Original Article

Step-in step-down approach in the management of bronchial asthma in adolescents and adults

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ABSTRACT

Introduction: Despite the **s**tep-up step-down approach of asthma management suggested by the Global Initiative for Asthma (GINA), control of asthma continues to be poor. It was hypothesized that a new "Step-in Step-down approach" could prove to be a better alternative. The present study was carried out with the objective to assess the efficacy and adverse effects of this new approach in the control of asthma. **Materials and Methods:** All treatment-naïve asthma patients were randomly allocated to either Group I (patients received budesonide 400 μg + formoterol 6 μg twice daily via dry powder inhalation device along with as-needed salbutamol) or Group II (patients received stepwise treatment as per GINA guidelines, 2017). Patients were monitored on a fortnightly basis for control of symptoms, spirometry, and complications if any. Asthma Control Questionnaire (ACQ-7) was used to assess control of asthma. Adverse effects, if any, were recorded and managed appropriately. Step-down was attempted on achieving sustained control of asthma, i.e., ACQ score of <0.75 on two consecutive fortnight assessments in both the groups. In Group I patients, long-acting β2-agonist was withdrawn first. Subsequently, a dose of budesonide was also reduced. In Group II patients, the treatment was decreased to the next lower step medicines as per the GINA guidelines. **Results:** After exclusions, a total of 787 patients were randomized to either Group I or II. The demographic profile of patients in the two groups was similar. Patients on "step-in step-down" approach had a statistically significant advantage over those on conventional step-up step-down approach in terms of (a) time to the first control (271 vs. 98 within first 4 weeks), (b) need for rescue steroids (two patients in Group 1 vs. 40 in Group 2), (c) number of exacerbations (30 vs. 232), and (d) use of rescue SABA (Only 30 patients in group I required > 5 inhalations per week as compared to all in group II). Adverse reactions were not observed in any of the patients in either group. **Conclusion:** We conclude that step-in step-down approach is a more robust and safer approach for control of asthma.

KEY WORDS: Asthma, step-in step-down, step-up step-down

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INTRODUCTION

Asthma is increasingly being recognized as an important health issue worldwide including India. The level of asthma control is closely linked to the use of health-care resources, the level of lifestyle impairment, and quality of life (QoL). The better is the control, the less is impairment, the lower is the use of health-care resources and the higher is the QoL.[1-6]

Global Initiative for Asthma (GINA) is publishing its guidelines to control asthma ever since the year 1995. It

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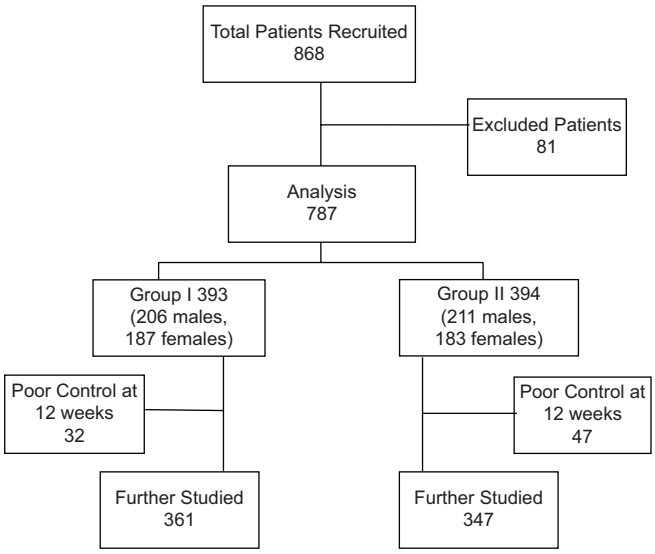

Figure 1: Flowchart of patients under the study

recommends the "Step-up Step-down approach" to control asthma whereby a patient is initiated basic treatment at the time of intake, depending on symptoms and severity of airflow obstruction, monitored from time to time, and then to step up or step down the treatment as per the level of control of asthma. GINA is updating its guidelines almost every year, the last at the time of conceptualization of this study being the Update-2017.[7]

Despite these guidelines in place, surveys in Europe, Asia-Pacific, and USA say that control of asthma continues to be poor.[8-10] UK statistics-2016 says that (a) every 10 s someone in the UK has a potentially life-threatening asthma attack, (b) three people die of asthma attack every day and two-third of these deaths could be prevented, and (c) others still suffer from asthma so severe that current treatments do not work.[11] Thus, complete control of asthma continues to be elusive.

