



Assessment of Oxidative Stress and Association of Oxidative Markers among High School Teachers

KEYWORDS

Teachers, Stress, oxidative stress enzyme

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ABSTRACT Teaching profession becomes a highly stressful occupation due to changing of social patterns. They have been found to have an increased prevalence of cardio vascular risk factors, metabolic syndrome, diabetes and oxidative stresses. The purpose of the present study is to examine the evaluation of oxidative stress and association of oxidative markers among high school teachers. Studies were conducted on randomly taken thirty five high school teachers. They were working in high school in Hooghly district. Study was conducted with six oxidative bio markers. Those were malondialdehyde (MDA), catalase (CAT), glutathione peroxidase (GPx), reduced glutathione (GSH), super oxide dismutase (SOD) and glutathione reductase (GR). It was found from the study that MDA, CAT, GSH, GPx, GR belongs to same category except SOD. It was also found that GSH has strong positive correlation with CAT, GPx and GR and negative correlation with MDA. It was also found from the study that enhancement of GSH was highly responsible for MDA reduction. Some recommendations are stated below to reduce their problems.

1. Introduction

International research literature shows that the extent to which teachers are satisfied with their jobs and working conditions is likely to have significant consequences for the retention of teachers within the profession, for their approach to teaching, for the creation of collegial relations within a school, and for student outcomes. There is now extensive international research in the area focussing on second-level as well as primary schools. The majority of articles explore the factors influencing the job satisfaction of teachers, with fewer focusing on school principals. Studies on teacher stress also abound (Kyriacou, 2001).

The role of the teacher in community is undergoing a transformation that reflects social and economic changes in the society. Study has shown that teachers have high risk for development of non communicable diseases and cardiovascular disease (CVD) events at an earlier age and that they die much earlier compared to other occupational group. Several studies have been demonstrated that the lifestyle and working environment of the teachers is under constant stress with a high rate of smoking and alcohol.

It is fact that teachers have been found to have an increased prevalence of CVD risk factors, metabolic syndrome and type two diabetes than any other occupational group and among the general population in due to their physically inactive life, disrupted sleep patterns and stress etc (Crossman & Harris, 2006).

According to the study, teachers suffer from insomnia, increased levels of stress hormones, post-traumatic stress disorder (PTSD). Study has been focused on the relationship of stress and cardiovascular disease in teachers. It shows that teachers experienced higher job stress than a reference population.

Himmeltrab et al (2004), Farukawa et al (2004) and Vincent et al (2007) believe that oxidative stress and inflammation are biological mechanisms whereby obesity leads to cardiovascular risk and other chronic diseases. Oxidative stress is defined as an imbalance between the production and removal of reactive oxygen species (ROS) (Turrens 2003 and Wu G et al 2004).

Researchers have shown a link between psychological stress and cellular oxidative stress. Enzyme super oxide dismutase (SOD), is an essential part of the delicious fruit which pre-

vents damage to the tissues of antioxidants. This unusual enzyme can help to damage caused by oxidative stress, which the process of free atoms in the known problems, such as free radicals to reduce the tissue (Dinkovo-Kostova, 2002).

Damage by oxidative stress is involved in many diseases – the change of living conditions, such as cancer and Alzheimer's disease, as we age. Free radicals are oxygen consumption by natural disasters, such as respiration, interaction with other molecules in the cells. No matter what happens in the body, problems such as pollution, sun and smoking also lead to the production of dangerous free radicals.

It has been found that the increased production of ROS may exceed the capacity of an oxidant defense system, resulting in oxidative damage to select DNA, proteins and lipids (Cross et al 1997). It has been found by the scientist WuG et al (2004) that glutathione (GSH) and super oxidase dismutase (SOD) are an antioxidant and as such; they remove free radicals and suppress oxidative processes. GSH peroxidase (GSH-Px) is an antioxidant enzyme which also plays an important role in counteracting oxidative stress by reducing hydrogen peroxide and alkyl hydro peroxides.

The present study is aimed at evaluating the level of oxidative stress among high school teachers and to examine the association of oxidative stress bio markers.

2. Materials & Methods:-

2.1. Subjects: After completion of questionnaire study, biochemical, studies were conducted after randomly taken thirty five high school teachers who are non smokers, non alcoholic as well as completed self-reported questionnaire. They all are working in high school in Hooghly district.

