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Evaluation of Oxidative Stress and Serum Magnesium Levels in South Indian Obese Males

Medical Science

KEYWORDS : Oxidative stress , Obesity , Hypomagnesaemia

*** Monika Dhaval Patel**	Lecturer, Department of Biochemistry, College of Dental Sciences& Research Centre Ahmadabad. * Corresponding Author
P. Krushna Kishore	Reader & H O D , Department Of Biochemistry, College Of Dental Sciences & Research Centre, Ahmedabad
Dr.Dhaval J. Patel	Associate Prof ,Department of Forensic Medicine,GMERS Medical College ,Dharpur ,Patan

ABSTRACT

Objective; To evaluate oxidative stress and serum magnesium levels in south Indian obese males.

Materials &Methods:

The study was conducted in Department of Biochemistry With collaborationof General Medicine , MGMCRI , Pondicherry, over two years. Total 60 subjects were divided in to Two groups. Group-I consists of 30 obese adult male patients with non alcoholic&non smokers .while Group-II consists of 30 Healthy controls.All the parameters were tested with venous blood samples collected after over night fasting. Values were determined by using semi auto analyzer and fully auto analyzer (Erba cam50 & Mura logo tech respectively) with ready to used kits.

Results;

Serum MDA values was significantly higher in obese when compared with non-obese , Serum Mg Negatively correlated (p<0.05) with MDA .Total cholesterol , TAG&HDL/LDL ratios ,were significantly raised(p<0.001) ,where as HDL was significantly lower in obese .

Statistical Analysis:

All data were expressed as mean and standard deviation; Spss 17 program was used for the analyses. The statistical significance , of the mean , in the subject and control groups were assessed using the paired Student t test. Correlations were computed based on Pearson' correlation analysis. A significant level of 95% was chosen for all tests p< 0.05. For student t test, the significance was represented as p< 0.001, whereinit was considered as highly significant.

Conclusion;

- *It is concludedthat Hypomagnesaemia that may be eventually linked to oxidative stress . Malondialdehyde, as the marker of oxidative stress is significant.*
- *In obese adult males low levels of serum magnesium associated with high levels of TAGs*

INTRODUCTION;

Overweight and obesity are defined by the World Health Organization (WHO) as abnormal or excessive accumulation of fat that pose a risk to an individual's health(1). Obesity is increasing at an alarming rate globally and more so in India. Obesity is not a disease in itself but is a significant risk factor associated with wide gamut of life threatening non-communicable diseases (2). Obesity predisposes an individual to many diseases and health conditions including Type 2 Diabetes mellitus (T2 DM), hypertension, dyslipidaemia, liver and cholelithiasis, insulin resistance etc. These conditions result in premature death or substantial morbidity Obesity is a major causative factor of metabolic syndrome (MS)(3). Increased oxidative stress due to accumulated fat is an important pathogenic mechanism implicated in obesity-associated metabolic syndrome. Fat accumulation correlates with systemic oxidative stress in humans. Production of **R**eactive **O**xygen **S**pecies (ROS) increases selectively in adipose tissue of obese humans accompanied by enhanced expression of NADPH oxidase and lowered expression of antioxidative enzymes. In cultured adipocytes, elevated levels of fatty acids increased oxidative stress via NADPH oxidase activation, and oxidative stress caused deregulated production of adipocytokines (4).

Most American adults, about sixty percent, do not get sufficient magnesium according to a U.S. report. A low magnesium level is related to many a health condition, namely heart disease, mainly attributed to inflammation (5). Obesity is marked by a low-grade inflammation, and a high number of obese people have low magnesium levels. A report in the July-September 2007 "California Agriculture" suggests that stores of magnesium decline as weight climbs. A marginal-to-moderate magnesium level among obese people contributes to obesity-related chronic diseases, including hardening of the arteries, high blood pressure, osteoporosis, diabetes and cancer (6). This acquires significance in the light of our study. Though several reports are available linking magnesium and carbohydrate metabolism, magnesium and oxidative stress, magnesium and insulin resistance, very few reports are available in the database implicating magnesium levels as related to obesity in the light of oxidative stress. Hence, we undertook this study to primarily address obesity as related to magnesium status, oxidative stress in males, especially because of fact that the protective effect of oestrogens seen in females would not apply here. Moreover, obesity is fast emerging as a pronounced cause of morbidity with several impending complications in the pipeline including hypertension, diabetes mellitus and stroke. Furthermore, we wanted to arrive at simple, sensitive and reliable biochemical indicators of obesity as linked to serum magnesium levels and oxidative stress.

