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A Retrospective Comparison of Single-Dose versus Tapering-Dose Corticosteroid Therapy in Acute Exacerbations of Bronchial Asthma

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Abstract:

Background. Bronchial asthma is a long-standing inflammatory disorder of the airways, and systemic corticosteroids continue to be a mainstay in the treatment of acute exacerbations. What remains unsettled in everyday practice is whether a short fixed course works better than a dose that is gradually reduced, particularly with methylprednisolone (MP).

Objective. We set out to compare the clinical course and tolerability of single-dose MP against a tapering-dose MP schedule in adults admitted with asthma exacerbations, and to see how patient profiles differed between the two approaches.

Methods. This was a hospital-based, retrospective, observational study of 100 adult patients managed at Erode Medical Centre, Erode, over a three-month window. Half of the patients had received a single dose of MP and the other half a tapering schedule spread over 5–14 days. Case records were reviewed for demographics, admission vital signs (SpO_2, pulse rate, respiratory rate and blood pressure), the duration of the acute episode, steroid dosing and the medicines used alongside MP. Changes within each group were examined using a paired t-test.

Results. Most patients were above 50 years of age. People on the single-dose schedule generally went home sooner, whereas those on a tapering schedule were more often already on maintenance therapy and tended to arrive with lower oxygen saturation and higher respiratory rates – markers of a more troublesome episode. Tracking the weekly tapering data, symptom control was largely achieved by the second week and was essentially complete by the fifth.

Conclusion. A single dose of MP appears well suited to rapid relief in milder acute episodes, while a tapering course fits patients whose disease is more severe and who need inflammation brought down slowly. Whichever route is chosen, close watch on cardiovascular and respiratory parameters matters.

Keywords: *bronchial asthma; methylprednisolone; corticosteroid tapering; acute exacerbation; retrospective study.*

1. Introduction

Asthma is one of the more common chronic conditions of the airways, and it rarely behaves the same way in any two people. It is marked by symptoms that come and go, narrowing of the airflow, twitchy airways that overreact to stimuli, and inflammation sitting underneath it all. The way these features combine in a given patient shapes how the illness shows up, how severe it becomes and how well it answers to treatment [1].

The 2023 Global Initiative for Asthma (GINA) report describes asthma as a heterogeneous disease that usually involves chronic airway inflammation. The diagnosis rests on a history of respiratory

complaints – wheeze, breathlessness, a tight chest and cough – that shift in intensity over time, together with variable expiratory airflow limitation [2]. Among the strongest triggers are inhaled particles and substances that either set off an allergic response or simply irritate the airway lining; workplace chemicals are a familiar example. Work-related asthma covers two broad situations: occupational asthma, brought on by sensitising or irritant exposures at work, and work-exacerbated asthma, where pre-existing disease is made worse, though not actually caused, by conditions on the job. In textile settings in particular, agents such as cotton dust and dyes are recognised contributors [3].

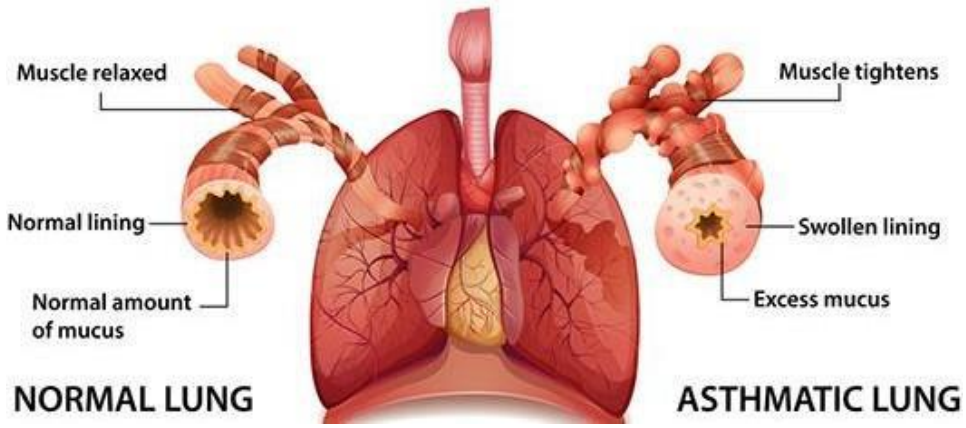

Fig 1: Comparison of a normal airway and an asthmatic airway.

