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### Assessment of Prescribing Pattern and Appropriateness of Steroids Prescribed In A Private Tertiary Care Teaching Hospital

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#### ABSTRACT

Steroids are widely prescribed in modern medicine, because steroid hormones are crucial for proper functioning of the body. Steroid prolonged use is associated with serious AEs. Hence this study was carried out to assess the prescribing pattern and appropriateness of steroids. A prospective observational study was conducted to analyze for the pattern of prescribed steroids and also analyzed to that of the recommended therapeutic guidelines. Out of 1084, 14.5% (157) were steroid therapy. Maximum use of steroids was prescribed for patients above 50 years of age. Almost 38.8% of reasons were related to RTI. The average number of drugs prescribed for each prescription was  $9.82 \pm 3.7$ . The drugs prescribed in the study population includes 13.29% of steroids and 54.1% were commonly given through nebulization at the time of admission and tablets was most common dosage form at the time of discharge.  $2.5 \pm 8.23$  average numbers of drug interactions, 21.66% had moderate drug interactions involving steroids. There were 4 adverse drug reactions observed and none of the steroids were involved in precipitating the ADRs. As per therapeutic guidelines, 38.85% of steroids were inappropriately prescribed and Rs.  $495 \pm 39.49$  was the average cost increased (drugs cost alone) for patients for whom the steroids were inappropriately prescribed. This study may be concluded that use of therapeutic guidelines while prescribing corticosteroids will benefit the patients because of lesser side effects, and it also may reduce the cost of treatment and improve therapeutic outcome.

**Keywords:** Steroids, Appropriateness, Therapeutic Guidelines, Outcome.

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## INTRODUCTION

Steroids are widely prescribed in modern medicine, because steroid hormones are crucial for proper functioning of the body. Steroids are mainly used treatment of asthma, chronic obstructive pulmonary disease, Hypersensitivity reactions, Autoimmune diseases and in Organ transplantation<sup>1</sup>. This has led to over prescribing of these drugs despite the benefits of these agents, their prolonged use (particularly at high doses) is associated with potentially serious AEs affecting the musculoskeletal, endocrine, cardiovascular, and central nervous systems as well as the GI tract<sup>2</sup>. As with any potent medication, they are not without significant side effects and these adverse events are costly. Hence, care should be exercised in the selection of corticosteroid drugs for use as well as their dosage regimen<sup>3</sup>.

One must always carefully assess the severity of the underlying disorder, the gains that can be expected from Steroid therapy, and the risks. Many of the standard treatment guidelines strongly recommend the use of steroidal drugs as a part of the therapy, e.g. in treatment of Asthma and COPD. Clinical guidelines are attempting to standardize the approach to management, but they still have problems.

Steroids are also one of the categories of the drug which are more abused. They also tend to interact more with the co administered drugs so excessive steroid use will lead to drug interactions and ADRs.

By this study we would like to draw an attention towards the inappropriate prescribing of steroids which may lead to therapeutic ineffectiveness or it may cause serious adverse effects. So this study might be helpful for the physicians to be conscious regarding the importance of appropriate prescribing of steroids as per recommended treatment guidelines.

The possibility of higher incidence of side effects, ADR's and drug abuse, the current study becomes more important and is planned to carry out in the department.

## MATERIAL AND METHOD

### Study Design

A prospective observational study was carried out for the duration of 9 months among the patients under inclusion criteria. All in-patients above the age of 12 years of both gender and were prescribed with at least one steroid (Glucocorticoids) and who were willing to participate were included in the study.

The departments selected for the study was all the wards of General Medicine and Pulmonology. The reason for selection of this department was because the steroidal drugs were

more commonly prescribed in this department.

