

Original Research Article

Patterns of Corticosteroid Prescriptions Among Patients at Community Pharmacies in Lahore, Pakistan

ABSTRACT

Background

Corticosteroids are a class of steroid hormones produced by the adrenal gland and are used to treat many diseases, including autoimmune diseases and inflammatory diseases. Besides their role in many diseases, long-term use, misuse, and overuse cause side effects including hypertension, diabetes mellitus, and osteoporosis.

Objective

The aim of current study is to evaluate the prescription pattern of corticosteroids in different community pharmacies, among patients, in Lahore.

Method

The cross-sectional stratified convenient study performed using a validated questionnaire to analyse the prescription pattern of corticosteroids in patients at different community pharmacies in Lahore. Total 92 patients are participating in this study.

Result

A total of 92 patients take part in the study. In this research 67.4% females are participated. The average age of patients is above 30 years. Asthma is the most common reason for corticosteroids administration (19.6%) followed by rheumatoid arthritis (12.0%) whereas in inflammatory bowel disease they are least prescribed (1.1%). Prednisolone is the most prescribed drug (33.7%) and Oral route is the frequently given route.

Conclusion

Our data shows that the prescription pattern of corticosteroid must be improved. Health care providers should pay attention to counseling of patients and guide them about dose tapering to avoid adverse effects.

INTRODUCTION:

A class of compounds comprises both naturally occurring hormones and synthetic molecules known as corticosteroids (1). In 1930, there was the first clinical proof that an extract of adrenocorticoid tissue from an animal could avoid adrenal failure in humans (2). In 1940, they were classified into two categories: one that causes salt and fluid retention (mineralocorticoids) and the other that reduces inflammation and shock (glucocorticoids) (3). In 1948, extractive chemistry (T. Reichstein), synthesis of chemicals (E.C. Kendall), and clinical research (P. Hench) came together, which led to the discovery of cortisone, leading to a long series of derivatives (4).

Corticosteroids are commonly used for the treatment of many immune and inflammatory diseases, thus improving patient outcome (5). Nowadays, glucocorticoids are used as standard treatment in asthma for immune activation, reducing inflammation, and allergic reactions (6). Corticosteroids are also used in autoimmune diseases such as dermatological, rheumatoid, inflammatory bowel, vascular, and other systemic disorders, and mainly in allotransplantation(7). Many inhaled and oral corticosteroids are used for the effective treatment of respiratory disorders like Bronchopneumonia, asthma, COPD, tuberculosis, and respiratory distress syndrome (8). In the appropriate doses corticosteroids can help manage severe symptoms, stop disease progression, and improve patients' quality of life (9). Oral corticosteroids (e.g., prednisone) in low dose are recommended during flare-ups in rheumatoid arthritis, according to American College of Rheumatology guidelines (10). Consultants widely prescribe steroids due to their potent immunosuppressive and anti-inflammatory properties, and this approach often results in over-prescription of these medications (11).

Corticosteroid-related adverse effects are due to impaired immunity, cardiovascular homeostasis, calcium metabolism, fluid retention, and different endocrine effects(12). Respiratory specialists worldwide have called a structured "OCS-stewardship" method to save patients from improper usage of OCS and its impacts (13). Improvement in the use of dose tapering has been done by the accessibility of OCS-sparing therapies with caution to avoid reoccurrence (14). This evaluation of corticosteroids is required for several reasons including adverse responses and drug interactions (15).

Inappropriate use of corticosteroids due to misuse, self-medication, and lack of proper medical guidance has caused adverse health effects (16). Misuse of steroids results in immunosuppression and a high risk of infections, osteoporosis, diabetes mellitus, and cardiovascular diseases (17). As a result, the healthcare costs and mortality rates due to complications from long-term usage are increased (18). A prescribing regimen is crucial in encouraging the rational use of medications (19). The prescribing pattern of corticosteroids is important in reducing the risk of systemic and local negative effects (20).

Drug usage evaluation can identify illogical drug use and promote the responsible use of medications in communities (21). This research on prescribing patterns aims to monitor, access, and make any changes to prescriber's practices to provide reasonable and economical medical care (22). In rational prescribing, clinicians should prioritize clinical effectiveness, reduce adverse effects, conserve healthcare resources, and respect patient preferences (23). Strategies for rational prescribing include education, management, and regulation (24). This approach leads to economic benefits, easy identification of drug use problems, and benefits like polypharmacy, drug interactions, and adverse reactions (25).

The current study aims to analyse corticosteroid prescription patterns among patients presented at several community pharmacies in Lahore, Pakistan. The misuse of corticosteroids is increasing day by day; to promote the rational prescribing of corticosteroids, the role of a healthcare provider is significant.

MATERIAL AND METHOD

The cross-sectional observational study was conducted at several community pharmacies in Lahore. The purpose of the study is to assess the prescription pattern of corticosteroids among patients at different community pharmacies in Lahore, Pakistan. The data collection was conducted in a community pharmacy within the period of 20 August 2024 to 31 August. The study had an intended sample size of 101; however, 9 were excluded due to certain criteria.