1.1 Burden of disease

More than 300 million people live with asthma worldwide, and the figure keeps climbing year on year, most steeply in low- and middle-income countries. The disease can begin at any age but tends to surface in childhood. Prevalence varies a good deal from region to region because of differences in genetics, environment and occupational exposure. Interestingly, the gap looks to be narrowing: rates in wealthier countries seem to be levelling off while those in poorer ones continue to rise. Global estimates put the number affected at around 334 million, with roughly a quarter of a million deaths attributed to asthma every year, and projections at the time suggested another 100 million cases by 2025 [4].

1.2 Phenotypes and types

Because asthma is driven by several different underlying processes, clinicians often group patients into phenotypes – recurring clusters of demographic, clinical and pathological features. Allergic asthma is the most readily recognised; it usually starts in childhood, runs alongside a personal or family history of eczema, hay fever or other allergies, and tends to respond well to inhaled corticosteroids (ICS). Non-allergic asthma is not tied to allergy and often answers less reliably to ICS. Adult-onset asthma appears for the first time later in life, more commonly in women, and may need higher ICS doses. Other recognised patterns include asthma with persistent airflow limitation, thought to follow airway remodelling, and asthma associated with obesity [5,6].

By behaviour, asthma is broadly split into intermittent disease, where the person feels well between flares, and persistent disease, where symptoms are present much of the time and may be mild, moderate or severe. Triggers can be allergic (moulds, pollen, pet dander) or non-allergic (exercise, stress, illness, weather). It is also classed by age of onset and by special situations such as exercise-induced asthma, occupational asthma and the asthma–COPD overlap [6].

1.3 Pathophysiology

The hallmark of asthma is variable airflow obstruction together with airway hyperresponsiveness, so the airways contract in response to a range of stimuli. The inflammation behind this is largely orchestrated by mast cells along with a host of other cells and cytokines, much as in allergic rhinitis. Eosinophils are the cells most characteristically found, and their numbers tend to track with severity. Narrowing of the airway lumen, whether from contractile mediators released by inflammatory cells or from reflex neural pathways, produces the variable reduction in airflow that defines the disease. In a subset of patients the obstruction becomes fixed, attributed to remodelling involving the epithelium, fibroblasts, smooth muscle and vasculature [7,8].

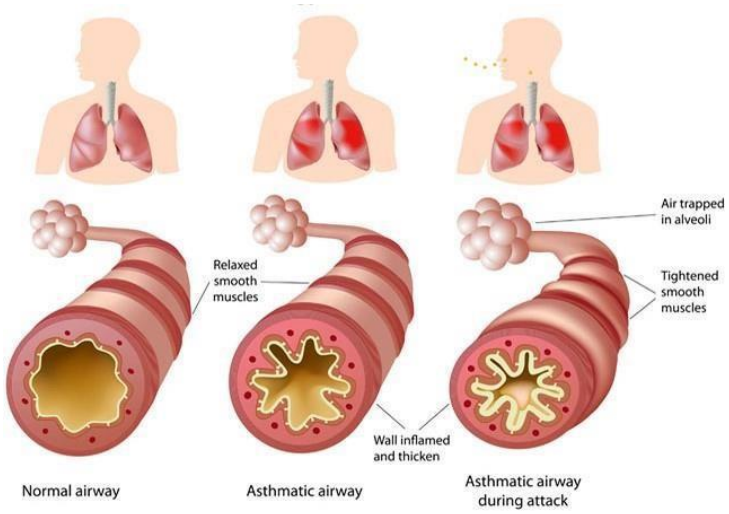

Fig 2: Airway changes in asthma, from a normal airway to an inflamed airway during an attack.

1.4 Assessment and management

Spirometry, bronchoprovocation testing, peak expiratory flow measurement and the fractional exhaled nitric oxide (FeNO) test are the usual tools for confirming the diagnosis and judging control. Severity itself is now framed in terms of how hard the asthma is to treat – in other words, the level of therapy needed to keep symptoms and exacerbations in check after several months of treatment. On that basis, severe asthma stays uncontrolled despite high-dose ICS–LABA (or needs it to stay controlled), moderate asthma is controlled on low-to-medium-dose ICS–LABA, and mild asthma settles on low-intensity treatment [9,10].