Participants provided a medical history and were required to fast 12 hours prior to a blood draw. A blood sample (serum) was taken from teachers between 8.00 AM, and 9:00 AM by a professional technician at the research site clinic. Blood parameters involved in oxidative stresses were measured by standard laboratory techniques.

2.2. Biochemical Estimation

The extent of lipid peroxidation was measured by malondialdehyde (MDA) by using the method of Ohkawa et al., (1979). Catalase (CAT) activity was measured in the serum and cell lysate were performed by the method of Aebi (1984). Glutathione peroxidase (GPx) activity was measured by the

method of Paglia and Valentine (1967). Reduced glutathione (GSH) estimation in the serum and cell lysate were measured by Beutler et al., (1963). The activity of glutathione reductase (GR) was measured by the method of Beutler (1963). Super oxide dismutase (SOD) activity was determined from its ability to inhibit the auto oxidation of pyrogallol according to Mestro and McDonald (1986). Total protein was measured according to Lowry et al., (1951) using bovine serum albumin as standard.

2.3. Variables:

Variables are

Dependable variable - Y

MDA

Independent variables – X

GSH -X1

CAT -X2

SOD- X3

GPx -X4

GR -X5

3. Data Analysis

The data was analyzed with a personal computer by using statistical software for social science (SPSS) version 16.0 for windows. The total six variables were stressed into SPSS V 16.0 for the analysis using descriptive statistics and frequency tables.

4. Result and Discussion:

4.1. Demographic features of the subjects

Descriptive statistics were calculated for each of the six variables and the results are presented in Table 1. In many of the variables mean value showed a tendency for accumulating around the tense about extreme, and some variables mean value showed a tendency for accumulating around the mid-point of the scale.

Table 1 : Descriptive statistics.

	Minimum	Maximum	Mean	S.D.
GSH	2.28	3.71	2.46	0.28
MDA	23.69	687.46	156.23	134.06
CAT	1847.07	4145.31	2810.78	653.89
SOD	6.48	8.09	7.72	0.55
GPx	3.68	7.58	5.60	1.05
GR	3.44	10.50	5.85	1.46

An exploratory factor analysis was conducted to determine the clusterification of oxidative stress among teachers during their service life. Two factors were found (see table 2). These two factors accounted for 64.67 % of the variability. All six variables were loaded into these two factors and rotation was converged in three iterations. Except SOD all variables belongs to the first factor.

Table 2 : Rotated Component Matrix

	Component	
	1	2
GSH	0.854	
MDA	-0.482	

CAT	0.642	
GR	0.843	
GPx	0.825	
SOD		0.915
Eigen values	2.665	1.209
% of Variance	44.244	20.231
Cumulative %	44.14	64.27

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 3 iterations.

Pearson correlation was conducted to measure the relationship between different types of variables. Pearson correlation coefficient measures the strength of linear association between variables. Multiple linear regression (step wise) analyses were conducted to examine the strength of association between MDA (dependent variable) and various potential predictors. It was found from Table 3 that GSH was positively and significantly correlated with CAT, GPx, GR and negative and significantly correlated with MDA. CAT was positively and significantly correlated with GR and GPx was positively and significantly correlated GR.

Table 3 : Correlations

	GSH	MDA	CAT	SOD	GPx	GR
GSH	1	-.380*	.467**	.027	.565**	.542**
MDA		1	-.191	.028	-.306	-.155
CAT			1	-.200	.301	.388*
SOD				1	.277	.035
GPx					1	.684**
GR						1

Correlation is significant at the *0.05 level and 0.01 (2-tailed).**

Multiple regression analyses and correlation were conducted to examine the relationship between MDA and various potential predictors. It was seen that GSH was negatively significant (.05. Level) correlates with MDA.

This relationship of two regressors can explain 15 % of total variation of dependent variable.

5. Conclusion and recommendations

Oxidative stress represents an imbalance between the production and manifestation of reactive oxygen species (ROS) and a biological system’s ability to readily detoxify the reactive intermediates or to repair the resulting damage. Oxidative stress is determined by the production of free radicals and enzymatic and non-enzymatic defense functions (Beltowski et al., 2000). The research findings revealed that the policing job is highly associated with oxidative stress and metabolic syndrome, including cardiovascular risk. It was seen that, there was a strong correlation established between oxidative stress markers. MDA and GSH are reversely responsible for each other.

The management should conduct different stress reduction sessions for different group of teachers because stress is appraised differently by different individuals based on their backgrounds, past and current experiences.

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