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Original Research Article

Study of Inflammatory Biomarkers in COPD and Asthma in Telangana Patients

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Conflict of interest: Nil

Abstract:

Background: COPD and asthma are obstructive ventilators for respiratory passage. These are life-threatening if not diagnosed and treated earlier; hence, inflammatory biomarkers can be a tool for therapeutics in such diseases.

Methods: Out of sixty, 40 (forty) patients with COPD and 20 with asthma were studied. Various inflammatory biomarkers were studied during admission and at the 6th week of resolutions; moreover, spirometric values (FEV1 O2 FEV1, 6W100, MRC breathless less scale) were also evaluated in both COPD and asthma patients.

Results: FEV1 6W100 had a significant p value ($p<0.001$). In COPD asthma patients, leptin ng/mL CRP resistin, L/A ratio, and RP (mg/dl) had highly significant p values ($p<0.001$).

Conclusion: It is concluded that inflammatory biomarkers like leptin, resistin, and CRP are significant biomarkers in both COPD and asthma. Different or variations in the values of TNF-a can be easily distinguished between COPD and asthma patients.

Keywords: biomarkers, chronic obstructive pulmonary disease (COPD), asthma, cytokines, Telangana.

Introduction

COPD and asthma affect more than 600 million individuals globally, although COPD and asthma are heterogeneous and complex diseases that share similarities concerning symptoms, inflammation, and airflow limitation [1]. COPD and bronchial asthma are characterized by obstructive ventilator pathophysiology [1].

Intense chronic airway inflammation is a distinctive feature of both diseases. Acute exacerbation of chronic obstructive pulmonary disease is the sudden worsening of symptoms of COPD like shortness of breath and increased quantity and color of sputum and has a significant impact on survival. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) and Global Initiative for Asthma (GINA) guidelines define exacerbations strictly on a clinical basis [2]. Inflammatory, precise aetiological diagnoses are urgently needed.

Adipokines, including adiponection, resistin, and leptin, are adipocyte-derived cytokines associated with systemic inflammatory activities and nutritional status [3]. Dysregulation of adipokines could affect COPD and asthma patients. Moreover, elevated C-reactive protein (CPP) levels have been shown to be associated with higher mortality in COPD patients. Increased cytokines such as TNF-a and II-6 have been linked to COPD and asthma. Hence, an attempt was made to evaluate various biomarkers in COPD and asthma during admission and the 6th week of resolutions after stabilization to find out potential diagnostic biomarkers for asthma and COPD patients.

Material and Method

40 (forty) COPD and 20 (twenty) adult patients aged between 25 to 65 years regularly visited the Respiratory Medicine Department at the MediCiti Institute of Medical Sciences in Ghanpur village, Medchal Mandal, Medchal Malkajgiri (dist), 501401 Telangana State, Hyderabad, were studied.

Inclusive Criteria

The patients clinically confirmed as having COPD and asthma, diagnosed on the basis of GOLD guidelines and GINA, respectively, and given written consent for treatment were selected for study.

Exclusion Criteria

Patients who had significant comorbidities, including pulmonary tuberculosis or other lung diseases apart from COPD and asthma, congestive cardiac failure (CF), ischemic heart diseases, renal or liver impairment or failure, diabetes mellitus, malignancy at the nay site, collagen vascular diseases, patients admitted to theintensive care unit (ICU), and other respiratory tract infections who were already on the treatment of corticosteroids, were excluded from the study.

Method

Every patient was subject to detailed history and clinical examination and relevant investigations, including a CBC and kidney function test. Liver function tests, CRP II-6, II-8, and TNF-a were studied before admission and 6 weeks after resolution (cessation of illness). 3 ml (Three milliliters) of venous blood were collected within the first 24 hours of admission and six weeks after resolution. Serum and plasma were obtained, dispensed in 0.5-ml aliquots, and stored at 80oc until used. Moreover, a pulmonary function test was carried out to determine the forced expiratory volume in seconds (FEV), forced vital capacity (FVC), and FEV/FVC ratio were studied. The duration of the study was from June 2020 to May 2023.

