Research Results in Pharmacology

Research Results in Pharmacology 5(2): 57–64
UDC: 616.085
DOI 10.3897/rrpharmacology.5.32584

Research Article

Assessment of drug utilization pattern of steroids in a district general hospital in Amravati region

Mulchand Shende[1], Bhupesh Ghutke[1], Dhanshree Panekar[1], Aparna Kachewar[1]

1 *Government College of Pharmacy, Kathora Naka, Amravati, Maharashtra 444604, India*

Corresponding author: *Mulchand Shende* (shende_mulchand@rediff.com)

Academic editor: *Tatyana Pokrovskaya* ♦ **Received** 20 December 2018 ♦ **Accepted** 27 March 2019 ♦ **Published** 27 June 2019

Citation: Shende M, Ghutke B, Panekar D, Kachewar A (2019) Assessment of drug utilization pattern of steroids in a district general hospital in Amravati region. Research Results in Pharmacology 5(2): 57–64. https://doi.org/10.3897/rrpharmacology.5.32584

Abstract

Introduction: Rational use of corticosteroids is very important in the long term for improving patient safety. The main objective of the study was to analyze the prescribing patterns of steroids in a district general hospital, Amravati.

Materials and methods: A prospective observational study was carried out over a period of six months in a district general hospital. All patients receiving any category of steroid therapy were enrolled, and the prescribing tapering patterns of steroids were reviewed. The demographic data, disease data and data on the utilization of various steroids were analyzed, and the knowledge of the patients was assessed by using a Michigan questionnaire.

Results and discussion: 179 patients were recruited for the study. Steroids were prescribed for various (29.6%) respiratory conditions, (10.1%) CVS diseases, (11.7%) CNS, (1.6%) in hepatic disorders, (1.1%) musculoskeletal disorders, (3.4%) skeletal disorders, (0.6%) renal impairments, (3.9%) GI disorders, (19.0%) skin diseases and (19.0%) other diseases. The utilization of steroid dexamethasone was the most commonly prescribed to 111 patients (63.8%) followed by hydrocortisone (57 patients, 32.8%) and prednisolone (6 patients, 3.4 %). Dexamethasone was most commonly associated with adverse effects (1.8% of such as headaches, abdominal pains, and rashes), followed by prednisolone (0.8% of such as facial swelling), clobetasol (0.4%) and fluticasone (0.4 %).

Conclusions: Very little variation was found in the prescription pattern amongst the healthcare professionals. Most of the drugs were prescribed rationally; the significance of the study is to improve the patient safety in the long-term use of steroid therapy by observing the prescribing patterns as irrational use of steroids can increase the risk of adverse effects.

Keywords

General medicine, prescribing pattern, rationality, tapering, steroids.

Introduction

Corticosteroids are widely accepted by health care professional for their anti-inflammatory qualities and some profound clinical results. Corticosteroids are drugs with immunosuppressive and anti-inflammatory properties. However, their side effect profile makes careful consideration before use and regular review paramount (Dhandapani et al. 2015). In the field of respirology, systemic corticosteroids are used for the treatment of acute exacerbations of chronic obstructive pulmonary disease (COPD) and severe, uncontrolled asthma, as well as for inflammatory parenchymal lung diseases, such as hypersensitivity pneumonitis and immune mediated vasculitis (Liu et al. 2013). Oral corticosteroids become important part of therapy regimens for a diverse variety of conditi-

ons. Despite their efficacy, they are associated with a wide variety of adverse events (Manson et al. 2009). There has been an increasing concern regarding the safety of corticosteroids, as a large number of patients are prescribed these drugs for a long-term prophylactic treatment. The dose of corticosteroids that is prescribed, dispensed and applied must be carefully considered as too little steroid can show poor response whereas excess application can increase the risk of adverse reaction. For this, rational use is necessary to minimize both systemic and cutaneous side effects (Ference and Last 2009). The corticoids have widespread actions. They maintain fluid-electrolyte, cardiovascular and energy substrate homeostasis and functional status of skeletal muscles and nervous system. They prepare the body to withstand effects of all kinds of noxious stimuli and stress (Sharma and Ksharma 2017).