### Study Procedure

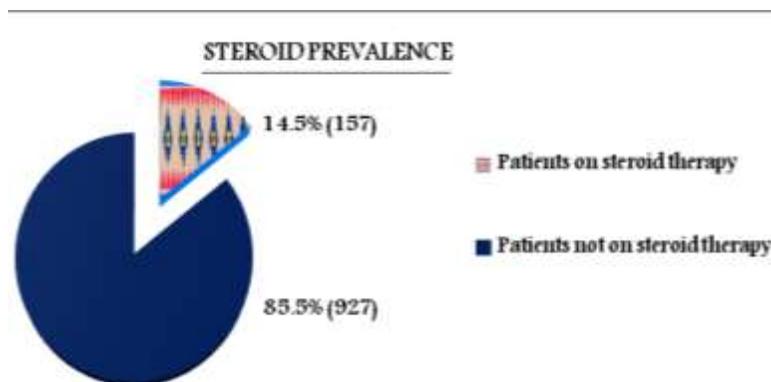
A separate data entry form for incorporating patient details were designed and the format contains provision to enter the details such as name, age, sex, height, weight, IP. No, date of admission, date of discharge, vital signs, reason for admission, past medical history, past medication history, and any predisposing factors. Provision was given in the format for entry of details like blood sugar levels, blood counts, liver function test, renal function test, pulmonary function test, electrolytes, urine examination, diagnosis, drug chart, ADR monitoring chart and drug interaction chart and dose and any interventions. Separate provision for entering the number of steroidal drugs prescribed to the patients.

A therapeutic guideline for appropriate use of steroids inside the hospital was planned to develop as a part of the current study. Various literatures and micromedex data were mainly used to formulate the guidelines. The prepared guideline was used to aware the appropriateness of steroids prescribed in the study population.

Data were collected during a regular ward round participation in the department of General medicine and Pulmonology. Patients who had satisfied the inclusion criteria were included. Patient or care givers were informed about the study and their written consent was obtained from them, using appropriate forms.

The obtained data will be thoroughly analyzed to obtain the following results are Prevalence of steroid prescription, to assess prescribing pattern of steroids, to assess appropriateness of the prescribed steroidal therapy with respect to the recommended treatment guidelines. Drug Interactions and ADRs occurred while using steroids.

## RESULTS AND DISCUSSION



**Figure 1 Prevalence of Steroids (n=1084)**

The data obtained by prospective observational study and were admitted in the study site during

the study period. The total of 1084 patients was analyzed and were included in the study as per inclusion and exclusion criteria, 157 (14.5%) patients were found to have been prescribed with steroid and it may be assessed that the percentage prevalence of steroid prescription were found to be 14.5% in the study site. The same was depicted in the Figure 1

In which 52.2% (82) were found to be males and 47.8% (75) were females. The age categorization showed 7% (89) of patients were belonging to age group of Middle Adult Hood and lowest number was 1.27% (2) and were belonging to the age group of Adolescent. Almost a similar result was observed in a study conducted by Ramanath KV et al. It was found that in both studies reveals that maximum uses of steroids were prescribed for patients above 50 years of age. Among the study 10.1% (16) were found to be smokers and 1.9% (3) were alcoholic and 11.5% (18) were found to have both habit of smoking and being alcoholic but 76.4% (120) were found to have none of these habits. The majority of the study populations were found not to have the risk factor of use of tobacco and alcohol which may exacerbate the disease condition and makes them to use steroidal drugs. The details were depicted in the Table 1

**Table 1 Social History (n=157)**

S. No	Category	% Study (n=157)
1.	Smokers	10.1 (16)
2.	Alcoholics	1.9 (3)
3.	Smoking+ Alcohol	11.5 (18)
4.	None	76.4 (120)

The number of the reason for admission were 583 for 137patients, in which patients with cough and expectoration, fever, breathlessness, cold, pain, vomiting etc were the major reasons for admission. The average number of reasons for getting admission of the study site was found to be  $3.71 \pm (2.4)$ . Almost 38.8% of reasons were related to respiratory tract infection for which steroid prescription was found to be common. A finding observed by Ramanath KV et al in his studies as steroids were more used in respiratory disease was matching with our results.

