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Glycaemic Status of Patients with Chronic Obstructive Pulmonary Disease on Inhaled Corticosteroid.

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Abstract

Background: *Although the hyperglycemic effects of systemic glucocorticoid therapy are well known, the effect of inhaled corticosteroids (ICS) on carbohydrate metabolism is still a subject of debate. The systemic bioavailability of ICS is claimed to be minimal and the side effects are negligible. However, some large retrospective cohort studies showed a definite association between ICS use and incidental diabetes or worsening glycemic control in pre-existing diabetes. There are no professional-body recommended guidelines on the diagnosis and management of steroid-induced diabetes for the general population.*

Objectives: *The aim of the study was to assess to the effect of inhaled corticosteroids on glycaemic status in patients with COPD.*

Methods: *After approval of the protocol by IRB and ethical committee, a cross-sectional analytical study was done in the Department of Internal Medicine at Ziaur Rahman Medical College, Bogura, Bangladesh. A total of 160 COPD patients were recruited consecutively upon fulfilling the inclusion criteria. Socio-demographic data and disease-related data were collected by face-to-face interview using a semi-structured case record form. The COPD patients were categorized according to the global initiative for obstructive lung diseases (GOLD) criteria. The collected data was then edited, analyzed, and presented as graphs, tables & charts.*

Results: *Different study showed that patients with COPD have a high co-morbidity of non-insulin dependent diabetes mellitus. There was no statistical difference in the mean age of both group which was 53.85 ± 7.9 and 56 ±7.6 in control and case respectively. Socio-demographic characteristics of the study showed that among the cases 85% were males and 15% were females while in control group it was 87.5% and 12.5% respectively. Among the cases 50% are from rural areas and 50% from urban areas where as in control group the rate is 65% and 35% respectively.77.5% of the case and 72.5% of control population are indulging in smoking while only 15% from each group are non-smoker. In respect of occupation it is found that there is a large number of cases are service holder and businessman (35% and 20%), which is true for control group also (20% and 47.5%). Most of the cases are from higher socioeconomic background (45%), whereas in control group it is 37.5%. In 20% cases symptoms duration was less than 5 years, where as in control group it was 42.5%. Researcher has found that 32% of cases and 7.5% of control group were diagnosed as diabetic when fasting plasma glucose taken into account, while in case of 2- hours plasma glucose the number were 32.5% and 10% respectively and in case of HbA1c the number were 23.5% and 10% respectively. The mean fasting plasma glucose (mmol/L), 2 hrs after breakfast plasma glucose (mmol/L) and HbA1c in case population was 5.97 ± 1.78, 8.98 ± 2.82, 6.23 ± 0.77 while in control group these figures are 5.14 ± 0.93, 7.45 ± 1.83 and 5.7 ± 0.54 respectively.*

Conclusion: *Pre-diabetes and diabetes are highly prevalent among people with COPD which remain undiagnosed & untreated. So, the study findings will help in the early intervention of glycaemic control among COPD patients.*

Keywords: *Glycaemic, Chronic obstructive, Pulmonary disease, Inhaled corticosteroid, Plasma glucose, Glycaemic status.*