Inclusion criteria:

The study participants are those who approached the community pharmacy to purchase corticosteroids and met the required criteria. Data collection was gathered from participants whose consent form was obtained before engaging in the study.

Exclusion criteria:

All patients under the age of 18 years are excluded from the study.

After inclusion and exclusion criteria 92 patients were enrolled in the study out of 101 patients. A validated questionnaire form was employed in the community pharmacy to assess the perception and feedback of the patients. Each questionnaire was administered within 5 to 8 minutes, and all participants received a clear explanation of each query. **Data collection was carried out by a pharmacy student from a private medical college, encompassing 12 different community pharmacies in Lahore, Pakistan.** After explaining the aim and objective of the study, informed consent was obtained from the participants. Subsequently, during the interview, the participant's information was entered into a questionnaire form.

Patients' information was collected using a detailed form, which consists of seven sections. **The first page of the questionnaire contains a consent form, which includes the purpose of the study along with the procedure and patient's confidentiality.** Sections A and B contain the patient's socio-demographic factors such as gender, age, weight, height, height and diagnosis of the patient, educational level, employment status, marital status, monthly income, smoking, and exercise habit. Section C includes yes/no questions to evaluate the patient's medical history and comorbidity. Section D contains the class of corticosteroids used to treat the disease, the frequency of the drug, and the number of corticosteroids **per prescription**. The drug information included in Section E includes the route of drug administration, duration of therapy, dose tapering, number of drugs per prescription, **supplements**, and OTC drugs. while sections F and G contain yes/no questions to assess the monitoring parameters (blood pressure, complete blood count) and compliance with therapy.

STATISTICAL ANALYSIS

By using SPSS version 26, the obtained data was analyzed. Standard deviation and mean are used to summarize the data. The data follows normal distribution or not to determine this skewness and kurtosis applied. For categorical data evaluation, the Fisher exact test and Chi-square test are used.

RESULT

Table 1 presents the demographics and social characteristics of 92 patients, who were mostly female (67.4%) and over 30 years old (64.1%). Most patients (81.5%) weighed 40-80 kg, and 53.3% were married. The study examines the relation of several variables to the corticosteroid prescription pattern in various diseases.

Table 1: Represent Patient's Demographics and Social Characteristics (N=92)

Variable	N (%)
Gender	
Male	30 (32.6)
Female	62 (67.4)
Age	
18-30	33 (35.9)
Above 30	59 (64.1)
Weight	
<40kg	2 (2.2)
40-80kg	75 (81.5)
>80kg	15 (16.3)
Height	
Below 5 ft	5 (5.4)
5 ft	18 (19.6)
Above 5 ft	69 (75.0)
Respiratory Diagnosis	
COPD	4 (4.3)
Tuberculosis	3 (3.3)
Asthma	18 (19.6)
None	67 (72.8)
Dermatological Diagnosis	
Dermatitis/Eczema	10 (10.9)
Psoriasis	2 (2.2)
Scabies	4 (4.3)
Fungal infection	5 (5.4)
None	71 (77.2)
Inflammatory Diagnosis	
Rheumatoid Arthritis	11 (12.0)
Osteoarthritis	7 (7.6)
Gout	2 (2.2)
IBD	1 (1.1)
None	71 (77.2)

Allergic Diagnosis	
Yes	13 (14.1)
No	79 (85.9)
Infectious Diagnosis	
Eye infection	2 (2.2)
None	90 (97.8)
Other Diagnosis	
Yes	16 (17.4)
No	75 (81.5)
Education level	
No formal education	12 (13.0)
Primary education	5 (5.4)
Secondary education	18 (19.6)
College	26 (28.3)
University	31 (33.7)
Employment status	
Not employed	64 (69.6)
Employed	28 (30.4)
Marital status	
Married	49 (53.3)
Not married	35 (38.0)
Divorced	1 (1.1)
Widow	7 (7.6)
Monthly income	
Rs 20k-30k	13 (14.1)
Rs 40k-50k	8 (8.7)
Rs 60k-80k	9 (9.8)
More than 80k	12 (13.0)
None	50 (54.3)
Smoking	
Yes	7 (7.6)
No	85 (92.4)

Exercise	
Yes	15 (16.3)
No	77 (83.7)

Hypertension was present in 29.3% of patients, while 12.0% had diabetes mellitus and 7.6% had liver disease. 5.4% had renal disease, and 10.9% had anemia. Obesity was present in 18.5% of patients. Additionally, 13.0% of patients reported other unspecified health issues. Further information regarding the participant's medical history is in Table 2.

