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Research Article

Evaluation of thyroid profile and oxidative stress and antioxidants parameters in chronic sinusitis

Prabhakar Reddy E^{*1}, Muthukumaraswamy B², Venkataramanan R³, Sai Ravi Kiran B⁴, Mohanalakshmi T⁵

¹Department of Biochemistry and Central Lab Head, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry-605502

²Department of General Medicine, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry-605502

³Department of ENT, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry-605502

⁴Department of Biochemistry, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry-605502

⁵Department of Microbiology, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry-605502

ABSTRACT

Oxidative stress, which is characterized as a misbalance between free radicals and antioxidants in favour of radicals, participates in the pathogenesis of many diseases and their complications. A free radical is a molecule or molecular fragment that contains one or more unpaired electrons in its outer orbit. The study consisted to a total of 80 subjects; 40 patients and 40 controls. 5 ml of random blood sample was collected from each of the cases and controls were studied parameters Thyroid profile (T3, T4, TSH), Vitamin C. Chronic sinusitis is associated with oxidative stress. Thyroid profile in chronic sinusitis patients is normal. Our findings demonstrate that detection of thyroid hormone status in addition to other biochemical variables in the early stage of the disease will help the patient to improve and reduce the morbidity rate.

Keywords: Oxidative stress; Thyroid hormones; Vitamin C; Sinusitis.

INTRODUCTION

Sinusitis is defined as an inflammatory condition of the para nasal sinuses. Chronic sinusitis is defined as an inflammatory process of the sinuses lasting for longer than 12 weeks. Most important cause of chronic sinusitis is a failure of acute infection to resolve (Lanza DC, Kennedy DW.1997). The causative factor for chronic sinusitis may be mixed aerobic and anaerobic bacteria such as *Streptococcus viridians*, *Streptococcus pneumonia*, *Hemophilus influenza* etc (Rolston KV.2001). However, it is now recognized that sinus inflammation can drive from a number of causes. Especially in chronic sinusitis, the role of infection and free radicals in the etiology of sinus inflammation is unclear. Previous studies are an alteration in oxidative stress parameters in most of the chronic disorders. Many studies have shown a decrease in antioxidant levels and increase in oxidative stress parameters (Cheng YK, Hwang GY, et al., 2006. Dagli M, Eryilmaz A, et al., 2004).

Asthma, an allergic disease, airborne allergens such as dust, mold and pollen, which trigger allergic rhinitis, may cause chronic sinusitis. In addition, people who

are allergic to fungi can develop a condition called "allergic fungal sinusitis". Damp weather or pollutants in the air and buildings can also cause sinusitis (Denning DW, O'driscoll BR, et al., 2006). Chronic sinusitis might develop if one has an immune deficiency disease or an abnormality in the way mucus moves through and from your respiratory system (e.g., immune deficiency, HIV infection, and cystic fibrosis), or a severe asthmatic response to aspirin and aspirin-like medicines such as ibuprofen are also causative factor for chronic sinusitis (Longmore M, Wilkinson I, et al., 2014. Spiro SG, Silvestri GA, et al., 2012). Mixed aerobic and anaerobic bacteria such as *streptococcus viridians*, *streptococcus pneumonia*, *hemophilus parainfluenza* etc., also may be the causative factor for chronic sinusitis.

Thyroid function has been shown to be altered in certain chronic conditions. There are no studies that have correlated the effect of chronic sinusitis of the thyroid function. Present study is to show if patients with chronic sinusitis demonstrate significant variation in thyroid hormones, antioxidant levels and protein carbohydrates (McMurray JJ, Adamopoulos S, et al., 2012. Fazio S, Palmieri EA, et al., 2004).

MATERIAL AND METHODS

This study was conducted in the Department of Biochemistry at Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry, in collaboration with the Department of ENT. The study consisted to a total of 80 subjects; 40 patients and 40 controls.

* Corresponding Author

Email: drpebyreddy@yahoo.com

Contact: +91-9159186879

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Selection of Patients

Inclusion criteria for patients: Patients diagnosed as chronic sinusitis presenting to the department of ENT, SLIMS, Pondicherry, were included.

Exclusion criteria for patients: Patients with asthma were excluded. Patients suffering from other chronic disease and illness such as malaria, tuberculosis typhoid, etc were not included in this study.

Selection of controls

Age and sex matched controls, who were healthy, were chosen. The study was explained to them and the samples were collected with their permission. They did not have any past history of asthma, cardiac illness, hypertension, diabetes mellitus, alcoholism and other known endocrinological or metabolic disorder that might have possibly altered their antioxidant status.

Sample Collection

5 ml of fasting blood sample was collected from each of the cases, by a clean venipuncture. The rest of the sample was used for serum separation, for the following estimations: Thyroid profile (T3, T4, TSH), Vitamin C, Uric Acid.

Statistics analysis

All results were summarized as mean \pm SD. The statistical analysis was done using SPSS 11.5 (SPSS, Inc., Chicago), and the comparison between patients and control was done by using Anova. A P-value less than 0.05 were considered statistically significant.