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I. Introduction

Chronic obstructive pulmonary disease (COPD) is a group of chronic inflammatory pulmonary disorders that encompasses emphysema, chronic bronchitis, and small airway obstruction and is characterized by largely irreversible airflow obstruction affecting around 10% of the population older than 40 years of age[1]. The main feature of COPD is poorly reversible obstruction of airflow that is progressive and is associated with a systemic inflammatory response. Consequently, the widespread use of inhaled corticosteroids at higher doses in patients with COPD, along with the elevated incidence of diabetes in this age group and their uncertain effectiveness, can have an impact on the risk-benefit profile of inhaled corticosteroids in COPD.[2] Some adverse effects have been detected in research studies, but they are thought not to be clinically important. A significant increase (1.0%) in glycosylated hemoglobin (%HbA1c) and persistent glucosuria has been reported previously in a patient with asthma who used inhaled fluticasone propionate (FP) at a high dose (2 mg/day)[3]. It is unclear whether lower doses of ICS might disturb glucose metabolism. Worthy of additional consideration is the increasing evidence, independent of glucocorticoid use, that COPD is associated with a higher risk of developing type 2 diabetes mellitus.[4] Analysis of the Nurses' Health Study Cohort showed an association between COPD and onset of diabetes mellitus, which did not occur with asthma despite similar uses of corticosteroids.[5] The American Diabetes Association recommends glucose monitoring be initiated in any patient not known to be diabetic who receives therapy associated with high risk for hyperglycemia, including high-dose glucocorticoid therapy.[6] Non-critically ill hospitalized patients are advised to have a random BGL of <10 mmol/L (unless tighter control was used previously or insulin therapy is used). It is apparent that prudent glycaemic observation and management should occur in respiratory wards. Prednisolone is an oral corticosteroid with a plasma half-life of 2–4 h. However, the duration of action has been reported to be 12–36 h.[7] A recent study explored the relationship between prednisolone dosing and BGL pattern in a population of patients admitted to hospital with COPD. Despite the continued prevalence of COPD and DM, the high morbidity and mortality rates, there has been little research on the impact of inhaled corticosteroids on patients' glycaemic control.

II. Objectives

a) General objective:

- To determine the effect of inhaled corticosteroid on glycaemic status in patients with COPD.

b) Specific Objectives:

- To determine HbA1C of COPD patients on ICS.
- To determine the fasting plasma glucose (mmol/L) & 2 hrs after breakfast plasma glucose (mmol/L) of COPD patients on ICS.

III. Methodology And Materials

This was a cross-sectional analytical study. This study was conducted at Ziaur Rahman Medical College, Bogura, Bangladesh .. A total of 160 patients with COPD were included in this study, of them clinically diagnosed 80 consecutive COPD patients who were receiving both bronchodilator & inhaled corticosteroids were recruited as case group and clinically diagnosed 80 consecutive COPD patients receiving only bronchodilator without inhaled corticosteroid/systemic steroid were recruited as control, group. Spirometry was done for confirmation and staging of COPD according to GOLD at indoor and OPD patients of the Department of Ziaur Rahman Medical College, Bogura, Bangladesh from July 2019 to January-2021. Expected sample size was calculated as 200. But due to time constraints sample size was finally fixed as 80 in each group. Samples were selected using the purposive sampling technique through the inclusion and exclusion criteria of this study. A predesigned questionnaire for socio-demographic and other variables and a checklist for collection of disease information and measurement were used for data collection. Face to face interview was conducted by the Researcher himself. In the case of illiterate patients data was collected from the patient's attendant. The collected data were analyzed and performed by statistical package for social science (SPSS), version-20. All collected data were checked and verified thoroughly to reduce inconsistency and for omission and improbabilities. Categorical variables were compared by the chi-square test. In the case group, the association of glycaemic status with different doses of ICS was seen by Pearson's correlation coefficient. The level of significance was set at 5% and a p-value of < 0.05 was considered as significant.

- **Inclusion Criteria**
  - **Case:**
    - Age more than 40 years
    - Gender (male & female)
    - Patients on inhaled bronchodilator & corticosteroid therapy for > 6 months
  - **Control:**
    - Age more than 40 years

- Gender (male & female)
- Patients who were not taking inhaled corticosteroid/systemic steroid during his /her illness
- **Exclusion Criteria**
  - Patients with a prior diagnosis of pre-diabetes & diabetes mellitus with COPD
  - Critically ill patients