Table 2 Medical history and comorbidity

Variable	N (%)
Hypertension	
Yes	27 (29.3)
No	65 (70.7)
Metabolic syndrome	
Yes	6 (6.5)
No	86 (93.5)
Renal disease	
Yes	5 (5.4)
No	87 (94.6)
Congestive Cardiac Failure	
Yes	0 (0.0)
No	92 (100.0)
Nephrolithiasis	
Yes	1 (1.1)
No	91 (98.9)
Liver Disease	
Yes	7 (7.6)
No	85 (92.4)
Diabetes Mellitus	
Yes	11 (12.0)
No	81 (88.0)

Myocardial infarction	
Yes	2 (2.2)
No	90 (97.8)
Hypothyroidism	
Yes	2 (2.2)
No	90 (97.8)
Hyperlipidemia	
Yes	6 (6.5)
No	86 (93.5)
Anemia	
Yes	10 (10.9)
No	82 (89.1)
Mental health issue	
Yes	1 (1.1)
No	91 (98.9)
Obesity	
Yes	17 (18.5)
No	75 (81.5)
Hospitalized	
Yes	8 (8.7)
No	84 (91.3)
Others	
Yes	12 (13.0)
No	80 (87.0)

Prednisolone was the most used glucocorticoid, prescribed to 33.7% of patients, followed by dexamethasone (15.2%) and betamethasone (13.0%). Only two patients received mineralocorticoids: fludrocortisone and aldosterone. In total, 85.9% of patients were on a single steroid, while 14.1% used two different steroids. Table 3 summarizes the corticosteroid therapy used.

Table 3 Represent Monotherapy used

Variable	N (%)
-----------------	--------------

Glucocorticoid	
Hydrocortisone	8 (8.7)
Prednisolone	31 (33.7)
Triamcinolone	2 (2.2)
Dexamethasone	14 (15.2)
Betamethasone	12 (13.0)
Budesonide	4 (4.3)
None	14 (15.2)
Prednisolone + Dexamethasone	2 (2.2)
Dexamethasone + Betamethasone	1 (1.1)
Hydrocortisone + Dexamethasone	1 (1.1)
Hydrocortisone + Betamethasone	1 (1.1)
Prednisolone + Methyl Prednisolone	1 (1.1)
Betamethasone + Budesonide	1 (1.1)
Dose	
Once a day	39 (42.4)
Twice a day	31 (33.7)
Thrice a day	9 (9.8)
None	13 (14.1)
Mineralocorticoids	
Fludrocortisone	1 (1.1)
Aldosterone	1 (1.1)
None	90 (97.8)
Dose	
Once a day	1 (1.1)
Twice a day	1 (1.1)
None	90 (97.8)
Other Steroids	
Beclomethasone	6 (6.5)
Clobetasol	5 (5.4)
Mometasone	2 (2.2)
Fluticasone	2 (2.2)

Fluocortolone	1 (1.1)
Flucinolone	1 (1.1)
None	75 (81.5)
Dose	
Once a day	11 (12.0)
Twice a day	4 (4.3)
Thrice a day	2 (2.2)
None	75 (81.5)
Number of steroids	
1 only	79 (85.9)
2 drugs	13 (14.1)

The participants mostly check blood pressure and performed CBC (complete blood count) test. Less number of participants analyze their bone density by using bone density test. Further information regarding patient's laboratory test analysis is given in Figure 1.

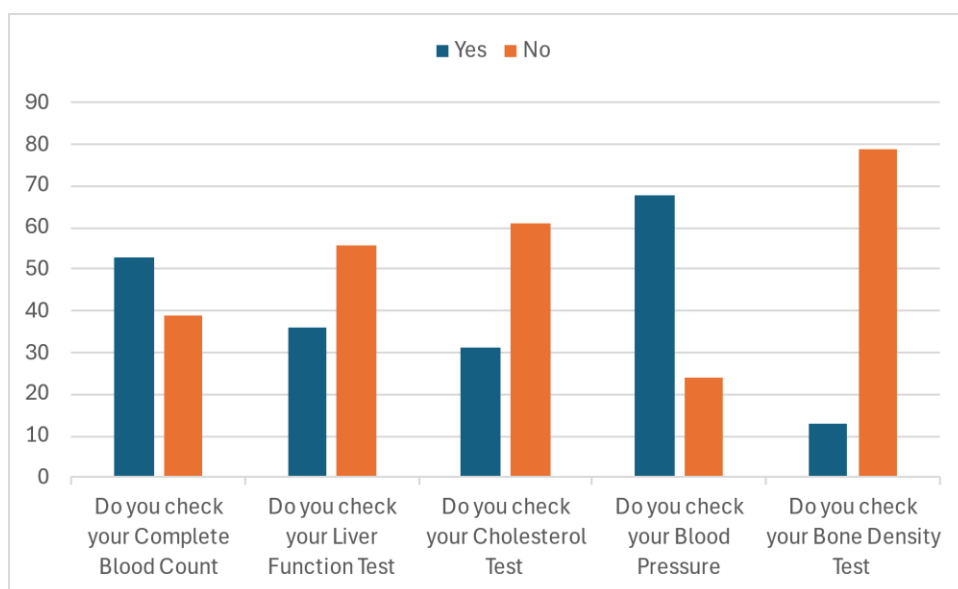


Figure 1: Laboratory test analysis

Most of the participants followed the instruction of prescriber and show maximum compliance towards therapy. Further information towards compliance of patients is given in Figure 2.

