The Research of Medical Science Review

Received: 16 November, 2024
Accepted: 16 December, 2024
Published: 23 December, 2024

ISSN: 3007-1208 | 3007-1216
Volume 2, Issue 3, 2024

FREQUENCY OF HYPERGLYCEMIA IN PATIENTS ON INTRAVENOUS STEROID THERAPY FOR RESPIRATORY ILLNESSES

Dr. Amina Mannan Malik[*1], Prof. Dr. Tahir Iqbal[2], Dr. Tahreem Mahmood[3]

*[*1,3](MBBS, PG Trainee Medicine), Shifa International Hospital Islamabad.*
[2](FCPS Medicine), Consultant Medicine, Shifa International Hospital Islamabad

[*1]raza.data01@gmail.com

ABSTRACT

Objective: *To determine the frequency of steroid-induced hyperglycemia in patients admitted with respiratory illness.*

Methods: *This cross-sectional study study was conducted in the medicine unit of Shifa International Islamabad from April 2024 to October 2024. All patients admitted to the department of medicine due to some pulmonary illness, such as acute exacerbation of COPD or asthma, who were hospitalized for at least 3 days were included. Frequency of hyperglycemia was determined.*

Results: *In this study, a total of 175 patients were recruited. The mean age of the participants was 52.7 years, with a standard deviation of 8.4 years. When considering the presence of comorbidities, diabetes was found in 65 (37.1%) individuals, and hypertension in 83 (47.4%) patients. Out of 175, hyperglycemia was diagnosed in 73 (41.71%) patients.*

Conclusion: *Hyperglycemia is a common complication in patients receiving corticosteroids admitted with respiratory illness. So blood glucose levels should be routinely monitored in patients receiving steroids, and appropriate management should be done in these patients to maintain blood sugar levels in normal limits.*

Keywords: *Respiratory illness, Intravenous steroids, hyperglycemia*

INTRODUCTION

Systemic glucocorticoids (GCs) have become integral to the management of numerous inflammatory and autoimmune disorders. Their applications continue to evolve, particularly in light of recent medical challenges such as the severe cases of coronavirus disease 2019 (COVID-19).[1, 2] GCs, known for their potent anti-inflammatory and immunosuppressive properties, offer significant therapeutic benefits in treating these complex conditions. However, their use is not without complications. One of the most notable adverse effects of glucocorticoid therapy is the development of hyperglycemia, which has been observed frequently among patients undergoing hospitalization. This rise in blood sugar levels can lead to a plethora of health complications, further complicating the clinical picture. Hyperglycemia can slow the healing process, hinder recovery from primary illnesses, and extend the duration of hospital stays, which may have far-reaching implications for both patient outcomes and healthcare resources.[3, 4]

Elevated blood sugar levels due to high doses of glucocorticoids (GC) are recognized in both diabetic and non-diabetic patients. This condition tends to develop rapidly, often within the first 24 to 48 hours after starting treatment, affecting a significant number of individuals undergoing this therapy.[5, 6] Several risk factors can increase the likelihood of experiencing GC-related hyperglycemia. These factors include having pre-existing diabetes, impaired glucose tolerance, a familial history of diabetes, abdominal obesity, a high

body mass index (BMI), elevated doses of glucocorticoids, prolonged treatment duration, and advanced age.[7] Despite the extensive applications of glucocorticoids and the well-documented adverse effects they can cause, effective strategies for managing hyperglycemia induced by these medications have yet to be fully defined. Additionally, management approaches may differ based on the specific clinical reason for treatment and the prescribed dosing regimen.[8]

There is a surge in indications for GC use in hospitalized patients. Moreover, hyperglycemia in hospitalized patients have been reported to increase length of stay and overall morbidity and mortality in hospitalized patients. Therefore, the aim of the proposed study was to determine the frequency of steroid-induced hyperglycemia in patients admitted with respiratory illness.