Gupta,[12] in a recent review, has argued that a more robust control of asthma can be achieved if: (a) treatment is initiated with moderate dose of inhaled corticosteroid (ICS, i.e., 800 μg of beclomethasone or equivalent)) along with inhaled long-acting β2-agonist (LABA) and (b) step-down is initiated with the withdrawal of LABA first and reducing the dose of ICS later, when sustained control is achieved (Asthma Control Questionnaire [ACQ] <0.75 for 2 consecutive fortnights). The authors named it as "Step-in Step-down approach." This approach is based on two studies, namely the FACET study[13] and GOAL study.[14] A revisit to the FACET study by Gupta[15] has revealed that a higher dose of ICS along with LABA gives more sustained control of asthma as compared to a lower dose of ICS along with LABA in short as well as long term. Important inferences of the GOAL study included (a) control was achieved more rapidly and at a lower dose with ICS + LABA than with ICS alone, (b) exacerbation rates were significantly lower with ICS + LABA than with ICS alone, and (c) not all poorly controlled asthma patients achieved a total asthma control despite the use of high doses of ICS + LABA or ICS over a prolonged period, thus emphasizing the importance of good initial control.

The present study was carried out to assess the efficacy and adverse reactions (local or systemic adverse events related to ICS or beta-2 agonists, if any) of the new "Step-in Step-down approach" vis a vis the GINA's "Step-up Step-down approach" in control of asthma and thus recommend the best approach for the control of asthma to ensure the best use of the health-care resources. The primary endpoint for the study included (a) number of rescue inhalations taken per week, (b) number of weeks required to achieve control of asthma, and (c) number of exacerbations recorded over a period of 52 weeks of follow-up. Secondary endpoints included (a) other factors influencing adverse outcomes and (b) adverse reactions if any.

MATERIALS AND METHODS

This study was conducted at three private chest clinics, at Jaipur, Nagpur, and Ajmer, having facilities for spirometry and monitoring of the patients. All patients, 12 years or above in age, reporting with respiratory symptoms such as wheeze, shortness of breath, chest tightness, and/or cough, varying over time or in intensity, were recruited. They were then assessed clinically and subjected to routine laboratory investigations, i.e., complete blood counts, blood sugar and complete urine examination, X-ray of the chest posteroanterior view, and sputum for acid-fast bacilli, if required. After excluding other diseases, these patients were subjected to spirometry including a reversibility test.[7] Those patients who did not show obvious airflow limitation (forced expiratory volume in 1 s/forced vital capacity (FEV1/FVC) <70%) on spirometry were provided a peak flow meter, trained in its use, and asked to record their peak expiratory flow rate (PEFR), morning and evening, for 15 days.

Inclusion criteria

1. Patients having characteristic respiratory symptoms
2. Reversible airflow limitation[7] and/or a diurnal variation of in PEFR of >15% as assessed for 15 days.

Exclusion criteria

1. Patients with age below 12 or over 80 years
2. Patients with prior history of the treatment of asthma of more than 15 days
3. Patients suffering from acute and/or severe asthma and
4. Patients suffering from other respiratory and nonrespiratory diseases.

After exclusions, the remaining patients, qualifying the criteria for the diagnosis of bronchial asthma, were finally enrolled for the study.

Sample size

The sample size for the study was calculated using software Primer Version 6 (Primer-E Ltd, Ivybridge, United Kingdom).[16] Assuming an efficacy of 70% in Group I patients and 60% in Group II patients (or the reverse of it) and at α error of 0.05 and power of 80%, a minimum of 376 subjects were to be enrolled in each group.

The intake for the study started in March 2018 and was to continue till about 1000 patients (about 500 in each group) were enrolled.

