

FEV1 and FEF 25%–75% values were significantly lower in children with Bronchiectasis (p=0.004). [4]

Source: www.aboutkidshealth.ca/Article

[6] UpToDate. Bronhiectasis [4]Patria MF et al. Italian Journal of Pediatrics (2016) 42:13

DISCUSSION: Managing Bronchiectasis

- Chest Physiotherapy should be actively done. During acute exacerbations, children should receive active chest physiotheraphy more frequently.[8]

- Salbutamol Puffer and Spacer should be used regularly if a patient responds well.[8]

- The use of Amoxycillin-Clavulanate in acute exacerbation cases and daily Erythromycin as prophylaxis was seen in 43.6% of the patients.
- Ciprofloxacin was used inpatients whose sputum isolated Klebsiella Pneumoniae (7) and Psudomonas Aeruginosa (2). In accordance with the European Respiratory Society Guideline. [8]

[8]Chang AB et al ERS Guidelines, Eur Respir J 2021;58

DISCUSSION: Addressing the knowledge gaps

• Awareness on diagnosis and management has resulted in an increase in the number of patients diagnosed and admitted. With a lower case fatality rate in 2023.

• Daily peak Flow meter measurements helps a patient and care giver assess lung capacity whereas exercise tolerance although we might think will cause distress to patient, helps improve sputum clearance.[2,12]

Mobilization even if in a wheel chair helps re-inflate posterior collapsed lung segments and induces cough and aids sputum clearance [2]

•**Can pediatric bronchiectasis be reversed or stabilized? Yes**

Implementing early recognition, a thorough diagnosis and aggressive management with monitoring improved patient outcome and prevented further complications.

---

[2] *Duke T, et al. Arch Dis Child 2017*

[12] *Eralp et al.BMC Pulmonary Medicine (2020) 20:17*

CONCLUSION:

This study has made ascertain that:

- Pediatric bronchiectasis should not be under recognized or neglected.
- Having comorbidities with recurrent acute lower Respiratory Tract Infections (ALRTIs), an incomplete vaccination schedule, early weaning and exposure to smoke predisposes patients to Bronchiectasis.
- It has given insight into:

- Identifying and diagnosing Bronchiectasis
- Short term and long term management

There is clearly a need for improvement in diagnosing and managing bronchiectasis.

As we still lack knowledge of the fact the bronchiectasis does exist in the pediatric population.

RECOMMENDATION

- Have a treatment Protocol: Diagnosis and Management.

Early Recognition and awareness in patients with recurrent ALRTIs or a Negative TB Sputum test.

- The use of spirometry to assess lung function and diagnose bronchiectasis.

- Implementing peak flow meters, exercise tolerance tests, and the use of salbutamol puffers for short term management.

- Develop and Implement individually-tailored Bronchiectasis Action Plan Management for long term management plan.

Acknowledgment

- Ross Trust Fund- Murdoch Children's Research Institute
- Professor Trevor Duke
- Dr. Rupert Marcus
- Dr. Francis Pulsan
- TB Team:Dr. Welch and HEO Verlyn. Apis
- Well Baby Clinic SIC
- Paediatric colleagues of PMGH
- Main Supporter system: My Family
- Above all: Thank you God

REFERENCES:

1. A.B. Chang, S.C. Dharmage, J.M. Marchant et al., Improving the Diagnosis and Treatment of Paediatric Bronchiectasis Through Research and Translation, Archivos de Bronconeumología, https://doi.org/10.1016/j.arbres.2024.03.003
2. Duke T, Kasa Tom S, Poka H, et al. Arch Dis Child .doi:10.1136/ archdischild-2017-313095
3. McCallum GB, Chatfield MD, Morris PS, Chang AB. Risk factors for adverse outcomes of Indigenous infants hospitalized with bronchiolitis. Pediatr Pulmonol 2016; 51:613.
4. Patria MF et al. Children with recurrent pneumonia and non-cystic fibrosis bronchiectasis, Italian Journal of Pediatrics (2016) 42:13
5. McGuinness G, Naidich DP, Leitman BS, McCauley DI. Bronchiectasis: CT evaluation. AJR Am J Roentgenol 1993; 160:253
6. Up-to-date. Bronchiectasis
7. Silverman PM, Godwin JD. CT/bronchographic correlations in bronchiectasis. J Comput Assist Tomogr 1987; 11:52
8. Chang AB, Fortescue R, Grimwood K, et al. European Respiratory Society guidelines for the management of children and adolescents with bronchiectasis. Eur Respir J 2021; 58: 2002990 [DOI: 10.1183/13993003.02990-2020].
9. Goyal V, Grimwood K, Marchant J, et al. Does failed chronic wet cough response to antibiotics predict bronchiectasis? Arch Dis Child 2014; 99:522.
10. *https://clinicalinfo.hiv.go/en/guidelines/pediatric-arv*
11. Eralp EE et al. Changing clinical characteristics of non-cystic fibrosis bronchiectasis in children. BMC Pulmonary Medicine (2020) 20:172
12. Verwey C, Gray DM, Dangor Z, Ferrand RA, Ayuk AC, Marangu D, Kwarteng Owusu S, Mapani MK, Goga A and Masekela R (2022) Bronchiectasis in African children: Challenges and barriers to care. Front. Pediatr. 10:954608. doi: 10.3389/fped.2022.954608