ABSTRACT

ANTIOXIDANT STATUS OF SUBJECTS WITH DIABETES MELLITUS

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India crowns the glory of being the ‘diabetic capital’ of the world; it is predicted that by 2025 India will harbor more than 60 million diabetic patients, i.e., one out of four individuals will be an Indian diabetic in the world (diabetesindia.com 2005). Kerala has the highest level of morbidity and hospitalization rate in India. Dietary antioxidants have been hypothesized to have a protective effect against the development of diabetes by inhibiting peroxidation chain reactions. Keeping the above facts as the basis, the present study entitled ‘Antioxidant Status of Subjects with Diabetic Mellitus’ was undertaken with the following objectives.

1. To study the socio-economic, dietary and life style pattern of diabetic patients.
2. To assess the health and clinical status of diabetic patients.
3. To analyse the antioxidant status of NIDDM, IDDM and Non-diabetic subjects and to assess the impact of food supplementation on the antioxidant status of diabetic patients.

Sample: - The samples for the study were selected from five diabetic clinics of Thiruvananthapuram city after attaining the consent from both the subjects and hospital authorities. A sample size of 400 subjects, with 200 each from type I and type II diabetes were selected.

Findings: - As far as the educational status was concerned, majority of them had education up to high school level and 28 percent of the subjects were either graduates or professionals (22.75%) and post graduates (5.25%). It was
also observed that 43.5 percent of the subjects had government job and more than 48 percent of the diabetics were in the sedentary category. Monthly income of majority (75.25 percent) of the subjects was between Rs. 2000 and Rs. 10,000. Majority (80.75 percent) of the subjects belonged to families having members four or below. Analysis of the Body Mass Index (BMI) showed that 9.92 percent of women and 10.2 percent of men had grade II obesity (BMI>30). The awareness regarding antioxidant and dietary management was initially low (-1.22), but the level of awareness increased from 12.2 percent to 51.93 percent after counseling.

The antioxidant status of Type I (n=20), Type II (n=20) and non diabetic (n=20) subjects were analysed (N=60), and compared with the control group (non-diabetic subjects). The total antioxidant status was found depleted in both the diabetic groups. Among the diabetic subjects, both the type I and type II subjects showed negligible difference in the serum vitamin A, beta carotene, vitamin E, superoxide dismutase and catalase content. Analysis of serum vitamin C and indicates increase in level among the type II diabetics than in type I diabetics. From the level of beta carotene and vitamin A (type I- 27.71ug/100ml, type II- 27.41ug/100ml, non-diabetic- 39.79ug/100ml) it could be inferred that non-diabetics have better status. The analysis of vitamin E showed negligible difference between the diabetics and the non-diabetics (type I- 0.72 mg percent, type II-0.75 mg percent, non diabetic- 0.75 mg percent). The status of vitamin C was 0.58 mg/100ml for non diabetic subjects, which is higher than the type I (0.43mg/100ml) and type II (0.41 mg/100ml) diabetic subjects.

The assay on enzymatic antioxidants – superoxidisedismutase and catalase showed the absolute and specific activity in the haemosylated serum. The specific activity of superoxide dismutase (reference value-884.2U/gHb) showed that the non diabetics have a higher specific activity of 923.95 U/gHb where as the type I and type II subjects have a lower activity of 842.05 U/gHb and 839.80 U/gHb respectively. Specific activity of Catalase (reference value-118.8k/gHb) showed a marginal increase among type I subjects (79.50k/gHb).
compared to the type II subjects (78.88k/gHb); whereas the non-diabetic subjects (83.00k/gHb) showed higher level than both the diabetic groups.

A sub-sample of twenty newly diagnosed diabetic subjects was selected for food supplementation. Lime juice and spirulina biscuits were supplemented to the subjects for a period of one month. Each biscuit weighed 15 grams containing 2.5 gram of spirulina each. The baked spirulina biscuits were packed in an air tight container and supplied to the subjects on weekly basis, so that face to face interaction was possible with every subject, which confirmed the regular intake of the biscuits and lime juice (30ml) without fail.

Analysis of blood on antioxidant status, after the completion of supplementation showed considerable increase in non-enzymatic antioxidants like Vitamin A (increased from 27.41ug/100ml to 37.99ug/100ml), Vitamin E (increased from 0.75mg percent to 0.91mg percent) and Vitamin C (increased from 0.41mg/100ml to 0.59mg/100ml) The specific activity of enzymatic antioxidants like Superoxide dismutase and Catalase also increased from 839.80U/gHb to 873.60U/gHb and from 78.88k/gHb to 90.03k/gHb respectively. Analysis of other major constituents in blood like Fasting Blood Sugar (Before 115.25 mg/dl, After 94.90mg/dl), Post-Prandial Blood Sugar (Before 189.10 mg/dl, After 129.25mg/dl), Total Cholesterol (Before 219.05mg, After 188.15mg), and Low Density Lipoproteins (Before 153.40, After 138.05) revealed remarkable decline in status while the level of High Density Lipoproteins (Before 40.75, After 48.50) showed progress after the spirulina biscuit supplementation. On detailed analysis, it was found that the special combination of spirulina, spices and oil in the spirulina biscuit along with lime juice were found to have contributed to the increase in antioxidant status in the newly diagnosed type-II human diabetic subjects.

The study revealed that antioxidant status could be improved on supplementation of spirulina biscuit and lime juice among the newly diagnosed diabetic subjects.