In India, most of these medications, especially topical corticosteroids, are sold without any prescription and a patient can easily obtain these medications from a local pharmacy. As per the information available on the Central Drugs Standard Control Organization (CDSCO) website, their off label use is more commonly practiced in India. Also, their inappropriate use in the treatment of various dermatological disorders, like acne, bacterial or fungal infections, and rash when prescribed by non-registered practitioners or on the advice of a pharmacist. This will increase the adverse effects and can lead to dependence on these medications (Ambika et al. 2014, Saraswat et al. 2011). Many researchers has been reported the use of corticosteroid was irrational due to as there were a number of interactions observed mostly prescribed in geriatric patient (Dabral and Devesh 2018, Mirshad et al. 2017, Nerurkar et al. 2016, Stern 1996). Prescriptions need to be audited periodically to enhance the therapeutic effectiveness, to minimize the adverse effects, to provide critical feedback to prescribers and to analyse the execution of medical treatment standards. Data evaluation is the most crucial step in the drug utilization studies (Kumar et al. 2011). Periodic monitoring of the drug utilization pattern is one of the methods to analyze the rationality of the drug and has been an effective tool to constitute guidelines for improving the utilization pattern (Sweileh 2006). This will not only constitute a rational therapy, but also lead to economic benefits and easy identification of the problem related to drug use, like poly pharmacy, drug interactions and adverse reactions (Aryal et al. 2017). The main objective of the study was to analyze the prescribing pattern of corticosteroids among the patients from general medicine and dermatology department of a district general hospital in Amravati.

Materials and methods

This was a qualitative study during which prospective observational, non-interventional interviews were conducted for six months to gather details about how patients perceived any category of steroid therapy. Research ethics approval was received from Research Ethics Committees of the participating hospital (REC/17/GCOPA/3) at government district general hospital, Amravati and Pharm.D pharmacy practice center of Government College of Pharmacy Amravati Maharashtra. Each patient was informed about the purpose of the study and written consent was obtained prior to their participation in the study. An informed consent form to participate in research of samples, ensure the confidentiality of the information received and used only for research purposes which were fully met.

Patients of either sex of various age groups who received any category of steroid therapy in both the departments, either inpatient or outpatient settings, were included for this study. Eligible patients, who were prescribed steroids medications to manage acute or chronic disease(s), had been admitted to a clinical area and presented a past history of steroid intake and those who had been reported of abusing steroids included. The operationally some important terms use like steroid abuse and it is defined as inappropriate use of steroids for a period of more than one year for the study purpose. Patients visiting the outpatient department of general hospital medicine ward, patients not willing to sign a consent, unconscious patients were excluded.

Sample size was 179 patients of various departments over a period of 6 months from October 2017 to March 2018 in a district general hospital, Amravati. Interview questions and prompts were designed to elicit participants' views about the use of corticosteroids. Observational notes and reflexive note-taking were conducted throughout the study. Patient data relevant to the study was collected from treatment charts/case sheets, laboratory reports and patients' or patients' caregivers' interviews by using a patient data collection form. It included the patient demographics data and occupation, the dosage regimen, duration of hospitalization, laboratory data, adverse drug reaction and other relevant information. The data was collected on a prevalidated case record proforma. The observational results were screened for various parameters viz; gender and age wise distribution, taking into account rationality, concomitant and comorbid diseases.

Practioners' opinions of effective use of steroids were analyzed using some guidelines. The samples of transcripts were checked by co-researchers to ensure appropriate and consistent interpretation. The data generated in this study was analyzed for ADR, documentation and reporting of ADRs, appropriateness of drug, dose, frequency and duration. The data were summarized by routine descriptive statistics, namely, mean and standard deviation, correlation for numerical variables, counts and percentages for categorical variables.

Results

A total number of 179 patients meeting the inclusion criteria were enrolled for present study. The study took place between October 2017 and March 2018. The detailed demographic data is demonstrated in Table 1. The subjects

Table 1. Basic demographic data (n = 179).

Gender	Number of Patients	Number of Patients (%)
Male	94	52.5
Female	85	47.5
Age in years		
<20	17	9.5
21–30	19	10.6
31–40	30	16.8
41–50	38	21.2
51–60	24	13.4
>60	51	28.5
Social Habits		
Smoker	59	32.9
Alcoholic	44	24.5

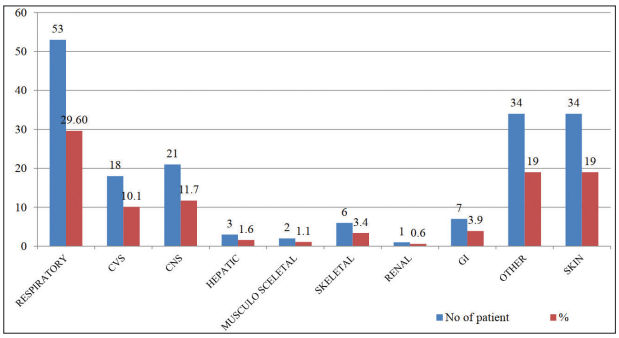

Figure 1. Systems associated with steroids use and their percentage.