Written consent was obtained from all the patients after explaining the study protocol. Although the study does not raise any ethical issue, ethical clearance was obtained from the local ethics committee at each center. The study was carried out by a team consisting of an investigator, a treatment adviser, and an evaluator. The former trained the latter as regards their role in the study methodology, prior to start of the intake.

The study patients, regardless of the severity of asthma, were then randomly allocated to one of the two groups using randomization tables (500 patients for each center). They were then put to treatment by the treatment advisor as under.

Group I patients:

All the patients of this group were given a combination of a moderate dose of ICS with LABA dry powder inhalation [DPI] budesonide 400 µg + formoterol 6 µg twice daily via DPI device along with as-needed reliever medication, i.e., DPI salbutamol 200 µg.

Group II patients

These patients received stepwise treatment as per GINA guidelines 2017 as under, depending on symptoms and severity of airflow obstruction as under:

a. Step I: DPI salbutamol 200 µg as needed
b. Step II: DPI budesonide 200 µg twice daily along with as-needed DPI salbutamol 200 µg
c. Step III: DPI budesonide 200 µg plus formoterol 6 µg, twice daily along with as-needed DPI salbutamol 200 µg.

All the patients were advised to avoid avoidable allergens, rinse their mouth after use of the inhaler, and quit smoking if any. Allergic rhinitis if any was managed as per the ARIA guidelines, 2017.[17] Defaulters were asked telephonically to comply with treatment on day 3 and day 7 of the default.

Monitoring

All the study patients were monitored on a fortnightly basis or earlier if required by an evaluator for (a) control of symptoms, (b) spirometry, and (c) complications, if any. ACQ-7 was used to assess control of asthma,[18] wherein a score of 0.75 or less meant that asthma is well controlled and a score of 1.5 or more meant that asthma is poorly controlled. Patients with a score of >0.75 but <1.5 were labeled as part controlled [Appendix 1].

Treatment after default

All the patients who reported with default of more than 3 days at any assessment were restarted on the same treatment where they left, regardless of the status of control in them.

Step-up

In Group 1 patients, the same treatment was continued until control was achieved or up to a maximum of 12 weeks.

In Group II, treatment was stepped up to the next level, after every fortnightly until control was achieved or up to a maximum of 12 weeks of poor control, as under:

a. DPI budesonide 200 µg twice daily along with as-needed DPI salbutamol 200 µg
b. DPI budesonide 200 µg plus formoterol 6 µg, twice daily along with as-needed DPI salbutamol 200 µg
c. DPI budesonide 400 plus formoterol 6 µg, twice daily along with as-needed DPI salbutamol 200 µg.

All the patients with poor control at 12 weeks were excluded from the drug protocol for further follow-up [Figure 1]. Patients with part control at 12 weeks were continued on the same treatment further until control was achieved or up to a maximum duration of 26 weeks. Patients who failed to achieve initial control even at 26 weeks were declared as failure and excluded from further follow-up.

Rescue steroids

Acute worsening of asthma during the therapy as reported by patients was recorded by the evaluator and reported to the investigator to decide the need for a short course of rescue systemic steroids, i.e., oral prednisolone 1 mg/kg body weight for 7 days.

Adverse effects of drugs, if any, were recorded by the evaluator and reported to the investigator to decide the need for corrective action if any.

Step-down

Once sustained control of asthma was achieved, i.e., ACQ-7 <0.75 for two consecutive fortnights, step-down was attempted as under:

Group I patients: Step-down was attempted in the order given below:

- DPI budesonide 400 µg twice daily along with as-needed DPI salbutamol 200 µg
- Budesonide 200 µg twice daily along with as-needed DPI salbutamol 200 µg.

In Group II patients, step-down was attempted as per the GINA guidelines,[7] i.e., to the next lower step medicines except that it was done after achieving ACQ-7 <0.75 for two consecutive fortnights as in Group I rather than the usual 3 months, to keep uniformity in the step-down protocol (modified step down).

Exacerbations

Any worsening, during the course of treatment after initial control, was recorded as exacerbation and was managed as under:

Group I: The patient was reverted to the initial level of treatment, i.e., DPI budesonide 400 µg + formoterol 6 µg twice daily along with as-needed DPI salbutamol 200 µg.

Group II: The patient received the next level of step-up medicines and further step-ups, if required.