METHODS:

This cross-sectional Study study was conducted in the medicine unit of Shifa International Islamabad from April 2024 to October-2024. All patients admitted in the department of medicine due to some pulmonary illness such as acute exacerbation of COPD, asthma, who were hospitalization for at least 3 days were included. Patients who had received administration of at least 10 mg prednisolone or its equivalent per day for atleast 3 days were included. While diabetic patients or those having history of chronic use of steroids were excluded.

Data regarding patients age, gender, smoking history and co-morbidities such as diabetes and hypertension

After inclusion, venous blood samples were obtained from each patient and were sent to the hematology laboratory of the hospital for determination of fasting or random blood sugar levels.

was defined

The definitive diagnosis of GC-induced hyperglycemia was established when a patient presents had fasting plasma glucose level exceeding 126 mg/dL (7.0 mmol/L) or a random plasma glucose measurement greater than 200 mg/dL (11.1 mmol/L).

Data analysis was performed using SPSS v25 software. Frequency and percentage was used to present qualitative variables such as gender, smoking history, hypertension and GC inducted hyperglycemia.

RESULTS:

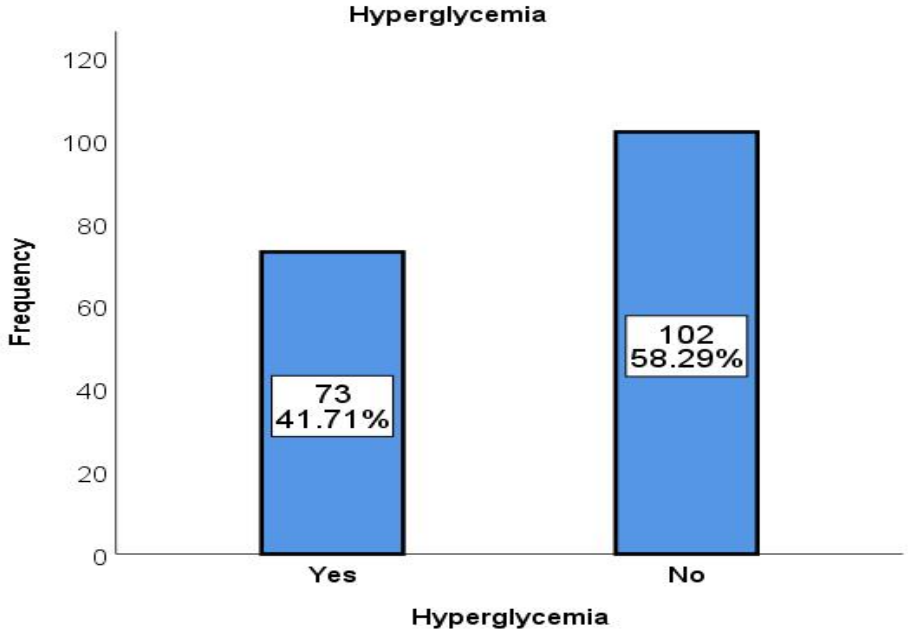
In this study, a total of 175 patients were recruited for participation. The mean age of the participants was 52.7 years, with a standard deviation of 8.4 years. When considering the presence of comorbidities among the patients, it was found that 65 individuals, which represents 37.1% of the total participants, had a diagnosis of diabetes. Additionally, a significant portion of the group, 83 patients or 47.4%, were diagnosed with hypertension (Table 1).

Out of 175, hyperglycemia was diagnosed in 73 (41.71%) patients. This finding highlights a significant prevalence of hyperglycemic conditions within the studied population (Figure 1).

Table 1. Baseline Characteristics

Age	52.7±8.4
Gender (Male/Female)	138 (78.8%) / 37 (21.1%)
Diabetes	65 (37.1%)
Hypertension	83 (47.4%)

Figure 1. Frequency of Hyperglycemia.