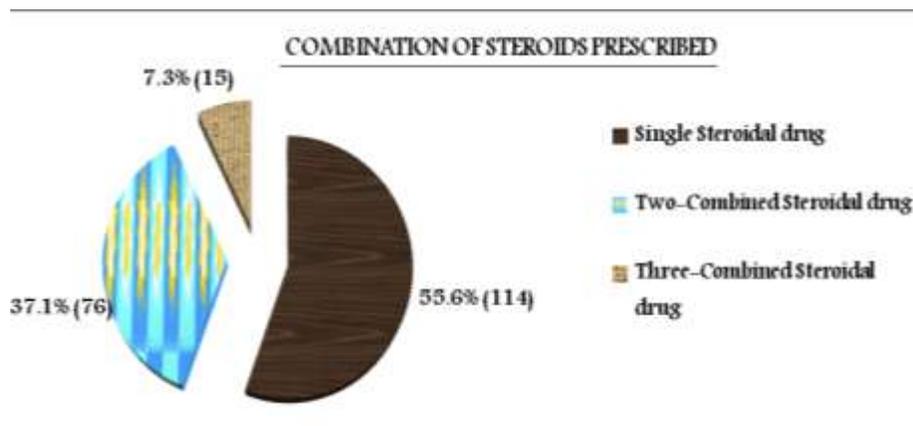
The past medical history results had shown that patients with SHT were found to be more followed by BA, COPD, and DM. 41.4% (65) of population had no past medical history. Only 49.68% (78) of patients were using past medication history. Out of which it was found to be 131 drugs, and in that 7.63% were found to be steroid therapy

The 29.93% of the patients had been diagnosed with LRTI either alone or in combination with other diseases. It was also found that 5.74% with Bronchial Asthma, 4.46% with COPD, 3.82% with Rheumatoid Arthritis, 3.82% with Pneumonitis was also observed. Almost 46.49% of diagnoses were related to respiratory disease. This shows that steroids were mostly used for

respiratory diseases. A similar finding was observed by Ramanath KV et al in his studies steroids are more used in respiratory disease.

For the study population, 1542 drugs were prescribed for 137 patients and the most commonly prescribed drug was Anti Asthmatics followed by Antibiotics, Anti Ulcer, Anti Emetics, Cough Suppressants, Vitamins, etc. The average number of drug prescribed for the study population was found to be  $9.82 \pm (3.74)$ . It was also found that 13.29% (205) steroids were also prescribed. A similar study by Ankit P et al reported that Glucocorticoid drugs were maximally utilized in disease related to the respiratory system.

To categorize the number of steroids prescribed in the study population. The results had revealed that 55.6% (114) had only one steroid in their prescription and remaining had more than one and a maximum of three steroids prescribed. The average number of steroid drug prescribed was found to be  $1.3 \pm (1)$  per prescription. The details were given in the following Table No.:14 and Figure 2



