Study of Malondialdehyde (MDA) As a Marker of Oxidative Stress in Obese Male Individuals

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Research Article

Abstract: **Background:** Obesity is associated with enhanced lipid peroxidation. Malondialdehyde (MDA), one of several by-products of lipid peroxidation process, is a biomarker that provides an indication of lipid peroxidation level. The objective of the present study was to estimate the level of MDA in obese individuals. **Methods:** 30 obese men with BMI between 25-30 Kg/m^2 and 30 non-obese men with BMI <25 Kg/m^2 were enrolled in the study. Malondialdehyde (MDA) was assessed in both the groups. **Results:** Plasma MDA activity was significantly increased in the obese subjects when compared with controls. **Conclusion:** This finding suggests that obesity is an important factor for enhanced oxidative stress in individuals.
Keywords: Malondialdehyde, Obesity, Oxidative Stress.

Introduction

Obesity is a pathological condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems [1]. Excessive fat accumulation is a consequence of positive energy balance that results from interaction among several factors, including diet (increased intake of energy-dense foods and decreased intake of food rich in micronutrients and bioactive compounds) [2], decreased physical activity (sedentary lifestyle), nutritional and hormonal status in early life [3], as well as genetic, environmental, cultural, and economic factors [4]. Other etiological factors that are associated with obesity are some chromosomal aberrations (such as Prader-Willi syndrome), hormonal pathologies (such as Cushing's disease), hypothalamic lesions or tumors, and drugs (such as steroids and antidepressants) [5]. The increasing prevalence of obesity in recent decades as a public health problem in both developed and developing countries is of concern, given the comorbidities of this condition. Obesity is recognized as a risk factor for insulin resistance, which can lead to major diseases, such as type II diabetes and cardiovascular disease [6]. A common pathological process associated with these disease conditions is oxidative stress [7]. The role of oxidative stress and reactive oxygen species (ROS) in the pathophysiology of obesity has been recently the focus of many investigations [8]. So the aim of the present study was to evaluate the level of malondialdehyde (MDA) in obese male individuals.

Materials and Methods

The present study was carried out in the Department of Biochemistry, MGM Medical College, Aurangabad. The study population consisted of 30 obese male subjects with a BMI between 25 to 30 Kg /m^2 and 30 non-obese age matched subjects (BMI < 25 Kg /m^2). Subjects with history of diabetes, hypertension and any infection were excluded from the study. Informed consent was obtained from all individuals after the purpose and nature of the study had been explained. This study was approved by the ethics committee of our institute. Body weight and height of the participants were measured. BMI was calculated as weight in kilogram divided by squared height in meter.

Collection of blood sample

5 ml venous blood was collected from both obese as well as non obese individuals for determination of Oxidative damage in terms of Lipid peroxidation product-Malondialdehyde (MDA). After clot formation, the tubes were centrifuged at 4000 rpm for 10 minutes. Serum thus separated was analyzed immediately for MDA. Serum maondialdehyde (MDA) was estimated by method of Nourooz-zadeh J *et al* [9].

Statistical analysis

Results were statistically analyzed by SPSS version 17. Student's t-test was used to assess the significance of difference between the groups. All results are presented as mean ± S.D. A 'p' value of less than 0.05 was considered significant.

Results

There was significant increase in level of MDA in obese males as compared to controls (p<0.05). The values obtained on analyzing specimens collected form obese males and control groups are tabulated. The mean values and standard deviation also have been calculated for comparative study of obese males and controls. The values of both groups are also graphically represented for comparison.

Table 1: Showing MDA levels in obese males and control groups

Parameter	Controls (n=30)	Obese males (n=30)
MDA (µmol/L)	1.2±0.9	2.6±1.2*

*$p < 0.05$
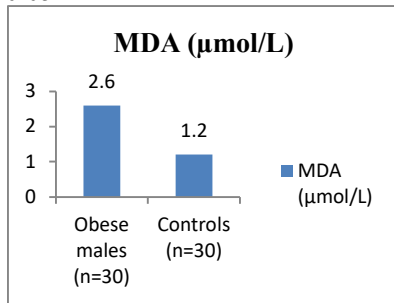
Figure 1: Comparison of mean MDA in obese males with controls

Discussion

There is an overwhelming evidence to indicate that oxidative stress, defined as an imbalance between oxidants and antioxidants in favour of the former, leads to many biochemical changes and these are important pathological mediators in a wide spectrum of human disease [10]. Oxygen free radicals are highly reactive and attack almost every cell component causing damage to the surrounding tissues [11]. The most deleterious impact of oxidative stress is lipid peroxidation, which has been implicated in the pathogenesis of numerous diseases including atherosclerosis, diabetes, cancer, and aging [12]. Lipid peroxidation is a chain reaction initiated by the hydrogen abstraction or addition by oxygen radicals, resulting in the oxidative deterioration of polyunsaturated fatty acids [13]. MDA assay of serum is the most frequently used method in clinical practice because of its sensitivity and simplicity, although several substances interfere with this assay [14]. This study demonstrates an elevated concentration of MDA in obese subjects, which reflects *in vivo* oxidative damage to lipids This is in agreement with Selvakumar *et al* [15], reporting significant increase in levels of MDA as a marker of oxidative stress in obese subjects as compared to non obese healthy controls and it has also been suggested that obesity on its own is an independent risk factor for plasma lipid peroxidation [16].

Conclusion

On the basis of above result we conclude that obesity is an important factor for enhanced oxidative stress. However, further studies are needed to evaluate the levels of MDA in obese male individuals.

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