DISCUSSION:

Corticosteroids play a significant role in influencing multiple physiological functions and have notable impacts on metabolic, respiratory, vascular, and other bodily systems.[9] In the scenario of an acute exacerbation of chronic obstructive pulmonary disease (AECOPD), these medications offer several advantages, including the enhancement of spirometry results, better gas exchange, and improvements in clinical outcomes such as lowering the chances of treatment failure and reducing the duration of hospital stays.[10, 11] The beneficial effects can be attributed to mechanisms that include the reduction of systemic inflammation and the preservation of beta-2 receptor responsiveness.[12] A systematic review conducted by Cochrane in 2014 found that administering corticosteroids to individuals experiencing an AECOPD significantly decreased the likelihood of treatment failure within a 30-day period by nearly 50%, demonstrating an odds ratio of 0.48 (95% confidence interval: 0.35-0.67) compared to placebo.[13]

In present study, we determined the frequency of hyperglycemia in patients admitted with respiratory illness who had received steroids. Out of 175, hyperglycemia was diagnosed in 73 (41.71%) patients.

Delfs et al. conducted a comprehensive retrospective study involving 2,424 hospitalized patients treated with glucocorticoids (GC) for various pulmonary disorders. The findings revealed that hyperglycemia was observed in 33.5% of these patients, indicating a significant incidence of elevated blood sugar levels related to glucocorticoid therapy.[14]

In contrast, a separate study by Scholl et al. focused specifically on patients suffering from chronic obstructive pulmonary disease (COPD). This research reported a notably higher incidence of steroid-induced hyperglycemia, affecting 48% of the 138 patients who were receiving systemic glucocorticoids for their condition.[15]

Previous research has pointed to a potential link between corticosteroid use and increased blood sugar levels, suggesting that this effect may vary depending on the dosage administered. However, this relationship has not consistently been confirmed, especially when considering the standard dosages commonly used in the treatment of acute exacerbations of chronic obstructive pulmonary disease (AECOPD).[11, 16] In a retrospective study conducted in 2016, researchers specifically investigated the dose-dependent impact of corticosteroids on the risk of hyperglycemia among hospitalized patients diagnosed with AECOPD. Participants in this study were classified into three tertiles based on the corticosteroid doses they received on the second day of

their hospitalization: low, moderate, and high doses. The findings indicated a numerical trend suggesting an increased risk of steroid-induced hyperglycemia as the dose increased from the low to moderate and then to high tertiles. However, it is crucial to note that while this trend was observed, the differences between the groups did not reach statistical significance, indicating that further research may be necessary to establish a clear relationship. Building on this, a separate retrospective study published in 2018 further explored the role of corticosteroid dosage in hyperglycemia among inpatients with AECOPD.[17] In this investigation, patients were divided into two categories: those receiving standard doses of corticosteroids (defined as 200 milligrams of prednisone or less) and those on high doses (exceeding 200 milligrams). Interestingly, this study also observed no significant differences in the rates of new blood glucose elevations between the standard and high-dose groups.[18]

In this study, we only determined the frequency of hyperglycemia, and we did not notice the doses of steroids administered to different patients, so we were not able to determine the association of the dose of steroids with the frequency of hyperglycemia.

CONCLUSION:

Hyperglycemia is a common complication in patients receiving corticosteroids admitted with respiratory illness. So blood glucose levels should be routinely monitored in patients receiving steroids, and appropriate management should be done in these patients to maintain blood sugar levels in normal limits

REFERENCES

Alexaki VI, Henneicke H. The Role of Glucocorticoids in the Management of COVID-19. Hormone and metabolic research = Hormon- und Stoffwechselforschung = Hormones et metabolisme. 2021;53(1):9-15.

Chan ED, Chan MM, Chan MM, Marik PE. Use of glucocorticoids in the critical care setting: Science and clinical evidence. Pharmacology & therapeutics. 2020;206:107428.