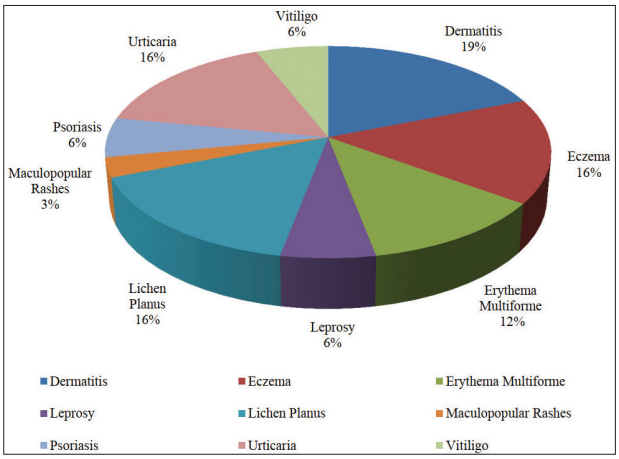

Figure 2. Dermatological disorder associated with steroid use.

were categorized according to gender and out of 179 subjects 94 (52.5%) were males and 85 (47.5%) were females. According to age group distribution, 17 subjects were in the age group of <20, 19 subjects were in the age group of 21–30 years, 30 subjects were in the age group of 31–40 years, 38 subjects were in the age group of 41–50, 24 subjects were in the age group of 51–60 and 51 subjects were in the age group above 60 years, the mean age of the population was 49.7±6.8 (Mean±SD) and the range of ages was between <20–60> years old. The mean ages of the male and female patients were 48.0±6.0 and 51.5±7.7 years old, respectively. Median of different age groups and frequency of patients was not correlated based on results (r^2=0.73). Social history of patients included information regarding social habits, such as smoking and alcoholism. The distribution of social habits in the patients who participated in the study were 59 smokers and 44 alcoholics (Table 1).

The routes of administration of corticosteroid were intravenous (87.1%), topical (9.3%) and oral (3.6%). The system associated with disease is given in Fig 1. The data collected comprised of 53 (29.6%) patients of respiratory condition, 18 (10.1%) patients of cardiovascular system diseases, 21 (11.7%) patients of central nervous system, 3 (1.6%) with hepatic disorder, 2 (1.1%) patients with musculoskeletal disorders, 6 (3.4%) patients with skeletal disorders, 1 (0.6%) patients with renal impairments, 7 (3.9%) patients with gastro intestinal disorders, 34 (19.0%) patients with skin diseases and 34 (19.0%) patients with other diseases.

Nine basic dermatological disorders were observed in which corticosteroids were used during the study (Fig 2). The most common indications of prescribing corticosteroids were dermatitis (19%), eczema (16%), lichen planus (16%) and urticaria (16%), erythema multiforme (12%), psoriasis (6%), vitiligo (6%) and leprosy (6%), and maculopopular rashes (3%).

From the data, after the first most common group of diseases – the respiratory system pathologies, 34 patients of various skin diseases were observed and so presented the structure of dermatological diseases. Respiratory system pathologies associated with steroids use comprised of 53 (29.6%) patients. The different respiratory system pathologies treated by corticosteroids demonstrated chronic obstructive pulmonary disease (COPD) (24 patients, 45.3%) lower pulmonary tract infection (12 patients, 22.6%), bronchial asthma (6 patients, 11.3%), 3 (5.7%). COPD was the diagnosis for which most of the corticosteroid were prescribed.

The results of steroid use in general medicine and dermatology are given in Table 2. The total of 225 steroid

Table 2. Steroid used in general medicine and dermatology.

Steroids	General Medicine	Percentage (%)	Dermatology	Percentage (%)	Total No of Patients	Percentage (%)
Betamethasone	0	0	1	2.0	1	0.4
Clobetasol	0	0	14	27.5	14	6.2
Dexamethasone	111	63.8	28	54.9	139	61.8
Fluticasone	0	0	4	7.8	4	1.8
Hydrocortisone	57	32.8	0	0	57	25.3
Prednisolone	6	3.4	2	3.9	8	3.6
Triamcinolone	0	0	2	3.9	2	0.9
Total	**174**	**100**	**51**	**100**	**225**	**100**

drugs were prescribed in 179 patients during the study period, from which 174 drugs – in the general medicine ward: dexamethasone was given to 111 (63.8%) patients, hydrocortisone was given to 57 (32.8%) patients and prednisolone was given to 6 (3.4%) patients.