Baring the need of rescue steroids and/or management of adverse reactions, all the basic treatment-related actions were taken by the treatment adviser only and the investigators/evaluators were blind to the treatment action plan of individual patients throughout the study.

COVID pandemic and changes in methodology

Due to the onslaught of an unprecedented COVID pandemic during the study period, the investigators were forced to undertake certain changes in the study methodology:

Further intake in the study was suspended with effect from March 22, 2020, and later, stopped all together.

1. Periodic and final monitoring of the patients was mostly performed telephonically by the evaluators. Spirometry as a part of monitoring was omitted. Therefore, it was a missing parameter in the calculation of ACQ-7
2. The treatment advisers ensured the supply of medicines to the patients as per the treatment protocol, as far as possible through the local chemists/police/postal or courier services.

The study data were tabulated and analyzed using Student's *t*-test, Chi-square test, and any other appropriate statistical tests if needed.

RESULTS

A total of 868 patients could initially be included in the study up to March 2020 (Jaipur 424, Ajmer 219, and Nagpur 225). Of these, 81 patients were unable to complete the essential physical follow-up/spirometry at 12 weeks, and these patients were, therefore, excluded from the final analysis. This left 787 patients in the study for final randomization. The demographic profile of these patients in two groups is shown in Table 1 ($P > 0.05$).

Table 2 shows the comparison of follow-up parameters in the two groups. Quit smoking was similar in the two groups. Default within the first 12 weeks was also similar in the two groups. The treatment compliance was also similar in the two groups. More patients in Group II needed rescue steroids. More patients in Group II had poor (47 patients) or part control (69 patients) at 12 weeks as compared to those on the Group I (32 and 27 patients, respectively). Further analysis was, thus, restricted to 361 patients in Group I and 347 patients in Group II [Figure 1]. All the 361 Group I patients were on formoterol 6 plus beclomethasone 400 at the time of first control. Compared to this, 98, 125, and 124 Group II patients were on beclomethasone 200 alone, formoterol 6+ beclomethasone 200, and formoterol 6+ beclomethasone 400, respectively, at the time of first control [Table 2]. Control was ultimately achieved in all the 27 patients of Group I by 14 weeks and in all the 69 patients of Group II by 18 weeks. Thus, further exclusions were not required at 26 weeks of the study.

Higher number of Group I patients (352 out of 361 patients, 97.5%) persisted with good control at 52 weeks of follow-up as compared to Group II (260 out of 347 patients, 74.93%) [Table 2, $P = 0.000$]. Three hundred and forty-one out of 361 Group I patients (95%) were on beclomethasone 200 alone at the end of the study. Compared to this, 28, 62, 11, and 262 Group II patients were on beclomethasone 200, formoterol 6 + beclomethasone 200, formoterol 6 + beclomethasone 400, and salbutamol as needed alone, respectively, at the end of the study [Table 2, $P = 0.000$].

Only 30 out of 361 Group I patients encountered one exacerbation during the study period. However, 178 and 54

Table 1: Basic parameters of the patients in the two groups

Parameter	Group I	Group II	t/χ^2	*P*
Total number of patients	393	394	-	-
Mean age (years)	41.18±11.2	39.22±11.7	2.59	>0.05
Sex				
Male	206	211	0.102	0.75
Female	187	183		
Occupation				
Farmer	27	40	0.565	0.50
Homemaker	161	156		
Labour	63	73		
Clerk	11	16		
Official	38	41		
Businessman	21	17		
Others	72	62		
Smoking status				
Current smoker	39	35	0.267	0.88
Ex-smoker	17	18		
Nonsmoker	337	341		
Family history/of allergy				
Yes	95	74	0.656	0.79
No	298	320		
Allergy in self				
Yes	138	143	0.119	0.73
No	255	251		
PB FEV1 (%)				
>75	106	102	0.145	0.93
50-75	169	170		
<50	118	122		
Initial ACQ-7				
>3	109	88	0.585	0.49
2-3	265	294		
<2	19	12		

FEV1: Forced expiratory volume in the first second, ACQ: Asthma Control Questionnaire, PB: Post bronchodilatation

out of the 347 Group II patients encountered one and two exacerbations, respectively [Table 2, $P = 0.000$]. The use of as-needed salbutamol was also significantly less in Group I patients as compared to Group II [Table 2]. None of the study patients encountered any drug-related adverse reactions.

