

**ROLE OF ANTIOXIDANTS
IN HEALTH AND DISEASE
DURING
AGING PROCESS**



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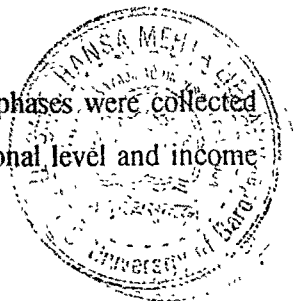
SUMMARY

Free radicals have been implicated in the occurrence of various chronic diseases that are common with advancing age. Cardiovascular diseases and cancer are two major diseases affecting the elderly in which free radicals play an important role. Antioxidants present in foods such as vitamin E, vitamin C and β -carotene contribute to prevention of these two diseases. Studies have been carried out on the western population emphasizing the role of antioxidants against free radical damage. However, there is dearth of information on the Indian elderly population especially with regards to the Indian traditional diets. Keeping this in mind, the present study was designed with a main focus on assessing the role of antioxidants in health and disease during the aging process.

The specific objectives included collection of baseline information of socio demographic attributes, nutritional status, dietary intake along with lifestyle assessment in terms of activity pattern and addiction pattern on the men and women (aged 45 years and above) selected for this study. Antioxidants profile from diet was evaluated in detail. The antioxidants levels in serum / plasma were also assessed in a sub sample of subjects with CVD and oral cancer. The study also involved assessment of the knowledge and practices of the caregivers, of elderly with respect to the role of antioxidants in the diets of the elderly.

The study was divided into four sections. For section I, two hundred men and women (aged 45 years and above) were randomly selected from the free living population of urban Vadodara. Random selection of hundred subjects (aged 45 years and above) comprising of men and women suffering from cardiovascular diseases (CVD) was done from the cardiac unit of a general hospital for the section II. Their respective age and economic status matched controls were purposively selected from the free living population. For section III, hundred men (aged 45 years and above) were randomly enrolled from the oncology ward of a general hospital. Their respective controls were selected purposively from the free living population after matching for age and economic status. Thirty caregivers, who were mainly daughters-in-law, of the elderly were randomly selected for the section IV of the study.

The data on socio-demography of the subjects for the first three phases were collected with respect to age, marital status, religion, ethnic group, educational level and income group.



Nutritional status was assessed using anthropometric measurements such as height, weight and body mass index (BMI). The diet related information was collected using 24 hour dietary recall method along with food frequency. Activity pattern was assessed by self reported time spent in work related and leisure time activities along with sleep. The addiction pattern was evaluated with respect to addiction to pan, supari, ghutka, cigarette and bidi smoking, alcohol consumption along with tobacco chewing using a questionnaire. Self reported personality traits were also assessed with respect to experiencing stress, anxiety and angry temperament. Disease profile was obtained by health records as well as a check list of health problems. Data on oral hygienic practices with respect to the cleaning and care of oral cavity was evaluated in men with and without oral cancer in section III using a questionnaire. Biochemical estimations with respect to blood sugar, lipid profile and antioxidants profile (serum α -tocopherol by Frank and Baker 1968, serum β -carotene by Dugan et al 1964 and plasma vitamin C by Roe, 1961) were carried out on a sub sample of subjects with CVD and oral cancer along with their healthy controls. The knowledge and practices (KAP) of the caregivers were assessed in section IV with respect to the importance of antioxidants in the diets of the elderly using a questionnaire.

The student's 't' test, percentages, odd's ratio, chi square for trend were used at appropriate places for the analysis of the data.

With regards to socio-demographic profile of the men and women (aged 45 years and above) from the free living population, it was found that 40 % of the men and 35 % percent of the women had completed their university level education.

With respect to their nutritional status, the mean BMI of the men and women was found to be 23 Kg/M² and 24 Kg/M² respectively which was within normal range.