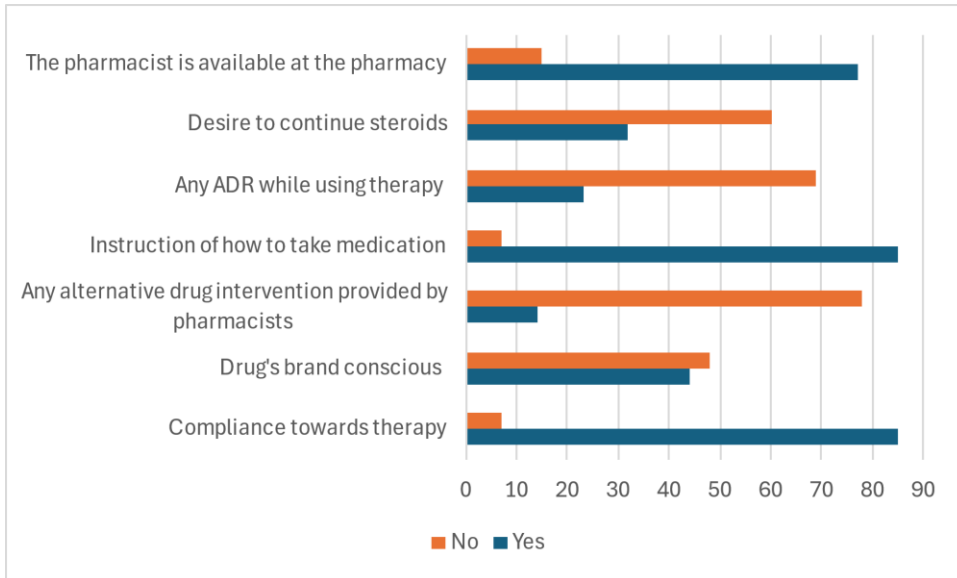


Figure 2: Compliance of patients toward therapy

Mostly corticosteroids prescribe to patients by Registered medical practitioner with a percentage of 88.0% followed by pharmacist 7.6%. Further information regarding prescribing is given in Figure 3.

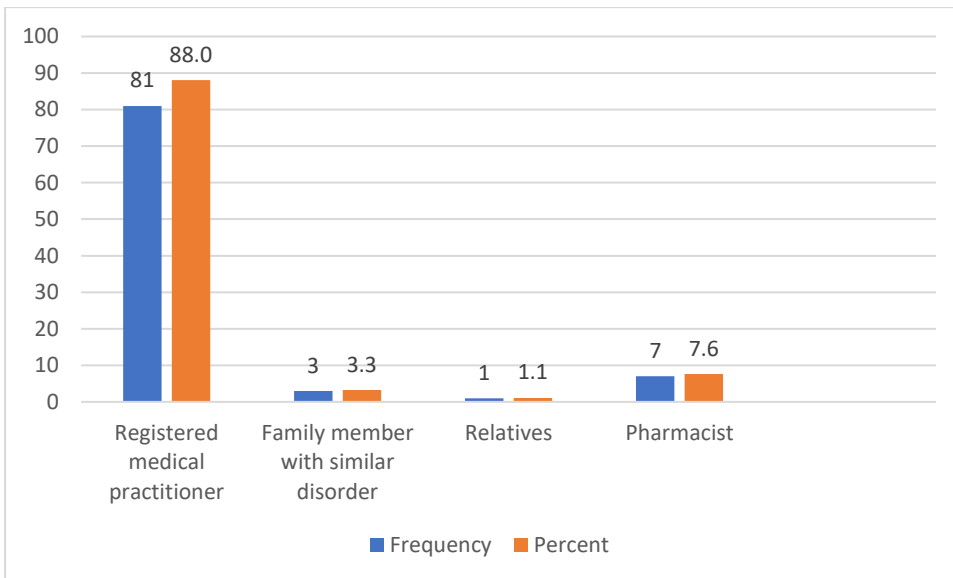


Figure 3: Prescribe by whom

DISCUSSION

The current study attempts to analyze patterns of corticosteroids in different diseases in different age groups. This study also estimates the corticosteroids used in several variables. Steroids are among the most commonly prescribed drugs in inflammatory diseases; in the present work, they treat asthma, dermatitis, and rheumatoid arthritis.

Several patients participated in this study. The research shows that the prescribing pattern of corticosteroids is higher in females (67.4%), compared to males (32.6%). The reason might be that some diseases are more common in females, like arthritis and rheumatic diseases, and a higher number of females are using topical corticosteroids because women are more conscious about their health. The findings of current studies are very similar to the research conducted in Nepal in 2015 (26).

The data shows that a high number of corticosteroids are used in patients with an age group above 30 that is 64.1% in contrast to the age group 18-30 that is 35.9%. Because the risk of diseases and comorbidity increases with increasing age. A similar study conducted in the US in 2017 is aligned with our current study (27).

In respiratory diagnosis, our study suggests corticosteroids use is more prevalent in asthma, which is 19.6% while COPD and tuberculosis, which are 4.3% and 3.3%. Because inhaled corticosteroids play an effective role in the treatment of asthma. The study is in line with a study conducted in the US in 2006 (28).

In dermatological diagnosis, our results show a high pattern of corticosteroid prescription in dermatitis 10.9% in comparison to fungal infection 5.4%, scabies 4.3%, and psoriasis 2.2%. The result of our study is in contrast with the study conducted in 2012 in India (29).

