ISSN No. 2394-3971

Original Research Article

A PROSPECTIVE OBSERVATIONAL STUDY OF CORTICOSTEROIDS USED IN A TERTIARY CARE CORPORATE HOSPITAL

M. Praveen Kumar*[1], K. Bhanu Prasad[1], Aziza Tahaseen[2], K. Rahul[2], M. Sree Lakshmi[2], V. Kalyan Chakravarthy[2]

1. Assistant Professor, Department of Pharmacy Practice, Holy Mary Institute of Technology and Science, Bogaram, Keesara, Hyderabad, India- 501301

2. PharmD Interns, Department of Pharmacy Practice, Holy Mary Institute of Technology and Science, Bogaram, Keesara, Hyderabad, India- 501301

Submitted on: October 2018
Accepted on: November 2018
For Correspondence
Email ID: praveen.pharmd16@gmail.com

Abstract

Objectives: Evaluation of a prospective observational study of the corticosteroids used in tertiary care hospital , to provide information and correct rationale pertaining to corticosteroids which also describes various interactions and adverse effects of corticosteroids to assess the statistical incidence regarding usage and its right provision.

Methodology: Study site was at SUNSHINE HOSPITALS, conducted for a period of 6 months. Both male and female individuals of age group 16-75years were included.

Results: Study included assessment of interactions, adverse effects and the rational usage of corticosteroids with total of 200 prescriptions; of which 34 pharmacokinetic drug interactions, 71 pharmacodynamic drug interactions and 9 major adverse effects were observed. The rational usage of drug was assessed based on proper indication, drug selection, goal and administration.

Conclusion: To conclude with, corticosteroids are effective drugs in an array of treatment of diseases involving careful consideration of factors such as potency, formulation, responsiveness and cost. Measures for prevention and early recognition of drug induced effects are important for better patient outcome.

Keywords: Corticosteroids, prospective observational, adverse effects, interactions, rational usage, potency, responsiveness, drug induced effects.

Introduction:

Any of a large group of fat soluble organic compounds containing a characteristic chemical ring system. The majority, including the sterols, bile acids, many hormones, and the D vitamins, have important physiological action. [1]

Corticosteroids are a class of steroid hormones that are produced in the adrenal cortex of vertebrates, as well as the synthetic analogues of these hormones. Two main classes of corticosteroids i.e., glucocorticoids and mineralocorticoids, are involved in a wide range of physiologic processes, including stress response, immune response, and regulation of

inflammation, carbohydrate metabolism, protein catabolism, blood electrolyte levels, and behavior.[2]

Understanding of the use of corticosteroids has been aided by knowledge of their effect on cellular protein synthesis and by an appreciation of how modification of their molecular structure alters their pharmacological action.

Their ability to modulate the immune response and to diminish inflammation make them useful in following departments: Rheumatology, respiratory diseases, allergies, endocrine and metabolic disorders, blood disorders, gastro-intestinal diseases, neurological and muscular diseases, renal diseases, cardiovascular disorders and skin diseases.[3,4]

Corticosteroids are available in a number of different forms including:

- Tablets: oral corticosteroids,
- Sprays and inhalers: inhaled corticosteroids,
- Creams and lotions: topical corticosteroids, and
- Injections: these can be injected into the bloodstream (intravenous corticosteroids) or into an affected muscle or joint.

Classification of steroids based on their relative activity:

- Short acting [t1/2 <12 hr]: Hydrocortisone, Cortisone.
- Intermediate acting [t1/2 12- 36] : Prednisolone , Methyl prednisolone, Triamcinolone.
- Long acting [t1/2 > 36]: Paramethasone, Dexamethasone, Betamethasone.

PHARMACOLOGICAL ACTIONS:

1. Direct (Intended) Actions

- Anti-inflammatory
- Anti-allergy
- Anti-immunity

2. Permissive Actions

- Lipolytic effects.
- Effect on blood pressure.
- Effect on bronchial muscles.
- Negative feedback mechanism.
- Steroids and drugs designed to mimic them are directly gene-active.
- Glucocorticoids (e.g., prednisolone) used to suppress inflammation, allergy and immune responses.
- Anti-inflammatory therapy is used in many illnesses (e.g., RA, UC, BA, eye and skin inflammations).
- Useful in, say, tissue transplantation and lymphopoiesis (leukemia's and lymphomas).
- Striking improvements can be obtained, but severe adverse, but highly predictable, effects are unsure. [5,6]

Objectives of the study:

Primary Objective:

To provide a prospective observational study of the corticosteroids used in a tertiary care hospital.