IV. Results

A total of 160 patients with COPD were included in this study, of them clinically diagnosed 80 consecutive COPD patients who were receiving both bronchodilator & inhaled corticosteroids were recruited as case group and clinically diagnosed 80 consecutive COPD patients receiving only bronchodilator without inhaled corticosteroid/systemic steroid were recruited as control, group. Table I shows the age distribution of the control group. The mean age of case group was 65.65±7.63 years, on the other hand, the mean age of control group was 53.85±7.9 years (p=0.841). Table IV shows the gender distribution of both the case and control groups having corticosteroids. Among the total studied patients, male was 138(86.30%), and female were 22(13.70%). Total underweight (<18.5) were 46(28.80%), normal weight was 106(66.30%), over weight (25.0-29.9), were 06(3. 80%), obese were 2(2,5%) in both the groups. Total rural residences were 92(57.5%), urban residences were 68(42.5%) in both the cases (Table VI). Total illiterate was 62(38.80%), primary level of education was present in 24(15%), secondary level was present in 22(13.80%), higher secondary level was present in 34(21.30%), bachelor or above was 18(11.30%) in both the cases **(**Table VII). Total service was 44(27.5%), business was 58(36.30%) in both the cases, retired were 30(18.80%), unemployed were 28(17.5%) in both the groups **(**Table VIII). Total monthly income, of < 10000 BDT were was present in 34(21.30%), monthly income of (10000 -30000BDT) were 60(37.5%) in both the groups, monthly income (>30000BDT) were 66(41.30%) in both the groups **(**Table IX). Total smokers were 120(75%), non-smokers were 24(15%), ex-smokers were 24(10%) in both the groups **(**Table X). Total duration of symptoms <5years were found in 50(31.30%), duration of symptom, (6-10years) were 80(50%), duration of symptom, (11-15years) were 30(18.80%) in both the groups (Table XI). In case group, stage (i) was 00(00%), and in control group, stage (i) was 14(17.55). The total stage (i) was 14(8.80%) in both the groups. In case group, stage (ii) was 36 (45%), and in control group followed the same 36 (45%). The total of stage (ii) was 72(45%) in both the cases. In case group, stage(iii) was 40(50%), and in control group, stage (iii) was 28(35%). The total stage (iii) was 68(42.5%). In case group, stage (iv) was 04(05%), and in control group stage (iv) was 02(2.5%). The total stage (iv) was 06(3.80%) in both the groups. **(**Table XIII) shows the distribution of FPG (mmol/L) value between case and control groups. In case group, DM (>7) was 26(32.5), and in control group, DM (>7) was 06(7.5%). The total DM (>7) was 32(20%) in both the groups. In case group, IFG (6.1-6.9 was 04(5%), and in control IFG (6.1-6.9 was 08(10%) which was double than case group. The total IFG (6.1-6.9 was 12(7.5%) in both the cases. In case group, Normal (< 6.1) was 50(62.5%), and in control group, Normal (< 6.1) was 66(82.5 %). The total Normal (< 6.1) was 116(72.5) in both the groups.

(Table XIV) shows the comparison of mean FPG value between case and control groups. In case group, the mean FPG-value was 5.97±1.78 On the other hand, in control group, the mean FPG-value was 5.14 ±0.93(p=0.01). (Table XV) shows the distribution of 2HABF value (2-hrs plasma glucose (mmol/L) between case and control groups. In case group, DM (> 11.1) was 26(32.5%), and in control group, DM (> 11.1) was 08(10%)/. The total DM (> 11.1) was counted 34(21.3%) in both the cases. In case group, IGT (7.8 - 11.1) was counted 08(10%), and in control group, IGT (7.8 - 11.1) was counted 10(12.5%). The total IGT (7.8 - 11.1) was counted 18 (21.3%) in both the cases. In case group, Normal (< 7.8) was counted 46(57.5%, and in control group, Normal (< 7.8) was counted 62(67.5%). The total Normal (< 7.8) 2hrs plasma(mmol/L) was counted 108(67.5%) in both the cases. **(**Table XVI) shows the comparison of mean 2HABF value between case and control groups.