According to our study findings, high corticosteroids are used in rheumatoid arthritis 12.0% in contrast to osteoarthritis 7.6%, gout 2.2% and inflammatory bowel disease 1.1%. The study conducted in the USA in 2006 is in line with the study's findings (30).

The outcome of current research suggests corticosteroids are less 14.1% used in allergy. Because corticosteroids are less effective in acute allergic reactions. Steroid use was not proven to be superior in terms of allergy related issues. Findings of our study are quite similar to a study conducted in America in 2015 (31).

Our research specifies less corticosteroids used as 2.2% in eye infections as compared to other infections. The result of our study is in line with the study conducted in New York in 2019 (32).

The statistical data shows that 33.7% of individuals who came to the pharmacy with a corticosteroid prescription have a higher level of education of university level. That could be because they are better aware of disease prognosis and more concerned about their health; thus, they seek medical examinations more frequently than individuals with only a primary level of education. The study conducted in Denmark in 2010 shows that an association is found between higher education level and Inhaled corticosteroids use (33).

According to the study statistics, there are more unemployed individuals (69.6%) than employed ones. The possible reason might be that they are dependent on their family for their financial needs, and there is someone who takes care of them. According to statistics, 53.3% of people were married, while 38% were unmarried. That may be due to aging and lifestyle factors such as higher levels of stress and responsibilities, which exacerbate certain health conditions like asthma, arthritis, or autoimmune diseases. The current is in line with the survey conducted in Khammam (21).

The study data indicates that 92.4% of participants are non-smokers who utilized corticosteroids. Non-smokers may also use corticosteroids more often than smokers because non-smokers are more likely to engage in the treatment of inflammation and follow a prescribed course of treatment. The people who don't exercise (83.7%) use more corticosteroid drugs as compared to the people who do exercise (16.3%) because of health issues. The use of most corticosteroids in chronic inflammatory conditions impedes exercise capacity. A study conducted in Japan about the effect of long-term corticosteroid treatment on skeletal muscle strength, functional exercise capacity, and health status in patients with interstitial lung disease demonstrates that muscle strength reduction while exercise capacity is unaffected (34).

The study highlighted the significant presence of comorbid conditions. These comorbidities are of concern in corticosteroid administration because these drugs have considerable side effects, mainly when used for chronic diseases. The analysis shows that 29.3% of the patients had hypertension, and 12.0% of patients had diabetes mellitus, which suggests that clinicians must take precautions when prescribing corticosteroids as they interfere with the regulation of blood pressure and glucose levels. It aligns with the previous study that highlighted corticosteroids as a risk factor in patients with hypertension and diabetes (35)(36).

Liver diseases (7.6% of patients) and renal diseases (5.4% of patients) also complicate the condition. Corticosteroids are metabolized by the liver and excreted through the kidneys. That is why the presence of liver disease or kidney disease increases the likelihood of drug

accumulation and toxicity. Previous research shows that patients with liver disease may have worsened side effects because of the inadequate metabolism of the drug (37). The study found that 18.5% of individuals were obese, demonstrating the potential for corticosteroids to contribute to obesity by changing fat distribution and increasing appetite (38). Obesity should **considered** while taking corticosteroids since it raises the risk of problems such as insulin resistance, hyperglycemia, and cardiovascular disease (39).

Although only 2.2% of patients had a myocardial infarction history, corticosteroid use can worsen the condition due to fluid retention and hypertension. A case-control retrospective study demonstrated that the current glucocorticoid use is related to a substantially elevated risk of heart failure (40). 10% of patients had anemia, 6% had metabolic syndrome, 2% had hypothyroidism, 6% had hyperlipidemia, 1% showed mental health issues and 12% had other unspecified conditions. These medical conditions and comorbidities are necessary for evaluating the proper use of corticosteroids because this medicine can have adverse effects.

The study shows that the most frequently prescribed corticosteroid from glucocorticoids is prednisolone 33.7%, dexamethasone 15.2% and betamethasone is 13.0%. **The frequent use of prednisolone is because** asthma and rheumatoid arthritis patient percentage is high. These medicines are usually given once daily 42.4%. A similar study conducted in Ethiopia in 2019 is comparable to our current findings (41).

Mineralocorticoid are used not commonly; the percentage of fludrocortisone and aldosterone prescribing in patients is 1.1%. About 97.8% patients do not used this class of corticosteroids. These findings contrast with the study conducted in India in 2019 (42). From other class of steroids, beclomethasone 6.5% and clobetasol 5.4% are used generally. **The current research does not align with survey** held in Ikeja in 2022 (43).

This study showed corticosteroids that are prescribed by a registered medical practitioner have the highest percentage (N=81, 88%) as corticosteroids are prescription drugs that must prescribed by a healthcare provider, and corticosteroids that are recommended by a family member with the same disorder (N=3, 3.3%) which is in contrast with the study conducted in Iraq in 2018 which reported opposite results regarding the use and abuse of corticosteroids (44).

