



Asthma Pathway

Background

- GBD study estimates [34.3 million](#) patients with asthma in India, accounting for 13.09% of the total asthma burden
- India [has 3x higher](#) asthma mortality and 2x higher asthma morbidity compared to global burdens
- Asthma is [underdiagnosed and undertreated](#) in India

Main Source Documents

- [GINA](#)
 - o Global Initiative for Asthma. Global Strategy for Asthma Management and Prevention, 2023. Updated May 2023. Available from: www.ginasthma.org
- UpToDate
- [Indian Guidelines](#) (2015)
- UK guidelines (BTS, NICE)
- US [NIH guidelines](#)
- WHO [https://www.who.int/publications/i/item/who-package-of-essential-noncommunicable-\(pen\)-disease-interventions-for-primary-health-care](https://www.who.int/publications/i/item/who-package-of-essential-noncommunicable-(pen)-disease-interventions-for-primary-health-care)
- International Union Against Tuberculosis and Lung Disease (The Union)
- Review article NIH discussing management of asthma in LMIC- shortcomings/ available resources <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9474897/>

Key points for contextualisation

- Diagnosis
 - o Diagnosis of asthma requires evidence of variable expiratory airflow obstruction
 - o The gold standard approach requires access to spirometry.
- Treatment – ensuring appropriate, evidence-based stepwise treatment
- Education – including appropriate use of inhalers, literacy?
- Non-pharmacological management
- Key barriers
 - o Environmental (how to address?)
 - o [Financial](#) – inhalers remain expensive/unaffordable in LMICs
- Currently do not address:
 - o Children 0-5

Diagnosis

- Intermittent dyspnoea, cough, wheeze, chest tightness
- Diagnosis requires symptoms + variable expiratory airflow obstruction
- Spirometry criteria:
 - o $FEV1/FVC < 0.7$
 - o AND reversibility (improvement in FEV1/FVC after 2-4 puffs of SABA)
 - Various ways to define this:
 - Increase of ≥ 12 percent **and** 200 mL in FEV1



- Alternatively: 20% improvement in peak expiratory flow 15 minutes after bronchodilation (for LMICs)
- In high-income settings, asthma is often overdiagnosed, or diagnosed without diagnostic testing

Differential Diagnosis (based on “cough” per UpToDate)

- chronic obstructive pulmonary disease
- gastroesophageal reflux disease
- pneumonia
- rhinitis or rhinosinus
- post-viral tussive syndrome
- eosinophilic bronchitis
- cough induced by angiotensin converting enzyme inhibitors
- infection with Bordetella pertussis

Non-pharmacological management (most important)

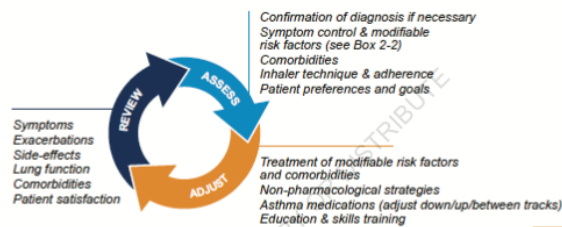
- Smoking cessation
- Avoid triggers

Stepwise Management of Asthma (in patients 12+) – based on GINA guidelines

Box 3-12. Personalized management for adults and adolescents to control symptoms and minimize future risk

GINA 2023 – Adults & adolescents 12+ years

Personalized asthma management
Assess, Adjust, Review
for individual patient needs



TRACK 1: PREFERRED CONTROLLER and RELIEVER
Using ICS-formoterol as the reliever* reduces the risk of exacerbations compared with using a SABA reliever, and is a simpler regimen

STEPS 1 – 2
As-needed-only low dose ICS-formoterol

STEP 3
Low dose maintenance ICS-formoterol

STEP 4
Medium dose maintenance ICS-formoterol

STEP 5
Add-on LAMA
Refer for assessment of phenotype. Consider high dose maintenance ICS-formoterol, ± anti-IgE, anti-IL5/5R, anti-IL4Rα, anti-TSLP

RELIEVER: As-needed low-dose ICS-formoterol*

See GINA severe asthma guide

TRACK 2: Alternative CONTROLLER and RELIEVER
Before considering a regimen with SABA reliever, check if the patient is likely to adhere to daily controller treatment

