GENERAL DISCUSSIONS

GENERAL DISCUSSION

Healthy ageing can be ensured by adopting a proper lifestyle with a focus on dietary intake, starting from adulthood - rightly described as 'elderly of tomorrow' or even earlier. Faulty dietary habits during adulthood and continuing it in the later years leads to various degenerative disorders. These diseases, in turn, imposes numerous restrictions in the diet of an individual. It is therefore, important to probe the linkage from a different angle - not what the ageing process imposes on dietary intake and the nutrient status, but "can a particular diet or specific nutrients delay the ageing process and in turn avoid the onset of chronic degenerative diseases ?" The major chronic degenerative diseases occuring with advancing age are cardiovascular diseases (CVD) and oral cancer.

Scientific bodies continue to accumulate impressive evidence that foodstuff rich in antioxidant vitamins have an important role to play in prevention of coronary heart disease as well as cancer. Though a wide variety of antioxidants in foods contribute to disease prevention, strong evidence supports the role of three antioxidants vitamins - vitamin E, vitamin C and β-carotene along with a non-nutrient component - flavonoids against the free radical damage. While each of the antioxidants nutrients have specific activities, they often work synergistically to enhance the overall antioxidants capability of the body. However, majority of studies related to the role of antioxidants in prevention of chronic degenerative diseases, have been carried out on western population where the lifestyle and dietary pattern are completely different from that found in India. Hence, we cannot extrapolate the entire data completely on Indian population. It becomes imperative to have studies carried out on our people to pinpoint the protective role of antioxidants vitamin against various diseases. The present study, therefore, focused on assessing the role of antioxidants vitamins in health and disease during the aging process.

For the first phase of the study, men and women (aged 45 years and above) were selected from the free living population. Patients with cardiovascular diseases (CVD) and oral cancer were included for the II and III phase respectively.

Our study revealed a prominent difference in the nutritional status of the subjects selected for all the phases of the study. Majority of men and women from the free-living population as well as the controls for CVD and oral cancer had satisfactory nutritional status as their body mass index (BMI) was within the normal range. However, obesity was prevalent in men with CVD in the present study. A shift in the nutritional status was observed in case of men with oral cancer. In these subjects, under-nutrition was found to be prevalent since majority of the men belonged to the lower and lower middle income groups.

The dietary pattern of the subjects indicated a vegetarian diet followed by men and women from the free-living population as well as those suffering from CVD and their respective controls. Vegetarian diets may be responsible for deficiencies of various nutrients found in the subjects selected in our study. On the other hand, higher number of men suffering from oral cancer were found to be consuming non-vegetarian and ovo-vegetarian diets than their healthy counterparts. Inspite of consuming flesh foods, nutritional inadequacy with respect to calories, protein and iron was still found in the diet of these subjects. This was mainly because the non-vegetarian foods was consumed once in a week or fortnight and the share of meal obtained per person was less due to more number of members in a family. Hence, even though non-vegetarian foods being rich in energy, protein fats, and iron, the subjects with oral cancer could not meet even 50-75 % of the energy and protein requirements, in the present study. The level of iron met through the diet was also found to be $1/4^{th}$ of the RDA by the cases and the controls in our study.

The most commonly consumed oils reported in our study were cottonseed and groundnut oil by the subjects enrolled for all the phases. Though, cottonseed oil having good amount of linolenic acid have been shown to have health implications, the amount of oil consumed by the subjects was far exceeding the recommended level. This was reflected in the amount of dietary fat met, which was above the recommended intakes.

The iron intakes of the subjects selected for the present study was below 50 % of the recommendations. This was mainly because majority of the subjects were vegetarians. The diet of the subjects selected in our study, mainly constituted of cereals, legumes, dairy products and some amount of green leafy vegetables. Even

though rich sources of iron were supposedly consumed by these subjects, polyphenols present in some vegetables and phytates present in whole grain cereals, legumes and green leafy vegetables can bind non-heme iron (only 2 - 20 % of which is absorbed) and reduce its absorption. In the present study, the calcium intake was found to be satisfactory in subjects selected for phase I and II. Consumption of calcium was above the recommended intakes in these individuals. A high calcium intake can also inhibit iron absorption by forming insoluble calcium salts.

