

Pattern of Electrolytes Imbalance in Patient with Exacerbation of Chronic Obstructive Pulmonary Disease and Asthma Attending in a Tertiary Care Hospital of Bangladesh

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Abstract:

Asthma and chronic obstructive pulmonary disease (COPD) are two common health problems in clinical practice. Exacerbation of both of this condition leads to serious health problem and affecting all population particularly extreme of age group. Severity of both of these conditions can affect quality of life and economic loss as well. It was observed in various part of the world that severity is associated with different electrolytes disturbance. Hence, to assess the pattern of electrolytes imbalance in patient with exacerbation of chronic obstructive pulmonary disease (COPD) and asthma attending in a tertiary care hospital was the objective of the study. This research was a hospital based descriptive cross-sectional study and conducted at the Department of Medicine of Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), National institute of Chest Disease & Hospital (NIDCH) & Dhaka Medical College Hospital (DMCH). Patients who got admitted in medicine department in relevant hospital due to exacerbation were approached for inclusion of study. Among the approached patient total 390 patient were selected according to the inclusion and exclusion criteria. Following selection, all patients were counselled regarding aim and objective of the study. Ethical measures were maintained throughout the study process in according to the declaration of Helsinki. Informed written consent was collected from each subject. Demographic data were collected from individual patient by investigator with an aid of a semi-structured questionnaire. Value of serum electrolytes (Na^+ , K^+) were also included during data collection of the patients. Edited and encoded data were analysed with a computer software SPSS version 22. Out of a total of 390 patients, 238 cases (61.02%) were diagnosed COPD and 152 (38.97%) cases diagnosed asthma. Most of the patients were male (76%) and rest of them were female. Overall age range was from 16-95 years and most of them were in age range 56-65 years.

Mean age of the population was 58.95 ± 15.44 SD. Majority (44.6%) of them were coming from middle class family followed by lower income group (28.2%) and then higher income group (27.2%). Among the study population, it was seen that 264 (67.69%) patients had dyselectrolytemia and rest of the population were in normal range. It was found that, 148 (37.9%) population had hyponatremia and 19 (4.9%) patient had hypernatremia and rest of them (57.3%) has normal sodium level. Similarly 145 (37.2%) hypokalaemia and 15 (3.8%) hyperkalaemia and rest of them are within normal range. COPD patients group electrolyte imbalance were $n=177$, (74.36%) and in asthma patients group there were $n=87$, (57.23%) had electrolyte imbalance. COPD group of patient had higher frequency of hyponatraemia than asthma patients group which was statistically significant ($p=.001$). Mean value of sodium and potassium were found 135.15 ± 7.98 SD and 3.7 ± 0.77 SD. Serum electrolytes were analyzed in COPD and Asthma group in relation to presence or absence of hypertension and found non significant difference (p value were $=0.37, 0.06$ respectively). Again both electrolytes were analyzed in COPD group in relation to presence or absence of DM and found non-significant difference (p value were $=0.97$ & 0.64 respectively). Whereas similar analysis showed significant difference ($p=.037, <.05$) is seen in asthma group in relation to DM. Hyponatraemia and hypokalaemia are found in patients with exacerbation of COPD and asthma. Hyponatraemia is more common in COPD than asthma patients but presence of diabetes in asthma patients found significant hyponatraemia.

Key words: Electrolytes, Exacerbation, COPD, Asthma

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Introduction

Bronchial asthma is a chronic inflammatory disease characterized by chronic lung airway inflammation, increased airway responsiveness and variable airflow obstruction. In recent decades, there has been a marked increase in asthma prevalence, particularly in western countries. Asthma attack or exacerbation can arise any time without any prodromal symptoms and can progress, either slowly or rapidly to life-threatening severity.¹ Abnormal electrolyte concentrations in asthma patients can be attributed to low intake^{2,3} or secondary to asthma medications.⁴ Hypokalemia was the earliest electrolyte disturbance reported in asthma and it was related to the use of β 2-agonists and aminophylline therapy.⁵ Recently, hypomagnesemia and hypocalcemia have also been reported after administration of β 2-agonists in normal subjects and in asthmatic patients.⁶ Electrolyte levels directly influence excitability of airway smooth muscles (ASM) by influencing the state of ion exchangers and Na⁺/K⁺ pump. Possible hypotheses that may lead to airway reactivity include a direct effect of electrolytes on bronchial smooth muscle contractility as well as potential enhancement of the release of mast cell-derived inflammatory mediators, possibly through airway osmolarity changes.⁷