Statistical Analysis

The various parameters of COPD and asthma during admission and after the 6th week of resolution were compared with the t test. The statistical analysiswas carried out in SPSS software. The ratio of males and females was 2:1.

Observation and Results

Table 1: Study of demographic characteristics of COPD and Asthma

Characteristics	COPD (N=40)	Asthma (N=20)	t test	p value
Smokers/Ex-Smo Kers	28 / 12	9 /11		
Pack years	62.45	11.19	8.97	P<0.001
	(± 32.77)	(± 10.72)		
Days	6.25	6.26	-0.01	p>0.98
	(± 2.05)	(± 2.40)		
BMI	26.92	28.41	1.0	p>0.32
	(± 5.20)	(± 5.50)		
MRC	2.50	1.04	6.57	P<0.001
Breathlessness	(± 0.92)	(± 0.78		
Scale				
FEV1 O2 100	48.79	84.28	9.32	P<0.001
	(± 14.18)	(± 13.72)		
FEV1 6W 100	55.32	85.07	7.42	P<0.001
	(± 16.64)	(± 13.50)		

Days from exacerbation to resolution are given. BMI = Body mass Index, FEV1 =Forced expiratory volume in the first second, FEV1 O2 100, FEV1 Measured at resolution. FEV1 6W100 – FEV1 measured at 6 weeks after resolution MRC – Medical research council.