In case group, the mean 2HABF value was 8.98±2.82 and in control group, the mean 2HABF value was 7.47±1.83 (p=0.01). **(**Table XVII) shows the distribution of HbA1C (mmol/L) value of case and control groups. In case group, DM (> 6.5) was counted 26(32.5%), and in control group, DM (> 6.5) was counted 08(10%). The total DM (> 6.5) was counted 34(21.3%) in both the cases. In case group, Normal (< 6.5) was counted 54(67.5%), and in control group, Normal (< 6.5) was counted 72(90%).The total Normal (< 6.5) HbA1C (mmol/L) value was counted 126(78.8%) in both the cases. (Table XVIII) shows the comparison of mean HbA1C value between case and control groups. In case group, the mean HbA1C value was 6.235±0.77146, and in control group, the mean HbA1C value was 5.765±0.54092 (p=0.082).

Table I: Age distribution of the studied patients (control group) (n=80).

Age group	Frequency	%
40-49	30	37.5
50-59	30	37.5
60 or above	20	25

Total	80	100

Table II: Age distribution of the studied patients (case Group) (n=80).

Age group	Frequency	%
40-49	18	22.4
50-59	32	40.00
60 or above	30	37.5
Total	80	100

Table III: Comparison of mean age between case and control groups (n=160).

Group	N	Mean	SD	p-value
Case	80	65.65	7.63	0.841
Control	80	53.85	7.9	

Table IV: Gender Distribution of the studied patients (n=160)

Gender		Patients having corticosteroids		Total
		Case	Control	
Male	Count	68	70	138
	Percentage	85.00%	87.50%	86.30%
Female	Count	12	10	22
	Percentage	15.00%	12.50%	13.70%
Total	Count	80	80	160
	Percentage	100.00%	100.00%	100.00%

Table V: Distribution of BMI of the studied patients having corticosteroid or not (n=160).

BMI		Case	Control	Total
Under weight(<18.5)	Count	26	20	46
	Percentage	32.50%	25.00%	28.80%
Normal(18.5-24.9)	Count	52	54	106
	Percentage	65.00%	67.50%	66.30%
Over Weight(25.0-29.9)	Count	0	6	6
	Percentage	0%	7.50%	3.80%
Obese(30-39.9)	Count	2	0	2
	Percentage	2.50%	0.00%	2.50%
Total	Count	80	80	160
	Percentage	100.00%	100.00%	100.00%

Table VI: Residential status of the studied patients (n=160).

Residence		Case	Control	Total
Rural	Count	40	52	92
	Percentage	50.00%	65.00%	57.50%
Urban	Count	40	28	68
	Percentage	50.00%	35.00%	42.50%
Total	Count	80	80	160
	Percentage	100.00%	100.00%	100.00%

Table VII: Educational status of the studied patients (n=160).

Educational status		Case	Control	Total
Illiterate	Count	26	36	62
	Percentage	32.50%	45.00%	38.80%
Primary level	Count	14	10	24
	Percentage	17.50%	12.50%	15.00%
Secondary level	Count	16	6	22
	Percentage	20.00%	7.50%	13.80%
Higher secondary level	Count	16	18	34
	Percentage	20.00%	22.50%	21.30%
Bachelor and above	Count	8	10	18
	Percentage	10.00%	12.50%	11.30%
Count		80	80	160
Percentage		100.00%	100.00%	100.00%

Table VIII: Occupation of the studied patients (n=160).