Secondary Objectives:

- To provide information and correct rationale pertaining to corticosteroids.
- To identify the various interactions with corticosteroids.
- To describe various adverse effects of corticosteroids.
- To assess the statistical incidence regarding usage, occurrence of adverse effects and right provision of corticosteroids.

Methodology:

This study was a prospective observational study on corticosteroids in a tertiary care corporate hospital. In this study we enrolled 200 subjects, which included 120 male patients and 80 female patients who were treated with corticosteroids among all departments. We were inclined towards the corticosteroids because they were known to have immense therapeutic uses n an array of diseases. They are widely used to treat a variety of autoimmune and

inflammatory conditions. Despite all the benefits, these agents are associated with potentially serious adverse effects. Through our project we learnt about the rational use of corticosteroids that would be helpful to treat patients by carefully optimizing therapy and thereby reducing the risk of any adverse effects. We obtained relevant information necessary for our project and recorded in the patient profile forms. We then studied individual case sheets and observed the incidence of corticosteroids prescribed in various departments and analyzed them for presence of any interactions and/or adverse drug reactions.

Results:

Table 1:- Age wise distribution

Age Group	No of Patients	(%)
<21	9	4.5
21-30	15	7.5
31-40	19	9.5
41-50	15	7.5
51-60	48	24
61-70	56	28
71-80	38	19
Total	200	100
Mean ± SD: 55.85±16.58		

Table 2:-Gender Wise Distribution:

Gender	No of Patients	(%)
F	80	40
M	120	60
Total	200	100

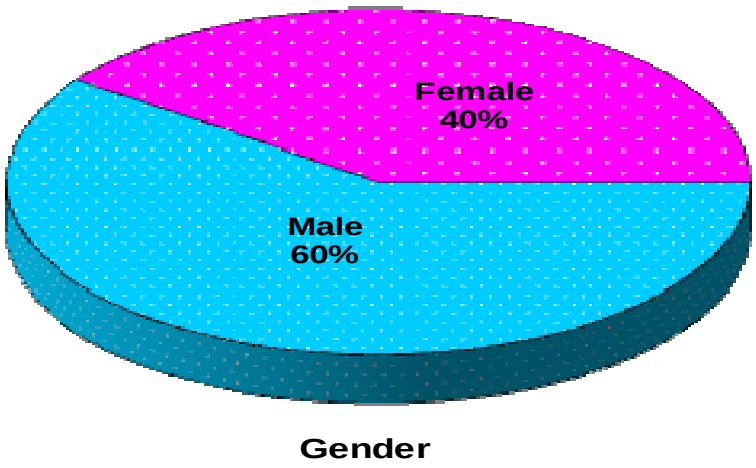


Table 3:- Steroids Wise Distribution In Departments:

DEPARTMENT	No of Patients	(%)
Cardiology	11	5.5
Gastroenterology	13	6.5
General Medicine	51	25.5
Nephrology	**6**	**3**
Neurology	23	11.5
Orthopedics	21	10.5
Pulmonology	**66**	**33**
SURGERY	9	4.5
TOTAL	200	100

Table 4:- Disease Wise Category:

DISEASE	No of Patients	(%)
CNS	15	7.5
CVS	8	4
GI TRACT	10	5
OTHERS	32	16
RENAL & UTI	7	3.5
RESPIRATORY	**111**	**55.5**
SKELETAL	9	4.5
SURGERY	8	4
TOTAL	200	100

Table 5:- Drug Interactions Distribution:

Interactions are divided into pharmacokinetic and pharmacodynamic interactions.

5.1 Pharmacokinetic Interactions:

Out of 200 patients pharmacokinetic interactions are seen in 34 patients.

