

**A STUDY OF OXIDANTS-ANTIOXIDANTS BALANCE IN ASTHMATIC PATIENTS**Lokendra Dave<sup>1</sup>, Tripti Saxena<sup>2</sup>, Swati Pathak<sup>3</sup>, Nishant Shrivastava<sup>4</sup>, A. K. Mathur<sup>5</sup>**HOW TO CITE THIS ARTICLE:**

Lokendra Dave, Tripti Saxena, Swati Pathak, Nishant Shrivastava, A. K. Mathur. "A Study of Oxidants-Antioxidants Balance in Asthmatic Patients". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 23, June 09; Page: 6282-6286, DOI: 10.14260/jemds/2014/2736

**ABSTRACT:** This study was done to observe the serum/plasma oxidant-antioxidant status among asthmatic patients. Plasma MDA (Malon-di-aldehyde), an oxidant and Serum SOD (superoxide dismutase), an antioxidant, were assayed among asthmatic patients and their mean values were compared with healthy volunteer controls. Values were also observed in different age groups. The difference in mean pMDA level was found statistically significantly among cases and control, higher among asthmatic patients. Likewise, s-SOD level was significantly reduced among asthmatic patients. Clearly, there was an imbalance between oxidants and antioxidants levels among asthmatic patients and this consideration may be helpful in proper planning of basket of anti-asthma interventions. Future studies are recommended.

**KEYWORDS:** Oxidative stress, Bronchial asthma.

**INTRODUCTION:** An imbalance between oxidants and antioxidants, in favour of the oxidants, potentially leading to damage at cellular level, is termed as "oxidative stress". Oxidants are formed as a normal product of aerobic metabolism but can be produced more, under various pathophysiological conditions. Oxidative stress is increased in asthmatic airways and this may contribute to its pathogenesis. Free radical injury specially lipid peroxidation is believed to contribute to pathophysiology of asthma.<sup>(1)</sup> Free Radicals due to their unstable and transient nature are difficult to measure directly. Their tendency to cause lipid peroxidation has been correlated and used as indirect measure. Malon-di-aldehyde (MDA) is a widely used marker of lipid peroxidation.<sup>(2,3)</sup>

The formation of lipid peroxidation products is normally prevented or scavenged by enzymatic and non-enzymatic antioxidants. These include Vitamin E, vit A and vit C, as well as enzymes glutathione peroxidase, glutathione reductase, superoxide dismutase (SOD) and catalase. SOD and Catalase prevent formation of cytotoxic hydroxyl radicals and protect against harmful effect of superoxide free radicals. The loss of SOD activity likely reflects increased oxidative stress in asthmatic airways and indirectly, serum SOD may serve as a marker of asthma severity.<sup>(2,3)</sup>

This study was planned to understand and confirm the induced biochemical changes influencing oxidant-antioxidant balance in asthmatic patients. The objective of the study was to determine lipid peroxidation (plasma malon-di-aldehyde) and antioxidant enzymes (serum superoxide-dismutase) level in asthmatic patients as compared to healthy individuals.

**METHODOLOGY:** This study has been conducted in Department of Chest-TB and Department of medical biochemistry, Gandhi Medical College, Bhopal. After clearance and permission of institutional ethical committee, Fifty confirmed adult cases of mild to moderate acute bronchial asthma were selected randomly as study subjects-cases and 50 healthy volunteers were selected from staff members and visitors in hospital. Purpose of study and methodology was explained and informed

## ORIGINAL ARTICLE

consent was obtained from all of them. Smokers and the patients having other cardio-respiratory disorders as well as diabetes were excluded from study groups.

Blood sample was obtained aseptically and processed. Plasma was separated for the estimation of MDA by thiobarbiturate (manual) method described by Jean CD et al. Serum was separated for SOD assay from manual method as per description of Mishra HP et al. The mean values of both these along with relation to different age and sex groups was statistically observed and compared.

**OBSERVATIONS AND RESULTS:** The present study comprised of 50 normal healthy control (M:F=1.7:1) and 50 patients (M:F=1.9:1) with confirm diagnosis of mild to moderate acute bronchial asthma. The age of all study subjects ranged between 18-65 years in both the groups. Table 1 and 2 show that there is significant difference observed among case v/s control in both the parameters (pMDA and s-SOD) and the same trend is seen when age wise and sex wise comparison was done among cases and control.