**Figure 2 Combination of Steroids Prescribed (n=205)**

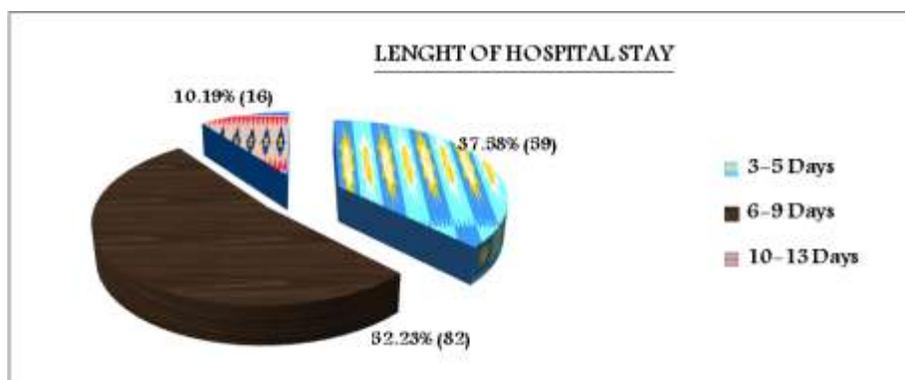
The analyze of results on the steroids prescribed revealed that only 8 steroids were used in the Study population, and most widely used was Budesonide followed by, Methyl Prednisolone, Dexamethasone, Hydrocortisone, Deflazacort, Prednisolone, Betamethasone valerate, and Triamcinolone acetonide. A similar result was found to published by Ramanath KV et as Budesonide was the most commonly used drug followed by Hydrocortisone and Dexamethasone The most common route of administration of this steroidal drug had revealed that steroids were most commonly administered through Nebulizer, Injection, Oral, Inhaler and Topical. The details of the results obtained were among various dosage forms, the steroid uses in the study population were majority by Nebulization and Injection. Almost 54.1% of Nebulization was commonly used it due to the nebulizers are commonly used for treatment of respiratory diseases and it is due to easy administration and they allow for the correct dose of medication to get

where it is needed most: deep into lungs. A similar result was found to be Ramanath KV et al in his studies as Nebulization was most commonly used for inpatients followed by injection, etc.

To categorize the discharge steroidal therapy for the study population revealed that only 33.12% (52) had been prescribed with steroid. 6 categories of steroidal drugs were used in the study population, mostly widely used for Deflazacort followed by Budesonide, Prednisolone, Fluticasone, Methyl Prednisolone and Mometasone.

The study revealed that 50.32% (79) prescription had one or more drug interaction. Further study on the prescriptions with interaction had revealed that more than 50% of prescriptions had more than one drug interaction. The minimum number of drug interactions was found to be one in 49.37% of prescription and maximum number were found to be 10 in 2.53% of patients. The average number of drug interaction was found to be  $2.5 \pm 8.23$ . Almost similar result was found to be Ramanath KV et al observed 55.8% IP prescription had some or the other drug interaction.

To categorize the duration of hospital stay were the minimum number of days of stay in the hospital for the study population was found to be 3days and maximum of 13days. The average of duration of hospital stay of the study population was found to be  $7.18 \pm 3.43$  days. A similar result was found to be published by Ramanath KV et al as the mean hospital stay of IP was  $6.11 \pm 4.86$  days. The same was depicted graphically in the Figure 3



**Figure 3 Length of Stay (n=157)**

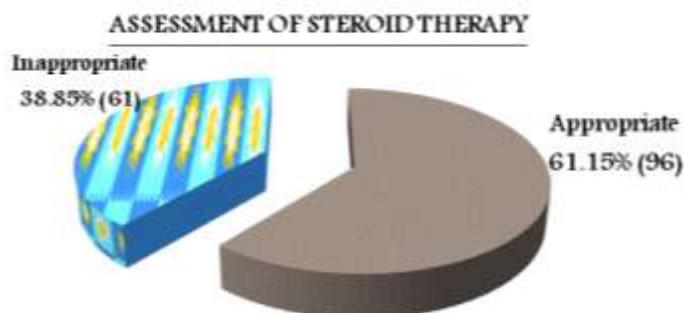
**Table .: 2 Adverse Drug Reaction (n=157)**

S. No	Drug	Adverse events	%Study (n=157)
1	Phenytoin	Rashes & swelling of both limbs	0.64 (1)
2	levofloxacin	Rashes	0.64(1)
3	Nevirapine	Ulcer over left chest and back	0.64 (1)
4	Nifedipine	Hypotension	0.64 (1)

The adverse drug reactions in the study population were also observed and were reported to the physician and it was found to have 4 adverse drug reactions in study population. Interestingly there was no adverse drug reaction with steroids was observed during the study period. The

details were given in the Table 2

To assess the appropriateness of prescribed steroids by using therapeutic guidelines, which had revealed that 61.15% (96) of study population's steroid therapy were found to be appropriate, while 38.85% (61) of steroids were inappropriate, which were totally not recommended for those specific disease condition, as per the recommended guidelines. The details for assessment of steroid therapy were depicted as Figure 4