The comparison of all other possible risk factors to the status of control at 12 weeks is shown in Table 3. Age and sex did not correlate, but low PB FEV1, high initial ACQ-7, default of >1 month in first 12 weeks, and continued smoking were significantly associated with poor control as compared to the rest.

Table 2: Follow-up parameters of the patients in the two groups

Parameter	Group I (*n*=393)	Group II (*n*=394)	t/χ^2	*P*
Quit smoking				
Yes	33	29	0.042	0.84
No	6	6		
Default in first 3 months (days)				
<30	342	346	0.178	0.94
>30	51	48		
Need for rescue steroid				
Yes	2	40	36.217	0.000
No	391	354		
Treatment compliance (months)				
<3	8	9	3.455	0.067
>3-6	51	42		
>6-9	44	47		
>9	258	249		
Week of first control				
<2	50	6	193.164	0.000
<4	221	92		
<6	38	31		
<8	23	94		
>8	29	124		
Status of control				
At 3 months*				
Control	334	278	26.346	0.000
Part control	27	69		
Poor control	32	47		
At 6 months**				
Control	349	309	15.681	0.000
Part control	12	38		
End of study				
Control	352	260	77.318	0.000
Part control	9	78		
Poor control	0	9		
Medicines on				
At first control				
Beclomethasone 200	0	98	178.668	0.000
Formoterol–beclomethasone 200	0	125		
Formoterol–beclomethasone 400	361	124		
At end of study				
Formoterol–beclomethasone 400	7	11	544.338	0.000
Formoterol–beclomethasone 200	13	62		
Beclomethasone 200	341	28		
Salbutamol as needed alone	0	246		
Number of exacerbations				
0	331	115	263.744	0.000
1	30	178		
>2	0	54		
Use of salbutamol (per week)				
<5	331	0	598.312	000
5-10	30	318		
>10	0	29		

*Poor control at 12 weeks led to exclusion of patients from the further study, **All patients with part control at 12 weeks achieved control by 26 weeks

All such factors that contributed to poor outcome at 12 weeks were put to multivariate analysis to ensure validity. Higher number of the patients who defaulted for >1 month ($r = 0.527$), on group II medicines ($r = 0.141$), continued with smoking ($r = 0.096$), higher initial ACQ-7 ($r = 0.0.081$), and lower PB FEV1 ($r = 0.025$) were associated with poorer outcome at 12 weeks in that order, but none of these risk factors were significantly correlating to the poor outcome.

A further analysis revealed that at least 1 more risk factor was present in all the 32 Group I patients and 34 out of 47 Group 1I patients with poor outcomes, but none of the other risk factors existed in 14 patients of Group II ($P = 0.000$).

DISCUSSION

The present study was undertaken in the backdrop of GOAL study,[14] wherein it was revealed that initial control of asthma was the most essential. If the patient remains poorly controlled after the initial treatment, a total asthma control was elusive in future, despite the use of high doses of ICS + LABA or ICS over a prolonged period.

It was hypothesized that a combination of LABA and moderate dose of ICS at diagnosis should lead to earlier and better control of asthma. This approach was called as step-in. Further, step-down was attempted by the first withdrawal of LABA and thereafter reducing the dose of ICS once optimum control was achieved for persistent control of asthma. This approach was called a newer step-down. Thus, a new "step-in step-down" approach was followed in this study in contrast to the existing "step-up step-down" of the then-available asthma guidelines, i.e., Update-2017[7] except that step-down was attempted in both groups earlier than the 3 months recommended by GINA for the sake of uniformity in step-down protocol.

The demographic profile of patients in the two study groups was similar ($P > 0.05$). Therefore, the study data are valid for statistical comparison.