Results

The study was conducted in Department of Biochemistry With collabration of Genaral Medicine , MGMCRI , Pandycheery, over two years. Total 60 subjects were divided in to Two groups. Group-I consists of 30 obese adult male patients with non alcoholic & non smokers .while Group-II consists of 30 Healthy controls

Table No.1: Comparison of lipid profile between obese and non-obese males.

Variables	Means		T- test (df=58)	P value
	Obese	Non-obese		
TC (mg/dl)	188.5 ± 33.26	152.73 ± 22.5	-4.866	0.000*
TAGs (mg/dl)	177.57± 67.41	108 ± 18.70	-5.373	0.000*
HDL (mg/dl)	34.35 ± 8.95	44.03 ± 11.00	3.738	0.000*
LDL (mg/dl)	112 ± 47.33	96.73 ± 26.48	-1.618	0.1111
HDL/LDL RATIO	0.3± 0.11	0.4 ± 0.36	2.542	0.001†

***indicates p<0.05 P<0.001(†) was the level of highly significance**

Denotes measurement of levels in serum

TC—Total cholesterol **TAGs** – Triacylglycerols
HDL—High Density lipoprotein **LDL**—Low Density lipoprotein

A detailed lipid profile was undertaken in obese and non-obese and the results are summarized in Table 1. The results suggests levels of TC , TAG & HDL($p<0.001$) levels were significantly higher in obese compared to non- obese .The HDL/LDL ratio was quite also significant .

Table 2: Key biochemical parameters between obese &non obese

Variables	Means		t-test (df=58)	P-value
	Obese	Non-obese		
Serum Magnesium (mg/dl)	1.39 ± 0.29	1.91 ± 0.36	6.085	0.00*
MDA (mmols/ L)	2.61 ± 1.00	1.03 ± 0.71	7.008	0.00*

P < 0.05 was the level of significance
Mg: Magnesium **MDA**: Malondialdehyde (marker of oxidative stress)

High levels of MDA (2.61 ± 1.0) and low Mg levels (1.39 ± 0.29) were seen while non –obese shows low levels of MDA (1.03 ± 0.71) and high levels of serum mg (1.91±0.36)which shows negative significance between MDA & Mg

Discussion
study was carried out on obese males where the obesity would not be linked to estrogen levels. Central adiposity is a major hallmark of metabolic syndrome . (7). The link between carbohydrates and lipid metabolism is well understood. Insulin which promotes the utilization of glucose by the tissues also is responsible for regulating the levels of fatty acids and triacylgyeceroles levels while promoting lipogenesis. Insulin prevents lipolysis and ketogenesis. Furthermore, there is a nexus among the lipoproteins, facilitated by the cholesterylester transfer protein (CETP) which mediates the exchange of cholesterol ester and triacylglycerol between lipoproteins(8). It is possible that insulin could effect some of the above mentioned changes that would eventually assume relevance in the biochemical events implicated in obesity. When a comparison of lipid levels in obese and non-obese males was made (Table 1), It was observed that the value of total cholesterol, triacylglycerol and HDL were quite significant in obese. This could probably be explained by the fact that increase in total cholesterol and triacylglycerol levels would be associated with a decrease in the good cholesterol namely HDL-cholesterol, probably through the direct action of insulin. Further studies have to be undertaken to corroborate the effect of insulin and CETP in the differential levels of the lipids viz. Total cholesterol, TAGs and HDL. Our study suggests that LDL was insignificant (Table1) which could be explained by a possible role for CETP.

A comparison was made between serum magnesium and oxidative stress as exemplified by MDA levels . Our results shown in table 1 clearly suggested that the mechanism of oxidative stress is linked to hypomagnesaemia. An earlier study performed by Romero etal on Hypomagnesaemia, oxidative stress, inflammation and metabolic syndrome has implicated inflammation and oxidative stress in the light of the risk for metabolic syndrome(9), whereas serum magnesium levels and metabolic syndrome are independently associated. Our study shows significant link between hypomagnesaemia and oxidative stress (Table 2) . More studies have to be undertaken to find out the cause / effect relationship and implicate magnesium levels in the light of oxidative stress.

Conclusion:
- ❖ It is concluded that Hypomagnesaemia that may be eventually linked to oxidative stress . Malondialdehyde(MDA), as the marker of oxidative stress is significant.
- ❖ In obese adult males low levels of serum magnesium associated with high levels of TAGs
- ❖ It is advised that monitoring magnesium status may be included in the biochemical investigations on obese males.

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