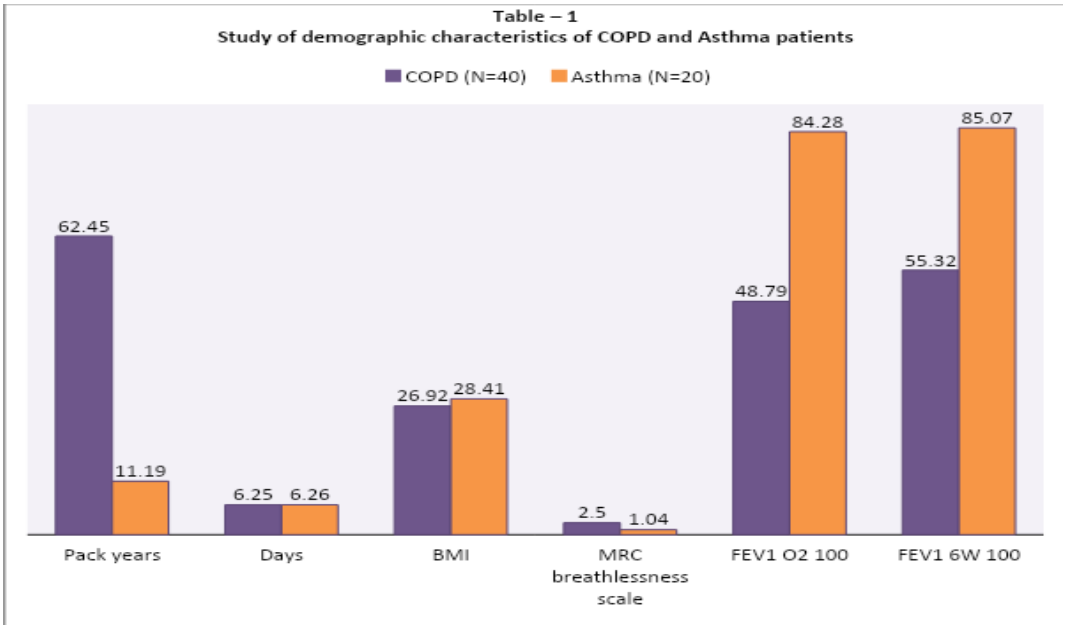

Figure 1: Study of demographic characteristics of COPD and Asthma patients

- Smokers were 28 and 12 were Ex-smokers in COPD, 9 smokers, 11 Ex-smokers in Asthma.
- Pack years – 62.45 (± 32.7) in COPD, 11.19 (± 10.72) in asthma, t test was 8.97 and p<0.001 (p value was highly significant)
- Days – 6.25 (± 2.05) in COPD, 6.26 (± 2.40) in asthma, t test was 0.01 andp>0.98
- MI – 26.92 (± 5.20) in COPD, 28.41 (± 5.50) in asthma, t test was 1.0 andp>0.32.
- MRC breathiness scale – 2.50 (±0.92) in COPD, 1.04 (± 0.75) in asthma patients, t test was 6.57 and p<0.001 (p value was highly significant).
- FEV1 O2100 – 48.79 (± 14.8) in COPD, 84.28 (± 13.72) in asthma patients, t testwas 9.34 and p<0.001 (p value was highly significant).
- FEV1 6W100 – 55.32 (± 16.64) in COPD patients, 85.57 (± 13.05) in asthmapatients, t test was 7.42 and p<0.001 (p value was highly significant).

Table 2: Comparative study of levels of leptin, adiponectin, resistin and CRP in COPD in patients during admission and 6th weeks of resolution

Parameter	During admission	6 weeks after resolution (cessation of Illness)	t test	p value
Leptin (ng)	32.04	24.52	2.20	P<0.03
	(± 15.3)	(± 10.72)		
Resistin	18.21	9.68	3.63	P<0.001
(ng/ml)	(± 14.10)	(± 3.08)		
Adiponectin	0.78	0.73	0.31	p>0.7
µg/ml	(± 0.60)	(± 0.58)		
L/A Ratio	0.06	0.03	7.74	P<0.001
	(± 0.04)	(± 0.01)		
Rp (mg/dl)	2.42	0.22	39.3	P<0.001
	(± 0.30)	(± 0.08)		
I2-6 (pg/ml)	14.44	16.14	0.54	p>0.58
	(± 12.60)	(± 10.7)		
IL 8 (pg/ml)	34.60	37.52	0.72	p>0.47
	(±14.2)	(± 15.1)		
IL-18 (pg/ml)	348	419	1.13	p>0.26
	(± 210)	(± 238)		
TNFα (pg/ml)	75.18	103.18	1.91	p>0.07
	(± 32.38)	(± 62.58)		

- Leptin (ng) – 32.04 (± 15.3) during admission, 24.52 (± 10.72) in the 6th week of resolution, t test was 2.20 and p<0.03.
- Resistin (ng/ml) – 18.21 (± 14.19) during admission, 9.68 (± 3.08) at 6th weekof resolution, t test was 3.63 and p<0.01 (p value is highly significant).
- Adiponectin (µg/ml) – 0.78 (± 0.60) during admission, 0.73 (± 0.58) at 6th weekof resolution, t test was 0.31 and p>0.7.
- L/A ratio – 0.06 (± 0.02) during admission, 0.03 (± 0.01) at 6th week of resolution, t test was 7.74 and p<0.001 (p value is highly significant).
- CRP (mg/dl) – 2.42 (± 0.30) during admission, 0.22 (± 0.08) at 6th week of resolution, t test was 39.3 and p<0.001 (p value is highly significant).
- IL 6 (pg/ml) – 14.44 (± 12.60) during admission, 16.14 (± 10.7) at 6th week of resolution, t test was 0.54 and p>0.58.
- IL 8 (pg/ml) – 34.60 (± 14.2) during admission, 37.52 (± 15.1) at 6th week of resolution, t test was 0.72 and p>0.47.
- IL 18 (pg/ml) – 348 (± 210) during admission, 419 (± 238) at 6th week of resolution, t test was 1.13 and p>0.26.
- TNF-α (pg/ml) – 75.18 (± 32.30) during admission, 103.18 (± 62.18) at 6th week of resolution, t test was 1.9 and p>0.07.