Occupation		Case	Control	Total
Service	Count	28	16	44
	Percentage	35.00%	20.00%	27.50%
Business	Count	20	38	58
	Percentage	25.00%	47.50%	36.30%
Retired	Count	18	12	30
	Percentage	22.50%	15.00%	18.80%
Unemployed	Count	14	14	28
	Percentage	17.50%	17.50%	17.50%
Count		80	80	160
Percentage		100.00%	100.00%	100.00%

Table IX: Monthly income of the studied patients (n=160)

Monthly income (BDT)		Case	Control	Total
< 10000	Count	14	20	34
	Percentage	17.50%	25.00%	21.30%
10000 -30000	Count	30	30	60
	Percentage	37.50%	37.50%	37.50%
> 30000	Count	36	30	66
	Percentage	45.00%	37.50%	41.30%
Total count		80	80	160
Total percentage		100.00%	100.00%	100.00%

Table X: Smoking status of the studied patients (n=160).

Participants' smoking status		Case	Control	Total
Smoker	Count	62	58	120
	Percentage	77.50%	72.50%	75.00%
Non- smoker	Count	12	12	24
	Percentage	15.00%	15.00%	15.00%
Ex-smoker	Count	6	10	16
	Percentage	7.50%	12.50%	10.00%
Count		80	80	160
Percentage		100.00%	100.00%	100.00%

Table XI: Duration of symptoms between case and control groups (n=160)

Duration		Case	Control	Total
<5years	Count	16	34	50
	Percentage	20.00%	42.50%	31.30%
6-10years	Count	46	34	80
	Percentage	57.50%	42.50%	50.00%
11-15years	Count	18	12	30
	Percentage	22.50%	15.00%	18.80%
Count		80	80	160
Percentage		100.00%	100.00%	100.00%

Table XII: Stages of COPD between case and control groups (n=160).

Stages		Case	Control	Total
i	Count	0	14	14
	Percentage	0.00%	17.50%	8.80%
ii	Count	36	36	72
	Percentage	45.00%	45.00%	45.00%
iii	Count	40	28	68
	Percentage	50.00%	35.00%	42.50%
iv	Count	4	2	6
	Percentage	5.00%	2.50%	3.80%
Count		80	80	160
Percentage		100.00%	100.00%	100.00%

Table XIII: Distribution of FPG value between case and control groups (n=160)

FPG(mmol/L)		Case	Control	
DM (>7)	Count	26	6	32
	Percentage	32.50%	7.50%	20.00%
IFG (6.1-6.9)	Count	4	8	12
	Percentage	5.00%	10.00%	7.50%
Normal (< 6.1)	Count	50	66	116
	Percentage	62.50%	82.50%	72.50%

Total	Count	80	80	160
	Percentage	100.00%	100.00%	100.00%

Table: XIV Comparison of mean FPG value between case and control groups (n=160).

		N	Mean	Std. Deviation	P Value
FPG-value	Case	80	5.97	1.78	<0.01
	Control	80	5.14	0.93	

Table XV: Distribution of 2HABF value between case and control groups (n=160).

2-hrs plasma glucose(mmol/L)			Case	Control	Total
2-hrs plasma glucose(mmol/L)	DM (> 11.1)	Count	26	8	34
		Percentage	32.50%	10.00%	21.30%
	IGT (7.8 - 11.1)	Count	8	10	18
		Percentage	10.00%	12.50%	11.30%
	Normal (< 7.8)	Count	46	62	108
		Percentage	57.50%	77.50%	67.50%
Total		Count	80	80	160
		Percentage	100.00%	100.00%	100.00%

Table XVI: Comparison of mean 2HABF value between case and control groups(n=160).

		N	Mean	Std. Deviation	P value
2HABF	Case	80	8.98	2.82	<0.01
	Control	80	7.47	1.83	

Table XVII: Distribution of HbA1C value of case and control groups (n=160).

HbA1C (mmol/L)			Case	Control	Total
	DM (> 6.5)	Count	26	8	34
		Percentage	32.50%	10.00%	21.30%
	Normal (< 6.5)	Count	52	72	126
		Percentage	67.50%	90.00%	78.80%
Total		Count	80	80	160
		Percentage	100.00%	100.00%	100.00%

Table XVIII: Comparison of mean HbA1C value between case and control groups (n=160).