In the dermatology department, out of 51 drugs, betamethasone was given to 1 (2.0%) patient, clobetasol was given to 14 (27.5%) patients, dexamethasone was given to 28 (54.9%) patients, fluticasone was given to 4 (7.8%) patients, prednisolone was given to 2 (3.9%) patients, and triamcinolone was also given to 2 (3.9%) patients. Dexamethasone (as a long-acting drug) was prescibed most frequently, while hydrocortisone was used as a short acting and prednisolone – as an intermediate acting corticosteroids (Fig. 3).

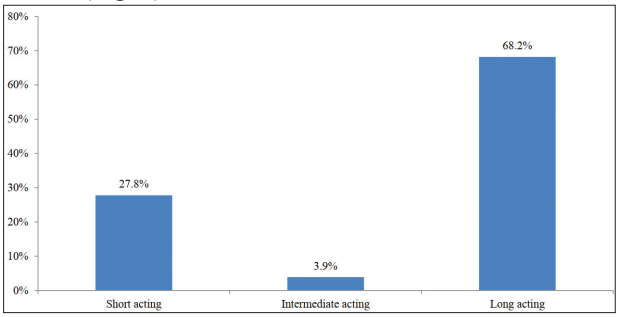

Figure 3. Steroid classification based on duration of action.

The rationality of steroids was measured on the basis of prescriber-related factors, steroid abuse and dose tapering. The prescriber-related factors, steroid abuse, dose tapering, ADRs due to corticosteroid use are given in Table 3. Maximum corticosteroids were prescribed by the generic name from the hospital pharmacy (96.8%) as compared to the brand name from outside pharmacies (3.1%). Out of 179 patients, 20 patients were found to have a past medication history of steroids. Out of 20 patients, 5 patients were found abusing steroids and 15 were not abusing steroids. Total 8 steroid-related adverse drug reactions were observed in the present study.

Table 3. Prescriber-related factors, steroid abuse, dose tapering in corticosteroid use.

Index	Index research group	Patients with the Index	
		N	%
Generic Name	225	218	96.9
Frequency Mentioned	225	223	99.1
Dose mentioned	225	223	99.1
Steroids abuse	20	5	25.0
Gradual withdrawal	225	11	4.9
Adverse drug effects	225	8	3.6

Types of adverse side effects of corticosteroids are presented in Table 4. Dexamethasone was most commonly associated with adverse effects (1.8% of all the prescriptions), such as headaches, abdominal pains, rashes, followed by prednisolone (0.8%) leading to such adverse effects as facial swelling, then clobetasol (0.4%) and fluticasone (0.4%).

Some factors were found to deviate from rationality, like inappropriate drug history, drug dose not mentioned, frequency not mentioned, wrong administration, dose omission, illegible hand writing, lack of dose tapering and steroid abuse of the patients 22 (12.3%). The strength of the active constituent 2 (2.1%), frequency of administration 2 (2.1%), wrong administration 10 (45.5%), dose omission 5 (22.7%), illegible hand writing 14 (63.6%), lack of dose tapering 6 (27.3%) and steroid abuse 3 (13.6%) were not specified for the majority of the prescriptions. But the frequency of their occurrence was statistically significantly negligible ($P<0.05$).

Discussion

Corticosteroids are commonly used for the treatment of many inflammatory and autoimmune conditions which requires time to time reviewing of the prescription. The rational prescribing of the drugs is essential to increase the therapeutic efficacy and decrease the adverse effects of the drugs. In addition, the study tried to describe the common diseases encountered and the drugs commonly prescribed in general medicine and dermatology. The commonly used steroids without consulting a dermatologist and their health consequences were addressed through the qualitative method. To ensure safety, effectiveness and well balanced therapeutic management of corticosteroids, both patients and prescribers should be more aware of the appropriate dose, dosage regimen, drug-drug interactions, ADRs and overall guidelines for prescribing corticosteroids. Considering the prevalence of use of corticosteroids and severity of the problems in patients, investigation of steroid utilization patterns help to evaluate and analyze the reasons for their increased and inappropriate use in population. The study will be of use to improve the patient safety by observing the prescribing patterns as irrational use of steroids. Several studies have addressed the issue of steroidal drug prescribing patterns. Some of these have indicated inappropriate utilization or over-utilization of potent, topical corticosteroids.