In the age group 18-29, 30-39, 40-49 and >50, the mean values of pMDA found was 4.64±0.78nm/ml, 4.78±0.68nm/ml, 5.17±0.86nm/ml and 5.42±0.86nm/ml respectively. When compared between cases of different age groups, highly significant variation was found between all age groups (p<0.001), as also seen in table 3. Also, statistically significant (p<0.05) difference was observed when mean value of pMDA in younger age group (18-29) was compared with older (>50 years).

Likewise, the mean value of S-SOD in patients of all these age groups were 9.13±0.43, 9.32±0.52, 9.23±0.52 and 9.22±0.48 U/mg Protein/ml, respectively. Statistically highly significant variation (p<0.001) was observed between cases and control in all the age groups (Table 3).

Parameter	Control gp	cases	t- value	p-value	significance
	N=50	N=50			
pMDA nm/ml	2.99±0.46	4.98±0.84	14.808	<0.001	HS
s-SOD U/mg Protein/ml	13.69±1.53	9.22±0.47	19.723	<0.001	HS

**Table 1: Mean levels of oxidant-antioxidant among cases and control**

Parameter	sex	Control gp	cases	t-value	p-value
pMDA	M	3.02±0.48	5.06±0.81	10.635	<0.001HS
	F	2.97±0.45	4.92±0.87	10.055	<0.001HS
s-SOD	M	13.94±1.39	9.15±0.39	15.89	<0.001HS
	F	13.53±1.65	9.27±0.53	12.697	<0.001HS

**Table 2: Sex-wise mean values of these parameters and their comparison**

## ORIGINAL ARTICLE

Age group (in years)	parameter	Case v/s control: t-value	Case v/s control: p-value	Inference	
18-29	p-MDA	7.298	<0.001	HS	
	s-SOD	13.216	<0.001	HS	
30-39	p-MDA	7.795	<0.001	HS	
	s-SOD	8.323	<0.001	HS	*Highest mean value among cases
40-49	p-MDA	7.265	<0.001	HS	
	s-SOD	11.761	<0.001	HS	
>50	p-MDA	7.922	<0.001	HS	*Highest mean value among cases
	s-SOD	10.881	<0.001	HS	

**Table 3: Age-group-wise comparison in mean values of these parameters**

**DISCUSSION:** Lipid peroxidation due to free radicals generated in the body was reflected by determining the concentration of pMDA. In control group, pMDA was found in range from 2.30 to 3.75 nm/ml with a mean value of  $2.99 \pm 0.46$  nm/ml. Among cases, it ranged from 3.94 to 6.32 nm/ml with a mean value of  $4.98 \pm 0.84$  nm/ml. The difference was found to be significant ( $p < 0.001$ ) when cases were compared with control. This shows oxidative stress among asthmatic patients.

Serum- SOD, which protects the cells by dismutating superoxide radicals among controls, it was found in range between  $11.68 \pm 16.32$  U/mg Protein/ml with a mean value of  $13.69 \pm 1.53$  U/mg Protein/ml. Among cases, it ranged between  $8.56 \pm 9.98$  U/mg Protein/ml with a mean value of  $9.22 \pm 0.47$  U/mg Protein/ml. This difference was also highly significant ( $p < 0.001$ ) and suggest decreased antioxidant levels in asthmatics.

Previous studies also observed the same fact and concluded that oxidative stress remains increased among asthmatics with low levels of antioxidant activity.<sup>(4-13)</sup>

Both p-MDA and S-SOD levels were found to vary in different age groups, there was statistically significant difference observed among cases and control in all age groups. There was no significant difference observed between both sexes among cases and controls. MDA level was found to increase with age, but this was not statistically significant except when the mean values for more than 50 years was compared to that of less than 30 years age group. P-MDA was found highest in the age group 50 and above. This shows that oxidative stress increases with advanced age. Mean S-SOD was found to be highest in the age group 30-39 yrs, however, SOD activity was not significantly different among different age groups ( $p > 0.05$ ).

