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Research Paper

Effect of Fiber Diet on Lipid Peroxidation and Dietary Management Strategy in Relation to age and Inhabitance

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Abstract
Background: *Prevalence of obesity is increasing at an alarming rate. The development in economy is linked to modernization and urbanization. This finally leads to rise in obesity cases. Systemic oxidative stress is induced by obesity.*
Objectives: *We used maize diet as we aim to control lipid peroxidation in obesity as a management strategy looking at the alarming rate of increase in global obesity.*
Material and Methods: *This study was done on 1001 girls. The age was between 18 to 34 years. We have distributed them according to age and inhabitance. The study was conducted for a period of six month and the girls were exclusively on maize diet; examined for MDA status before and after the diet and statistically evaluated.*
Results: *There was reduction in the level of MDA in all the subclasses. Lipid peroxidation in all the girls before the consumption of the diet was 2.50 ± 0.52nmol/ml which lowered to 1.6 ± 0.34nmol/ml after the completion of the study. (P<0.001)*
Conclusions: *Oxidative stress improved dramatically in all the subgroups especially in overweight and obese girls. (P<0.001) After the study we recommend a diet plan which is healthy consisting of less fat and more fiber intake*
Keywords: *Obesity, prevalence, oxidative stress, MDA, age, inhabitance.*

Introduction

Obesity is defined as a state of over nutrition when the body mass index is 30 or more than 30 kg/m2.BMI of 25-29.99 kg/m2 is called overweight. Obesity with BMI of 40 kg/m2 or more is called morbid obesity. There are growing recommendations for high fiber diet as a daily routine diet. With the newer understanding, there are emerging concepts of protective foods like dietary fiber. The present study was done taking maize diet on 1001Rajasthani and non-Rajasthan girls respectively, aged between 18 to 34 years to evaluate the level of MDA before and after the maize diet in different subclasses. In the second half of the study statistical results were obtained.

Material and Method

Practical work was carried out in the department of biochemistry, Pacific medical college and hospital, Udaipur. Normal subjects of the same age group acted as control. Two groups were made:

Control Group

Consisting of normal body weight with healthy BMI between 18 – 25kg/m^2

Study Group

Consist of overweight and obese subjects with BMI in the range of 25-30kg/m^2. All the other cereals were excluded from their daily diet and they were asked to consume maize chapatti instead of wheat chapatti for 30 days. The effect of this diet was then evaluated. On comparison of two communities, before and after the consumption of diet, there was significant difference in the parameter.

Thiobarbituric Acid Reactive Substances (TBARS)

Method

We added 1.2 ml TCA-TBA-HCl reagent to 0.8ml serum, boiled for 10 minutes. After cooling, 2 ml of NaOH was added. Pink color was obtained and absorbance was measured at 535nm.

Calculation

Molar extinction of TBARS at 535 nm 1.56X 10-5/ M/Cm.

$$\frac{V \times OD \text{ at } 535 \text{ nm}}{0.156} = \frac{V \times OD \text{ at } 535 \text{ nm}}{0.156}$$

= 25.6 x delta OD at 535 n moles /serum

Normal range= 2.0-3.0 n mole/ml serum

Statistical Analysis

Data was analyzed statistically by using student ttest with the help of SPSS software version 19

Results

Table 1 -4 shows MDA in total girls before and after maize diet. They were statistically evaluated when compared beforeand after consumption of maize, and also comparison was made for Rajasthani v/s Non-Rajasthani before (BMD) as well as after the maize diet (AMD). As per ICMR recommendations the normal range of malondialdehyde is 1.05-3.2 n moles/ml. In our study, MDA level in total girls before the maize diet was 2.50 ± 0.52nmol/ml which reduced to 1.6 ±0.34nmol/ml after the diet (P<0.001).

According to Age

The subjects were divided as less than and more than 20 years. Malondialdehyde increased as the age increased. MDA also showed significant change when comparison was done before and after maize diet (P<0.001). When comparison was made between 2 communities of age <20 group, statistically significant change was observed for malondialdehyde (P<0.05).

According to Inhabitance

Girls of urban inhabitance showed more oxidative stress in comparison to those of rural inhabitance. MDA for both the inhabitance categories was statistically significant (P<0.001) (Tables 1-4).