The result of the present study clearly shows that the "step-in step-down" approach has a statistically significant advantage over the conventional step-up step-down approach, as regards to the time to the first control, need for rescue steroids, level of control achieved at 3, 6, and 12 months, number of exacerbations, and use of rescue SABA during the study period [Table 2, $P = 0.000$]. These benefits were observed without any increase in adverse reactions. Lack of adherence to therapy and continued smoking emerged as important risk factors for poor control of asthma.

Table 3: Comparison of various parameters with status of control at 12 weeks

Parameter	Control, *n* (%)	Part control, *n* (%)	Poor control, *n* (%)	t/χ^2	*P*
Total number of patients (*n*=787)	612 (77.8)	96 (12.2)	79 (10)	-	-
Mean age (years)*	40.14±09.7	40.1±12.2	40.83±10.3	0.426	>0.5
Sex					
Male	328 (53.6)	51 (53.1)	38 (48.1)	0.848	0.357
Female	284 (46.4)	45 (46.9)	41 (51.9)		
Group					
I	334 (54.6)	27 (28.1)	32 (40.5)	26.346	0.000
II	278 (45.4)	69 (71.9)	47 (59.5)		
PB FEV1 (%)					
>75	187 (30.6)	31 (32.3)	22 (27.8)	5.825	0.016
50-75	253 (41.3)	48 (50)	38 (48)		
<50	172 (28.1)	17 (17.7)	19 (24)		
Initial ACQ-7					
>3	143 (23.4)	29 (30.2)	25 (31.6)	7.539	0.006
2-3	443 (72.4)	62 (64.6)	54 (68.4)		
<2	26 (4.2)	5 (5.2)	0		
Default in first 3 months					
<30D	578 (94.4)	87 (90.6)	23 (29.1)	272.576	0.000
>30D	34 (5.6)	9 (9.4)	56 (70.9)		
Smoking status					
Current smoker	4 (0.7)	2 (2.1)	6 (7.6)	25.302	0.000
Quit smoker	47 (7.7)	9 (9.4)	6 (7.6)		

FEV1: Forced expiratory volume in the first second, ACQ: Asthma Control Questionnaire, PB: Post bronchodilatation, *p-values < 0.05 were considered significant

These results of the current study are at least in line with the results of FACET and Goal studies.[13,14] Our results are also in line with the recent SYGMA clinical trial.[19] This trial clearly showed that even in patients with mild asthma, as-needed budesonide–formoterol (combination of LABA and ICS) provided superior asthma-symptom control as compared to as-needed terbutaline (SABA alone) and that regular budesonide alone during maintenance therapy was superior to both as-needed terbutaline (SABA alone) and as-needed budesonide–formoterol (combination of LABA and ICS). This study further supports our step-in step-down approach, at least in some respects.

Initiating treatment with a combination of ICS and LABA rather than ICS alone or SABA alone is now widely accepted as a proper approach in the control of asthma. Even the current GINA guidelines for the management of asthma advocate as-needed ICS + LABA for step I, low-dose ICS on a regular basis or as-needed low-dose ICS + LABA for step II, and medium-dose ICS along with LABA for step III. Further, the preferred reliever therapy for all these steps is as-needed low-dose ICS + LABA rather than SABA.[20] There is also a strong scientific rationale for the combination of these two drugs in the control of asthma. While ICS suppresses chronic inflammation of asthma and reduces bronchial hyperresponsiveness, LABA, in addition to its bronchodilator effect, also inhibits mast cell mediator release, plasma exudation, and possibly also reduces sensory nerve activation. Thus, these two classes of drugs act complementary to each other and at different pathophysiology aspects of asthma. Not only this but several positive interactions have also been described between ICS and LABA which may optimize each other's beneficial actions on the airways. Moreover, low systemic effects of these drugs do not result in increase in adverse events. Therefore, this combination is a logical advance with more favorable results.[21]

A Cochrane database systematic review on the addition of LABA to ICS versus the same dose of ICS for chronic asthma in adults and children substantiated that the need for rescue use of SABA was significantly reduced, and the risk of exacerbations requiring oral corticosteroids was also significantly reduced with the combination. The addition of LABA to ICS, according to them, led to a significant greater improvement in FEV1 and in proportion of symptom-free days.[22]

Another Cochrane database systematic review also concluded that the addition of LABA to ICS significantly improved lung functions, reduced symptoms, and marginally decreased use of rescue SABA, but it did not significantly reduce the risk of exacerbations requiring rescue systemic corticosteroids.[23]

Thus, our approach of step-in approach (initiating treatment with a combination of LABA and moderate dose of ICS) and new step-down approach of withdrawing LABA first and continuing regular low-dose ICS during maintenance is mostly in line with the available literature and is the clear answer to the infirmity of available asthma guidelines.