The study shows that the highest tested lab monitoring parameter in patients taking corticosteroids is blood pressure monitoring, as the oral corticosteroids are related to the high possibility of hypertension. The lowest percentage of lab monitoring parameters is the bone

density test. It is the major side effect of corticosteroids, but it has not been checked appropriately reported by previous studies conducted in England in 2017 (45).

The data shows a remarkable 85.24% compliance rate, which demonstrates that effective counselling and thorough follow-up improve patient adherence to therapy. These findings correlate with the study conducted in Malaysia, which indicates that more compliant patients had better outcomes in randomised control trials to assess patients with diabetes mellitus (46). The data also shows that 67.1% of patients do not desire to continue their corticosteroid therapy. This is in line with the study conducted in India that the topical corticosteroids were used among outpatient attendees with dermatophyte infections, in which 92.67% of patients wanted to change their drug therapy (47).

According to the study, 44.12% of patients were brand-conscious. This is due to the high cost of the drug. A study conducted in New York found that the branded drug costs between 30% and 60% more than the generic drug (48). A literature review finding suggests that 13% of the population would not accept generic drugs that confirm brand loyalty among minorities (49). The percentage of any alternative drug intervention provided by pharmacists was 14.4%, which shows that majority of patients prefer only physician-prescribed medication, especially elderly patients. The adverse effect of the treatment was 23.6%, which mostly included peptic ulcer, weight gain, fracture, and osteoporosis. The study revealed that the use of steroid-sparing agents and prophylactic drugs to reduce the incidence of adverse effects was not a routine practice among physicians (43). The results also show that 85.24% of patients received instruction on how to take medication, emphasizing the importance of proper use of medication in reducing the undesirable adverse effects among patients using corticosteroid therapy.

CONCLUSION

Our data confined that the prescription pattern of corticosteroid must be improved for rational use. Researchers can use this data to enhance prescribing patterns. Some participants use corticosteroids without prescription, and they are unaware of their potential adverse effects. The health care provider should counsel the patients about the use and side effects of corticosteroids. The health care providers must pay attention to the rational use of corticosteroids and prescribe medications according to standard guidelines.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

REFERENCES

1. Patra JK, Shukla AC, Das G. Advances in pharmaceutical biotechnology: Recent progress and future applications. *Advances in Pharmaceutical Biotechnology: Recent Progress and Future Applications*. 2020;(March):1–478.
2. Miller WL, White PC. History of Adrenal Research: From Ancient Anatomy to Contemporary Molecular Biology. *Endocr Rev*. 2023;44(1):70–116.
3. Sanghavi J, Aditya A. Applications of Corticosteroids in Dentistry. *Journal of Dental and Allied Sciences*. 2015;4(1):19.
4. Miller WL, White PC. A Brief History of Congenital Adrenal Hyperplasia. *Horm Res Paediatr*. 2022;95(6):529–45.
5. Williams DM. Clinical pharmacology of corticosteroids. *Respir Care*. 2018;63(6):655–70.
6. Calhoun WJ, Chupp GL. The new era of add-on asthma treatments: where do we stand? *Allergy, Asthma and Clinical Immunology*. 2022;18(1):1–13.
7. Reichardt SD, Amouret A, Muzzi C, Vettorazzi S, Tuckermann JP, Lühder F, et al. The role of glucocorticoids in inflammatory diseases. *Cells*. 2021;10(11):1–30.
8. Yeh JJ, Lin CL, Kao CH. Associations among chronic obstructive pulmonary disease with asthma, pneumonia, and corticosteroid use in the general population. *PLoS One*. 2020;15(2):1–17.
9. Lewis W. The Role of Steroids in Clinical Practice: Benefits, Risks, and Considerations for Therapeutic Use. 2023;13:128–31.
10. Fraenkel L, Bathon JM, England BR, St.Clair EW, Arayssi T, Carandang K, et al. 2021 American College of Rheumatology Guideline for the Treatment of Rheumatoid Arthritis. *Arthritis Care Res (Hoboken)*. 2021;73(7):924–39.