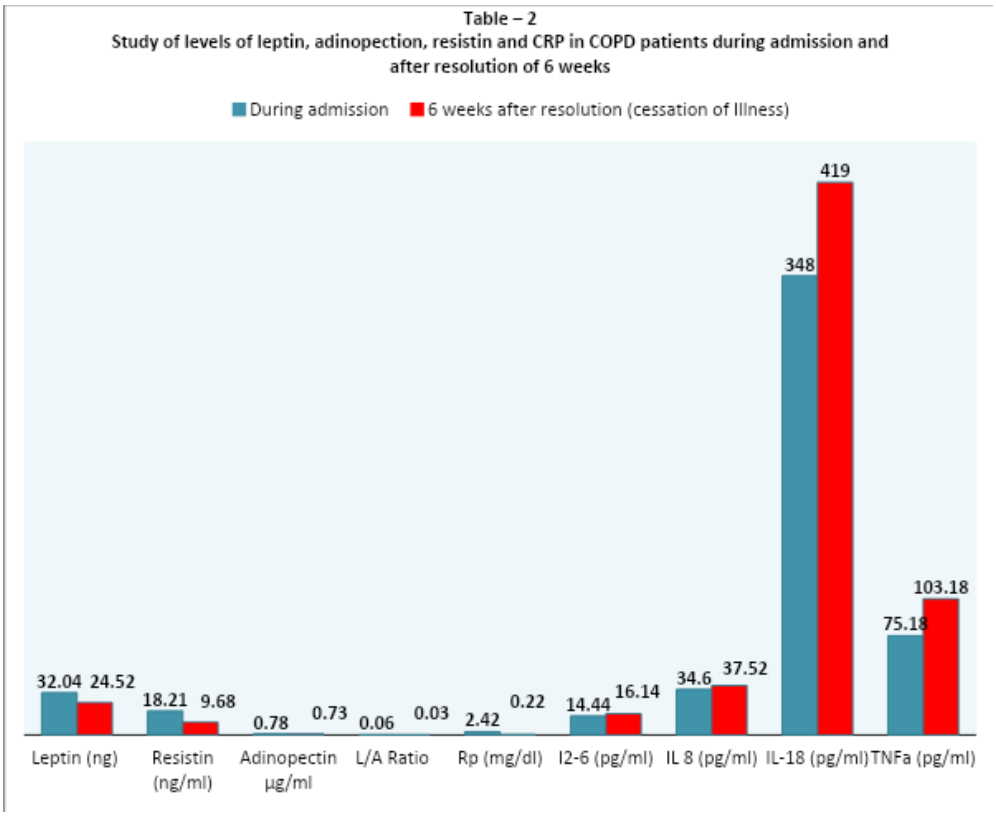

Figure 2: Study of levels of leptin, adiponectin, resistin and CRP in COPD patients during admission and after resolution of 6 weeks

Table 3: Comparative study parameters of during admission and at 6th week of resolution asthma patients

Parameter	During admission	6 weeks after resolution	t test	p value
Leptin ng/ml	49-40	33.05	2.36	P<0.02
	(± 36.8)	(± 16.6)		
Resistin ng/ml)	15.92	6.98	4.62	9<0.001
	(± 11.30)	(± 3.28)		
Adiponectin	0.78	0.81	0.18	p>0.85
(µg/ml)	(± 0.62)	(± 0.65)		
LA/ratio	0.07	0.03	5.16	P<0.001
	(± 0.04)	(± 0.02)		
CRP (mg/dl)	1.62	0.35	11.2	P<0.001
	(± 0.70)	(± 0.11)		
I2 6 (pg/ml)	15.88	17.70	0.4	p>0.65
	(± 14.12)	(± 13.89)		
I2 8 (pg/ml)	20.00	46.02	9.2	P<0.001
	(± 8.7)	(± 11.02)		
I2 18 (pg/ml)	236	291	0.98	p>0.33
	(± 140)	(± 230)		
TNF-α (pg/ml)	54.78	63.80	0.78	p>0.44
	(± 43.2)	(± 41.68)		