The total of 179 patients meeting the inclusion criteria were enrolled into the present study. The study took place between October 2017 and March 2018. Participants' de-

Table 4. Types of Adverse Drug Side Effects by Use of Corticosteroids.

Index	Drug			
	Dexamethasone	Prednisolone	Clobetasol	Fluticasone
Total drug prescriptions	139	8	14	4
ADR	Headache, Abdominal pain, Rashes	Facial swelling	Pigmentation on skin	Redness of skin
Number of ADR	4	2	1	1
Percentage	2.9	25.0	7.1	25.0

mographic information includes 94 (53%) males and 85 (47%) females. P-value is 0.002518, which is less than 0.05, hence males were found significantly different when using corticosteroids as compared to females. The majority of the study subjects who participated in this study belonged to the age group of >60 years, followed by those of 41–50 years of age and 51–60 years old. It seems that geriatric patients are prone to a higher risk of medication-related problems because of the higher numbers of prescribed medications, intensity of the work environment, presence of critical illness, and increased use of high risk medications. Similarly, more males were found to be using corticosteroids as compared to females. Out of 179 patients, 103 patients were associated with social habits, such as smoking and alcoholism, which means the reported information was affected by these factors. The difference in patients between these two groups (smokers (59), alcoholics (44) and normal (76)) was statistically significant ($p<0.05$). The prevalence of prescription users increased substantially with age and one of factors could be illiteracy. Thus, persons aged 40–60 were more than 4 times as likely and persons aged above 60 were more than 3 times as likely to receive treatment than those aged under 19 years old. This shows that with advanced age, the number of diseases increases, due to which the use of corticosteroids increases. During the study period, 225 steroid drugs were prescribed to 179 patients who met the criteria considering the prevalent use of corticosteroids for treatment of any types of diseases. Therefore, diseases classified were based on human system-related issues viz; respiratory condition, CVS diseases, CNS diseases, hepatic disorders, musculoskeletal disorders, skeletal disorders, renal impairments, GI disorders and skin diseases. From among the three routes of administration related to the above diseases for the use of corticosteroids, none was specified for the majority of patients. But for the majority of inpatients' prescriptions, a route of administration and duration of application were specified and the mean hospital stay of the patients was 18 days, while the longest inpatient stays were 31 days for COPD patients. The most preferred route of administration of corticosteroid was intravenous (87.1%) followed by topical (9.3%) and oral (3.6%). Where injection dosage forms that were prescribed along with the topical preparation constituted 36%, oral 2% and combination of topical, oral and injection dosage forms accounted for 5%. Based on disease conditions, the various routes of administration were applied to the exposed steroids, and in some instances, only one route of administration was applied to the patients; hence this can be due to the difference in the inclusion criteria of the study. A similar study was conducted for evaluation of corticosteroid utilization patterns in a tertiary care hospital (Dabral and Devesh 2018). These all data suggested that among various dosage forms of steroids use, injection was most widely/frequently used, followed by topical and oral forms. The major clinical complaints of the patients admitted in general medicine departments were related to Respiratory tract (29.6%), followed by dermatological complaints (19%), renal impairments (4%) and musculoskeletal disorders (3%), which was similar to the study done in a pulmonary department (Varkey and Sen 2015). The most common indications for prescribing corticosteroid were dermatitis (19%), eczema (16%), lichen planus and urticaria (16% each), erythema multiforme (12%), psoriasis and vitiligo (6%), maculopopular rashes (3%) and others (6%). The total of 225 steroid drugs were prescribed to 179 patients during the study period. The study was conducted in general ward and dermatological department of the hospital. In relation to this, dermatological diseases and diseases of the respiratory systems were easy to facilitate patient tracking for compile structure and related information. Considering the duration of therapy, investigation requires tracking patients associated with short and long courses of treatment to find out efficacy of steroids. For inpatients' prescription, the duration of application was specified at 18 days. Systemically dexamethasone was commonly prescribed to most of the patients, which may be due to its potency and longer duration of action. In the present study out of 21 topical steroid, ultra high-potency corticosteroids were prescribed more frequently (66.26% of cases), followed by moderate-potency (13.9%) and high-potency (27.9%). In the study, long acting corticosteroids used were dexamethasone and betamethasone. Non-infectious skin diseases, like dermatitis, topped by 19%, followed by Eczema (16%), lichen planus and urticaria (16% each). This disease pattern is comparable to the study conducted in Karaikal, which showed similar reports (Divyashanthi et al. 2014, Wahane et al. 2016). This shows that the incidence of the skin disease depends mostly on a geographical location, genetic makeup as well as environmental factors. In spite of the fact that these drugs can cause serious adverse effects, these are easily available and are sold without prescription, and also there is very little awareness about the potential side effects in the general public. In the general medicine ward, dexamethasone was given to 63.8% of patients, followed by hydrocortisone (32.8% of patients) and prednisolone (3.4% of patients). In dermatology department, out of 51 drugs, betamethasone was given to 1.9% of patients. Dexamethasone was prescribed most frequently, while hydrocortisone was used as a short acting and prednisolone as an intermediately acting corticosteroid. The study included only rationality of steroids use in population to find out their safety of use. From the data, after the first most common group of diseases – the respiratory system pathologies, 34 patients of various skin diseases were observed and so presented the structure of dermatological diseases in the manuscript. Respiratory system pathologies associated with steroids use comprised of 53 (29.6%) patients. The different respiratory system pathologies treated by corticosteroids were bronchial asthma (6 patients, 11.3%), laryngeal edema (2 patients, 3.83%), allergic, obstructive syndrome (6 patients, 11.3%), lower pulmonary tract infections (12 patients, 22.6%), chronic obstructive pulmonary disease (COPD) (24 patients, 45.3%), pneumonia (3 patients,