Chronic Obstructive Pulmonary Disease (COPD) is characterized by the presence of airflow obstruction due to chronic bronchitis or emphysema, the air flow obstruction is generally progressive and may be partially reversible. Chronic Obstructive Pulmonary Disease (COPD) is a major public health problem; its prevalence varies according to country, age and sex. On the basis of epidemiologic data, by 2020, COPD will be the third leading cause of death worldwide and the fifth leading cause of disability.⁸ About 15% of COPD patients need admission to general hospital or intensive respiratory care unit for acute exacerbation, leading to greater use of medical resources and increased cost.⁹ Even though the overall prognosis of COPD patients is lately improved, the mortality rate remains high, and electrolyte disorders occurring in these subjects can affect the outcome.¹⁰

Though the COPD patients mostly present with the feature of acute respiratory infections (productive cough, dyspnea etc.) there may be a number of metabolic disorders like electrolyte disturbances arising out of the disease process or as a consequence of the therapy. Though most of these features are correctable, very often they are missed or confuse the diagnosis, thus simple overlooking of the coexisting metabolic abnormalities may contribute to a great deal of mortality and morbidity in the COPD patients.¹³ Water retention and hyponatremia are typically observed in the final stages of chronic obstructive pulmonary disease owing to several hormonal abnormalities: renin, angiotensin II, aldosterone, atrial natriuretic peptide and vasopressin.¹¹

High mortality and morbidity in patients with hypokalemia and other electrolyte disorders may be attributed to its harmful effects like cardiac arrhythmias, central nervous system dysfunction, confusion, convulsions, coma, secondary renal insufficiency, hampered nerve-muscle conduction and respiratory muscle affection even death.¹²

Hypokalaemia, hypomagnesemia, and hypocalcemia are well-known causes of cardiac arrhythmia.^{14,15} So, it appears that hypokalaemia and other electrolyte disorders may be a common associated finding in the subjects with exacerbation of asthma and COPD that should be corrected promptly to avoid fatal outcomes.

This study aimed to detect the frequency of electrolytes (Na, K,) disturbances in exacerbation of COPD and asthma. Because therapeutic agents are used to treat asthma & COPD attack have an effect on abnormal electrolyte levels.

Objectives of the Study

General Objective

- To find out the pattern of electrolyte disturbances in patients with exacerbation of asthma and exacerbation of chronic obstructive pulmonary disease (COPD).

Specific Objectives

- 1) To see the socio-demographic profile among the study participants.
- 2) To determine serum electrolyte disturbance (Na, K) in patients with exacerbation of asthma.
- 3) To determine electrolyte disturbance (Na, K) in patients with exacerbation of COPD.
- 4) To determine difference of electrolyte disturbance (Na, K) in exacerbation asthma & COPD with diabetic & non-diabetic patients.

Methods:

It was a cross-sectional observational study conducted in the Department of Medicine, BIRDEM General Hospital, Shahabag, Dhaka, NIDCH & DMCH during the period of 8 months started from July 2016-March 2017. All patients with diagnosis of acute exacerbation of COPD and acute exacerbation of asthma admitted in the Department of Medicine of BIRDEM General Hospital, NIDCH & DMCH. Total 390 population were considered for the study. Non-probability purposive consecutive sampling method was used to select sample population. After collecting the data, it was checked and rechecked for omission, inconsistencies and improbabilities. After cleaning the data it was edited, coded and entered into the computer. Statistical analysis of the study was done by computer software device as the Statistical Package for Social Science (SPSS) version 22.0. The qualitative variables were expressed as frequency and percentage and the quantitative variables were expressed as mean with standard deviation. During analysis chi-square test and unpaired student t-test was done to estimate the relationship or association between variables and in all cases p value <.05 was considered statistically significant.

Result

Total 390 cases were taken for this study. Out of which 238 (61.02%) cases had a diagnosis of COPD and 152 (38.98%) cases bronchial asthma as illustrated in figure 1.