Consumption of nutrients like energy, and protein, were found to be 50-75 % of the recommended allowance whereas fibre, and iron intakes were noted to be < 50 % of the RDA by men and women belonging to the younger (45-59 years) and elderly age (60

years and above) groups. Twenty one percent of the elderly men reported consumed > 100 % of the β -carotene requirements. The dietary intake of fats, calcium and vitamin C exceeded the recommended intakes, by men and women from both the age groups.

A direct relationship was observed with higher educational level and increased consumption of antioxidants vitamin like β -carotene and vitamin C.

Intake of antioxidants rich foods such as green leafy vegetables, vegetables rich in β -carotene and isoflavonoids along with fruits rich in β -carotene was found to be frequent in majority of the men and women selected for the present phase. Consumption of sweets and snacks was found to be non-frequent by the subjects from the free living population.

A sedentary lifestyle and a low addiction pattern was prevalent in men and women (aged 45 years and above) from the free living population.

Younger men and women (45-59 years) reported higher level of stress, anxiety and angry temperament than their elderly counterparts.

Gastrointestinal problems were higher in younger men (45-59 years) along with elderly men and women (60 years and above) whereas problems related to the nervous system were highest in the younger women.

Data on men and women (aged 45 years and above) suffering from cardiovascular diseases (CVD) showed that, 62 % of men and 71 % of women (aged 45 years and above) were found to be suffering from myocardial infarction. The mean age of occurrence of CVD in men was 60 years and in women, it was 66 years.

Forty one percent of men and 26 % of women with CVD had school education as compared to 43 % and 15 % of their respective controls who had university education.

Obesity was found in 17 % of men and 15 % of women with CVD as compared to 4 % and 7 % of their respective controls.

Consumption of roti with extra fat as a topping was significantly associated with the occurrence of CVD in men (OR=2.84) and women (OR=2.21).

The data on nutrient intake revealed a significantly higher intakes of fat by the men ($p<0.001$) and women ($p<0.01$) with CVD as compared to their respective controls. As against this, consumption of antioxidants vitamin like β -carotene and vitamin C were significantly higher in healthy men ($p<0.01$ and $p<0.001$) and women ($p<0.05$, $p<0.001$) without CVD as compared to their respective cases.

The mean amount of antioxidants rich fruits and green leafy vegetables consumed in a day was found to be low in men and women with CVD as compared to the healthy subjects without CVD.

A declining trend of association was observed with the increasing intakes of β -carotene and vitamin C when compared between the highest quartile of intake with the lowest quartile by the healthy men ($p<0.001$) and women ($p<0.01$)

Frequent consumption of green leafy vegetables (men-OR=0.43, women-OR=0.59) vegetables rich in β -carotene (men-OR=0.15, women-OR=0.28), and isoflavonoids (men-OR=0.26, women-OR=0.38) along with fruits rich in β -carotene (men-OR=0.10, women-OR=0.18) and vitamin C (men-OR=0.15, women-OR=0.29) gave a protective effect against the occurrence of CVD in the men and women without CVD. The beneficial effect of fruits and vegetables was especially strong in elderly men and women without CVD even after adjusting for age.

Consumption of milk based (men-OR=5.32, women-OR= 1.18), khoa based (men-OR=8.48, women-OR=3.11) and ghee based sweets frequently (men-OR=3.56, women-OR 3.11) along with deep fried foods (men-OR=9.28, women-OR=9.50) were found to increase the risk of developing cardiovascular disease.

Addiction pattern indicated at positive association between smoking bidis and occurrence of CVD in men (OR=5.75). Seventeen percent of the men with CVD also reported alcohol consumption and tobacco chewing as compared to 6 % and 9 % of their respective controls.

A non-significant association was observed between stress, anxiety and angry temperament in the men and women with and without CVD.

Gastrointestinal tract problems were found to be highest in men and women with and without CVD.

Increased risk of CVD was associated with higher serum TG, TC and LDL-C values and lower HDL-C values ($p<0.05$).

Serum α -tocopherol, serum β -carotene, and plasma vitamin C were significantly higher ($p<0.001$) in the men and women without CVD as compared to their diseased counterparts.

Higher values for antioxidants vitamins in blood were observed in subjects consuming increased levels of these nutrients through diets.