The intake of antioxidants vitamin like β-carotene and vitamin C indicated a higher consumption of these nutrients, through diets, by men and women from the free living population and also by the healthy controls of CVD and oral cancer patients. Though amount of vitamin C was far above the recommended intakes, the cooking losses should be kept in mind before attributing the beneficial effect of this antioxidants. Among the subjects with CVD and oral cancer, a distinct difference was observed with respect to the dietary levels of these antioxidants. Compared to the men with oral cancer, subjects suffering from CVD had higher intakes of β-carotene and vitamin C through their diets. This may be primarily because of the differences in the economic status and their educational level. Since majority of subjects with CVD were from middle income group, they had better affordability for purchasing fruits and vegetables as compared to the men with oral cancer who belonged to either lower or lower middle income group. Also being exposed to more years of education and access to media, men and women with CVD may have had some awareness regarding the beneficial effect of fruits and vegetables than their counterparts suffering from oral cancer who were either illiterate or were school dropouts. In our study a linear relationship existed between educational level and consumption of foods rich in β-carotene and vitamin C. The family type of the subjects should also be kept into mind while assessing the intake of antioxidants rich foods. More the number of members in a family, as seen in men with oral cancer, less the share of food obtained per person.

Our study reported frequent consumption of antioxidants rich vegetables and fruits by men and women from the freeliving population. The green leafy vegetables along with vegetables rich in β-carotene and isoflavonoid and yellow orange fruits rich in β-carotene and citrous fruits rich in vitamin C gave a protective effect against cardiovascular diseases and oral cancer as observed by odd's ratio, in the present

study. This finding is in line with evidences obtained from other epidemiological, cohort, observational and case control studies examining the role of fruits and vegetables in causation of free radical diseases like CVD and oral cancer. Once again, among subjects with two diseases in our study, consumption of fruits and vegetables was less frequent by men with oral cancer as compared to those suffering from CVD.

Frequent consumption of fat rich snacks and sweets were found to be a risk factor in the occurrence of cardiovascular diseases in our study. However, this effect was not found in men with oral cancer in the present study.
Our study reported sedentary lifestyle by almost all the subjects selected in the present study irrespective of their health and diseased status.

A distinct difference was observed in the addiction pattern of the subjects selected in our study. Very less addiction was reported by men from free living population. Addiction was mainly in terms of smoking either cigarettes or bidis. When compared to the diseased men, men with CVD reported higher addiction to smoking and alcohol consumption as compared to the free living males. However, when we examined the addiction pattern of men with oral cancer, it was highest as compared to the men from other two phases. Addiction were reported in terms of smoking bidi, alcohol consumption paired with tobacco chewing in men with oral cancer, thereby aggravating the disease in these individuals. Moreover, it was also observed that the frequency and intensity of addiction in terms of number of years and amount per day, was highest in men with oral cancer followed by those with CVD. Men from free-living population had lowest duration of smoking and number of cigarettes smoked per day as compared to the men from other two phases.

The antioxidants status in terms of serum β-carotene, serum α-tocopherol and plasma vitamin C, assessed in our study also gave a distinct profile with respect to the occurrence of the diseases. Subjects with CVD and oral cancer had significantly lower antioxidants profile as compared to their respective controls. Also when compared between the two disease conditions selected in our study, except for serum α-tocopherol, serum β-carotene and plasma vitamin C were lower in men with oral cancer as compared to those with CVD. Serum α-tocopherol was lower in men with CVD as against those with oral cancer, thereby, supporting the association observed

by other studies with respect to vitamin E and occurrence of CVD. In our study, low levels of α-tocopherol along with serum β-carotene and plasma vitamin C, were associated with increased risk of developing CVD. Positive association of lower serum α-tocopherol and plasma vitamin C levels was observed in men suffering from oral cancer in our study.

There is now convincing evidence that foods containing antioxidants may be of major importance in disease prevention. Humans require external sources of vitamin E, C and β-carotene as the body is unable to produce these nutrients. Through analysis of available data, Grey et al (1994) proposed that decreased ischaemic heart disease risk through nutrition may be possible when plasma concentrations of vitamin C are > 50 μmol/L, vitamin E is > 30 μmol/L and β-carotene is > 4 μmol/L. To achieve these levels, a dietary intake of ~ 150 mg of vitamin C, 30 mg of vitamin E and 3 mg of β-carotene has been suggested. Interestingly, these levels are much greater than the currently recommended dietary allowances which represent levels suggested to prevent deficiencies in healthy population. Optimal intakes of antioxidants may have to be achieved with the use of supplements. Hence, it is necessary to ensure that antioxidant supplements are safe and free from side effects. However, till such time as recommendations of these nutrients based on their disease prevention ability emerge, emphasis on promoting consumption of fruits and vegetables may help in reducing the risk of degenerative diseases.