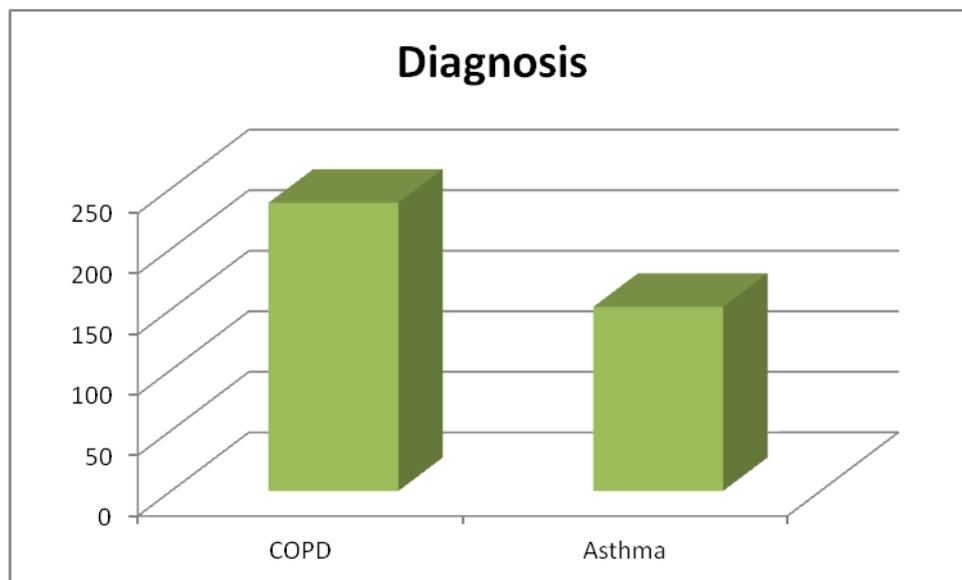


Figure 1. Diagnosis of study population (n=390)

Mean age of the study participants was 58.95 ± 15.44 . Maximum age was 95 years and minimum age was 16 years. Among 238 cases of COPD mean, maximum and minimum age was 65.40 ± 10.51 , 92 and 35 years respectively. Among 152 cases of asthma mean, maximum and minimum age was 48.84 ± 16.49 , 95 and 16 years respectively. Among 390 patients, most of the population (n=304, 77.94%) came from rural area and rest of them (n=86, 22.06%) came from urban area. Figure 4 depicts the distribution. Most of the patients in this study were from middle class family (n=174, 44.6%), followed by 110 cases (28.2%) from lower class and 106 (27.2%) patients from upper class family. See figure 5 for a bar chart. Most of the patients (86, 22.1%) were farmers, followed by 79(20.3%) patients who were service holders, 67(17.2%) patients who were retired service holders, 64(16.4%) patients who were housewives, 54 (13.8%) patients were doing business, 16(4.1%) patients were students, another 16 (4.1%) patients were day labourer, 6 (1.5%) rickshaw-pullers and finally 2 (0.5%) patients were fishermen. See figure 7.

Among 390 patients total 160 (41.0%) patients were smokers and 65 (16.7%) patients had history of smoking. Among 238 COPD patients 145 patients (60.9%) were current smokers and 61 (25.6%) were ex-smokers. In comparison only 9.9% (15) patients from total 152 asthma patients were current smokers and only 2.6% (4) patients had history of smoking. Significant difference (p value 0.0001) was noted between COPD and asthma patients in relation to smoking. See details in table 1.

Table 1: Smoking habit in COPD and Asthma patients (n=390)

	Current Smoker (n=160)		Ex-smoker (n= 65)		Non-smoker (n= 165)		P value
	Frequency	%	Frequency	%	Frequency	%	
COPD	145	60.9%	61	25.6%	32	13.4%	0.0001
Asthma	15	9.9%	4	2.6%	133	87.5%	
Total	160	41.0%	65	16.7%	165	42.5%	

Among the study population, it was seen that 264 (67.69%) patients had dyselectrolytemia and rest of the person were in normal range.