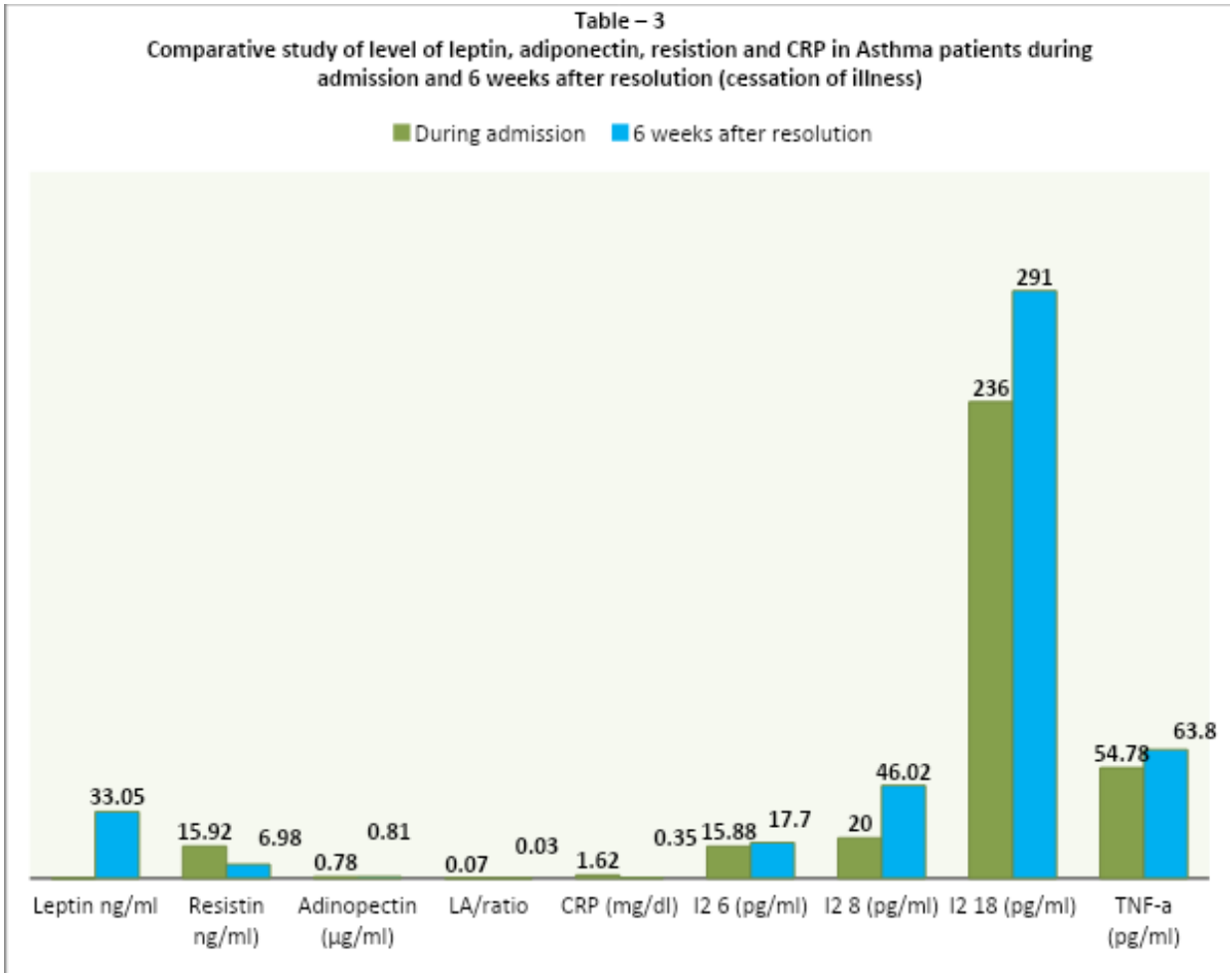

Figure 3: Comparative study of level of leptin, adiponectin, resistion and CRP in Asthma patients during admission and 6 weeks after resolution (cessation of illness).