5.7%). COPD was the diagnosis for which most of the corticosteroids were prescribed.

The rationality of steroids is measured on the basis of prescriber-related factors, steroid abuse and dose tapering. Like with alcohol or street drugs, the common signs of addiction may develop with the use of steroids. These include drug cravings, requiring more drugs to provide the same effect, and withdrawal symptoms if someone stops taking the drug. This condition is referred to as steroids abuse. The steroid abuse factor was defined as a factor influencing the rational use of steroids through the administrator that includes dose omission and withdrawal. According to the National Institute of Drug Abuse, the use of steroids continues to be a significant problem in the adolescent population. They published data on steroid abuse factor associated with steroids. Maximum corticosteroids were prescribed by generic names from hospital pharmacies (96.8%) as compared to brand names from outside pharmacies (3.2%). Out of 179 patients, 20 patients were found to have a past medication history of steroids. Out of 20 patients, 5 patients were found abusing steroids and 15 were not abusing steroids. So there is a rational use steroid according to the steroid abuse factor. In the data collected, dose tapering was done for 11 drugs, and tapering was not done for 214 drugs. Ultra high-potency corticosteroids were clobetasol used in dermatitis, lichen planus, psoriasis and eczema. High-potency corticosteroids, like triamcinolone and betamethasone, were prescribed for vitiligo maculopopular rashes. Moderate-potency corticosteroids, such as fluticasone, were prescribed for vitiligo and eczema. There is no use of low-potency corticosteroids. An ultra-high-potency drug causes serious adverse effect, and these drugs are easily available and are sold without prescription, and also there is very little awareness about their potential side effects in the general public. Using generic names usually provides flexibility to the dispensing pharmacist, and generic drugs are less expensive than the branded drugs. There is rational use of steroids by prescriber-related factor. The dose was tapper, it require so there were in rational use of steroid by this factor. It was found out that right steroids were prescribed for right indications to right patients. This assures that rationality is genuinely followed while prescribing. However, some factors were found that deviate from rationality, such as inappropriate drug history, not mentioned drug dose, not mentioned frequency, wrong administration, dose omission, illegible hand writing, lack of dose tapering and steroid abuse. Not specifying these factors can lead to under usage of the medication and can further lead to sub therapeutic outcome; at the same time excessive usage can lead to unwanted effects (Ference and Last 2009, Sweileh 2006). Most drugs were prescribed in generic names, and doses were mentioned with frequency, but no fixed dose combinations of steroids were used. Appropriate dose tapering was done in required patients. Few patients were found to be abusing steroids due to lack of knowledge about the medication. Clear instructions should be provided so that the patients are aware of how much steroid should be used and how long it should be used (Oshikoya et al. 2008). Also, generic names for most of the drugs were not mentioned at all. Using generic names usually provides flexibility to the dispensing pharmacist and generic drugs are less expensive than the branded drugs.