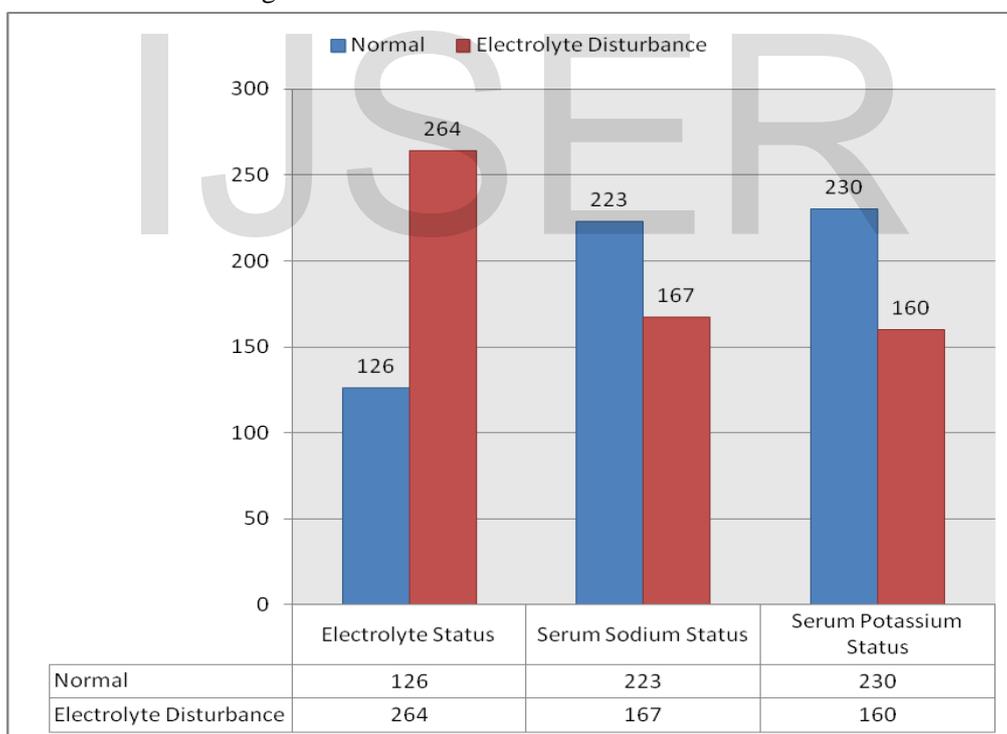


Figure 7. Status of electrolyte imbalance among study population (n=390)

During analysis of total electrolyte status between COPD and asthma patients revealed that in COPD patients group electrolyte imbalance were more prominent (n= 177, 74.36%) than in asthma patients group there were 57.23% (n=87) had electrolyte imbalance.

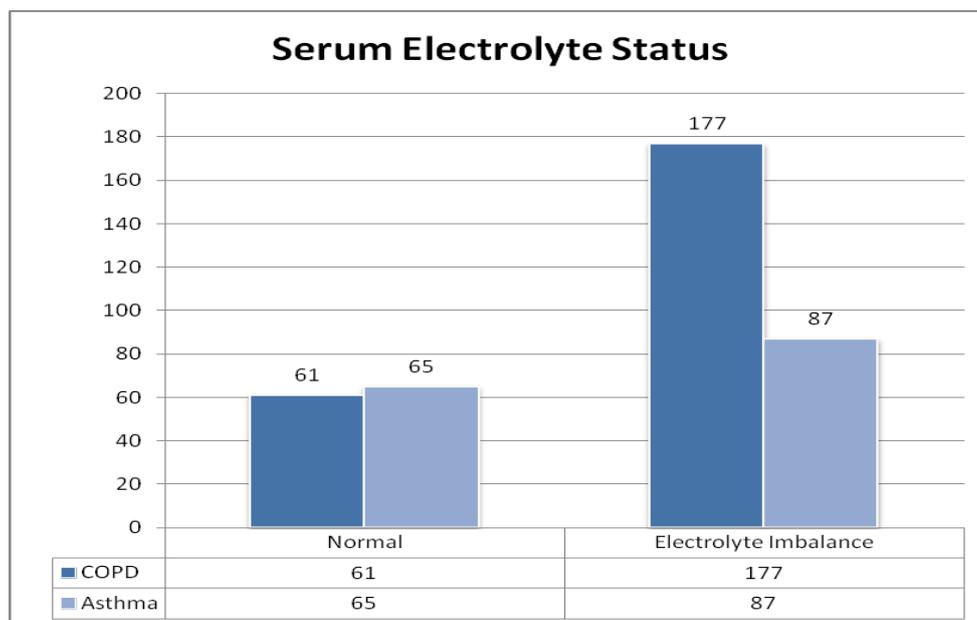


Figure 8. Status of electrolyte imbalance in COPD and asthma patients

Mean values of serum sodium and potassium in COPD group were 133.93 (± 9.18) and 3.60 (± 0.84) respectively. In asthma patients these were respectively 137.05 (± 5.07) and 3.85 (± 0.63). Statistically significant difference was noted in between group (p value for serum sodium = <0.001 , p value for serum potassium = <0.001) See details in table 2.