- Leptin (ng/ml) – 49.40 (± 36.8) during admission, 33.05 (± 16.6) at 6th week of
- resolution, t test was 2.36 and p<0.02 (p value is highly significant)
- Resistin (ng/ml) – 15.92 (± 11.30) during admission, 6.98 (± 3.28) at 6th week of resolution, t test was 4.62 and p<0.001 (p value is highly significant).
- Adiponectin (µm/ml) – 078 (± 0.62) during admission, 0.81 (± 0.65) at 6th week of resolution, t test was 018 and p > 0.85.
- LA ratio – 0.07 (± 0.04) during admission, 0.03 (± 0.02) at 6th week of resolution, t test was 5.16 and p < 0.001 (p value is highly significant).
- CRP (mg/dl) – 1.62 (± 0.70) during admission, 0.35 (± 0.11) at 6th week of resolution, t test was 11.2 and p < 0.001 (p value is highly significant).
- IL 6 (pg/ml) – 15.88 (± 14.12) during admission, 17.70 (± 13.89) at 6th week of resolution, t test was 0.4 and p > 0.6.
- IL 8 (pg/ml) – 20.00 (± 8.7) during admission, 46.02 (± 11.02) at 6th week of resolution, t test was 9.2 and p < 0.001.
- IL 18 (pg/ml) – 236 (± 140) during admission, 291 (± 230) at 6th week of resolution, t test was 6.98 and p > 0.33.
- TNF-α (pg/ml) – 54.78 (± 43.2) during admission, 63.80 (± 41.68) at 6th week of resolution, t test was 0.78 and p > 0.44.

Discussion

Present study of inflammatory biomarkers in COPD and asthma in Telangana patients in the demographic characteristics of COPD-asthma patients, 28 were smokers, 12 were ex-smokers in COPD, 6 were smokers, and 11 were ex-smokers in asthma. MRC breathlessness scale 2.50 (± 0.92) in COPD and 1.04 (± 0.75) in asthma, t test 6.57 and (p<0.001). FEV1 O2 100 – 48.79 (± 14.8) in COPD, 84.28 (± 13.7) in asthma, t test was 9.34 and p<0.001, FEV1 6W100 – 55.32 (± 16.6) in COPD, 85.07 (± 13.5) in asthma, t test was 7.42 and p<0.001 (Table-1).

In a comparative study, levels of cytokines in COPD patients during admission and at the 6th week of resolution, Leptin (ng) – 32.04 (± 15.3)

during admission, 24.52 (± 10.72) in the 6th week of resolution; ttest: 2.20 and p<0.03, Resiston (ng/ml): 18.21 (± 14.19) during admission, 9.68 (± 3.08) at the 6th week of resolution; t test: 3.63 and p<0.01 (p value is highly significant). Adinopectin (µg/ml) – 0.78 (± 0.60) during admission, 0.73 (± 0.58) at 6th week of resolution, t test was 0.31 and p>0.7. L/A ratio – 0.06 (± 0.02) during admission, 0.03 (± 0.01) at 6th week of resolution, t-test was 7.74 and p<0.001 (p value is highly significant).

CRP (mg/dl): 2.42 (± 0.30) during admission, 0.22 (± 0.08) at 6th week of resolution; t test: 39.3 and p<0.001 (p value is highly significant). IL 6 (pg/ml) – 14.44 (± 12.60) during admission, 16.14 (± 10.7) at 6th week of resolution, t test was 0.54 and p>0.58 IL 8 (pg/ml) – 34.60 (± 14.2) during admission, 37.52 (± 15.1) at 6th week of resolution, t test was 0.72 and p>0.47. IL 18 (pg/ml) – 348 (± 210) during admission, 419 (± 238) at 6th week of resolution, t test was 1.13 and p>0.26. TNF-a (pg/ml) – 75.18 (± 32.30) during admission, 103.18 (± 62.18) at 6th week of resolution, t test was 1.9 and p>0.07 (Table-2).