Thus, it can be proposed to maintain balance between oxidants-antioxidants among asthmatic patients through therapeutic intervention for their healthy living. Whether Intervening through antioxidants could be a therapeutic option for asthmatic patients, further research is advocated!

**CONCLUSION:** The finding of raised level of oxidants and simultaneously decreased level of antioxidants suggests the presence of excessive oxidative stress in asthmatic airways. Probably, controlling this phenomenon, at appropriate time may be critical for effective control of bronchial asthma. However, further studies are needed on this subject.

**REFERENCES:**

1. Wood LG, Gibson GP, Garg LM. Biomarkers of lipid peroxidation, airway inflammation and asthma. *Eur Respir J* 2003; 21: 177-186.
2. Moore K, Roberts LJ. "Measurement of lipid peroxidation". *Free Radic Res* 28 (6):659-71.
3. Sharma Anita, Bansal Satish, Nagpal R K. Lipid peroxidation in bronchial asthma. *Ind J Pediatric* 2003; 70: 715-717.
4. Reena Kaur, Rooprai. Plasma oxidant-antioxidant status in asthma and its correlation with pulmonary function test. *Indian J physiol Pharmacol* 2011; 55(3): 281-287.
5. N omer Al-abdulla, Naama LM, Hassan M K. Antioxidant status in acute asthmatic attack in children. *JPMA* 2010; 60:1023
6. Nouf O, Al Afaleg, Abdul Rehman Al-senidey et al. Oxidative stress and antioxidants status in Saudi asthmatic patients. *J Clin Biochem* 2011; 01:16.
7. C Sackesen, H Ercan, E Dizdar et al. A comprehensive evaluation of the enzymatic and non-enzymatic antioxidants system in childhood asthma. *J of Allergy Clin Immunology* 2008; 122:78-85.
8. Raghunath R, Madhvi S Phadke. Plasma oxidants- antioxidants status in different respiratory disorders. *Indian Journal of Clinical Biochemistry* 2006; 21(2): 161-164.
9. Ram Suresh, Awasthi Shally et al. Assesment of association of exposure to polycyclic aromatic hydrocarbons with bronchial asthma and oxidative stress in children: A case control study. *Indian Journal of Occupation and environmental medicine- april2009- vol 13 (1)*.
10. Ahmad A, Shameem M, Hussain Q. Relation of oxidant-antioxidant imbalance with disease progression in patients with asthma. *Ann Thorac Med* 2012oct-dec;7(4):226-232.
11. Smith LJ, Shamsuddin M et al. Reduced superoxide dismutase in lung cells of patients with asthma. *Free Radic Biol Med* 1997; 22 : 1301-7.
12. Comhair SAA, Ricci KS, Arroliga M et al. Correlation of Systemic Superoxide Dismutase deficiency to airflow obstruction in asthma. *Am J Resp Crit Care Med*. 2005 ; 172 : 306-313.
13. Judith C, W Mak et al. Systemic oxidative and antioxidative status in Chinese patients with asthma. *J Allegy Clin Immunol* 2004; 114:260-264.

**AUTHORS:**

1. Lokendra Dave
2. Tripti Saxena
3. Swati Pathak
4. Nishant Shrivastava
5. A. K. Mathur

**PARTICULARS OF CONTRIBUTORS:**

1. Associate Professor, Department of Chest and TB, Gandhi Medical College, Bhopal.
2. Associate Professor, Department of Medical Bio-Chemistry, Gandhi Medical College, Bhopal.
3. Post Graduate Student, Department of Medical Bio-chemistry, Gandhi Medical College, Bhopal.
4. Assistant Professor, Department of Chest and TB, Gandhi Medical College, Bhopal.

5. Professor, Department of Medical Bio-chemistry, Gandhi Medical College, Bhopal.

**NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. Lokendra Dave,  
Associate Professor and HOD,  
Department of Chest and TB,  
GMC & HH, Bhopal.  
Email: drlokendradave@yahoo.com

Date of Submission: 22/05/2014.  
Date of Peer Review: 23/05/2014.  
Date of Acceptance: 28/05/2014.  
Date of Publishing: 03/06/2014.