Table 2: Comparison of mean serum sodium and mean serum potassium concentration between COPD and asthma patients (n=390)

Diagnosis	COPD (n=238)		Asthma (n= 152)		t Statistics	P value
	Mean	$\pm SD$	Mean	$\pm SD$		
Serum Sodium	133.93	9.18	137.05	5.07	-4.31	<0.001
Serum Potassium	3.60	0.84	3.85	0.63	-3.38	<0.001

Test done by one way Student's t test

Among all cases 148 (37.9%) patients had hyponatremia and 19(4.9%) patients had hypernatremia. COPD group consisted of significantly higher frequency of hyponatremic patients (108, 73%) than asthma group (p value 0.001). Details are enlisted in table 3.

Table 3: Relationship between COPD and asthma patients and serum electrolyte (Na⁺, K⁺) status (n=390)

		COPD (n=238, 100%)	Asthma (n= 152, 100%)	t value	P value
		Frequency (%)	Frequency (%)		
Level of Sodium	Hyponatremia	108 (45.4%)	40 (26.3%)	15.08 6	0.001
	Normal	118 (49.6%)	105 (69.1%)		
	Hypernatremia	12 (5.0%)	7 (4.6%)		
Level of Potassium	Hypokalemia	98 (41.2%)	47 (30.9%)	4.78	0.091
	Normal	130 (54.6%)	100 (65.8%)		
	Hyperkalemia	10 (4.2%)	5 c(3.3%)		
Test done by Pearson's Chi-Square test					

Analysis was done to examine effect of inhaler use on electrolyte imbalance. Statistically significant difference was found in regular and irregular intake of inhaler (p value in both sodium and potassium group <0.0001). Details are given in table 4.

Table 4: Relation of serum electrolyte with practice of Inhaler intake (n=390)

		Regular (n=142, 100%)	Irregular (n= 213, 100%)	Does not use (n= 35, 100%)	P value
		Frequency (%)	Frequency (%)	Frequency (%)	
Level of Sodium	Hyponatremia	44 (31.0%)	79 (37.1%)	25 (71.4%)	<0.001
	Normal	91 (64.1%)	122 (57.3%)	10 (28.6%)	
	Hypernatremia	7 (4.9%)	12 (5.6%)	0 (0.0%)	
Level of Potassium	Hypokalemia	32 (22.5%)	96 (45.1%)	17 (48.6%)	<0.001
	Normal	104 (73.2%)	111 (52.1%)	15 (42.9%)	
	Hyperkalemia	6 (4.2%)	6 (2.8%)	3(8.6%)	
Test done by Pearson's Chi-Square test					

Among the study population 58 (24.4%) COPD patients had hypertension and 35 (23.8%) asthma patients had hypertension. No significant electrolyte disturbance (serum sodium and serum potassium) were noted between two groups in relation to hypertension (p value for sodium =0.37, p value for potassium .06). As detailed in table 5.

Table 5: Relationship of serum electrolyte with hypertension (n=390)

		Present (n=93, 100%)		Absent (n= 297, 100%)		P value
		Frequency	%	Frequency	%	
Level of Sodium	Hyponatremia	33	35.5%	79	38.7%	0.37
	Normal	91	57.0%	122	57.2%	
	Hypernatremia	7	7.5%	12	4.0%	
Level of Potassium	Hypokalemia	32	31.2%	96	39.1%	0.06
	Normal	104	61.3%	111	58.2%	
	Hyperkalemia	6	7.5%	6	2.7%	
Test done by Pearson's Chi-Square test						

Among 390 patients only 39 (10%) patients were diabetic. Among them 24 patients had COPD and 15 patients had asthma. No significant difference was noted between COPD and Asthma group in relation to diabetes (p value 0.945). See table 6 for details.

Table 6: Frequency of Diabetes among COPD and Asthma patients (n=390)

Diagnosis	Diabetes				P value
	Present (n=39)		Absent (n= 351)		
	Frequency	%	Frequency	%	
COPD (n = 238, 100%)	24	10.1%	214	89.9%	0.945
Asthma (n =152, 100%)	15	9.9%	137	90.1%	
Total (n=390, 100%)	39	10.0%	351	90.0%	

Status of serum sodium and potassium concentration were analyzed in COPD patient group in relation to presence or absence of diabetes. No statistical significant difference were seen. Details are given in table 7

Table 7: Relationship of COPD with serum electrolyte(Na⁺, K⁺) in respect to diabetes (n=238)

		Diabetes		P-value
		Present (n=24, 100%)	Absent (n= 214, 100%)	
		Frequency (%)	Frequency (%)	
Level of Sodium	Hyponatremia	11 (45.8%)	97 (45.3%)	0.979
	Normal	12 (50.0%)	106 (49.5%)	
	Hypernatremia	1 (4.2%)	11 (5.1%)	
Level of Potassium	Hypokalemia	12 (50.0%)	86 (40.2%)	0.643
	Normal	11 (45.8%)	119 (55.6%)	
	Hyperkalemia	1 (4.2%)	9 (4.2%)	