STEP 1
Take ICS whenever SABA taken*

STEP 2
Low dose maintenance ICS

STEP 3
Low dose maintenance ICS-LABA

STEP 4
Medium/high dose maintenance ICS-LABA

STEP 5
Add-on LAMA
Refer for assessment of phenotype. Consider high dose maintenance ICS-LABA, ± anti-IgE, anti-IL5/5R, anti-IL4Rα, anti-TSLP

RELIEVER: as-needed SABA, or as-needed ICS-SABA*

Other controller options (limited indications, or less evidence for efficacy or safety – see text)

Low dose ICS whenever SABA taken*, or daily LTRA, or add HDM SLIT

Medium dose ICS, or add LTRA, or add HDM SLIT

Add LAMA or LTRA or HDM SLIT, or switch to high dose ICS

Add azithromycin (adults) or LTRA. As last resort consider adding low dose OCS but consider side-effects

*Anti-inflammatory relievers (AIR)

Step 1: Infrequent symptoms (<2 times/week)

- Low dose ICS/rapid onset LABA (Track 1) OR
- SABA + ICS whenever SABA used (Track 2)

Step 2: Symptoms or need for inhaler ≥ 2 times/week



- Low dose ICS-formoterol as needed (Track 1) OR
- Low dose ICS daily AND SABA (Track 2)

Step 3: symptoms on most days, nocturnal awakening due to asthma \geq once/month, risk factors for exacerbations

- Low dose ICS-formoterol for maintenance and reliever (MART; Track 1) OR
- Low dose ICS-LABA AND SABA (Track 2)

Step 4: severe uncontrolled asthma with \geq of: daytime symptoms \geq 2 times/week, nocturnal awakening due to asthma, reliever needed $>$ 2 times/week, activity limitation

- Medium dose ICS-formoterol for maintenance and reliever (MART; Track 1) OR
- Medium Dose ICS-LABA AND SABA PRN (Track 2)

Step 5: Consider high dose ICS-LABA and Add-on LAMA

Stepwise treatment of children ages 6-11

Step 1: Symptoms less than twice a month and no risk factors for exacerbation

- As needed SABA

Step 2: Symptoms or need for reliever more than twice a month but less than daily

- Low dose ICS with as-needed SABA

Step 3: Symptoms most days, nocturnal awakenings due to asthma, especially in the context of risk factors for exacerbation

- Low dose ICS-LABA with as needed SABA OR
- Medium dose ICS with as needed SABA

Step 4: As for Step 3, but with poor lung function

- Medium dose ICS-LABA AND referral to specialist

Step 5: consider high dose ICS-LABA

Dosage adjustments

- Day to day adjustments
 - o Reliever inhaler can be adjusted as needed (i.e. used more)
- Short term adjustments: increase in ICS dose for 1-2 weeks may be necessary (e.g. if viral illness, or allergen/pollution exposure)

Stepping down therapy

- Continue with same treatment and once good asthma control has been achieved and maintained for 2–3 months, consider stepping down gradually to find the patient's lowest treatment that controls both symptoms and exacerbations.

If poor response to therapy

- Inhaler technique!!



- Confirm/reconsider diagnosis
- Assess risk factors and comorbidities
- Consider stepping up treatment

Management of exacerbations- location of management based on extent of exacerbation.

Home therapy

- All patients should be provided an asthma action plan
- Home therapy of exacerbations depends on whether we are doing Step 1 or Step 2
- Increase reliever for acute exacerbation
 - o If usual reliever is ICS-LABA, increase frequency not exceeding maximum daily dosage of inhaler
 - o If usual reliever is SABA, then increase frequency
- Increase preventer to prevent future exacerbations
 - o If usual preventer is ICS-formoterol, continue maintenance ICS-formoterol AND increase reliever ICS-formoterol as required
 - o If usual preventer is ICS with SABA as reliever, quadruple ICS dose
- Above changes should be continued for 1-2 weeks
- If peak flow is < 60% of previous best peak flow, OR if not improving after 48 hours
 - o Continue reliever and preventer
 - o Add prednisone 40-50mg
 - o **Contact doctor**