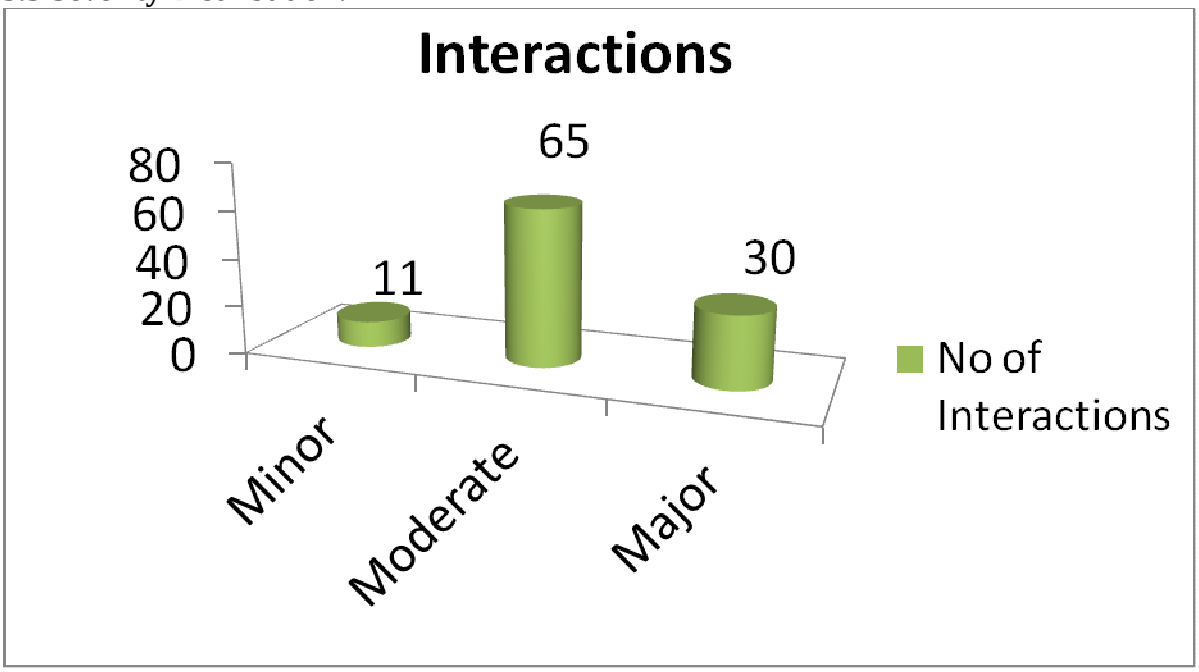
PHARMACOKINETIC	No of Interactions
Absorption	26
Distribution	1
Metabolism	7
Total	34

5.2 Pharmacodynamic Interactions:

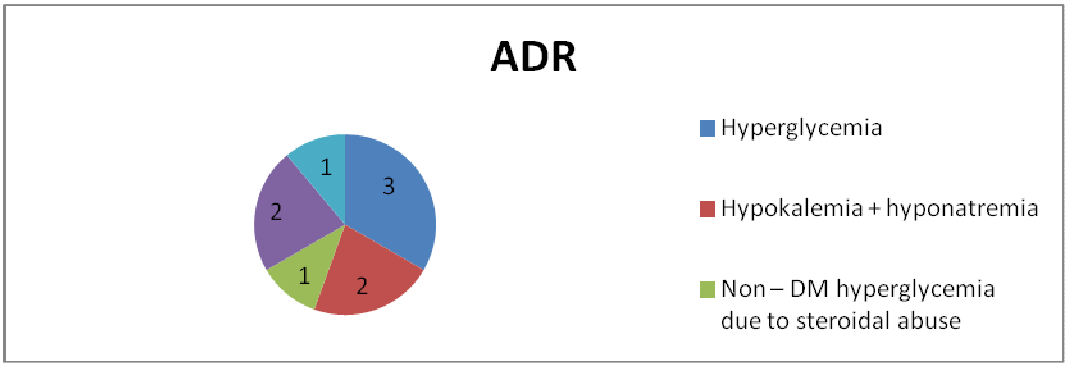
Out of 200 patients pharmacokinetic interactions are seen in 72 patients.

PHARMACODYNAMIC	No of Interactions
Additive	16
Antagonist	43
Synergistic	13
Total	72

5.3 Severity Distribution:



Adverse Drug Reactions Distribution:



Out of 200 patients, 9 patients are observed with ADRs, these 9 ADRs are written progress chart of patients in which mainly hyperglycemia, hypokalemia and pedal edema are recorded.