The long-term aims of management are straightforward to state: keep symptoms under good control with normal activity, and cut the risk of attacks, fixed airflow limitation, treatment side effects and death. GINA frames this as a stepwise plan in which treatment is stepped up or down to match control, and reliever therapy is built around as-needed low-dose ICS–formoterol or a short-acting beta-agonist (Figure 3) [11].

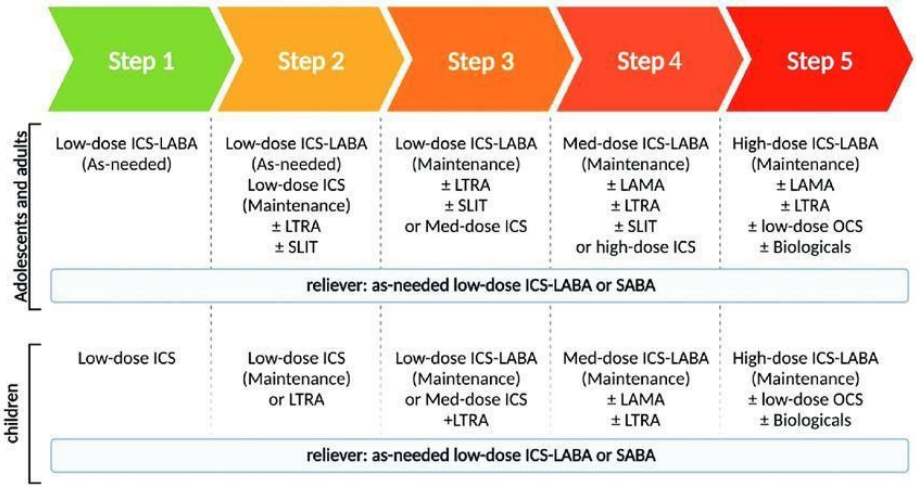

Fig 3: GINA stepwise approach to controlling symptoms and reducing future risk.

1.5 Rationale and corticosteroid dosing

Systemic corticosteroids have anchored the treatment of asthma flares for more than half a century, dampening inflammation, improving lung function and easing cough, wheeze and breathlessness. Two practical strategies dominate. A single, fixed short course is convenient and supported by guidelines for most exacerbations; the alternative is a tapering schedule in which the dose is wound down gradually. Evidence here is mixed. Some authors report that brief tapering packs such as the Medrol Dosepak deliver too little steroid and leave a meaningful proportion of patients relapsing, while others argue that a slow

taper helps selected patients with frequent attacks or possible adrenal suppression [15,17,18]. Methylprednisolone is widely used for this purpose, and head-to-head work suggests it performs much like prednisone, with the intravenous form favoured when speed matters [13]. Prolonged exposure, however, carries the familiar risks of hyperglycaemia, hypertension and bone loss, so the lowest effective dose for the shortest sensible time remains the guiding principle [14]. Against this background, comparing the two dosing styles in real patients is clinically useful.

2. Aim and Objectives

Aim. To retrospectively analyse the clinical outcomes and safety of single-dose versus tapering-dose corticosteroid therapy in asthma patients across different age groups.
The specific objectives were:

- To review the types and stages of bronchial asthma exacerbations.
- To examine the treatment options used in managing these exacerbations.
- To assess how the two dosing approaches influenced patient recovery.
- To look at the effect of treatment duration on symptom relief and peak-flow improvement.
- To explore the rate of recurrence of exacerbations after treatment.

3. Materials and Methods

Study site and design. The work was carried out at Erode Medical Centre, Erode, Tamil Nadu, as a retrospective observational study.

Study population. Records of 100 patients with bronchial asthma were reviewed to compare the effectiveness and safety of single-dose against tapering-dose methylprednisolone for acute exacerbations. They were split into two groups of equal size – one given a single dose of MP, the other a tapering dose over 5–14 days. Information was gathered on demographics, asthma severity, how often exacerbations occurred and the outcomes of treatment. The main outcomes of interest were resolution of symptoms, time to recovery and relapse; corticosteroid-related side effects were looked at as secondary outcomes.

3.1 Inclusion criteria

- Patients with a confirmed diagnosis of bronchial asthma.
- Adults aged 18 years and above.
- Patients with or without other coexisting conditions.

3.2 Exclusion criteria

- Pregnant or lactating women.
- Individuals older than 80 years.

3.3 Data collection

Data were collected over a three-month period and covered demographic details, asthma severity and treatment outcomes for both groups. A structured proforma was used to record each patient's history, examination findings, diagnosis and the full treatment regimen, including the type of corticosteroid (single or tapered), the steroids used and the total duration of therapy.