RESULTS AND DISCUSSION

The disturbances in the delicate balance between normal production of oxidant such as super oxide anion radical and the hydroxide radical and protective antioxidant are associated with the pathogenesis of several chronic inflammatory disorder of the respiratory tract (Travis WD, King TE, et al., 2002). Therefore, a role of oxidative stress in chronic upper airway tract infections can anticipate. Free radicals are extremely reactive. (Khansari N, Shakiba Y, et al., 2009).

In the presents study the evaluation of thyroid profile and oxidative stress in chronic sinusitis. Being inflammatory conditions, immunocytes are expected to be in activated state in this condition. It has been shown that oxygen free radicals released by certain immune cells can damage normal tissue (Flinn IW, Byrd JC, et al., 2000). Oxidative stress is implicated in numerous diseases and is found to be most pronounced in chronic conditions. Hence we evaluated oxidative stress in chronic sinusitis.

The enzymatic production of oxygen species by inflammatory cell may contribute to the pathophysiology of chronic sinusitis (Simon HU, Yousefi S, et al., 1997).

In addition to their direct action on cellular constituents, oxygen metabolites may also act as specific modulator of the inflammatory process. For example, in vitro active oxygen species can affect the activity of inflammatory immune modulator such as interferon, leukocyte dependant inflammatory process, leukocyte clastogenic factor, lymphocyte clastogenic factor, and vascular permeability regulating factors.

Chronic diseases are often found with altered thyroid function. No such studies are available for chronic sinusitis. Moreover, association between altered thyroid function and oxidative stress is reported in certain disease such as Diabetes mellitus, chronic renal failure etc., Hence we estimated thyroid profile in chronic sinusitis.

The levels of non-enzymatic antioxidants such as Glutathione, Vitamin C, Vitamin E, Uric acid, Bilirubin are altered in oxidative stress conditions (Testa B, 1995. Özkan SA, Uslu B, et al., 2003). In our data also, we have found a significant decrease in the reduced form of vitamin C levels. Reduced vitamin c is converted to oxidize on reaction with oxidants. Hence its level falls in oxidative stress. So the fall in reduced vitamin C levels also indicates that oxidative stress prevails in chronic sinusitis. Vitamin C is maintained in phagocytes and lymphocytes at 100 times greater concentration than the plasma and inhibits histamine secretion by white blood cells (Steve Helms, ND. Et al., 2006).

Vitamin C is an antioxidant. daily intake of vitamin C reduces this risk for cancer. Vitamin C is used as an adjuvant in infections. Clinical dose is 500mg/day. it is also having power to heal wounds, vitamin C has been recommended for treatment of ulcer, trauma, burns, cold and flu. (Miles Hassell MD, Rennard et al., 2000).

Uric acid is the major low molecular weight intracellular antioxidant in upper respiratory fluids (Sharp PM, Stenico M,). It is co-secreted with lactoferrin in the upper respiratory airways and is closely associated with mucin, it scavenges ozone in plasma and probably has the same action in respiratory tract, urate can also chelate transition metals and this may contribute to its antioxidant activity (Leng GC, Lee AJ, et al., 1996).

Glutathione is another molecular weight antioxidant present in significant amount in epithelial lining fluid (ELF) and in the lower respiratory tract, in addition, it act as an epithelial cofactor for the antioxidant enzyme glutathione concentration then recycled by glutathione reductase, which also known to be present in ELF (Boot RG, Renkema GH, et al., 1998. Cross JC, Hemberger M, 2002). Our aim is to study if there is oxidative stress in chronic sinusitis patients and to evaluate its effect on thyroid status the following parameters were assessed in chronic sinusitis patient. Thyroid profile (T3, T4, TSH), Vitamin C, Uric acid.

Table 1: Shows Mean \pm SD and p value of patients and control groups

Parameter	Control (n=40)	Cases (n=40)	'p' Value
Tri iodo thyronine (T3)	139.3 \pm 16..56	145.5 \pm 22.39	>0.05
Thyroxine(T4)	7.24 \pm 1.97	7.28 \pm 1.61	>0.05
TSH	3.24 \pm 0.5	2.88 \pm 0.59	>0.05
Vitamin C	1.61 \pm 1.24	0.7 \pm 0.09	<0.05*

P value <0.05 is significant

The other objective of our study was to evaluate the thyroid status in chronic sinusitis patients. We have found that there is no significant alteration in the thyroid function in comparison to healthy controls. Correlation analysis showed a positive correlation of T4 levels with vitamin C levels ($r=0.499$) and a negative correlation of T4 levels with protein carbonylation levels ($r=0.528$)

These correlations probably indicate that thyroid function is influenced by oxidative stress. The mechanism is yet to be explored. However, such impact, if present at all, has not been found to alter the euthyroid status in all the 40 cases, we studied.

So, it is evident from the present study that chronic sinusitis is associated with oxidative stress. But there is no alteration in thyroid function in chronic sinusitis.

CONCLUSION

Chronic sinusitis is associated with oxidative stress. Thyroid profile in chronic sinusitis patients is normal. The present study is to examine changes in several measures of oxidative stress and antioxidant status in sinusitis patients. Vitamin C reduces inflammation and allergic responses.

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