Clinic management

- Assess clinical stability
 - o If severe: If unable to talk in full sentences, respiratory rate > 30, accessory muscle use, HR > 120, SpO₂ on air < 90%, peak flow < 50%
 - Transfer to higher center of care
 - In the interim, give SABA, ipratropium bromide, O₂, systemic corticosteroid
 - o If mild or moderate: talks in phrases, prefers sitting to lying down, not agitated, respiratory rate increased from baseline, accessory muscles not used, pulse 100-120 beats per minute, O₂ saturation on air 90-95%, peak flow >50% predicted or best
 - Treat at clinic
 - Salbutamol 4-10 puffs via spacer, every 20 minutes for 1 hour
 - Prednisolone 40-50mg (adults), children 1-2mg/kg max 40mg
 - O₂ therapy if available: target SpO₂ 93-95% (children 94-98%)
 - Reassess at 1 hour
 - If worsening, requires transfer to higher center of care
 - If improving, discharge. signs of improvement below
 - o Improving symptoms, no SABA requirement
 - o Peak flow 60-80% of predicted or personal best
 - o SpO₂ > 94% on room air
 - o Safe discharge destination



- Ensure has home action plan
 - Prednisolone – to be continued for 5-7 days (adults), 3-5 days (children)
 - Follow up within 2-7 days (adults), 1-2 days (children)
 - continue the rescue inhaler as needed. rescue inhaler may be SABA, low dose ICS-LABA, or ICS-SABA
 - up titrate maintenance inhaler- ICS-LABA – to be continued or uptitrated

Asthma-COPD overlap

- Both are obstructive conditions with overlapping diagnostic criteria
- Some patients may have features of both conditions
 - Particularly if long standing asthma and risk factors for COPD (e.g. smoking)
- For patients with features of both asthma and COPD, treat as asthma with ICS
 - First line therapy for COPD (i.e. LAMA or LABA without ICS) is not appropriate for patients with features of asthma (see CSA COPD pathway)

Other topics to address

- Risk factor modification/non-pharmacological measures?
- Other than avoiding smoke/pollution, this is tricky

Interventions to avoid

- Do not use oral steroids as a first line therapy for asthma
 - “It is not acceptable in 2022 to manage asthma with SABAs and oral corticosteroids instead of preventive ICS-containing treatments” – GINA
- Avoid SABA monotherapy, even in cases of mild asthma
 - Associated with [increased rates](#) of asthma-related death, and urgent asthma-related healthcare
- Do not treat asthma exacerbations with corticosteroid therapy
- Do not treat asthma with methylxanthines (e.g. theophylline)

Vaccinations

- Influenza
- Pneumococcal
- COVID-19

APPENDIX A

List of available drugs along with cost information

Drug Class	Drug name	Type	Brand	Pricing



SABA	Salbutamol	Rotacaps	Cipla - Asthalin	200 mcg - 60 capsules in 1 bottle- Rs 98/pack
		Metered dose inhaler	Cipla - Asthalin	Rs 110/ box
		Respules	Cipla - Asthalin	2.5mg/2.5 ml pack of 5 - Rs 28
	Levisalbutamol	Rotacaps	Cipla- Levolin	100 mcg- 30 capsules in 1 bottle - Rs 30/pack
		Metered dose inhaler	Cipla- Levolin	50 mcg inhaler / Rs 200 per pack
		Respules	Cipla - Levolin , Lupin- Salbair	0.63 Mg/ 1 respule- Rs 5 per respule, 0.63mg/2.5 mL respule - Rs 7 per respule
Combination - SABA and SAMA	Ipravent and Levosalbutamol	Rotacaps	Cipla - Duolin	60 capsules - 100 + 40 mcg/ Rs 144 per bottle
		Metered dose inhaler	Cipla - Duolin Forte	200 mdi inhaler - Rs 393
		Respules	Cipla - Duolin	3 ml respules - pack of 5- Rs 104
ICS	Fluticasone	Rotacaps		
		Metered dose inhaler	Cipla - Flohale	125 mcg/dose, Rs 267/ inhaler
		Respules	Cipla- Flohale	0.5 mg respules - Rs 240