3.4 Statistical analysis

A paired t-test was applied to assess changes in asthma parameters – symptom resolution, recovery time and relapse – before and after treatment within the same group of patients. This helped indicate whether either schedule produced a statistically meaningful improvement in managing the acute episode.

4. Results

The findings are set out below for each variable, with the supporting counts given in the tables and the corresponding figures alongside.

4.1 Gender

Men slightly outnumbered women in the single-dose group, while the tapering-dose group had more women (Table 1, Figure 4).

Table 1: Gender distribution

S. No	Gender	Single Dose	Tapered Dose
1	Male	28	20
2	Female	22	30

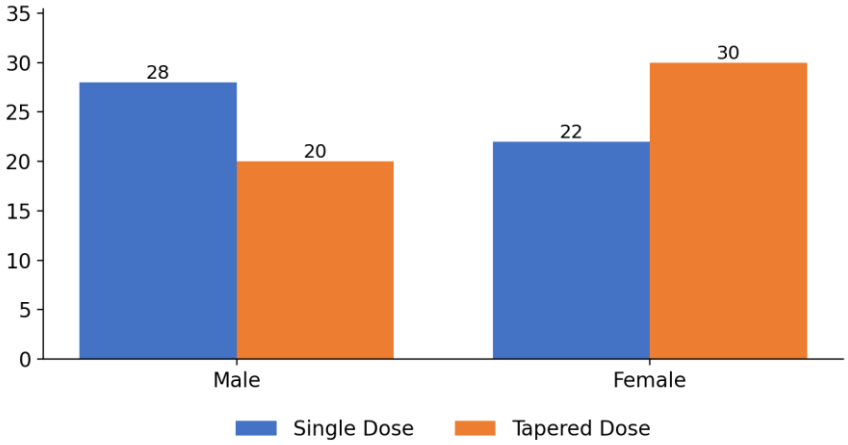

Fig 4: Gender distribution across the two treatment groups.

4.2 Age

Patients over 50 years formed the largest band in both groups, confirming that older adults made up most of the study sample (Table 2, Figure 5).

Table 2: Age distribution (years)

S. No	Age group	Single Dose	Tapered Dose
1	20–35	4	6
2	36–50	9	12
3	Above 50	37	32

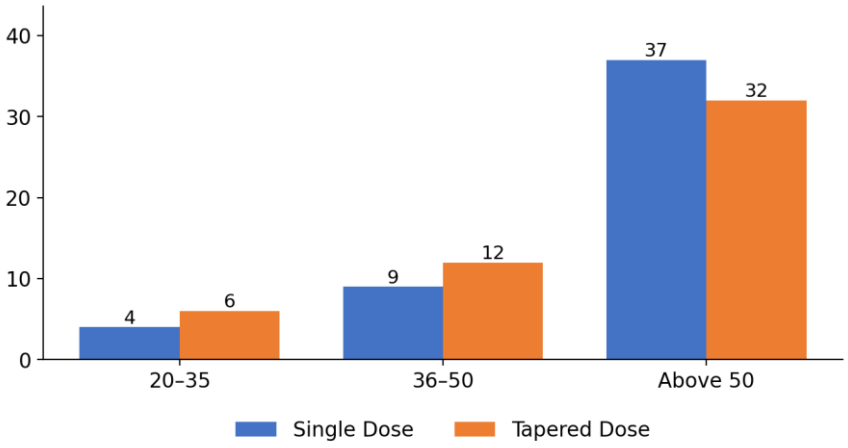

Fig 5: Age distribution across the two treatment groups.

4.3 Past medication

More of the tapering-dose patients were already on treatment at presentation, whereas the single-dose group held more patients who had not been on any prior therapy (Table 3, Figure 6).

