

Original Article

Steroid-induced Hyperglycaemia: A Myth or Fact; Our Experience at a Tertiary care Hospital in Pakistan

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Abstract

Background: Glucocorticoids are the mainstay of treatment in dermatology and other specialities of medicine, due to their strong immunosuppressive and anti-inflammatory action. However, their side effects limit their use often. Hyperglycaemia is one of the commonest and potentially damaging adverse effects associated. Not much research is done on steroid-induced hyperglycaemia in our part of the world.

Objective: To estimate the frequency of development of hyperglycaemia among patients on systemic corticosteroids for skin disorders.

Methods: We enrolled 120 patients of both genders and ages between 18 and 70 years in this descriptive case series, presenting to the Dermatology Department of Services Hospital, Lahore for 6 months. Patients on 30mg or more of prednisolone for the first time for the management of various dermatological disorders were enrolled. Blood sugar levels of the patients, both fasting and postprandial were measured in venous samples 1 week after initiation of therapy to assess the development of steroid hyperglycemia.

Results: Patients' mean age at presentation was 49.64±12.41 years. Sixty-four (53.33%) patients were male while fifty-six (46.67%) patients were females. Steroid induced-hyperglycemia was found in 25(20.83%) out of 120 patients.

Conclusion: Steroid induce hyperglycemia occurred in one-fifth (20.83%) of the patients.

Keywords: Steroid-induced hyperglycemia; myth; dermatological disorders

Introduction:

Steroids are a commonly used class of drugs with strong immunosuppressive and anti-inflammatory action. They can be prescribed for less than one month (short term) or more than a month (long-term). They have a key role in the management of multiple inflammatory, auto-immune and eczematous disorders.¹

Steroids being the most powerful and lifesaving drugs are not free from side effects. They may lead to weight gain, gastritis, hypertension, diabetes, menstrual irregularities, fluid retention, glaucoma, insomnia and infections. Hyperglycaemia is a common adverse effect. Steroids increase blood sugar levels by enhancing insulin resistance,

increasing glucose production by the liver and decreasing its utilization by the tissues. Its peak effect is seen about four to six hours after the morning dose. Therefore, postprandial blood sugar monitoring is preferred over fasting serum glucose levels.²

The risk of hyperglycaemia has been observed to increase with increasing the dose and duration of steroid treatment, age of the patient and BMI.³ Majority of international studies, have seen the effect of long term steroids on the development of hyperglycaemia, however, no data is available on patients receiving steroids for a short-term.²⁻³ According to a study conducted in India by Dave Priti

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et al in 2011, 62.5% of patients were seen to develop hyperglycaemia after taking steroids for three days.⁴ In 2018, a study conducted in Pakistan reported the frequency of steroid-induced hyperglycemia as 18.7%.⁵ Current study has been conducted to evaluate our population's tendency to develop hyperglycaemia after taking steroids. It may also increase awareness about steroid hyperglycaemia among doctors so that they may consider frequent blood sugar monitoring in patients taking steroids. Knowing the incidence of hyperglycaemia due to short-term steroid therapy can help to formulate some treatment guidelines as there is no data available for reference on our population's tendency to develop steroid-hyperglycaemia.

Methods:

After getting approval from Ethical Review Board, this descriptive case series was conducted at the Dermatology Department of Services Hospital, Lahore for six months from 15th October 2020 to 15th April 2021. After taking informed consent, 120 patients with skin diseases, requiring prednisolone (30 mg or more), of both genders and ages between 18 and 70 years were enrolled in the study. Diabetes or any other endocrinological disorder was excluded from history and labs. Patients taking medicines that cause hyperglycaemia were also excluded. Pregnant and lactating mothers were also excluded. Detailed demographic data were collected and recorded. After one week of treatment with steroids, the patients were called to measure their blood glucose levels (fasting as well as postprandial) to assess the presence of steroid induced-hyperglycaemia according to American Diabetes Association Criteria.⁶

Data were analyzed in SPSS version 22. Numerical variables like blood sugar level, age and dose of steroid were presented as mean \pm standard deviation. Qualitative variables like gender & steroid-induced hyperglycaemia were presented as frequency and percentage. Data was stratified for age, gender and dose of steroids to evaluate the effect modifiers. Post-stratification Chi-square test was applied to check the significance with a p-value < 0.05 as significant.

Results:

A total of 120 patients were included in the study. The mean age of the patients was 49.64 ± 12.41 years. 64 (53.33%) patients were male while 56 (46.67%) patients were females. The male to female

ratio of the patients was 1.14:1.108(90%) patients were married and 12(10%) patients were unmarried. The mean dose of steroids taken by the patients was 45.42 ± 8.97 mg with minimum and maximum doses of 30 & 60 mg respectively. The mean BMI of the patients was 23.36 ± 2.77 kg/m² with minimum and maximum BMI of 19 & 30 kg/m² respectively.

After 1st week the mean fasting blood sugar of the patients was 98.72 ± 11.42 mg/dl and the mean postprandial blood sugar was 148.11 ± 62.77 mg/dl. In our study, steroid-induced hyperglycaemia was found in 25(20.83%) patients.