11. KB B, Patil R, Pillai R. Drug prescribing pattern of topical corticosteroids in dermatology unit of a tertiary-care hospital. *Int J Med Sci Public Health*. 2015;4(12):1702.
12. Yao TC, Huang YW, Chang SM, Tsai SY, Wu AC, Tsai HJ. Association between oral corticosteroid bursts and severe adverse events: A nationwide population-based cohort study. *Ann Intern Med*. 2020;173(5):325–30.
13. Al-Ahmad M, Al Zaabi A, Madkour A, Alqaraghuli HA, Al Hayaan H, Mobayed H, et al. Expert consensus on oral corticosteroids stewardship for the treatment of severe asthma in the Middle East and Africa. *Respir Med*. 2024;228(May):107674.
14. Suehs CM, Menzies-Gow A, Price D, Bleecker ER, Canonica GW, Gurnell M, et al. Expert consensus on the tapering of oral corticosteroids for the treatment of asthma: A delphi study. *Am J Respir Crit Care Med*. 2021;203(7):871–81.
15. Pandey A, Garg S, Khunger M, Darden D, Ayers C, Kumbhani DJ, et al. Dose–Response Relationship Between Physical Activity and Risk of Heart Failure: A Meta-Analysis. *Circulation*. 2015 Nov;132(19):1786–94.
16. Besra L, Tripathy R, Srivastava V, Gaba S, Padhee S. Comparative Evaluation of Safety and Economic Burden Due to Topical Steroid Misuse in Patients with Self-medication and Prescribed Medication. *J Pharmacol Pharmacother*. 2023;14(4):290–5.
17. Mulximovna MS. Distinctive Features of Long-Term Use of Glucocorticoids. 2024;141–4.
18. Rice JB, White AG, Scarpati LM, Wan G, Nelson WW. Long-term Systemic Corticosteroid Exposure: A Systematic Literature Review. *Clin Ther*. 2017;39(11):2216–29.
19. Patterns P, The A, Of U, Therapy C, Tertiary AT, Hospital C. UPI Journal of Pharmaceutical Medical , and Health Sciences PRESCRIBING PATTERNS AND ANALYZING THE USAGE OF CORTICOSTEROID THERAPY. 2024;7(1):1–8.
20. Chalitsios C V., Shaw DE, McKeever TM. A retrospective database study of oral corticosteroid and bisphosphonate prescribing patterns in England. *NPJ Prim Care Respir Med*. 2020;30(1):1–8.
21. Chowdhury MH, Shravya K, Prasad DrM, Eswaraiyah DrMC. Evaluation of Corticosteroid Utilization Pattern in the Various Departments of a Tertiary Care Teaching Hospital, Khammam. *Saudi Journal of Medical and Pharmaceutical Sciences*. 2019;05(12):1094–101.
22. Javsén C, Suman RK, Patil VG DYA. To Study Prescription Pattern of Corticosteroids in Skin OPD in Tertiary Care Teaching Hospital. *Asian Journal of Pharmacology and Toxicology*. 2014;02(04):23–6.
23. Eriksen J, Gustafsson LL, Ateva K, Bastholm-Rahmner P, Ovesjö ML, Jirlow M, et al. High adherence to the “Wise List” treatment recommendations in Stockholm: A 15-year retrospective review of a multifaceted approach promoting rational use of medicines. *BMJ Open*. 2017;7(4):1–10.
24. Zahid Iqbal M, Shahzad S, Muhammad Usama Latif S, Mubarik A, Fatima N, Arshad S, et al. Prescription pattern of antibiotics and infection control among outpatients presented at the different community pharmacies in Lahore, Pakistan. *Med Sci*. 2024;28(146):1–9.
25. Shende M, Ghutke B, Panekar D, Kachewar A. Assessment of drug utilization pattern of steroids in a district general hospital in Amravati region. *Research Results in Pharmacology*. 2019;55(2):57–64.

26. Shrestha S, Bhandari M, ... RSKU, 2015 undefined. Study on corticosteroids use pattern in dermatological practice and investigating adverse effect of corticosteroids including its associated factors. nepjol.infoSS Shrestha, M Bhandari, R Shrestha, SR Thapa, A Karki, M Prajapati, S Shrestha, S KcKathmandu University Medical Journal, 2015•nepjol.info [Internet]. 2015 [cited 2024 Sep 18];13(3):261–8. Available from: <https://nepjol.info/index.php/KUMJ/article/view/16819>
27. Waljee AK, Rogers MAM, Lin P, Singal AG, Stein JD, Marks RM, et al. Short term use of oral corticosteroids and related harms among adults in the United States: population based cohort study. bmj.comAK Waljee, MAM Rogers, P Lin, AG Singal, JD Stein, RM Marks, JZ Ayanian, BK Nallamothumbmj, 2017•bmj.com [Internet]. 2017 [cited 2024 Sep 18];357:1415. Available from: <https://www.bmj.com/content/357/bmj.j1415.abstract>
28. Larj M, Chest EB, 2004 undefined. Therapeutic responses in asthma and COPD: corticosteroids. Elsevier [Internet]. [cited 2024 Sep 18]; Available from: <https://www.sciencedirect.com/science/article/pii/S0012369215314835>
29. Prasad G, Ragul G, Mohanta G, ... PMIJRP, 2012 undefined. Study of prescribing pattern of topical corticosteroids in the department of dermatology of a multispecialty tertiary care teaching hospital in south India. academia.eduGS Prasad, G Ragul, GP Mohanta, PK Manna, C MoorthiInt J Res Pharm Sci, 2012•academia.edu [Internet]. [cited 2024 Sep 18]; Available from: <https://www.academia.edu/download/30669896/30-10145.pdf>
30. Caplan L, Wolfe F, Russell A, of KMTJ, 2007 undefined. Corticosteroid use in rheumatoid arthritis: prevalence, predictors, correlates, and outcomes. jrheum.orgL Caplan, F Wolfe, AS Russell, K MichaudThe Journal of rheumatology, 2007•jrheum.org [Internet]. [cited 2024 Sep 18]; Available from: <https://www.jrheum.org/content/34/4/696.short>
31. Grunau B, Wiens M, Rowe B, McKay R, ... JLA of emergency, 2015 undefined. Emergency department corticosteroid use for allergy or anaphylaxis is not associated with decreased relapses. Elsevier [Internet]. [cited 2024 Sep 18]; Available from: <https://www.sciencedirect.com/science/article/pii/S0196064415001900>
32. Holland E, Fingeret M, Cornea FM, 2019 undefined. Use of topical steroids in conjunctivitis: a review of the evidence. journals.lww.comEJ Holland, M Fingeret, FS MahCornea, 2019•journals.lww.com [Internet]. [cited 2024 Sep 18]; Available from: https://journals.lww.com/corneajrnl/fulltext/2019/08000/Use_of_Topical_Steroids_in_Conjunctivitis__A.26.aspx/1000
33. Davidsen JR, Søndergaard J, Hallas J, Siersted HC, Knudsen TB, Lykkegaard J, et al. Impact of socioeconomic status on the use of inhaled corticosteroids in young adult asthmatics. Respir Med. 2011;105(5):683–90.
34. Hanada M, Sakamoto N, Ishimatsu Y, Kakugawa T, Obase Y, Kozu R, et al. Effect of long-term treatment with corticosteroids on skeletal muscle strength, functional exercise capacity and health status in patients with interstitial lung disease. Respirology. 2016;21(6):1088–93.
35. Mebrahtu TF, Morgan AW, West RM, Stewart PM, Pujades-Rodriguez M. Oral glucocorticoids and incidence of hypertension in people with chronic inflammatory diseases: A population-based cohort study. Cmaj. 2020;192(12):E295–301.
36. Blackburn D, Hux J, Mamdani M. Quantification of the risk of corticosteroid-induced diabetes mellitus among the elderly. J Gen Intern Med. 2002;17(9):717–20.

