



Original Research Article

Effect of blood glucose & glycated hemoglobin levels on the outcome of patients with acute exacerbation of chronic obstructive pulmonary disease

JV Praveen¹, Praveena S^{1*}, K Preethi¹, B Padmaja¹¹Dept. of Pulmonary Medicine, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India

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ABSTRACT

Introduction: The connection to hyperglycaemia & intense intensifications of persistent obstructive pneumonic infection (COPD) are presently starting to arise. Expanded blood glucose is related with unfriendly clinical results among patients with significant ailments. Hyperglycemia might be related with expanded mortality, length of stay (LOS), & re-confirmations in COPD patients.

Materials and Methods: This study was finished in 80 hospitalized patients with intense compounding of persistent obstructive aspiratory sickness in the Department of pneumonic medication between June 2021 to January 2022. The segment, clinical data, lab results, radiographic outcomes, & data on Length of stay (LOS), mortality & re-confirmation were gathered. Point of the review is to concentrate on the impact of blood glucose, HbA1c levels on the mean length of medical clinic stay in patients of AECOPD.

Results: Out of 80 COPD individuals, 61(76%) were male & 19(24%) were female. Majority belonged to 56-65 years (38.8%), followed by 66-75 years (28.8%). Of the total 80 COPD individuals, 100% of male patients (n=61) were smokers, 15% of females (n=3) were smokers. Duration of the hospital stay was more with higher RBS values of ≥ 200 mg/dl (9.2 ± 3.5 days) when compared to RBS value of 171-200 mg/dl (7.6 ± 2.3 days) which was more than the RBS group with values of 141-170 (7.2 ± 1.9 days). Whereas for normal RBS values of ≤ 140 mg/dl mean duration of hospital stay was (5.12 ± 0.82 days).

Conclusion: The conclusion arrived from our study, Higher the RBS at the time of admission, longer the mean duration of stay in the hospital. At admission, RBS more than 170 mg/dl is detrimental in AECOPD patients. High HbA1C levels (>6%) were associated with a high risk of exacerbations.

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1. Introduction

Persistent Obstructive Pulmonary Disease (COPD) is as of now the fourth driving reason for death on the planet, yet is projected to be the third driving reason for death by 2020.¹ Elevated blood glucose is a typical pathophysiological reaction to intense sickness because of expansion in hepatic glucose creation & fringe insulin opposition, driven by expansions in glucocorticoids, catecholamines & proinflammatory cytokines.² DM can deteriorate the movement & visualization of COPD due to the immediate

impacts of hyperglycemia on lung, expanded irritation, expanded helplessness to bacterial infection.³ Patients with DM & AECOPD habitually (half 80%) present with hyperglycemia & require longer length of clinic stay & higher death rates when contrasted with patients without DM.⁴ Higher HbA1c levels were related with an expanded gamble of intensifications in COPD patients with type 2 DM.⁵

2. Aim

To study the effect of blood glucose, HbA1c levels on the mean length of hospital stay in patients of AECOPD.

* Corresponding author.

E-mail address: drveenaslif@gmail.com (Praveena S).

3. Materials and Methods

This prospective study was conducted in the Department of Pulmonary Medicine, Government hospital for chest & communicable disease. This study included 80 patients of acute exacerbation of COPD admitted during the period of June 2021 to January 2022. The demographic, clinical information, laboratory results, radiographic results, & information on Length of stay (LOS), mortality & re-admission were collected.

3.1. Inclusion criteria

All cases of COPD with acute exacerbation admitted in the hospital.

3.2. Exclusion criteria

COPD patients admitted with other comorbidities like pre-existing Renal, Hepatic, other Endocrinal, Cardiac illness, Interstitial Lung Disease, Pulmonary tuberculosis & Bronchiectasis.