Assessment of personality traits such as stress, anxiety and hot temperament, in our study, revealed that as compared to the subjects from free living population, higher number of subjects with CVD and oral cancer reported experiencing stress and anxiety along with angry temperament than their respective counterparts. These personality traits were more prominent in men with oral cancer as compared to men with CVD thereby supporting the fact that stress and malignancy are related.

The disease profile of the subjects selected for the present study revealed that gastrointestinal tract disorders ranked higher in men and women selected for all the phases followed by oral cavity problems. Men with oral cancer rated oral cavity disorders first followed by other disorders. Nervous problems were higher in men with CVD and oral cancer as compared to their free living counterparts.

The knowledge and practices of the caregivers observed in our study, indicated less attention paid towards the dietary care of the elderly with and without minor or major complaints since the cooking practices in terms of meal were mostly dependent on the preferences and age of other family members.

Numerous studies were carried out on the geriatric population, on local elderly since 1992. The earlier studies were conducted on the free living population of Vadodara city whereas the later studies were carried out on hospitalised elderly with various chronic disorders. Controls were also selected in studies on hospitalised elderly. A distinct difference was observed when we assessed the trend of dietary intake in the subjects studied from the year 1992. A declining trend with respect to the intake of nutrients like energy and protein was noted from 1991 to the year 2004 in men and women above 60 years. However, fat intake continued to be more than the recommended allowances in the subjects through out the decade. With passing years, lesser intakes of fibre and iron rich foods were also revealed. This may be due to the higher consumption of fast foods which are low in these nutrients. Consumption of antioxidants vitamins such as β-carotene and vitamin C was found to be higher in the starting of this decade i.e from 1991 till 2003. An increase in the trend (Figure I) of β-carotene consumption has been found since past few years which suggested increased awareness regarding the beneficial effect of β-carotene through fruits and vegetables. However, with initial sharp decline in consumption of vitamin C by men and women, an increase in the consumption has been revealed since couple of years (Figure II).

The disease profile of elderly men from 1993 consistently showed complaints related to oral cavity, gastrointestinal tract and locomotive system. These problems were also noted in men even after a decade i.e till 2003 suggesting no change in the dietary pattern of the elderly subjects (Figure III).

Figure I : Trend of β-carotene consumption from 1991 to 2003 by men and women (60 years and above) from free-living population

Figure II : Trend of vitamin C consumption from 1991 to 2003 by men and women (60 years and above) from free-living population