In this study, among patients having age ≤ 50 years steroid-induced hyperglycaemia was found in 16(26.7%), while in patients having age > 50 years steroid-induced hyperglycaemia was found in 9(15%). The p-value of 0.116 made this difference statistically insignificant. (Table I)

In male patients, steroid-induced hyperglycaemia was found in 17(26.6%) patients while in female patients steroid-induced hyperglycaemia was found in 8(14.3%) patients. the p-value of 0.099 made this factor insignificant. (Table I)

In this study among patients having BMI ≤ 25 kg/m², steroid-induced hyperglycaemia was seen in 16(18.4%) patients, while in patients having BMI > 25 kg/m² the steroid-induced hyperglycaemia was found in 9(27.3%) patients. This difference was statistically insignificant. i.e. p-value=0.285. (Table II) In patients having a dose of steroid ≤ 40 mg, the steroid-hyperglycaemia was found in 10(15.6%) patients, while in patients having a dose of steroid > 40 mg the steroid-induced hyperglycaemia was found in 15(26.8%) patients. the p-value of 0.133 made this factor insignificant. (Table III)

Discussion:

Many studies have reported the effect of steroids given for a long time on the blood glucose level. However, there is a dearth of studies on the effect of steroids on blood glucose when given for a short term. In this study, the frequency of steroid hyperglycaemia was evaluated after one week of 30mg or more of steroid therapy in patients with skin disorders. 20.83% of the patients developed hyperglycaemia.

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TABLES

Table I: Stratification concerning age and gender of patients

		Steroid Induced Hyperglycaemia		Total	P-Value
		Yes	No		
Age (years)	≤50	16	44	60	0.116
		26.7%	73.3%	100.0%	
	>50	9	51	60	
		15.0%	85.0%	100.0%	
Total		25	95	120	
		20.8%	79.2%	100.0%	

		Steroid Induced Hyperglycaemia		Total	P-Value
		Yes	No		
Gender	Male	17	47	64	0.099
		26.6%	73.4%	100.0%	
	Female	8	48	56	
		14.3%	85.7%	100.0%	
Total		25	95	120	
		20.8%	79.2%	100.0%	

Table II: Stratification concerning BMI (kg/m2)

		Steroid Induced Hyperglycaemia		Total	p-value
		Yes	No		
Steroid Dose (mg)	≤40	10	54	64	0.133
		15.6%	84.4%	100.0%	
	>40	15	41	56	
		26.8%	73.2%	100.0%	
Total		25	95	120	
		20.8%	79.2%	100.0%	

In this study, the frequency of steroid hyperglycaemia was evaluated after one week of 30mg or more of steroid therapy in patients with skin disorders. 20.83% of the patients developed hyperglycaemia.

Table III: Stratification concerning dose of steroids

		Steroid Induced Hyperglycaemia		Total	p-value
		Yes	No		
Steroid Dose (mg)	≤40	10	54	64	0.133
		15.6%	84.4%	100.0%	
	>40	15	41	56	
		26.8%	73.2%	100.0%	
Total		25	95	120	
		20.8%	79.2%	100.0%	

Patients with rheumatoid arthritis were evaluated by an English study, and almost 9% developed hyperglycaemia within 2 years of starting steroids.⁷ We found hyperglycaemia in 20.8% of patients, however, their patients were followed for a longer duration and their mean was also higher (62 years) than ours (41.83 years).

A study in Korea conducted on patients with respiratory disorders reported the frequency of steroid-hyperglycaemia as 14.7%, comparable to our findings.⁸ In a Japanese study, 42% of non-diabetic patients diagnosed with primary renal disease developed postprandial hyperglycaemia (with normal fasting sugar levels) after treatment with prednisolone 0.75 mg/kg/day.⁹ This was much higher frequency than our results maybe because of the effect of glycosuria in these patients or due to ethnic and cultural differences.

An Indian study by Dave Priti et al concluded that 62.5% of patients were noted to develop hyperglycaemia after three days of taking steroids.⁴ This is much higher than our results. This can be due to earlier follow-up of patients before physiological correction of drug-induced hyperglycaemia takes place. A significant effect of age on the development of steroid hyperglycaemia was reported by a Norwegian study, which studied renal transplant recipients and a local study.^{10,5} This was contrary to our observations as we didn't find any statistically significant effect of age. We found no significant association between the dose of steroids or gender on the frequency of hyperglycaemia. No effect of gender was also seen in a Swiss study and the Norwegian study.¹⁰⁻¹¹ A Mexican study on patients with rheumatic disease concluded that an increased dose of steroids was associated with an increased risk of developing steroid hyperglycaemia.¹² The small study sample and

different ethnicity of the populations might explain the controversial results.

Conclusion:

It is concluded that one-fifth of the total patients with dermatological disorders on systemic steroid therapy developed steroid-induced hyperglycaemia. Steroids can lead to the development of hyperglycaemia in a significant proportion (20.83%) of the population even after short-term use. Therefore, it may be suggested that blood glucose levels should be measured meticulously in a patient taking steroids to reduce the potentially harmful effects of raised blood glucose levels, because hyperglycaemia, even if of short duration may be associated with significant morbidity.

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Conflict of interest:

All authors declare no conflict of interest.
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