As many as 246 patients in Group II of our study were on salbutamol alone at the end of the study, but at the same time, 78 and nine patients of them were part controlled or poorly controlled, respectively, as compared to only nine and nil in Group I. This again retreats the fact that SABA alone is inferior to ICS, even during the maintenance phase.

The present study also highlights the importance of quit smoking and regular intake of medicines for good control of asthma.

Limitations of the current study include (1) lack of total double blindness, although it was ensured that the investigators and evaluators remain blind to basic treatment action plan throughout the study and (2) early step-down in both group patients than the usual 3 months recommended by GINA for ethical reasons. This could have affected the number of exacerbations to some extent in Group II, but it should not have any bearing on the other outcomes of the study. (3) Mid-study changes in the study protocol due to COVID-19 pandemic, although the total intake was still sufficient to meet the sample size criteria (376 patients in each group) for the study and any changes that were affected were common to both the groups. Further, it was not inclusive in the scope of the current study whether further stepping down of ICS to once-daily dose as maintenance therapy is feasible or not.

CONCLUSION

From the results of this study, we can safely conclude that the "step-in step-down" approach is robust and safe to follow in asthmatics to achieve faster control of the disease, decrease exacerbations, and thereby prevent a possible progression of the disease. At least a case is made out to initiate larger double-blind control trials to further validate this "step-in step-down" approach, i.e., use of moderate dose of ICS along with LABA as initial therapy, and withdrawal of LABA first, is, however, required to substantiate this step-in step-down approach.

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Conflicts of interest

There are no conflicts of interest.

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SUPPLEMENTARY INDEX

Appendix 1: Asthma control questionnaire

Patient ID……. Date……

1. On an average, during the past 7 days, how often were you woken up by your asthma during night
   - 0 Never
   - 1 Hardly ever
   - 2 a few times
   - 4 Many times
   - 5 a great many times
   - 6 Unable to sleep due to asthma Several times

2.On an average, during the past 7 days, how bad were your asthma symptoms when you woke up in the morning
   - 0 No symptoms
   - 1 Very mild symptoms
   - 2 mild symptoms
   - 3 moderate symptoms
   - 4 Somewhat severe symptoms
   - 5 severe symptoms
   - 6 Very severe symptoms

3.On an average, during the past 7 days, how limited were you in your activities because of your asthma
   - 0 Not limited at al l
   - 1 Very slightly limited
   - 2 slightly limited
   - 3 moderately limited
   - 4 Very limited
   - 5 Extremely limited
   - 6 Totally limited

4.On an average, during the past 7 days, how much shortness of breath did you experience because of your asthma
   - 0 None
   - 1 A Very little
   - A little
   - A moderate amount
   - 4 Quite a lot
   - 5 A great deal
   - 6 A very great deal

5.In general, during the past 7 days, how much time did you wheeze
   - 0 Never
   - 1 Hardly any time
   - A little of the time
   - 3 A moderate amount of time
   - 4 A lot of the time
   - 5 Most of the time
   - 6 All the time

6.On an average, during the past 7 days, how many puffs/inhalations of reliever have you used each day ?
   - 0. None
   - 1. 1–2 puffs most days
   - 2. 3–4 puffs most days
   - 3. 5–8 puffs most days
   - 4. 9–12 puffs most days
   - 5. 13–16 puffs most days
   - 6. >16 puffs most days

7.FEV1% predicted…….
   - 0. >95% predicted
   - 1. 90–95
   - 2. 80–89
   - 3. 70–79
   - 4. 60–69
   - 5. 50–59
   - 6. <50

ACQ-7 score = Total of 7 parameters/7.

Score <0.75 = Good control, Score <0.75–1.5 = part control and Score >1.5 = poor control.