Table 3: History of past medication

S. No	Past medication	Single Dose	Tapered Dose
1	On treatment	20	28
2	No treatment	30	22

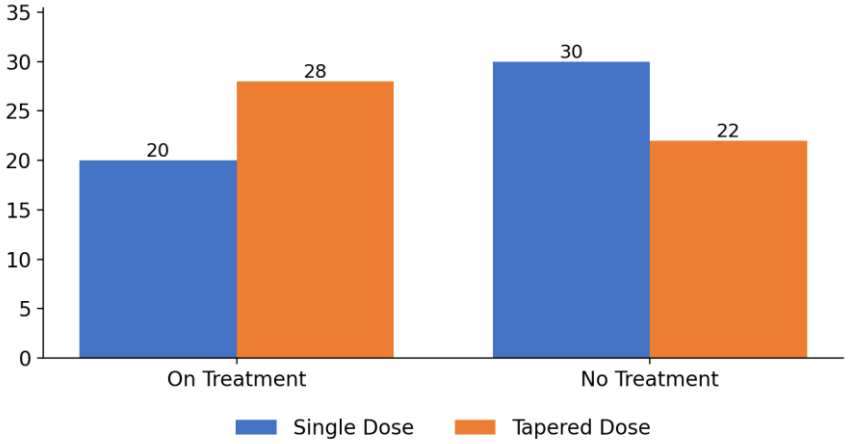

Fig 6: History of past medication across the two treatment groups.

4.4 Duration of the acute episode

The great majority of patients in both groups recovered within five days, with only a handful needing longer (Table 4, Figure 7).

Table 4: Duration of the acute episode

S. No	Duration	Single Dose	Tapered Dose
1	0–5 days	45	45
2	6–10 days	1	1
3	Above 10 days	4	4

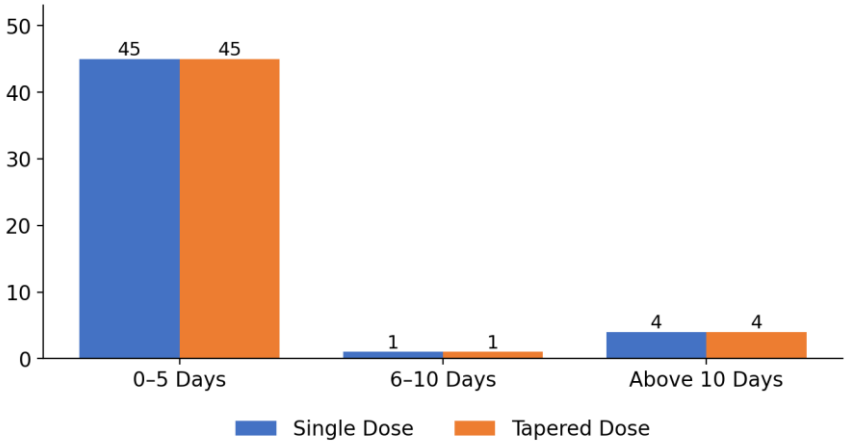

Fig 7: Duration of the acute episode across the two treatment groups.

4.5 Oxygen saturation (SpO_2)

At admission, a larger share of tapering-dose patients sat in the normal SpO_2 band, but the group also carried patients at the lower, more critical ranges, pointing to a spread of severity (Table 5, Figure 8).

Table 5: Oxygen saturation (SpO_2) at admission

S. No	Range	Single Dose	Tapered Dose
1	100–98% (Normal)	6	17
2	97–95% (Insufficient)	24	18
3	94–90% (Decreased)	10	7
4	<90% (Critical)	5	3
5	<80% (Severe hypoxia)	3	2
6	<70% (Acute danger to life)	2	3

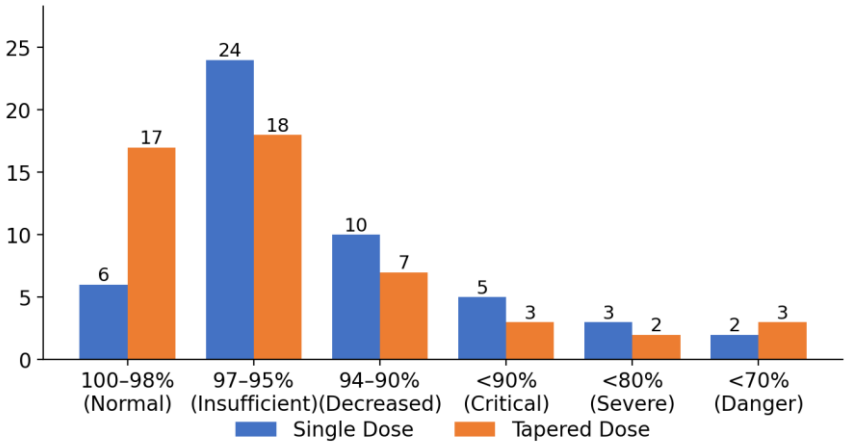

Fig 8: Oxygen saturation at admission across the two treatment groups.