AECOPD patients were enrolled & their informed consent was taken. A detailed clinical history including duration of COPD, hospital admissions & physical examination. Random blood sugar level was estimated by GOD-POD method (glucose oxidase - peroxidase) method at the time of admission. HbA1c level was measured by HPLC method. Other baseline investigations such as CBP, RFT, chest X-ray, ECG, 2D Echo, sputum examination & ABG were done to rule out co-morbid conditions. The subjects were divided into four groups, Random blood glucose ≤ 140 mg/dl (excluding hypoglycemia assumed as <60 mg/dl), Random blood glucose 141-170mg/dl, Random blood glucose 171-200 mg/dl, & Random blood glucose ≥ 200 mg/dl. Based on HbA1c, two groups were divided which includes ≤ 6 & >6 . Patients were discharged when they are clinically stable & the mean length of hospital stay was calculated corresponding to each group. For the statistical analysis Microsoft Windows based statistical package for social services 21.0 have been used. The study results were interpreted with the p-value. A p-value of <0.05 was considered statistically significant.

4. Results

Out of 80 COPD individuals, 61(76%) were male & 19(24%) were female. Majority belonged to 56-65 years (38.8%), followed by 66-75 years (28.8%).

Out of total 80 COPD individuals, 100% of male patients (n=61) were smokers, 15% of females (n=3) were smokers.

The patients were grouped into 4 groups based upon the blood glucose levels. Group 1 ≤ 140 , Group 2 = 141 -170, Group 3 = 171 -200, Group 4 ≥ 200 . Length of hospital stay was recorded in these 4 groups of patients. COPD severity & risk of adverse outcome was also noted in these 4 groups.

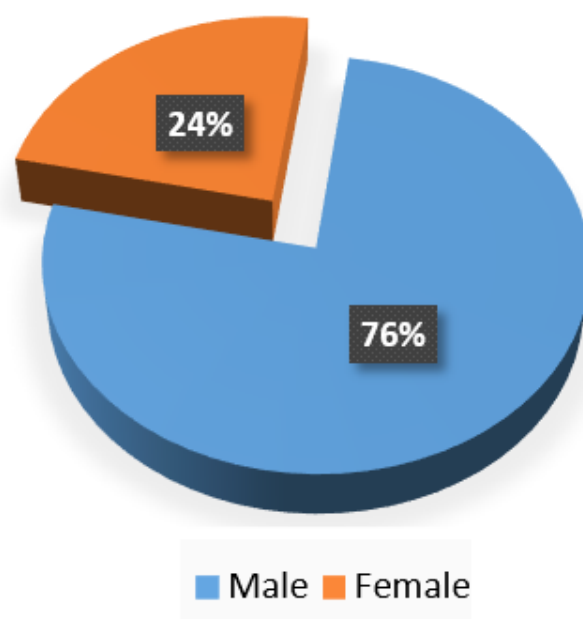


Figure 1: Gender wise distribution

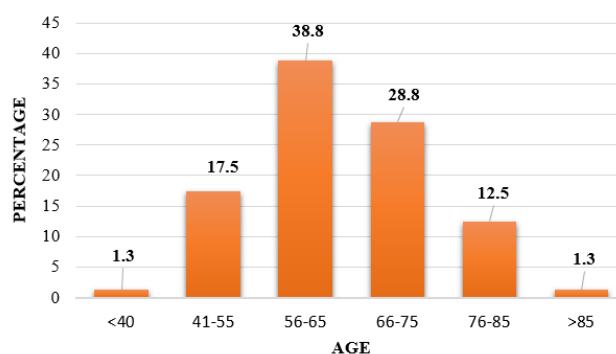


Figure 2: Age wise distribution.

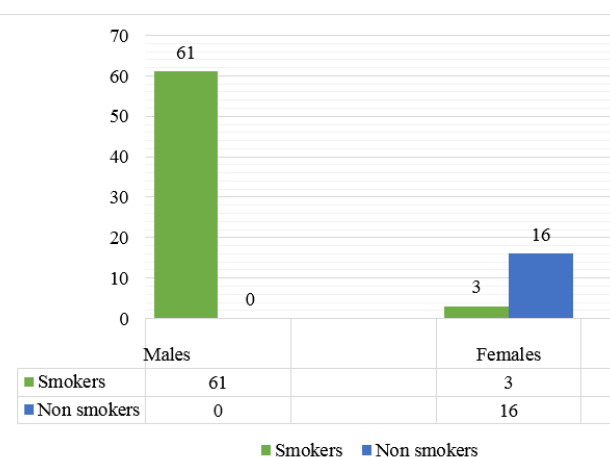


Figure 3: Smoking among study population.