		N	Mean	Std. Deviation	p-value
HbA1C value	Case	80	6.235	0.77146	0.082
	Control	80	5.765	0.54092	

V. Discussion

The systemic bioavailability of ICS is claimed to be minimal and the side effects negligible. However, some large retrospective cohort studies showed a definite association between ICS use and incident diabetes or worsening glycemic control in pre-existing diabetes. Systemic glucocorticoid therapy can lead to various metabolic complications in glucose homeostasis including insulin resistance, hyperglycemia, and increased risk of diabetes.[8] In this cross-sectional analytical study, total of 160 subjects was included for the study on the basis of inclusion and exclusion criteria, 80 of them were taken as case and 80 as age matched control. There was no defaulter or drop out cases, so finally 160 subjects were enrolled in this study, clinically diagnosed 80 consecutive COPD patients (50%) who were receiving both bronchodilator & inhaled corticosteroids were recruited as case. Clinically diagnosed 80 consecutive COPD patients (50%) receiving only bronchodilator without inhaled corticosteroid/systemic steroid were recruited as control. Both groups were well matched for age and other socio-demographic variables. There was no statistical difference in the mean age of both groups which was 53.85 ± 7.9 and 56 ±7.6 in control and case respectively. These findings were somewhat different from some previous other studies, where the mean age was somewhat higher than our study group.[9,10] Spirometry was done for confirmation and staging of COPD according to GOLD at indoor and OPD patients of the Department of Internal Medicine, BSMMU. ICS is considered an integral part of anti-inflammatory treatment in patients with asthma, although their effectiveness in COPD remains controversial[11]. In patients with COPD, the use of ICS is primarily recommended for severe disease and in those with frequent episodes of exacerbations.[12] Nevertheless, they are increasingly being used even in patients with less severe disease.[13] In our study it was also found that a significant number of GOLD stage 1 and 2 were using inhaled steroids which were not justified. Similar trends were found in most of the previous studies. Using a population-based study on COPD patients, we found that the use of inhaled corticosteroids is associated with a significant increase in the risk of incidence of diabetes. The observed treatment-related changes in % N HbA1c in this study are consistent

with another report of hyperglycemia and glucosuria in an asthmatic patient who took very high doses of inhaled FP at a dose of 2 mg/day; however, the mean increase resulting from FP therapy, relative to the individual's baseline, is substantially smaller than in that individual case.[14] Socio-demographic characteristics of the study showed that among the cases 85% were males and 15% were females while in control group it was 87.5% and 12.5% respectively. This was somewhat similar to most previous studies. Other studies conducted on this topic found a similar high ratio of male smokers among the samples[15]. Most of the population belongs to male sex which was probably due to the higher smoking ratio among male population. These findings were in accordance with some previous studies done elsewhere.[9,16]. 77.5% of the case and 72.5% of control population were indulging in smoking while only 15% from each group were non- smoker. This picture is somewhat different from the study done by Christofer et al[17], where the number of smoker in case and control group are 27% and 22% respectively. These signify the high disease burden among smoker. Proper education, awareness creating program, symposium, anti-smoking movement, and strong stand of policymaker, all can improve this picture and can help in reducing the future prevalence of the disease burden. In respect of occupation, it was found that a large number of cases were service holders and businessmen (35% and 20%), which was true for control group also (20% and 47.5%). Most of the cases were from higher socioeconomic background (45%), whereas in control group it was 37.5%. They found that 89% of case population and 87% of control population belonged to lower socio-economic group. But this figure was similar to a study conducted in 2012[18]. In 20% cases symptoms duration was less than 5 years, where as in control group it was 42.5%. And duration more than 11-15 years was 22.5% and 15% respectively. We had found that 32% of cases and 7.5% of control group were diagnosed as diabetic when fasting plasma glucose taken into account, while in case of 2 hours after breakfast plasma sugar the number were 32.5% and 10% respectively and in case of HbA1c the numbers were 23.5% and 10% respectively. The present study evaluated data from randomized controlled trials and analyzed based on intention-to-treat, which mitigated the risk of confounding. We found that the risk for onset of diabetes mellitus / hyperglycemia in inhaled corticosteroid treated patients with COPD increased with increasing age, increasing BMI, and increasing COPD severity, as measured by decreasing baseline FEV1. The significant increases in risk observed in this part of the analysis for age and BMI have been well established. However, the increased risk for low baseline FEV1 is novel. This study was not designed to determine the mechanisms or a cause-and-effect relationship behind this association. Large intervention studies in patients have demonstrated that intensive glycemic control reduces the onset and delays the progression of diabetic complications, including retinopathy, nephropathy, and neuropathy[19]. Risk reductions in various outcomes ranged between 25% to 75%, and these reductions appeared to be related to the duration and severity of hyperglycemia. The United Kingdom Prospective Diabetes Study demonstrated a continuous relationship between glycemic control and various complications, such that for a reduction in % HbA1c of 1.0, there was a 35% reduction in the risk of complications, a 25% reduction in diabetes-related deaths, a 7% decrease in all-cause mortality and an 18% reduction in combined fatal and non-fatal myocardial infarction. Accordingly, modest deterioration in glucose control attributable to COPD therapy, even on the order of the differences observed in this study, could contribute to the development of diabetes in at-risk populations. The treatment that has been shown to increase survival in COPD is smoking cessation. This is the only measure that slows the accelerated decline in lung function in these patients.

