CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187
http://doi.org/10.5281/zenodo.4039520

Available online at: http://www.iajps.com *Research Article*

INHALATION OF HYDROGEN GAS WITH RELATION TO OXIDATIVE STRESS IN ASTHMA

Dr Muhammad Furqan Ismat Virk[1], Muhammad Hamza Noon[2], Dr. Qasim Niaz[1]
[1]District Headquarters Hospital, Hafizabad, [2]Rural Health Centre Sukhaki Tehsil Pindi Bhattian District Hafizabad.

Article Received: July 2020 **Accepted:** August 2020 **Published:** September 2020

Abstract:
Introduction: *Oxidative stress is implicated in the pathogenesis and progression of asthma, chronic obstructive respiratory disease (COPD), and cystic fibrosis (CF). Reactive oxygen species are unstable compounds with unpaired electrons, capable of initiating oxidation.*
Aims and objectives: *The basic aim of the study is to measure the level of antioxidants and inhalation of hydrogen gas which relation to oxidative stress in asthma.*
Methodology of the study: *This cross sectional study was conducted at DHQ hospital, Hafizabad during 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 asthma diseases.*

Corresponding author:
Dr. Muhammad Furqan Ismat Virk,
District Headquarters Hospital, Hafizabad.

QR code

Please cite this article in press Muhammad Furqan Ismat Virk et al, ***Inhalation Of Hydrogen Gas With Relation To Oxidative Stress In Asthma.,*** *Indo Am. J. P. Sci, 2020; 07(09).*

INTRODUCTION:

Oxidative stress is implicated in the pathogenesis and progression of asthma, chronic obstructive respiratory disease (COPD), and cystic fibrosis (CF). Reactive oxygen species are unstable compounds with unpaired electrons, capable of initiating oxidation. Several of the inflammatory cells that participate in the inflammatory response, such as macrophages, neutrophils, and eosinophils, release increased amounts of reactive oxygen species exceeding the already reduced tissue antioxidant defenses of patients with asthma and patients with COPD. 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 [2]. 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. Hydrogen is considered an inert gas and has been used in medical applications to prevent decompression sickness in deep divers [3].

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 [4]. 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. The general process of lipid peroxidation consists mainly of initiation, propagation and termination [5]. Commonly applied method to analyze oxidative stress is to determine lipid peroxidation with the thiobarbituric acid reactive substances. Interestingly, ROS may induce carcinogenesis by oxidation of DNA, proteins and lipids [6]. Several studies have reported the elevated levels of lipid peroxidation in human colorectal cancer and gastric cancer tissues. The major aldehyde products of lipid peroxidation are malondialdehyde (MDA) and 4-hydroxynonenal. MDA is mutagenic and thus carcinogenic in mammalian cells [7].

Aims and objectives:

The basic aim of the study is to measure the level of antioxidants and inhalation of hydrogen gas which relation to oxidative stress in asthma.

Methodology of the study:

This cross sectional study was conducted at DHQ hospital, Hafizabad during 2019. 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**.**

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 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:

Oxidative stress plays an important role in the occurrence and development of bronchial asthma, especially in the acute exacerbation period. 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 [8]. Asthma is a chronic inflammatory airway disease whose pathogenesis is not completely elucidated. However, the "airway injury from free radicals and oxidant/antioxidant imbalance" theory has aroused widespread attention. 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 [9]. The routes of hydrogen gas administration in animal models and human clinical studies are roughly classified into three types: inhalation of hydrogen gas, drinking hydrogen dissolved in water and injection of hydrogen dissolved in saline [10].

CONCLUSION:

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

REFERENCES:

1. Gardette B, Delauze HG. Techniques of underwater intervention: means, methods, research and outlook. Bull Acad Natl Med. 1996;180(5):975–983.
2. Ji X, Liu W, Xie K, Liu W, Qu Y, Chao X, Chen T, Zhou J, Fei Z. Beneficial effects of hydrogen gas in a rat model of traumatic brain injury via reducing oxidative stress. Brain Res. 2010;1354:196–205.
3. Kajiya M, Silva MJ, Sato K, Ouhara K, Kawai T. Hydrogen mediates suppression of colon inflammation induced by dextran sodium sulfate. Biochem Biophys Res Commun. 2009;386(1):11–15.
4. Cui J, Chen X, Zhai X, Shi D, Zhang R, Zhi X, Li X, Gu Z, Cao L, Weng W, Zhang J, Wang L, Sun X, Ji F, Hou J, Su J. Inhalation of water electrolysis-derived hydrogen ameliorates cerebral ischemia-reperfusion injury in rats - a possible new hydrogen resource for clinical use. Neuroscience. 2016;335:232–241.
5. Nadeem A, Masood A, Siddiqui N. Oxidant--antioxidant imbalance in asthma: scientific evidence, epidemiological data and possible therapeutic options. Ther Adv Respir Dis. 2008;2(4):215–235.
6. Ben Anes A, Ben Nasr H, Fetoui H, Bchir S, Chahdoura H, Yacoub S, Garrouch A, Benzarti M, Tabka Z, Chahed K. Alteration in systemic markers of oxidative and antioxidative status in Tunisian patients with asthma: relationships with clinical severity and airflow limitation. J Asthma. 2016;53(3):227–237.
7. Kurokawa R, Seo T, Sato B, Hirano S, Sato F. Convenient methods for ingestion of molecular hydrogen: drinking, injection, and inhalation. Med Gas Res. 2015;5:13.
8. Ning Y, Shang Y, Huang H, Zhang J, Dong Y, Xu W, Li Q. Attenuation of cigarette smoke-induced airway mucus production by hydrogen-rich saline in rats. PLoS One. 2013;8(12):e83429.
9. Seys SF, Daenen M, Dilissen E, Van Thienen R, Bullens DM, Hespel P, Dupont LJ. Effects of high

altitude and cold air exposure on airway inflammation in patients with asthma. Thorax. 2013;68(10):906–913.
10. Ahmad A, Shameem M, Husain Q. Relation of oxidant-antioxidant imbalance with disease progression in patients with asthma. Ann Thorac Med. 2012;7(4):226–232.