4.6 Pulse rate

Most patients fell within the 70–100 beats-per-minute band; raised pulse rates above 100 were a little more common in the single-dose group (Table 6, Figure 9).

Table 6: Pulse rate (beats/min)

S. No	Rate	Single Dose	Tapered Dose
1	Below 70	2	3
2	70–100	26	34
3	Above 100	22	13

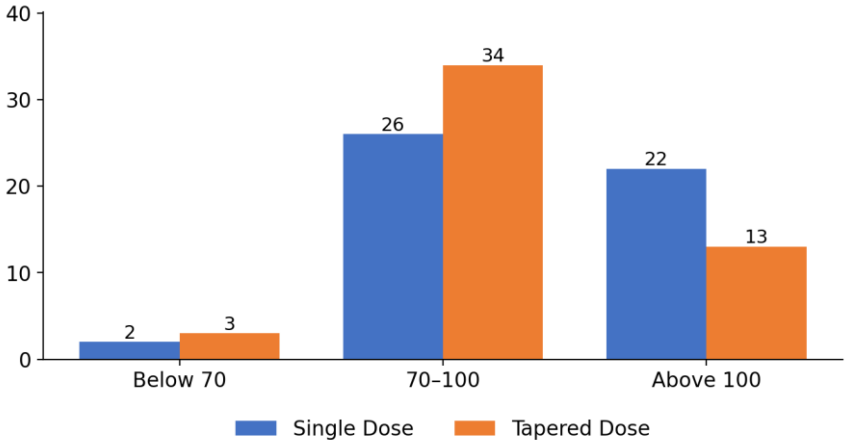

Fig 9: Pulse rate across the two treatment groups.

4.7 Respiratory rate

Raised respiratory rates above 20 breaths per minute dominated both groups, in keeping with patients presenting in respiratory distress (Table 7, Figure 10).

Table 7: Respiratory rate (breaths/min)

S. No	Rate	Single Dose	Tapered Dose
1	12–20	7	8
2	Above 20	43	42

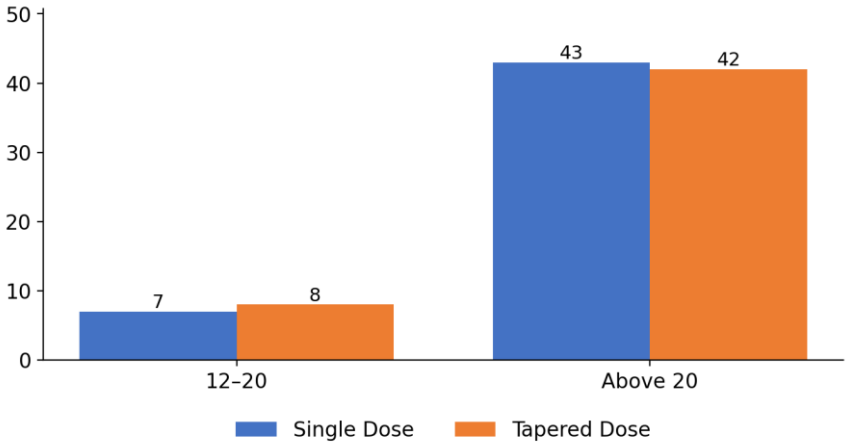

Fig 10: Respiratory rate across the two treatment groups.

4.8 Blood pressure

Readings were broadly comparable, with the single-dose group showing slightly more in the high range (Table 8, Figure 11).

Table 8: Blood pressure category

S. No	Category	Single Dose	Tapered Dose
1	Normal	22	25
2	Elevated	11	10
3	High	17	15

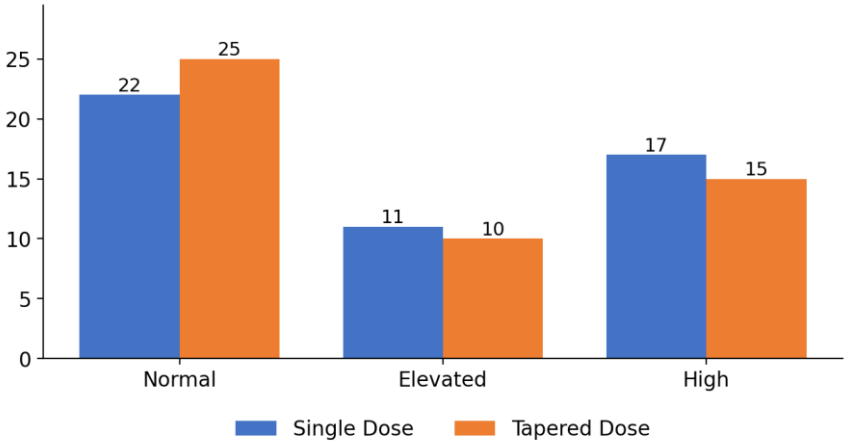

Fig 11: Blood pressure category across the two treatment groups.