Test done by Pearson's Chi-Square test

Status of serum sodium and potassium concentration were analyzed in asthma patient group in relation to presence or absence of diabetes. Change in serum sodium level was statistical (p=.04<.05) significant. Details are given in table 8

Table 8: Relationship of asthma with serum electrolyte (Na⁺, K⁺) in respect to diabetes (n=152)

Diagnosis		Diabetes				P-value
		Present (n=15, 100%)		Absent (n= 137, 100%)		
		Frequency	%	Frequency	%	
Level of Sodium	Hyponatremia	8	53.3%	32	23.4%	0.04
	Normal	7	46.7%	98	71.5%	
	Hypernatremia	0	0.0%	7	5.1%	
Level of Potassium	Hypokalemia	1	6.7%	46	33.6%	0.06
	Normal	14	93.3%	86	62.5%	
	Hyperkalemia	0	0.0%	5	3.6%	

Test done by Pearson's Chi-Square test

Discussion

Asthma and COPD are most commonly encountered respiratory problems in day-to-day clinical practice. Without treatment, it significantly hamper quality of life and economic loss as well. Several triggering factors and risk factors were identified which provokes the disease process. It was postulated that in both cases electrolytes imbalance might be due to reduced intake and/or due to secondary to medication that were used in management purpose. Moreover, it can be developed with acute exacerbation of both of the disease process due to metabolic derangements. Whatever the cause, prompt recognition and correction of this electrolyte disturbance can save the valuable life.^{2,4,6}

This cross-sectional observation study was carried out with an aim to assess the pattern of electrolyte disturbances (Na, K) in patients with exacerbation of COPD and asthma patient in multiple tertiary care hospital in Bangladesh. Beyond this, this study also focused to determine difference of electrolyte disturbance (Na, K) in exacerbation asthma & COPD with diabetic & non-diabetic individuals.

According to the inclusion and exclusion criteria total 390 sample were collected over 8 months of period from BIRDEM general hospital, NIDCH and Dhaka Medical College Hospital. Total 390 cases were taken for this study. Out of 390-study population, 238- (61.02%) cases had a diagnosis of COPD and 152 (38.98%) cases had Bronchial Asthma.

In this study, Mean age of the 390 cases was 58.95 ± 15.44 and range from 16-95 years. Among 238 cases of COPD mean, maximum and minimum age was 65.40 ± 10.51 , 92 and 35 years respectively. Among 152 cases of asthma mean, maximum and minimum age was 48.84 ± 16.49 , 95 and 16 years respectively. Most of the patients were from 56-65 years group. Similar result was found in study entitled Study of serum electrolytes in exacerbation of chronic obstructive pulmonary disease patients by Goli et al. (2016).¹⁶ Here Mean age of subjects of COPD were in the age range of 50-75 years, average age of presentation being 61.22 ± 11.45 years. In the control group, subjects were in the age range of 50- 75 years, average age being 61 ± 9.5 years. Ouf et al. (2012)¹⁷ showed the mean age were 61.5 ± 9.8 years which is almost similar to this study. Moreover, mean age range of asthma patient was 35.54 ± 6.39 in the study entitled study of electrolyte disturbances in patients.

With chronic stable asthma and with asthma attacks by Mohammad et al. 2014. Which showed marked dissimilarity of age group in asthma patients. But according to the study- Epidemiological Study on Bronchial Asthma at Shaheed Suhrawardy Medical College Hospital, Dhaka the age range is supported.¹⁸

It is observed in the study that, there is male predominance among the study population and estimated percentage of male were 76% and 24 % constituted female. The findings is supported by another study. Goli et al. (2016)¹⁶ found that out of 62 patients of COPD, 48 were males and 14 were females. In addition, out of 20 age- sex matched healthy controls 15 were males and 5 were females. According to the study by Ouf et al. (2015)¹⁷ there was

83.3% were male and only 16.7 % were female. This finding is matched with the age adjusted prevalence of COPD in original literature. In case of asthma slightly different situation was found in study done by Mohammad et al. 2014 and showed 32% male and 68% female but the finding of the study is also supported by the epidemiological data of Bangladesh.¹⁸

In this study most of the population (77.94%) 304 lived in rural area and 22.06% (86) live in urban area. That may be explained by, in our community most of house wife uses biomass fuel for cooking and males are exposed to dust almost every day, as a result there prolonged exposed to biomass fuel, dust and that may be responsible for their diseases.