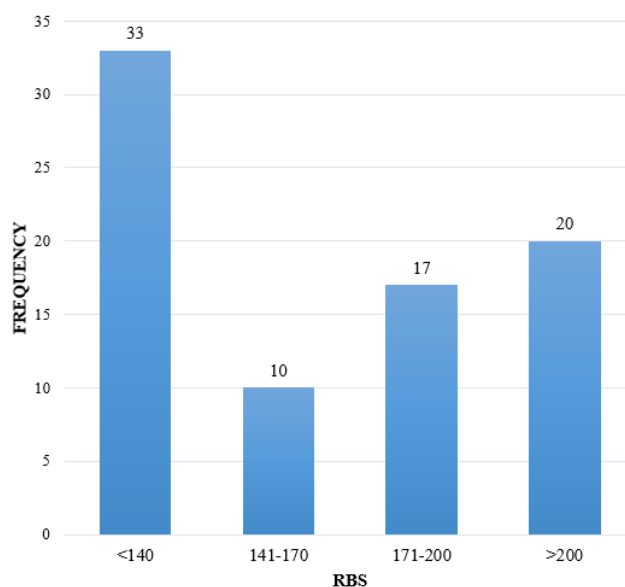


Figure 4: Group wise distribution of study population

Intergroup comparison of duration of hospital stays among patients with different levels of blood sugars:

Table 1: Comparison of duration of hospital stays among patients with different levels of blood sugars:

RBS(mg/dl)	Mean duration of hospital stay	SD	F value	p value
≤140	5.12	0.82	14.84	<0.0001
141-170	7.2	1.9		
171-200	7.6	2.3		
≥200	9.2	3.5		

Duration of the hospital stay was more with higher RBS values of ≥200mg/dl (9.2 ± 3.5 days) when compared to RBS value of 171-200 mg/dl (7.6 ± 2.3 days) which was more than the RBS group with values of 141-170 (7.2 ± 1.9 days). Whereas for normal RBS values of ≤140 mg/dl mean duration of hospital stay was 5.12 ± 0.82 days.

Table 2: P-value in patients with various blood sugar values.

RBS (mg/dl)	p value
≤140	141-170 0.033
	171-200 0.002
	≥200 0.001
141-170	171-200 0.94
	≥200 0.21
171-200	≥200 0.38

Patients were also grouped based upon the values of HbA1c into patients with ≤6 & >6 HbA1c levels. The mean duration of the stay, standard deviation & p value were calculated in these two groups of patients. In patients with HbA1c ≤6 mean duration of stay is (8.94 ± 2.95 days)

& in patients with HbA1c >6 mean duration of stay is (5.45 ± 1.25 days).

Table 3: Association of HbA1c with duration of hospital stay:

HbA1c	No. (n)	Mean duration of stay	SD	t value	p value
≤6	46	5.45	1.25	-	0.0001
>6	34	8.94	2.95	7.179	

The need for NIV or oxygenation were also recorded. More number of patients with HbA1c values of >6 needed NIV or invasive mechanical ventilation. More number of patients with HbA1c levels of ≤6 needed only oxygen therapy. Out of 17 patients requiring NIV, 15 (88%) patients were having higher HbA1c >6 & only 2 patients (12%) were having lower HbA1c ≤6. Out of 63 patients who were on oxygen therapy majority 44(69%) were having HbA1c ≤6 & 19(31%) were having HbA1c >6.