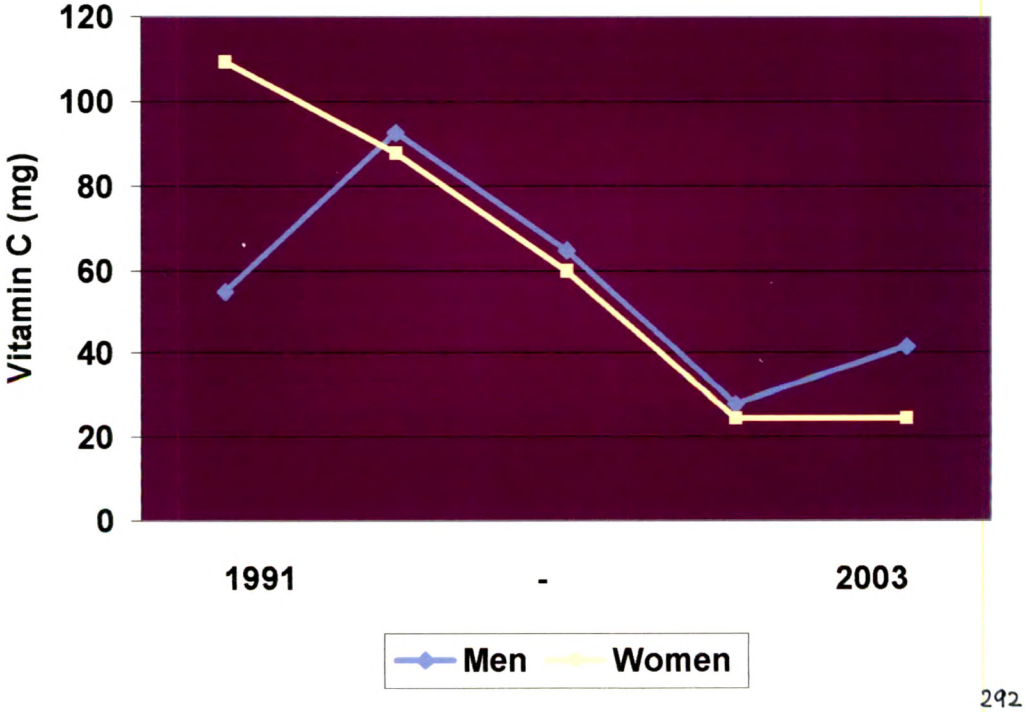
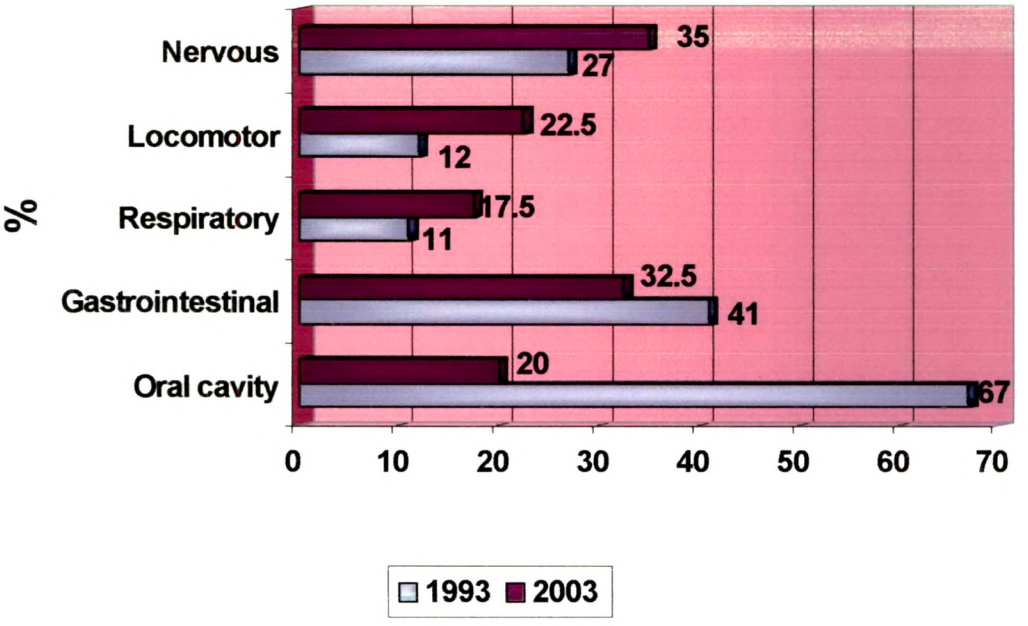


Figure III : Change in disease profile of men (aged 60 years and above) from 1993 - 2003



Thus, from the present study, some observations were worth noting :

- As compared to the free-living subjects, obesity was more prevalent in CVD cases whereas under nutrition was more prevalent in oral cancer cases.

- Dietary β-carotene and vitamin C status was better in healthy men and women without any disease than their counterparts with CVD and oral cancer.

- Higher consumption of fruits and vegetables by healthy elderly men and women as compared to population which was a decade younger was revealed in our study. This suggests health awareness with respect to the beneficial role of these foods in protecting them from various chronic disorders.

- Addiction to smoking and alcohol consumption in men with CVD coupled with tobacco chewing in oral cancer, increased the risk of developing the diseases in these men as compared to their healthy controls.

- The KAP survey of caregivers indicated a need to spread awareness regarding importance of dietary care in maintaining proper health and nutritional status of the elderly.

Though aging is inevitable process and often complicated by the disease process, its complexity can be minimised with proper dietary care and lifestyle changes from early decade of life. Efforts should be made to ensure optimum intakes of foods rich in antioxidants rich vegetables and fruits. Authorities in several countries have recommended that atleast 5 servings of fruits and vegetables should be included in the diets daily. Unfortunately, most of our diet patterns do not lay such an emphasis on vegetables and fruits. Hence nutrition health education is very important to create awareness in the general population regarding the protective role of fruits and vegetables in the daily diets.