In this cross-sectional study, most of the patients in this study were coming from middle class family (174, 44.6%), followed by 110(28.2%) cases from lower class and 106 (27.2%) patients from upper class family. Very limited literature was found to compare these findings. However, it can be assume that as most of poor-middle income population consult this kind of government hospital for health problems so the findings may be a reflection of existing scenario of socio-economic situation of Bangladesh.

In this study patient comes from various occupation like service holder, retired person, farmers, businesspersons, students and homemakers etc. But majority population were farmer (86, 22.1%), followed by service holder (79, 20.3%), retired (67,17.2%), housewives (64,16.4%), businesspersons (54,13.8%), students (16, 4.1%), day labourer (16,4.1%), rickshaw-pullers (6,1.5%) and fishermen (2,0.5%). Occupational status implied as a risk factors for the development of COPD and account for approximately 10-15% of all COPD.^{19,20} Very few studies tried to established impact of occupation in electrolyte disturbance in Asthma and COPD patients.

Among the study population 160 (41.0%) patients were smokers and 65 (16.7%) patients had history of smoking. Among 238 COPD patients 145 patients (60.9%) were current smokers and 61 (25.6%) were ex-smokers. In comparison, only 9.9% (15) patients from total 152 asthma patients were current smokers and only 2.6% (4) patients had history of smoking. Significant difference (p value 0.0001) was noted between COPD and Asthma patients in relation to smoking and signify that smoking has strong role in acute attack of COPD and asthma. Tobacco smoke is a key risk factor for development of COPD, 15% of smokers develop COPD. Conversely, 10% of those with COPD have no smoking history.²¹ In case of asthma there is similar association had established in different literature. According to the literature Effects of Tobacco Smoke Exposure on Asthma Prevalence and Medical Care Use in North Carolina Middle School Children by Sturm, J. et al. (2004)²² showed that children who currently smoked or reported any exposure to smoke were at increased risk of reporting active asthma symptoms. Exposure to ETS and childhood cigarette smoking was responsible for 15% of the asthma cases observed in the study population. Epidemiological data of Bangladesh also investigate effects of biofuel, gas and solid fuel in asthma other than smoke.¹⁸

Among 238 patients of COPD, 49 (20.6%) were on adherence of their regular medication and taking inhaler regularly and 166 patients (69.7%) were taking inhaler infrequently or during attack. Whereas, among 152 Asthma patients majority (93, 61.2%) patients were regular taker of inhaler and 47 (30.9%) patients were taking inhalers irregularly. Analysis was done to examine effect of inhaler use on electrolyte imbalance. Statistically significant difference was found in regular and irregular intake of inhaler (p value in both sodium and potassium group <0.0001). An interview based study were underwent in two rural area of Australia and found that thirty-eight percent of patients used preventer medication as prescribed and 11% never used it and rest of them use it regularly; which is almost similar in this study findings. In case of COPD patients the adherence rate to the prescribed regimen is about 40%–60% and only 1 out of 10 patients with a metered dose inhaler performs all essential steps correctly.²³ The result is about near to the current study findings though elicit the cause of non-adherence is beyond of scope.

Among the study population, it was seen that 264 (67.69%) patients had dyselectrolytemia and rest of the person were in normal range. During analysis of total electrolyte status between COPD and asthma patients revealed that in COPD patients group electrolyte imbalance were more prominent (n= 177, 74.36%) and in asthma patients group there were 57.23% (n=87) had electrolyte imbalance. Similar type of results found in different study done by Hussain et al. (2008).²⁴

Among 390 cases 145 (37.2%) had hypokalemia and 15 (3.8%) had hyperkalemia. Among 145 cases of hypokalemia 98 patients (67.6%) had COPD and 47 patients (32.4%) had Bronchial Asthma. Among 15 cases of hyperkalemia 10 cases (66.7%) had COPD and 5 (33.3%) had Asthma. Comparative analysis between COPD and asthma group in relation to serum potassium status was not statistically significant (p value 0.091).

Among 390 cases 37.9% (n=148) patient had hyponatraemia and 4.9% (n=19) patients hypernatremia. Within the group of hyponatraemia 108 patient were in exacerbation of COPD and 48 person suffers from asthma attack. On contrary, in between group of hypernatremia 12 person had COPD exacerbation and only 7 person had an acute asthma attack. In comparison of both COPD and asthma patients it was noticed that, COPD group consisted of significantly higher frequency of hyponatremic patients (108, 73%) than Asthma group (p value 0.001).