**Figure 4 Assessment of Steroid Therapy**

**Table 3 Assessment of Individual Steroid Drugs**

S. No	Steroid Drug	(n=205)	Appropriate	Inappropriate
1	Neb. Budesonide	85	15.61 (32)	25.86 (53)
2	Inhaler. Budesonide	4	1.46 (3)	0.49 (1)
3	Inj. Dexamethasone	48	21.46 (44)	1.95 (4)
4	Inj. Methylprednisolone	24	11.22 (23)	0.49 (1)
5	Inj. Hydrocortisone	17	8.29 (17)	–
6	Tablet. Deflazacort	16	6.34 (13)	1.46 (3)
7	Tablet. Prednisolone	6	2.93 (6)	–
8	Tablet. Methylprednisolone	3	1.46 (3)	–
9	Ointment. Betamethasone	1	0.49 (1)	–
10	Ointment. Triamcinolone	1	0.49 (1)	–
Total		205	69.75 (143)	30.25 (62)

The data analysis of individual steroidal drug's appropriateness had revealed that 69.76% (143) were appropriate and 30.24% were inappropriate. The inappropriate prescribing of drugs were found to be 26.34% (53) with budesonide followed by 1.95% (4) with dexamethasone, 1.46(3) with deflazacort, and 0.49% (1) with methyl prednisolone. The details of individual steroid drugs according to disease conditions were depicted in Table 3

The disease conditions were inappropriate steroid prescriptions for budesonide (nebulization & inhaler) was found to be LRTI followed by fever, Pneumonitis, bronchitis, etc. According to the therapeutic guidelines and Woodhead M et al treatment guidelines, for management of LRTI, Pneumonitis and Bronchitis, budesonide was not recommended at all. Deflazacort was also

inappropriately prescribed in disease condition like obstructive lung disease and tuberculosis. According to the GOLD therapeutic guidelines and WHO treatment guidelines for treatment of obstructive lung disease and tuberculosis, deflazacort was not recommended. Dexamethasone was also inappropriately prescribed in disease conditions like rheumatoid arthritis and according to the therapeutic guidelines, dexamethasone was not recommended. Similarly Methylprednisolone was also inappropriately prescribed in disease conditions like fever which was not recommended as per the therapeutic guidelines.

The risk of side effects and toxicity precipitation was also increased along with the inappropriate prescription of the steroids. And also depends upon the dose and duration of the treatment the cost of the therapy also increased. The total costs of inappropriate prescribed steroids were found to be INR Rs. 30,709.22. The data provided is only the cost of the drug alone but the overall cost will include the cost of administration, cost of hospitalization, extended hospital stay, etc. The details of the cost of drug incurred for the inappropriate prescribed steroid drugs were depicted in Table 4

**Table 4 Inappropriate Prescribed Steroid drug and Cost**

S.NO	Drug	Total drug	Unit (rs.)	Cost (rs.)
1	Budesonide respules	917	25	22925
2	Inj. Dexamethasone	40	10.36	414.40
3	Tab.Deflazacort	42	46.46	1951.32
4	Inj.Methyl Prednisolone	10	589	5890
5	Budesonide Inhaler	1	203.5	203.5

## CONCLUSION

In the present study, according to the therapeutic guidelines steroid drugs were prescribed appropriately. Interestingly there were no adverse drug reactions observed with steroids. According to the therapeutic guidelines, there was some amount of inappropriateness with steroid prescription and the inappropriate drugs were not recommended in the study population and also it had increased the treatment cost for the patients. So this study may be concluded that use of therapeutic guidelines while prescribing corticosteroids will benefit the patients because of lesser side effects, and it also may reduce the cost of treatment and improve therapeutic outcome.

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