Total 8 steroid-related adverse drug reactions were observed in the present study. Dexamethasone was most commonly associated with adverse effect (1.8%), such as headaches, abdominal pains, rashes, followed by prednisolone (0.8%) with side effects such as facial swelling, then clobetasol (0.4%) and fluticasone (0.4%). There were no appropriate guidelines, and drug interaction reporting is emerging scope of pharmacy should be considerable (Mukherjee et al. 2016). Most of the drugs were prescribed for right indications to right patients; however, some factors, such as in appropriate drug history, improper mentioning of dose and frequency, wrong administration time, dose omission, improper dose tapering were found to be deviating away from the rationality.

The use of steroids is seen more frequently in elderly patients, which suggests that elderly patients should be monitored more closely while treating them with steroids. To ensure safety, effectiveness and well balanced therapeutic management of corticosteroids, both patients and prescribers should be more aware of the appropriate dose, dosage regimen, drug-drug interactions, ADRs and overall guidelines for prescribing corticosteroids. Hence, a clinical pharmacist can perform a potential role in health care system in assisting a physician in altering the number of medications taken, the number of doses taken, improving the patient's medication adherence, preventing the adverse drug reactions, drug-drug interactions, in counseling patient to improve the health-related quality of life and in decreasing the health care cost to the patient. Moreover, the lack of medical education from the health care professionals to the patients enforces the conduction of the study. It has therefore become very important to monitor and evaluate the prescribing patterns of corticosteroids.

A key strength of this study is its novel approach taken in hospitals to the obtained results which may have implications for both pharmacy students and medical practitioners by increasing their awareness of patients when using steroids. Interestingly, overtime and perhaps with changing demographics and patients' expectations of healthcare professionals, researchers have found that an increasing proportion of patients prefer sharing decision roles with clinicians. Potential limitation of this study was the limited samples due to a short study period. The data were collected only from October 2017 to March 2018. Very few patients were available in the dermatology department, as most of the patients did not require hospital admission. The regional language barrier during communication with the patients when the supporting staff were not available in the ward was another limitation.

Easy availability of the steroids in pharmacies, especially, topical steroids, is one of the major factors responsible for their irrational use. Irrational use/abuse of topical or systemic steroids may lead to severe ADRs and affect

the quality of life of patients. Hence, establishing standard guidelines for prescribers for treating any acute and chronic diseases where steroids are necessary is highly warranted. Also, there is an increasing need to strengthen the laws regarding the procurement, storing, dispensing of steroidal medicines at the retail pharmacies.

Conclusion

There was not much variation found in the prescription patterns amongst the healthcare professionals. Although most of the drugs were prescribed rationally, involvement of a clinical pharmacist in patient care can help rational prescribing along with prevention and early detection of ADRs, which can directly promote drug safety and improve patients' outcomes.

Acknowledgements

We gratefully acknowledge the support provided by the health professionals of hospitals for their kind support in managing the cases.