Variance analysis between COPD group and asthma patients in relation to serum sodium (p= 0.0001 $<$ 0.05) and serum potassium level (p=0.002 $<$ 0.05) was estimated and it was found statistically significant. Mean values of serum sodium and potassium in COPD group were 133.93 (\pm 9.18) and 3.60 (\pm 0.84) respectively. In asthma patients these were respectively 137.05 (\pm 5.07) and 3.85 (\pm 0.63). According the study Goli et al. (2016)¹⁶ average serum sodium and potassium levels in COPD patients were 132 \pm 5.65 meq/lit and 3.29 \pm 0.96 meq/lit respectively and the levels in the control group were 140 \pm 2.28 mEq/lit and 4.51 \pm 0.02 meq/lit respectively, which showed almost similar pattern like in this study. Another study

done by Bai et al. (2013) showed Electrolyte disturbance in acute asthmatic patient at the time of admission was found in 27 patients (54 %); the highest proportion was Hyponatremia 16(32%), followed by Hypomagnesemia 15(30%). After standard treatment decrease in all electrolytes level was noted. Maximum drop in magnesium and potassium levels were noted at 90min, sodium and phosphorous levels at 180min. The study found disorder in sodium level which have near to the estimation of this study but did not match potassium disturbance. Moreover, estimation of magnesium was beyond limit of the study.

During analysis of impact of hypertension on asthma and COPD patients it was found that 58 COPD patients (24.4% among all COPD) had hypertension and 35 Asthma patients (23.8% among all Asthma) had hypertension. Mean difference between two groups in relation to hypertension were not statistically significant (p value 0.761). Very few studies are available to find out the impact of hypertension Asthma and COPD alone and no study is found which investigate in both disease at a time.

Among the study population (n=390) only 39 patients (10%) were diabetic. Among them 24 patients had COPD and 15 patients had asthma. There were no statistical significant difference was noted between COPD and asthma group in relation to diabetes (p value 0.945). Asthma and diabetes are frequent and complex diseases whose prevalence is increasing, particularly among young people. There are also studies that demonstrate the association between the decline of lung function and glucose levels or with the diagnosis of diabetes by itself. These studies demonstrate an inferior lung function among diabetic patients in comparison to non-diabetic patients.^{25,26} Similar pattern is noticed in case of COPD patients and a study showed the prevalence of diabetes mellitus in COPD patients with severe and very severe stage was 21%. In the very severe group were recorded significantly higher average values of glycaemia compared with severe group (7.67 ± 3.7 vs. 5.62 ± 0.9 , $p=0.018$).²⁷

Furthermore, status of serum sodium concentration and serum potassium concentration were analyzed in COPD group in relation to presence or absence of diabetes. But it was found that, no statistically significant difference was present in this study ($p^{\text{Na}}=0.97 > .05$ and $p^{\text{K}}=0.64 > .05$) in between group analysis. Similarly, Status of serum sodium concentration was analyzed in Asthma group in relation to presence or absence of diabetes and statistically significant difference was noted ($p^{\text{Na}}=0.037$ & $p^{\text{K}}=.06$). This means that presence of diabetes was associated with significantly higher amount of hyponatremic patients than expected in Asthma patients.

It is known to all that, Diabetic patients frequently develop a constellation of electrolyte disorders. These disturbances are particularly common in decompensated diabetics, especially in the context of diabetic ketoacidosis or nonketotic hyperglycemic hyperosmolar syndrome. These patients are markedly potassium-, magnesium- and phosphate-depleted. Diabetes mellitus (DM) is also linked to both hypo- and hypernatremia reflecting the coexistence of hyperglycemia-related mechanisms, which tend to change serum sodium to

opposite directions. Moreover, change in potassium homeostasis occurs in Impaired renal function, potassium-sparing drugs, hypertonicity and due to insulin deficiency.²⁸ Individual association is established between DM with asthma and COPD.^{25,26,27} But no study was found hyponatraemia is associated with exacerbation of COPD and Asthma in relation to DM, which made a scope of further research and to conclude the findings.

Conclusion

The present study found that hyponatraemia and hypokalaemia are associated with exacerbation of COPD and asthma patients. Hyponatraemia is more prevalent in COPD patients than asthma patients. But presence of diabetes in asthma patients found significant hyponatraemia. As electrolytes are predictor of outcome of critically ill patients, prompt identification and immediate management could alleviate the sufferings of the patients.

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