4.9 Single-dose methylprednisolone

Among the single-dose patients, the 16 mg dose was used most often, followed by 4 mg and then 8 mg (Table 9, Figure 12).

Table 9: Single-dose methylprednisolone (MP)

S. No	Dose (MP)	No. of patients
1	4 mg	14
2	8 mg	7
3	16 mg	29

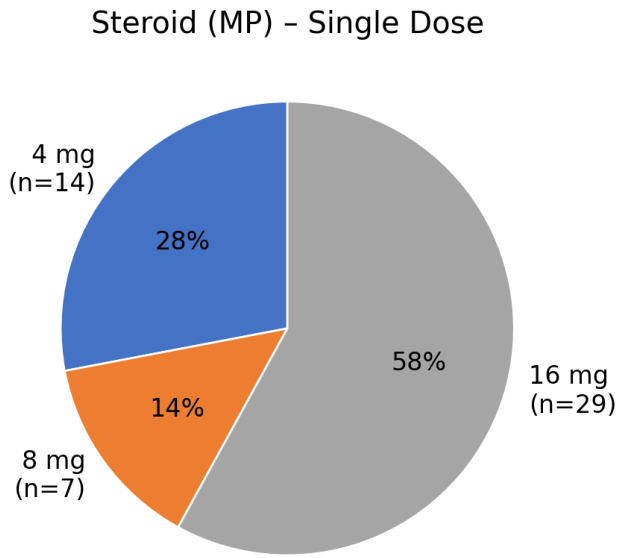

Fig 12: Distribution of single-dose methylprednisolone strengths.

4.10 Weekly tapering doses

For patients on a tapering schedule, the first week was dominated by the higher 80 mg and 48 mg doses, which then stepped down week by week. By the third and fourth weeks the doses had fallen into the 8–24 mg range, and only a single patient remained on a 20 mg dose by the fifth week (Table 10, Figure 13).

Table 10: Weekly tapering doses and number of patients

Week 1	Week 2	Week 3	Week 4	Week 5
40 mg – 1	12 mg – 1	18 mg – 1	8 mg – 1	20 mg – 1
48 mg – 6	20 mg – 4	20 mg – 13	12 mg – 8	–
80 mg – 43	24 mg – 6	24 mg – 20	20 mg – 7	–
–	40 mg – 18	40 mg – 1	–	–
–	48 mg – 19	48 mg – 1	–	–
–	80 mg – 2	–	–	–

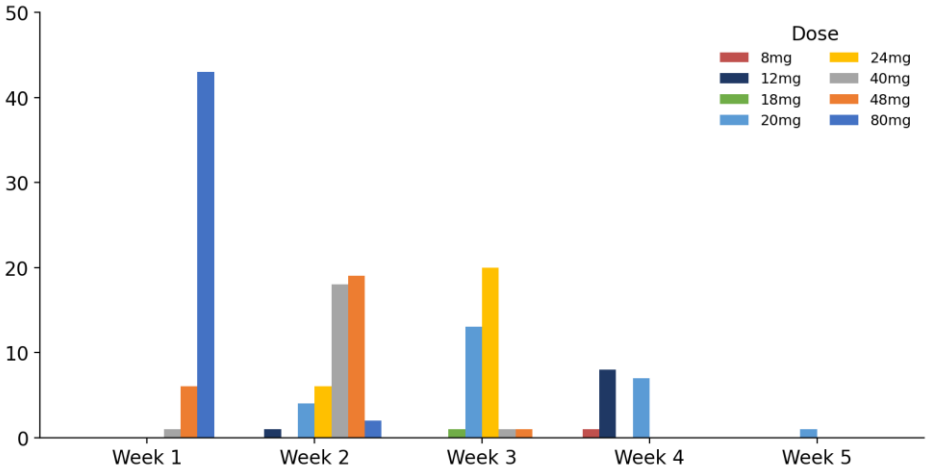

Fig 13: Weekly tapering doses of methylprednisolone and patient numbers.