	Budesonide	Rotacaps	Cipla - Budecort	200 mcg , 30 capsules in 1 bottle - Rs 92
		Metered dose inhaler	Cipla- Budesonide inhaler	100, 200 mg- Rs 400
		Respules	Cipla - Budecort respules	0.5 mg respules, Rs 115 - pack of 5
	Ciclesonide	Rotacaps	Cipla - Ciclohale	400 mcg -30 capsules , Rs 195
		Metered dose inhaler	Cipla- Ciclohale, Ranbaxy - Osonide	Ciclohale- 160 mcg- Rs 350, Osonide- 160 mcg- Rs 300
		Respules	NA	
Triple therapy, combination drug ICS+LABA+LAMA	beclometasone dipropionate/formoterol fumarate/glycopyrronium bromide (BDP/FF/G)	pressurized metered-dose inhaler	TRIMBOW® , Chiesi Farmaceutici SpA	Single dosage- 87/5/9 µg (two inhalations twice daily)
	Fluticasone Furoate/Umeclidinium/Vilanterol FF/UMEC/VI	Multidose dry-powder inhaler (MDDPI) formulation to be delivered through the ELLIPTA inhaler device (Single-Inhaler Triple Therapy (SITT))	TRELEGY ELLIPTA®, GlaxoSmithKline	Single dosage- 92/22/55 µg (one inhalation per day) - Maintenance treatment of both asthma and COPD

	GlaxoSmithKline FF/UMEC/VI	Dry powder inhaler	Trelegy Ellipta	Once daily - Maintenance treatment of COPD; ₹2822/box
	AstraZeneca BDP/FOR/GP Beclomethasone/Formoterol/G lycopyrronium	pressurized metered- dose inhaler	BREZTRI	Twice daily (CJ: can't find this drug online; probably not sold in India yet)
	Novartis IND/GLY/MF Indacaterol/Glycopyrronium/ Mometasone furoate	Dry powder inhaler	Energair Breezhaler	Once daily (CJ: can't find this drug online; probably not sold in India yet)
	Glenmark GLY/FOR/FP Glycopyrronium/Formoterol/F luticasone propionate	Dry powder inhaler	Airz-FF	Twice daily ; ₹535/box of 30 capsules
	Cipla GLY/FOR/BUD Glycopyrronium/Formoterol/B udesonide	Dry powder inhaler	Glycohale- FB	Twice daily; ₹184.7/box of 10 rotacaps
	Tiotropium/Formoterol/Cicles onide (TFC)	Dry powder inhaler (DPI)/ Pressured metered dose inhaler (pMDI)	Triohale®, Cipla	18 mcg/12 mcg/400 mcg - once-daily; ₹1132/ inhaler with 200 metered doses



ICS and LABA-combination	Fluticasone and Salmeterol	Rotacaps	Macleods Pharma-Flutrol, Zydus Cadila-Forair R cap, Seroflo- 500 rotacaps	Flutrol rota capsule- 50/100 mcg- Rs 155, Forair R cap- 100/50 mcg- Rs 361- for 30 capsules, Seroflo500 rotacaps -500/50 mcg- Rs 472
		Respules	Lupin Labs- Esiflo,	Esiflo- 100/50 mcg- 30 capsules Rs 108
		Metered dose inhaler	Glenmark - Airtec SF, Sun pharma- Combitide	Airtec SF- 50 mcg/100 mcg- Rs 330, Combitide - 25/125 mcg - Rs 292
(rapid onset)	Budesonide and Formoterol	Rotacaps	Zydus cadila - Formonide Resicaps ,	Formonide resicaps- 200/6 mcg- Rs 147- for a bottle of 30
		Respules		
		Metered dose inhaler	Kopran Pharma- VentFB inhaler	Vent FB inhaler - 100/6 mcg- Rs 134
	Fluticasone and Vilanterol	Rotacaps		
ICS and SABA combo	Budesonide(0.5 Mg) + Salbutamol / Albuterol(1.25 Mg)			Budesal 0.5mg 2ml Packet Of 5 Respules for ~ Rs 240
				Derisal 0.5mg 2ml Packet Of 7 Respules for ~ RS 340



	Levosalbutamol (50mcg) + Beclometasone (50mcg)		Cipla	Aerocort Inhaler for ~Rs 270 / 1 Packet 200 MDI Inhaler
		Respules		
		Metered dose inhaler		
LABA+LAMA	Formoterol Fum.	single inhaler device disposable	Tioform	Dosage- 6 or 12 µg (18/12 mcg; 9/6 mcg); ₹677
Prednisolone		(40-50mg)	various brands	40mg oral - avg Rs 25/ strip of 10 tablets
			Depomax S 40mg Injection, Mps 40mg Injection	Rs 100-150