Limitations of the study:

There were some limitations in the present study that may have had some potential impacts on the results. First, the baseline risk and number of cases was low and the confidence intervals were wide enough to have missed a clinically important effect of ICS on the risk of onset of diabetes. Second, we did not have biochemical validation of cases. Thus, case misclassification was possible, which would have diluted the results. Third, there was no follow-up. As ICS are recommended as maintenance therapy, future studies will be needed to evaluate the long term effects of ICS on these endpoints. The study only included patients on inhaled corticosteroids not the systemic one. Therefore, the study's results could not be generalized for all types of COPD patients. However, from the public health perspective, COPD patients on ICS are the most important group of COPD patients and these are the most common group of patients used to evaluate the onset of diabetes.

VI. Conclusion And Recommendations

Although recent studies have suggested that high dose inhaled corticosteroid (ICS) therapy might contribute to the development of type 2 diabetes mellitus in COPD patients, this concept remains controversial and requires further investigations. Nevertheless, there's reason to think about clinical implications associated with high dose ICS therapy in COPD patients. In Addition, ICS overuse presents a critical issue that has got to be addressed. As we learn more regarding the adverse effects related to ICS therapy, adequate patient selection and monitoring are going to be necessary to improve the safety and efficacy of those treatments. In this regard current evidence may suggest that care should be taken when administering high dose ICS within

the development and progression of diabetes, As well as improved therapeutic regimens to reduce side effects (i.e. optimal dosing) can lead to improved management of COPD patients. Care providers and policy makers need to ensure not only the resource and health care system, but also they should acquire sufficient knowledge, attitude and skills in their profession, so that one is attracted and act on their for the care they have . A significant proportion of individuals are affected by COPD in our country. This study showed that onset of diabetes is more in patients on ICS than in patients of bronchodilators. To ameliorate their disease burden, community awareness about health care facilities and self-concern of COPD patients for their own health needs are to be emphasized. The primary referral units at grass root level, community clinics, union sub enters for health and family welfare, upazilla health complexes are required to be equipped infrastructural for improving and addressing health problems of COPD patients and to provide appropriate referral service. Built in service components' may improve self-reporting of new diabetic patients. Compliance to medication and ensuring proper lifestyle is a crucial issue for COPD patient for its future treatment reception, Care providers and policy makers need to ensure the resource of health care system along with sufficient knowledge, attitude and skills in their profession to improve the specified outcome.

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