5. Discussion

Putting the two schedules side by side brought out a few consistent patterns. Age was distributed similarly, with the single-dose group running marginally older, which tells us both approaches were used across the age spectrum rather than being reserved for one band. The common complaints – breathlessness, cough, cold, fever and palpitations – turned up in both groups, though generalised aches and shoulder pain were noted more often among tapering-dose patients, hinting at differences in the kind of patient who ended up on each schedule.

Length of stay differed in a way that makes clinical sense. Tapering-dose patients tended to stay longer, which fits the need to keep an eye on them while the dose is brought down step by step, whereas single-dose patients were discharged sooner because the treatment is delivered up front. Gender showed only a small skew, with tapering-dose MP a little more likely to be prescribed to women.

The vital signs add to the picture. Oxygen saturation at admission tended to be lower in the tapering-dose group, and respiratory rates ran higher, both suggesting that these patients arrived in a more compromised state and were therefore steered towards a longer course of steroid. Pulse-rate variation was a reminder to monitor for cardiovascular effects. Blood pressure was more variable in the single-dose group, plausibly reflecting the abrupt hit of a large corticosteroid dose, while the tapering group looked steadier as the drug was eased in and out.

Co-prescribing also diverged. Both groups received bronchodilators, antibiotics, antihistamines and anti-inflammatory agents, but tapering-dose patients were more often given longer-term respiratory medicines such as famotidine and budesonide, whereas single-dose patients more frequently received fast-acting drugs aimed at the acute symptoms. None of this points to one regimen being simply better than the other; rather, it underlines that the choice should be tailored to the patient in front of you.

Looking specifically at the tapering data, control improved noticeably by the second week and continued through the third and fourth, with every patient showing good control of the exacerbation by the fifth week. That trajectory supports the idea that a gradual reduction can carry more severe patients safely back to baseline.

6. Limitations

Several caveats temper these findings. The sample, while adequate for description, is modest and drawn from a single centre, so it may not represent every population treated with MP. Patients were not randomised to the two schedules, and the dose chosen was almost certainly influenced by how unwell each person was, along with comorbidities such as diabetes, hypertension or coexisting lung disease that were not fully controlled for. Some recorded variables were subjective, and the dataset did not formally grade disease severity. There were also gaps and formatting inconsistencies in items such as length of stay and blood-pressure readings, and manual or device differences could have introduced measurement error.

Because the records stopped at discharge, post-discharge recovery and relapse could not be tracked, nor could the longer-term harms of steroid use such as adrenal suppression, osteoporosis or metabolic change. The many additional drugs prescribed may have shaped outcomes independently of MP. Finally, hard clinical endpoints – mortality, time to symptom resolution, need for ventilation and readmission – were not available, so only short-term effects can be inferred rather than long-term effectiveness.

7. Conclusion

Single-dose methylprednisolone lends itself to acute situations where quick symptom relief and a short hospital stay are the priority, while a tapering schedule suits more severe or longer-running disease that calls for gradual recovery and longer admission. The trends in oxygen saturation, respiratory rate and pulse rate suggest that tapering MP was generally reserved for patients with more troublesome respiratory disease, whereas the single-dose group showed the larger swings in blood pressure, most likely a consequence of the sudden corticosteroid load. Tapering-dose patients were also more likely to be placed on longer-term respiratory medicines, and single-dose patients on fast-acting relief. In short, single-dose MP is a reasonable choice for short-term control of acute distress, and tapering MP for preventing relapse where inflammation needs to be wound down slowly. In either case, careful monitoring of cardiovascular and respiratory parameters is central to good care.

8. Future Directions

Steroid therapy is best tailored to how sick the patient is, with attention to SpO_2, overall severity, comorbidities and the risk of relapse. For mild-to-moderate episodes with SpO_2 above 94%, single-dose MP may be preferred, offering faster recovery and lighter use of hospital resources. Patients kept on steroids longer should be watched for hyperglycaemia, secondary infection and bone loss, and improving long-term lung function deserves attention in this group. Future work could measure respiratory recovery more objectively – through PaO_2/FiO_2 ratios, six-minute walk tests and lung imaging – to pin down which dosing strategy serves which severity best, and prospective, randomised designs would help remove the confounding that limits a retrospective review like this one.

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