Table 4: Association of HbA1c with mode of treatment

Mode of treatment	HbA1c	Number of patients	%
NIV/ Invasive ventilation (n= 17)	≤ 6	2	12
	>6	15	88
Only O2 therapy (n= 63)	≤ 6	44	69
	>6	19	31

5. Discussion

Exacerbations are the most common cause of hospitalization among COPD patients.⁶ DM is a risk factor for AECOPD.⁷ Hyperglycemia appears to cause cellular stress, damage capillaries resulting in impaired immunity leading to adverse outcomes.⁸ Comparing the mean length of hospital stay there is statistical significant relation between RBS ≤140mg/dl with 171-200mg/dl & ≥200mg/dl with p-value 0.002 & 0.001 respectively. Mean duration of hospital stay of patients having HbA1c >6 (8.94) was found to be higher than that of HbA1c ≤6 (5.45), which is statistically significant (p <0.001). Invasive/ non-invasive ventilation was required in 17 patients of which 15(88%) had HbA1c value of >6%. Of 80 patients enrolled, one death was recorded who belonged to GOLD stage D as indicated by the past history & medical records, whose RBS at the time of admission was >200, HbA1c >6. In the study done by Pramila et al.; 2016, the hyperglycemia was assumed as random blood glucose levels >140 mg/dl. Out of 100 patients 35% (n=35) were normoglycemic & 65% (n=65) were hyperglycemic. This study inferred that RBS more than 140 mg/dl is detrimental in AECOPD patients.⁹ Baker EH et al.; 2006 in which they have divided the patients in to quartiles i.e., 108mg/dl, <126mg/dl, 126-162mg/dl & >162mg/dl, found that RBS>7 mmol/l(126 mg/dl) is detrimental in AECOPD patients.¹⁰ Burt et

al.; 2014, reported that the length of hospital stay is increased by 10% (21hours) for each 18 mg/dl increase in mean glucose ($P=0.01$). Higher mean daily glucose levels were positively associated with longer hospital stays; this relationship with length of stay was not significant for other markers of disease severity.¹¹ Patients with DM & AECOPD more commonly presented with hyperglycemia during their hospital stay due to which their hospital stay as was also prolonged.¹² Hyperglycemia has an adverse effect on the lungs by causing glycosylation of the connective tissue & decline on the elastic recoil & respiratory muscle weakness.¹³ A history of DM imparts long term mortality associated with AECOPD.¹⁴ Higher levels of blood glucose in blood is associated with liver abscesses, community acquired pneumonia, & acute myocardial infarction.¹⁴ By incorporating glycemic gap into the presently existing pneumonia severity scores could increase the discriminative performance for predicting the adverse outcomes.¹⁵ Previous studies have shown that there is a strong association between susceptibility to bacterial infection & life threatening complications in COPD with DM with hyperglycemia.¹⁶ Systemic corticosteroid therapy is frequently applied to the patients with COPDAE.¹⁷ Whether this corticosteroid therapy is associated with hyperglycemia in patients with DM with COPD is still controversial.¹⁸ Other studies argued that corticosteroid do not have any effect on the HbA1c levels in patients with DM & AECOPD.¹⁹ Patients with high risk COPD group had a higher rate of developing ARF.²⁰ Another finding in corticosteroid users is higher risk of cardiovascular disease. The adverse effects of corticosteroids on cardiovascular risk factors might be due to its effect on the blood pressure, blood glucose levels, & lipid profile control.²¹

6. Conclusion

The conclusion arrived from our study, Higher the RBS at the time of admission, longer the mean duration of stay in the hospital. At admission, RBS more than 170 mg/dl is detrimental in AECOPD patients. High HbA1C levels ($>6\%$) were associated with a high risk of exacerbations. The results gathered from our study suggest that strict control of blood sugar in the pre-hospitalization period as well as during hospital stay results in better outcomes such as shortened duration of hospital stay; decreased morbidity & mortality.

7. Limitations

This study was performed in a single hospital, limits generalizability to other population. Even though we were able to standardize the timing of blood glucose measurement (i.e., at the time of admission), this does not completely exclude the confounding effects of corticosteroids.

8. Conflict of Interest

The authors do not have any conflicts of interest.

9. Source of Funding

None.

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Author biography

JV Praveen, Assistant Professor  <https://orcid.org/0000-0003-2453-0594>

Praveena S, Associate Professor  <https://orcid.org/0000-0002-3931-1805>

K Preethi, Associate Professor  <https://orcid.org/0000-0002-0636-9234>

B Padmaja, Assistant Professor  <https://orcid.org/0000-0002-5816-3211>

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