Bruginski D, Précoma DB, Sabbag A, Olandowski M. Impact of Glycemic Variability and Hypoglycemia on the Mortality and Length of Hospital Stay among Elderly Patients in Brazil. Current diabetes reviews. 2020;16(2):171-80.

Akirov A, Diker-Cohen T, Masri-Iraqi H, Shimon I. High Glucose Variability Increases Mortality Risk in Hospitalized Patients. The Journal of clinical endocrinology and metabolism. 2017;102(7):2230-41.

Li C, Krause P, Stern G. Risk factors for corticosteroid-induced hyperglycemia requiring insulin therapy in hospitalized patients without diabetes. Endocrine. 2021;73(2):476-9.

Cho JH, Suh S. Glucocorticoid-Induced Hyperglycemia: A Neglected Problem. Endocrinology and metabolism (Seoul, Korea). 2024;39(2):222-38.

Elena C, Chiara M, Angelica B, Chiara MA, Laura N, Chiara C, et al. Hyperglycemia and Diabetes Induced by Glucocorticoids in Nondiabetic and Diabetic Patients: Revision of Literature and Personal Considerations. Current pharmaceutical biotechnology. 2018;19(15):1210-20.

Amratia DA, Viola H, Ioachimescu OC. Glucocorticoid therapy in respiratory illness: bench to bedside. Journal of investigative medicine : the official publication of the American Federation for Clinical Research. 2022;70(8):1662-80.

Taylor DR, Hancox RJ. Interactions between corticosteroids and beta agonists. Thorax. 2000;55(7):595-602.

Woods JA, Wheeler JS, Finch CK, Pinner NA. Corticosteroids in the treatment of acute exacerbations of chronic obstructive pulmonary disease. International journal of chronic obstructive pulmonary disease. 2014;9:421-30.

Johannesmeyer HJ, Moussavi K, Rambaran KA, Kolyouthapong K. Corticosteroid administration and glycemic outcomes during treatment of acute exacerbation of chronic obstructive pulmonary disease. American journal of medicine open. 2022;8:100027.

Zhai Y, Zhang H, Sun T, Ye M, Liu H, Zheng R. Comparative Efficacies of Inhaled Corticosteroids and Systemic Corticosteroids in Treatment of Chronic Obstructive Pulmonary Disease Exacerbations: A Systematic Review and Meta-Analysis. Journal of aerosol medicine and pulmonary drug delivery. 2017;30(5):289-98.

Walters JA, Tan DJ, White CJ, Gibson PG, Wood-Baker R, Walters EH. Systemic corticosteroids for acute exacerbations of chronic obstructive pulmonary disease. The Cochrane database of systematic reviews. 2014;2014(9):Cd001288.

Delfs N, Struja T, Gafner S, Muri T, Baechli C, Schuetz P, et al. Outcomes of Hospitalized Patients with Glucocorticoid-Induced Hyperglycemia-A Retrospective Analysis. Journal of clinical medicine. 2020;9(12).

Scholl T, Kiser TH, Vondracek SF. Evaluation of Systemic Corticosteroids in Patients With an Acute Exacerbation of COPD and a Diagnosis of Pneumonia. Chronic obstructive pulmonary diseases (Miami, Fla). 2018;5(1):57-65.

Petite SE, Murphy JA. Impact of the implementation of a pharmacist-driven chronic obstructive pulmonary disease exacerbation orderset in an inpatient setting. American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists. 2020;77(14):1128-34.

Baker JM, Pace HA, Ladesich JB, Simon SD. Evaluation of the Impact of Corticosteroid Dose on the Incidence of Hyperglycemia in Hospitalized Patients with an Acute Exacerbation of Chronic Obstructive Pulmonary Disease. Hospital pharmacy. 2016;51(4):296-304.

Petite SE, Murphy JA. Systemic Corticosteroid and Antibiotic Use in Hospitalized Patients With Chronic Obstructive Pulmonary Disease Exacerbation. The Annals of pharmacotherapy. 2019;53(2):144-50