Comparative study of level of cytokines in asthma and during admission and at 6th week of resolution – Leptin (ng/ml) – 49.40 (± 36.8) during admission, 33.05 (± 16.6) at 6th week of resolution, t test was 2.36 and p<0.02 (p value is highly significant). Resistin (ng/ml) – 15.92 (± 11.30) during admission, 6.98 (± 3.28) at 6th week of resolution, t test was 4.62 and p<0.001 (p value is highly significant). Adinopectin (µm/ml) – 078 (± 0.62) during admission, 0.81 (± 0.65) at 6th week of resolution, t test was 018 and p>0.85. LA ratio – 0.07 (± 0.04) during admission, (± 0.02) at 6th week of resolution, t test was 5.16 and p<0.001 (pvalue is highly significant). CRP (mg/dl) – 1.62 (± 0.70) during admission, 0.35 (± 0.11) at 6th week of resolution, t test was 11.2 and p<0.001 (p value is highly significant). IL6 (pg/ml) – 15.88 (± 14.12) during admission, 17.70 (± 13.89) at 6th week ofresolution, t test was 0.4 and p>0.63. IL 8 (pg/ml) – 20.00 (± 8.7) during admission,

(± 11.02) at 6th week of resolution, t test was 9.2 and p<0.001. IL 18 (pg/ml) – 236 (± 140) during admission, 291 (± 230) at 6th week of resolution, t test was 6.98 and p>0.33. TNF-a (pg/ml) – 54.78 (± 43.2) during admission, 63.80 (± 41.68) at 6th week of resolution, t test was 0.78 and p>0.44 (Table-3). These findings are more or less in agreement with previous studies (5, 6, 7].

COPD and asthma are slowly progressive diseases induced primarily by smoking, tobacco, air pollution, poor nutrition, professional risk of work, and genetic factors that may have dominated. The exact pathophysiology of asthma is not completely understood. In the interest of improving the diagnosis of COPD and asthma, several types of biomarkers have been measured that are related to disease pathophysiology and the inflammatory and distinctive processes of the lung. CRP is an acute-phase protein synthesized predominantly by hepatocytes in response to tissue damage or inflammation. It has been accepted that levels of CRP relate to the presence of airflow obstruction. Evaluated CRP has been known to be used as a surrogate marker of systemic inflammation in diverse conditions. The elevated difference in the CRP level confirms that the CRP level is an ideal inflammatory biomarker [8, 9].

Leptin and resistin are hormones produced by the adipose tissue; both are strongly associated with obesity, diabetes, atherosclerosis, coronary heart disease, and inflammatory diseases [10]. Elevations of these hormones indicate that apart from inflammation disease, there may be involvement of coronary heart or atherosclerosis with COPD and asthma [11]. In the present study, there is no difference or significant value between Il-6, 8, 18, and TNF-a, although they are inflammatory biomarkers. The treatment of COPD and asthma is no longer focused exclusively on inhaled therapy but is taking a multidimensional approach. It is reported that statins possess pleotrophic conventional cholesterol-towering properties, including anti-inflammatory, antioxidant, anti-thrombogenic, and vascular function-restoring actions [12]. Hence, COPD and asthmatic patients have a multi-dimensional approach.

Summary and Conclusion

Asthma and COPD compose a great burden for public health worldwide, and the need for early diagnosis and intervention is still of great importance. In the present study, leptin and the resistance hormone COPD proved ideal inflammatory biomarkers. Though several phenotypes and endotypes are reported in the literature, the main biomarkers IL- 6, 8, 18, and TNF-a were stable in the present study. Hence, such clinical trials must be conducted in a large number of patients where the latest technologies are available to confirm the present significant results because the exact pathogenesis of asthma and COPD is unclear.

Limitation of study

Owing to tertiary location of research centre, small number of patients and lack of latest technologies, we have limited findings and results.

- This resent study was approved by Ethical committee of MediCiti Institute of Medical Sciences Ghanpur Village, Medchal Mandal, Medchal Malkajgiri (Dist), 501401 Telangana state, Hyderabad.
- No conflict of Interest
- Self-funding

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