By long term usage and high dosing of steroids chance may occur with suspected ADRs are seen in patients.

Table 7:- P- value:

CATEGORY	Beta	Bude	Defl	Dexa	Hydr	Meth	Mome	Pred	P value
AGE									
• <21	.	1	.	4	2	.	.	2	P<0.0001***
• 21-30	1	.	.	9	3	.	.	2	
• 31-40	.	7	.	6	5	2	.	3	
• 41-50	.	5	.	3	8	1	.	2	
• 51-60	.	25	.	9	10	8	1	15	
• 61-70	.	39	1	2	18	1	1	10	
• 71-80	.	31	.	1	11	4	.	7	
Total	1	108	1	34	57	16	2	41	200
SEX									
• F	.	39	.	10	23	8	1	24	P=0.2272
• M	1	69	1	24	34	8	1	17	
Total	1	108	1	34	57	16	2	41	200
DEPARTMENT									
• Cardio	.	7	.	1	4	.	.	2	P<0.0001***
• GE	.	7	.	.	6	1	.	3	
• GM	1	8	.	23	16	1	1	7	
• Nephro	.	2	1	.	1	.	.	4	
• Neuro	.	7	.	7	4	1	.	6	
• Ortho	.	12	.	1	8	.	.	1	
• Pulmo	.	59	.	.	18	12	1	16	
• Surgery	.	6	.	2	.	1	.	2	
Total	1	108	1	34	57	16	2	41	200
DISEASE									
• CNS	.	1	.	7	2	1	.	6	P<0.0001***
• CVS	.	4	.	1	5	.	.	1	
• GI TRACT	.	2	.	1	7	.	.	3	
• OTHERS	1	1	.	22	6	1	1	4	
• RENAL & UTI	.	.	1	.	4	.	.	2	
• RESPIRATORY	.	98	.	.	24	13	1	20	
• SKELETAL	.	.	.	1	6	.	.	2	
• SURGERY	.	2	.	2	3	1	.	3	

Total	1	108	1	34	57	16	2	41	200

Beta=Betamethasone, Bude=Budesonide, Defl=Deflazacort, Dexa=Dexamethasone, Hydr=Hydrocortisone, Meth=Methyl Prednisolone, Mome=Momentasone, Pred=Prednisolone.

Discussion:

A total of 200 prescriptions were reviewed in a Tertiary Care Corporate Hospital during six months study period and among those 200 prescriptions, 120 were male patients and 80 were female patients, in which males count was higher than that of female.

Our study found that among 200 patients, corticosteroids were used most commonly among the following departments in hospital were:

1. Pulmonology -33%
2. General Medicine-25.5%
3. Neurology-11.5%
4. Orthopaedics-10.5%
5. Gastroenterology-6.5%
6. Cardiology-5.5%
7. Surgery-4.5%
8. Nephrology-3%

Our study found out that among 200 patients, the routes through which corticosteroids administered were:

1. Nasal
2. Parenteral
3. Oral
4. Very few subjects were administered topically.

The main course of this study includes the drug interactions, the adverse effects, and the rational usage of drug in tertiary care corporate hospital among 200 prescriptions which consisting of corticosteroids and their effects on drug therapy and ongoing drug treatment for presented disease condition.

Our study conducted among 200 patients, in which drug –drug interactions were identified and the drug interactions were separated based on the pharmacodynamic and pharmacokinetic studies and their level of severity.

The corticosteroids with pharmacokinetic drug interactions found were 34 and was separated based on following:

1. Absorption: 26
2. Distribution: 01
3. Metabolism: 07

The corticosteroids with pharmacodynamic drug interactions found were 71 and was separated based on following:

1. Additive: 16
2. Antagonist: 42
3. Synergistic: 13

The corticosteroids separated based on level of severity of their drug interaction were found to be 106 and as follows:

1. Major: 30
2. Moderate: 65
3. Minor: 11.

The reason behind all the drug- drug interactions during the study was found to be due to the multiple drug therapy, over dosage of prescribed drugs or may occur out of accidental misuse or due to lack of knowledge of active ingredients involved in the relevant substances and this action may be synergistic or antagonist or a new effect can be produced that neither produces on its own.

