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A STUDY ON INHALATION OF HYDROGEN GAS WHICH REDUCES OXIDATIVE STRESS IN ASTHMATIC PATIENTS

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Abstract:
Aims and objectives: *The basic aim of the study is to measure the level of antioxidants in because inhalation of hydrogen gas which reduces oxidative stress in asthmatic patients.* ***Methodology of the study:*** *This cross sectional study was conducted in Rural Health Center Nia Lahore, District Toba Tek Singh during January 2019 to August 2019. All the data was collected according to the rules and regulations of authority. The data was collected from both genders which suffer from asthma. The blood was drawn from all patients for further analysis of antioxidants.* ***Results:*** *Mean values of investigated parameters and differences in the values between, before and after inhalation of hydrogen gas. The values are expressed in terms of mean± SD. According to the analysis, the level of SOD, MDA and GSH increase as compared to normal level. But the level of catalases decreased with the value of 0.43±0.39.* ***Conclusion:*** *It is concluded that inhalation of hydrogen gas can imbalance the level of antioxidants in the blood in asthmatic patients. More clinical trials are needed to prove the clinical safety of its use and the protective effects of hydrogen gas at the bedside.*

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INTRODUCTION:

Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning[1]. Asthma is a common chronic respiratory disease with increased prevalence, resulting in a heavy burden on public health worldwide. This challenging disease characterized by persistent airway inflammation cannot be cured. Although many efforts have been made to increase the therapeutic effect. Oxidative stress plays an important role in the pathogenesis of this chronic disorder. Inflammation induces lung oxidative stress reaction and leads to a large number of reactive oxygen species. The effect of reactive oxygen species on the pathogenesis of asthma is to stimulate pulmonary function impairment, mast cell degranulation, and airway remodeling and mucus secretion by epithelium, all of which in turn can aggravate the local inflammation of the lung[2].

Hydrogen is considered an inert gas and has been used in medical applications to prevent decompression sickness in deep divers. It was reported in 2007 that hydrogen delivered via inhalation has authentic antioxidant and anti-apoptotic properties that can protect the brain against ischaemia/reperfusion injury by selectively neutralizing hydroxyl radicals. This report aroused considerable interest worldwide. The therapeutic effects of molecular hydrogen on various diseases have been investigated regarding its antioxidation capability and its anti-inflammation and anti-apoptosis capabilities[4]. Compared with traditional antioxidants, hydrogen is a small molecule that can easily dissipate throughout the body and cells, and it is sufficiently mild that it does not disturb metabolic oxidation-reduction reactions or ROS-mediated cell signaling. ROS are produced endogenously or exogenously. *In vivo*, free radicals are created during normal aerobic respiration, phagocytosis, β-oxidation of fatty acids in peroxisomes and by auto-oxidation of various molecules[5].

In cell, mitochondria constitute the main physiologic source of reactive oxygen species, which are generated during mitochondrial respiration. Superoxide radicals that are formed by side reactions of the mitochondrial electron transport chain or by an NADH-independent enzyme, can be converted to H_2O_2 and further to a powerful oxidant, the hydroxyl radical. Oxidative stress in organisms leads to the oxidation of all major biomolecules, such as DNA, proteins and lipids. Among these targets, the peroxidation of lipids is particularly devastating, because the formation of lipid peroxidation product leads to spread of free radicals[6]. The general process of lipid peroxidation consists mainly of initiation, propagation and termination. Commonly applied method to analyze oxidative stress is to determine lipid peroxidation with the thiobarbituric acid reactive substances[7].

Aims and objectives

The basic aim of the study is to measure the level of antioxidants in because inhalation of hydrogen gas which reduces oxidative stress in asthmatic patients.

METHODOLOGY OF THE STUDY:

This cross sectional study was conducted in Rural Health Center Nia Lahore, District Toba Tek Singh during January 2019 to August 2019. All the data was collected according to the rules and regulations of authority. The data was collected from both genders which suffer from asthma. The blood was drawn from all patients for further analysis of antioxidants. Blood was centrifuged at 4000 rpm for 10 minutes and serum was separated. Blood samples were collected into EDTA tubes. Subsequently, indomethacin and butylate dhydroxy toluene were added into the plasma samples. Blood samples were stored at -80°C**.**

Hydrogen gas administration

The mixed gas consisting of 67% H_2 and 33% O_2 was produced by the AMS-H-01 hydrogen oxygen nebulizer, which was specifically designed to extract the hydrogen and oxygen from water. During each experiment, the concentration of hydrogen gas in the box was monitored by Thermal trace GC ultra-gas chromatography

Statistical Analysis

Statistical analyses (Anova Test and Post Hoc) were performed using the SPSS software program (17.0). All results were expressed as the mean ± standard deviation (SD). P value below 0.05 was considered to be statistically significant.

RESULTS:

Mean values of investigated parameters and differences in the values between, before and after inhalation of hydrogen gas. The values are expressed in terms of mean± SD. According to the analysis, the level of SOD, MDA and GSH increase as compared to normal level. But the level of catalases decreased with

the value of 0.43±0.39. All the data are explained in table 01.

Table 01: Analysis of parameters

No.of Obs	Analysis of blood	Normal µg/mL	After treatment(5min) µg/mL	After treatment(15min) µg/mL	After treatment(60min) µg/mL
01	**SOD**	0.32±0.00	0.39±0.00	0.45±0.19	0.51±0.21
02	**CAT**	4.16 ±0.00	0.43±0.39	0.30±0.24	0.19±0.18
03	**GSH**	1.89 ±0.00	3.23±0.03	4.92±0.57	5.64±0.55
04	**MDA**	2.35±0.00	4.95±0.97	5.13±1.06	6.58±0.00

DISCUSSION:

Asthma is a chronic inflammatory airway disease whose pathogenesis is not completely elucidated[8]. However, the "airway injury from free radicals and oxidant/antioxidant imbalance" theory has aroused widespread attention. Oxidative stress plays an important role in the occurrence and development of bronchial asthma, especially in the acute exacerbation period[9]. Excessive production of oxidative stress has been reported to lead to airway inflammation, lung function decline, mucus overproduction, tissue injury, and remodeling in animal models and human studies. Fatani found that MDA increased in asthmatic patients, especially in the exacerbation periods. The mouse model used in this study presented lung resistance increase, different types of inflammatory cell infiltration dominated by eosinophils, and mucus plug formation. All these are similar to the manifestations observed in the acute asthma attack[9]. We also found oxidative marker elevation and antioxidative enzyme reduction, confirming that oxidative stress exists in this classic asthmatic mouse model. Hydrogen is a colourless and odourless gas composed of the simplest molecule in the world. Molecular hydrogen functions as an antioxidant and anti-inflammatory agent[10].

CONCLUSION:

It is concluded that inhalation of hydrogen gas can imbalance the level of antioxidants in the blood in asthmatic patients. More clinical trials are needed to prove the clinical safety of its use and the protective effects of hydrogen gas at the bedside.

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