Table No. 1 Oxidative Stress in Girls of Age <20

Parameters	Total Girls (n=481/1001)				RAJASTHANI				NON RAJASTHANI				Total Girls B vs A (n=481/1001)	Raj B vs A	Non raj. Bvs A	Raj vs nonraj. BMD	Raj. Vs non raj AMD
	Before		After		Before		After		Before		After						
	Mean	± SD	Mean	±SD	Mean	± SD	Mean	±SD	Mean	± SD	Mean	±SD					
MDA (nmol/ml_	2.33	0.76	1.77	0.46	2.28	0.74	1.78	0.47	2.44	0.76	1.83	0.71	13.7[c]	10.83[c]	7.15[c]	1.87	2.45[a]

P value : a=<0.05; b=<0.01; c=<0.001

Table No. 2 Oxidative Stress in Girls of Age >20

	Before		After		Before		After		Before		After						
	Mean	± SD	Mean	±SD	Mean	± SD	Mean	±SD	Mean	± SD	Mean	±SD					
MDA (nmol/ml_	2.40	0.76	1.84	0.47	2.38	0.76	1.84	0.49	2.24	0.76	1.73	0,43	14.05[c]	7.73[c]	12.79[c]	2.37[a]	0.83

P value : a=<0.05; b=<0.01; c=<0.001

Table No. 3 Oxidative Stress in Rural Girls Before and After Diet

Parameters	Total Girls (n= 242/1001)				RAJASTHANI				NON -RAJASTHANI				Total Girls B vs A (n=242/1001)	Raj B vs A	Non raj. Bvs A	Raj vs nonraj. BMD	Raj. Vs non raj AMD
	Before		After		Before		After		Before		After						
	Mean	± SD	Mean	±SD	Mean	± SD	Mean	±SD	Mean	± SD	Mean	±SD					
MDA (nmol/ml_	2.32	0.75	1.75	0.46	2.33	0.71	1.80	0.48	2.35	0.74	1.78	0.46	9.77	4.9[c]	8.47	0.1	0.78

P value: a=<0.05; b=<0.01; c=<0.001

Table No. 4 Oxidative Stress in Urban Girls Before and After Diet

Parameters	Total Girls (n=759/1001)				RAJASTHANI				NON RAJASTHANI				Total Girls B vs A (n=759/1001)	Raj B vs A	Non raj. Bvs A	Raj vs nonraj. BMD	Raj. Vs non raj AMD
	Before		After		Before		After		Before		After						
	Mean	± SD	Mean	±SD	Mean	± SD	Mean	±SD	Mean	± SD	MeAN	±SD					
MDA (nmol/ml_	2.38	0.79	1.80	0.45	2.37	0.75	1.82	0.46	2.44	0.78	1.8	0.45	17.01[c]	12.35[c]	11.81[c]	0.74	0

P value: a=<0.05; b=<0.01; c=<0.001

Discussion

Lipids on exposure to oxygen, moisture and bacteria, undergo auto-oxidation known as lipid peroxidation which produce free radicals. It occurs as chain reaction causing extensive cellular damage. Cell injury produce cytokines specially tumor necrosis factor alpha. Consumption of hyperlipidemic diet also causes lipid peroxidation. Previous studies indicate that peroxidation increases with age as oxidative stress and load of free radicals increases and scavenging actions are reduced.[5]. In our study, PMDA was high and in acceptable range for girls above 20 years as compared to the other group (2.40±0.75nmol/ml v/s 2.33 ±0.7nmol/ml). This is due to changes in membrane actions of RBC which reduce the actions of antioxidants which result in free radicals production and damage of tissues in obesity. P-MDA was low in rural inhabited girls exhibiting minimum oxidative stress (2.30 ± 0.63 v/s 2.35± 0.71). This is well supported by the works of Gamal A.et al [15] and Camille A et al[4]. Buege JA and Aust SD[2] have shown significant increase in oxidative stress in urban subjects in comparison to rural subjects. Indirectly it is indicated that the alterations in oxidation of LDL were higher in obese of urban population and may be one of the many etiological factors in obesity. Our results are well in accordance to that of Fernandez ML[12]. Effect of fiber diet was observed in all sub classes. Highly significant changes were observed for MDA inrural and urban categories for oxidative stress when matched for diet (P<0.001).

Summary and Conclusion

MDA was with inacceptable range as per ATP III guidelines in total, Rajasthani and Non-Rajasthani's girls. MDA increased with age. In total girls the average level of MDA for age <20 years was 2.31n mole/ml of serum while for age >20years it was 2.39n mole/ml of serum. The same observation was seen in Gujarati's girls (2.40 ± 0.75nmol/ml v/s 2.33± 0.7nmol/ml). Rural inhabitants showed less oxidative stressas compared to urban inhabitants (2.30 ± 0.63 v/s 2.35 ± 0.71). The oxidative stress showed improvement in normal, overweight and obese girls, most significantly on overweight and obese girls after taking the diet although the MDA levels were high but in acceptable range before the diet was taken. MDA levels were significantly reduced after the diet (P<0.001). When matched for age, MDA was significantly decreased for both the groups after the diet. When the two groups were compared with each other MDA was statistically

significant P<0.001). Effect of maize was seen for all classes. Highly significant changes were observed for this parameter in rural and urban categories for oxidative stress when matched for diet (P<0.001).

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