Results on men (aged 45 years and above) with and without oral cancer showed that the site of oral cancer in majority of men with oral cancer was found to be at the sides of tongue. The mean age of occurrence of oral cancer was 57 years. Illiteracy was as high as three times in the men with oral cancer as compared to the controls.

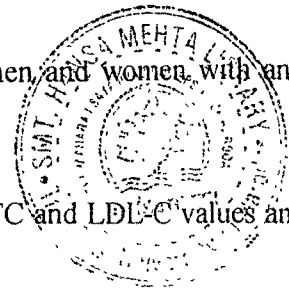
Anthropometric measurements indicated that undernutrition was prevalent in 1/4th of the total cases.

Higher consumption of fat was reported by the younger and elderly men with oral cancer as compared to their healthy controls.

Significantly higher intakes of antioxidants vitamins like β -carotene (850 μg vs 592 μg) and vitamin C (35 mg vs 29 mg) by the younger and elderly men without oral cancer against their diseased counterparts were noted down (588 μg vs 592 μg and 24 mg vs 21 mg).

The consumption of green leafy vegetables (GLVs) and fruits was found to be higher in younger men and elderly men without oral cancer as compared to their diseased counterparts.

A protective effect was observed with the frequent consumption of GLVs (OR=0.48), vegetables rich in β -carotene (OR=0.34) and vegetables rich in isoflavonoids (OR=0.56) against the disease in men without oral cancer.



Frequent consumption of fruits rich in β -carotene gave highly significant protective effect against oral cancer in the controls (OR=0.33) whereas a non-significant negative association was also observed with frequent intake of vitamin C rich citrus fruits (OR=0.47).

A strong positive association was observed with smoking \hat{b} idi (OR=3.33), alcohol consumption as well as tobacco chewing with the occurrence of oral cancer (OR=4.45 and OR=2.25 respectively). A highly significant association was observed in cases reporting stress (OR=3.47) and the occurrence of oral cancer.

More than 3/4th of the cases reported various oral cavity problems against 45 % of the men without oral cancer.

A significantly higher values were also obtained for low density lipoprotein (LDL) cholesterol in cases ($p < 0.001$) whereas high density lipoprotein (HDL) cholesterol was significantly higher in men without oral cancer than the cases ($p < 0.001$).

Significantly higher values for serum α -tocopherol and plasma vitamin C ($p < 0.001$) were observed in men without oral cancer. Serum β -carotene was found to be higher in controls, however the difference between the case and the controls was not significant.

Oral cavity problems were highest in men with oral cancer as compared to their respective controls.

Poor oral hygiene was observed in men with oral cancer. More than 80 % of the cases did not clean their teeth after meals or consuming sweet and sticky foods.

Data on assessment of knowledge attitude and practices of the caregivers of the elderly revealed that the caregivers were ignorant about various physiological changes and disorders occurring with advancing age. Also, limited knowledge with respect to the relationship between diet and degenerative disorders was seen among the care givers. Certain level of misconception regarding beneficial role of antioxidants rich foods and nutrients rich in fruits and vegetables were also noted among the caregivers of the elderly.

Regarding practices, very few caregivers of the elderly were found to put the knowledge into action. Cooking green leafy vegetables separately for the elderly was practiced by

very few caregivers due to unavailability of the time. Also, the caregivers were not found to encourage the elderly to consumed more serving of fruits in either whole or juice form even though they had the adequate knowledge about the benefits of these food for the elderly.

Thus, the present study has indicated that the increased frequency of fruits and vegetables rich in antioxidants vitamins like vitamin E, vitamin C and β -carotene is inversely associated with cardiovascular diseases and oral cancer. A balanced and regular diet rich in fruits and vegetables is a critical component of such a healthy living. Also, the changes in lifestyle pattern with emphasis on regular exercise and avoidance of smoking, tobacco or alcohol abuse is key for prevention of several age-related diseases. Present study further suggests the need to impart nutritional health education to the caregivers of the elderly to ensure healthy aging.