References

- Ambika H, Vinod CS, Yadalla H, Nithya R, Babu AR (2014) Topical corticosteroid abuse on the face: a prospective, study on outpatients of dermatology. Our Dermatol Online 5(1): 5–8. https://doi.org/10.7241/ourd.20141.01
- Aryal A, Kunwar K, Shadvar S, Kharel S, Ramasamy R, Shashidhar G, Aneesh S, Nazeem T (2017) Study on steroid utilization pattern in a tertiary care teaching hospital. Indian Journal of Pharmacy Practice 10(2): 96–103. https://doi.org/10.5530/ijopp.10.2.19
- Dabral A, Devesh KJ (2018) Evaluation of corticosteroid utilization pattern in tertiary care hospital, Dehradun. International Journal of Advanced Research 6(2): 126–132. https://doi.org/10.21474/IJAR01/6418
- Dhandapani C, Arulkumaran KS, Asha P (2015) Drug utilization evaluation of corticosteroids based on safety. International Journal of Pharmacy Teaching and Practices 6(1): 1591–1597.
- Divyashanthi CM, Nandhini A, Kumar SA (2014) Study on drug utilization pattern of antibiotics among dermatology in-patients of a tertiary care teaching hospital, Karaikal, Puducherry. International Journal of Basic and Clinical Pharmacology 3(6): 1072–1077. https://doi.org/10.5455/2319-2003.ijbcp20141227
- Ference JD, Last AR (2009) Choosing topical corticosteroids. American Family Physician 79(2): 135–140. [PubMed]
- Kumar AM, Noushad PP, Shailaja K, Jayasutha J, Ramasamy C (2011) A study on drug prescribing pattern and use of corticosteroids in dermatological conditions at a tertiary care teaching hospital. International Journal of Pharmaceutical Sciences Review and Research 9(2): 132–135.
- Liu D, Ahmet A, Ward L, Krishnamoorthy P, Mandelcorn ED, Leigh R, Brown JP, Cohen A, Kim H (2013) A practical guide to the monitoring and management of the complications of systemic corticosteroid therapy. Allergy, Asthma and Clinical Immunology 9(1): 30. https://doi.org/10.1186/1710-1492-9-30 [PubMed] [PMC]
- Manson SC, Brown RE, Cerulli A, Vidaurre CF (2009) The cumulative burden of oral corticosteroid side effects and the economic implications of steroid use. Respiratory Medicine 103(7): 975–994. https://doi.org/10.1016/j.rmed.2009.01.003 [PubMed]
- Mirshad PV, AK AK, Fasalu RO, TK MM (2017) Prescription audit of corticosteroid usage in the department of dermatology at a tertiary care teaching hospital. International Journal of Basic and Clinical Pharmacology 2(4): 411–413. https://doi.org/10.5455/2319-2003.ijbcp20130813
- Mukherjee S, Era1 N, Banerjee G, Tripathi SK(2016) Assessment of corticosteroid utilization pattern among dermatology outpatients in a tertiary care teaching hospital in Eastern India. International Journal of Green Pharmacy 10(4): S178–182. https://doi.org/10.22377/ijgp.v10i04.780
- Nerurkar RP, Kokane MR, Mehta MN (2016) Study of prescribing pattern of topical corticosteroids in dermatology out patients department in a tertiary care hospital in India. International Journal of Basic and Clinical Pharmacology 5(5): 2194–2198. https://doi.org/10.18203/2319-2003.ijbcp20163261
- Oshikoya KA, Bello JA, Ayorinde EO (2008) Prescribing knowledge and skills of final year medical students in Nigeria. Indian Journal of Pharmacology 40(6): 251–255. https://doi.org/10.4103/0253-7613.45150 [PubMed] [PMC]
- Saraswat A, Lahiri K, Chatterjee M, Barua S, Coondoo A, Mittal A, Panda S, Rajagopalan M, Sharma R, Abraham A, Verma SB (2011) Topical corticosteroid abuse on the face: A prospective, multicenter study of dermatology outpatients. Indian Journal of Dermatology, Venereology, and Leprology 77(2):160. https://doi.org/10.4103/0378-6323.77455 [PubMed]
- Sharma HL, Ksharma K (2017) The Principles of Pharmacology" 3rd edition Paras Medical Publication, pp. 568–601
- Stern RS (1996) The pattern of topical corticosteroid prescribing in the United States, 1989–1991. Journal of the American Academy of Dermatology 35 (2Pt 1): 183–86. https://doi.org/10.1016/S0190-9622(96)90319-9 [PubMed]
- Sweileh WM (2006) Audit of prescribing practices of topical corticosteroids in outpatient dermatology clinics in north Palestine. Eastern Mediterranean Health Journal 12(1–2): 161–169. [PubMed]
- Varkey S, Sen S (2012) Prescribing patterns of corticosteroids in pulmonology department. International Journal of Pharmacy Teaching and Practices 3(3): 334–337.
- Wahane PA, Jagtap RP, Ghongane BB (2016) Evaluation of corticosteroid use pattern in steroid responsive dermatological conditions. International Journal of Medical Research and Health Sciences 5(1): 82–86. https://doi.org/10.5958/2319-5886.2016.00017.5

Author contribution

- **Mulchand Shende,** Department of Pharmacy Practice, e-mail: shende_mulchand@rediff.com. Being the author of the idea and the project coordinator, the author helped to draft the manuscript, analyzed the general results and provided the final conclusions, finalizing the article.

- **Bhupesh Ghutke,** Pharm. D Intern, Department of Pharmacy Practice, e-mail: bhupeshghutke@gmail.com. The author carried out collecting and recording data, participated in the design of the study and helped to draft the manuscript and edited the final version of the article.

- **Dhanshree Panekar,** Pharm. D Intern, Department of Pharmacy Practice, e-mail: dhanashree@gmail.com. The author was responsible for gathering the data, conducting the regional study in hospital, helped to draft the manuscript.

- **Aparna Kachewar,** Pharm. D Intern, Department of Pharmacy Practice, e-mail: akachewar@gmail.com. The author carried out literature review, edited the final version of the manuscript.