Our study conducted among 200 patients, a large amount of adverse effects can be suspected and severity can be calculated through Naranjo scale, and out of which 9 adverse effects were observed during the case study which included the following reactions to prescribed corticosteroids:

1. Hyperglycemia: 3
2. Hypokalemia+Hyponatremia: 2
3. Non –DM Hyperglycemia due to steroidal abuse: 1
4. Pedal edema: 2
5. Skin rashes: 1.

The reason behind all the adverse effects during the study was found to be due to hypersensitivity to prescribed corticosteroids, comorbidities, over dosage of drugs, existing disease condition, resistance to prescribed drug, may occur due to following a single dose or prolonged administration of a drug or

result from the combination of two or more drugs.

The rational usage of drug should be followed during prescribing corticosteroids which is possibly helpful in many factors, including the purpose for use, desired route of administration, characteristics of individual clients, expected adverse effects.

The rational usage of drug including appropriate goals of therapy, indication of therapy, the proper drug selection, the proper drug dosage, the drug administration and figuring out the drug interactions and adverse effects and proper steps to be followed to reduce the effects of undesired conditions.

The goal of corticosteroid therapy is usually to reduce symptoms to a tolerable level. Total suppression of symptoms may require excessively large doses and this may lead to serious adverse reactions, indications for their clinical use should be as clear cut as possible.

Conclusion:

Corticosteroids are effective drugs in an array of diseases and abundant choices are available in different formulations.

Optimal therapy involves careful consideration of factors such as potency, formulation, responsiveness and the cost of the steroid.

Despite the benefits of these agents, their prolonged use (particularly at high doses) is associated with potentially serious AEs affecting the musculoskeletal, endocrine, CV, and central nervous systems as well as the GI tract.

Many of these side effects can be minimized through careful patient monitoring and implementation of preventive measures, including the use of lower potency agents and the lowest effective dose required for management of the underlying condition.

Patients should be informed about the AEs associated with systemic corticosteroid use and should be advised on lifestyle modification strategies that may help reduce the risk of these events.

We observed that the incidence of occurrence of drug interactions increases in case of patients with multiple therapies (polypharmacy) and presence of other underlying conditions.

During the course of our study we observed that the chance of significant side effects increases with the dose and duration of treatment and so only the minimum dose necessary to control the disease should be given.

Measures for prevention and early recognition of glucocorticoid-induced adverse effects are important for better patient outcome.

References:

1. D.Lednicer, Steroid Chemistry at a Glance, America l Journal of steroidal chemisty, 2011.
2. Nussey, Stephen, Whitehead, The adrenal gland, BIOS scientific publishers, 2001.
3. Liu, Dora, Ahmet, Alexander, A practical guide to the monitoring and management of the complications of systemic corticosteroids therapy, British Journal on corticosteroid therapy, 2013.
4. Hall , Richard, Psychiatric Adverse Drug reactions : steroid Psychosis, American Journal of Adverse reactions,2005
5. S.Korte, corticosteroids in relation to fear, anxiety and psychopathology, Journal on corticosteroids effect on psychotherapy, vol: 25, pg no: 117-142.
6. K.D.Tripathi,Essentials of pharamacology,6 th Edition, Pg -275 to 280,publication 2008.
7. Kwatra G., Mukhopadhyay S. (2018) Topical Corticosteroids: Pharmacology. In: Lahiri K. (eds) A Treatise on Topical Corticosteroids in Dermatology. Springer, Singapore, Pg 11-22.
8. Stephen L. Swartz, Robert G. Dluhy, Corticosteroids: Clinical

Pharmacology and Therapeutic Use, Drugs, 1978, Volume 16, Number 3, Page 238.
9. Wolterskluwer,vitalstream.com/sample content/9780781762632_abrams/chapter3.pdf.
10. P .Demoly and K.F. Chung, Pharmacology of corticosteroids, Respiratory medicine, March 1998, Volume 92, Issue 3, Pages 385–394.
11. V. K. Grover, Ramesh Babu, S. P. S. Bedi, Steroid Therapy – Current Indications in Practice, Indian Journal of anaesthesia, Vol-51, Year-1998, Pg:389.
12. Symreng T. Karlberg BE, Kagedal B, Schildt B, Physiological cortisol substitution of long-term steroid treated patients undergoing major surgery. British Journal of Anaesthesia, Year- 1981; Vol-53, Pg: 949-53