37. Palatini P, De Martin S. Pharmacokinetic drug interactions in liver disease: An update. *World J Gastroenterol*. 2016;22(3):1260–78.
38. Spencer SJ, Tilbrook A. The glucocorticoid contribution to obesity. *Stress*. 2011;14(3):233–46.
39. Liu D, Ahmet A, Ward L, Krishnamoorthy P, Mandelcorn ED, Leigh R, et al. A practical guide to the monitoring and management of the complications of systemic corticosteroid therapy. *Allergy, Asthma and Clinical Immunology*. 2013;9(1):1.
40. Souverein PC, Berard A, Van Staa TP, Cooper C, Egberts ACG, Leufkens HGM, et al. Use of oral glucocorticoids and risk of cardiovascular and cerebrovascular disease in a population based case-control study. *Heart*. 2004;90(8):859–65.
41. Wondmkun YT, Ayele AG. Assessment of prescription pattern of systemic steroidal drugs in the outpatient department of menelik ii referral hospital, Addis Ababa, Ethiopia, 2019. *Patient Prefer Adherence*. 2021;15:9–14.
42. Rajesham V V., Swethasri Ch, Mamatha E, Tiwari K, Pooja Raj P. A Prospective Study on Usage Pattern of Corticosteroids in a Tertiary Care Hospital. *International Journal of Pharmaceutical Sciences and Drug Research*. 2019;11(5):152–6.
43. Ogundele SO. Use of corticosteroids in medical practice: Pattern of prescription, adverse effects and pre-prescription counselling practices. *IOSR J Pharm*. 2022;12(7):12–6.
44. Alfetlawi B, ... AAJI in, 2020 undefined. Evaluating factors related to the abuse of oral corticosteroids among community pharmacy customers: using theory of reasoned action. [ncbi.nlm.nih.gov](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8132515/) BG Alfetlawi, AA Al-Jumaili, MH Zalzal *INNOVATIONS in pharmacy*, 2020 • [ncbi.nlm.nih.gov](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8132515/) [Internet]. [cited 2024 Sep 18]; Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8132515/>
45. Mebrahtu TF, Morgan AW, West RM, Stewart PM, Pujades-Rodriguez M. Oral glucocorticoids and incidence of hypertension in people with chronic inflammatory diseases: A population-based cohort study. *Cmaj*. 2020;192(12):E295–301.
46. Iqbal MZ, Alqahtani SS, Mubarak N, Shahid S, Mohammed R, Mustafa A, et al. The influence of pharmacist-led collaborative care on clinical outcomes in type 2 diabetes mellitus: a multicenter randomized control trial. *Front Public Health*. 2024;12(February).
47. Chaudhary R, Rathod S, ... AJID, 2019 undefined. Prescription and usage pattern of topical corticosteroids among out-patient attendees with dermatophyte infections and its analysis: A cross-sectional, survey-based. [journals.lww.com](https://journals.lww.com/idoj/fulltext/2019/10030/Prescription_and_Usage_Pattern_of_Topical.9.aspx) [Internet]. [cited 2024 Sep 18]; Available from: https://journals.lww.com/idoj/fulltext/2019/10030/Prescription_and_Usage_Pattern_of_Topical.9.aspx
48. Costa-Font J, Rudisill C, Tan S. Brand loyalty, patients and limited generic medicines uptake. *Health Policy (New York)*. 2014;116(2–3):224–33.
49. Straka RJ, Keohane DJ, Liu LZ. Potential clinical and economic impact of switching branded medications to generics. *Am J Ther*. 2017;24(3):e278–89.