CHAPTER - V

SUMMARY AND CONCLUSIONS
Ageing is a continuous process that beings at conception and continues until death. It is inexorable, ubiquitous, and affects all forms of life. Although specific mechanisms of ageing remain unknown, it is generally accepted that the genes contain a hereditary programme for maximum life of a species and that genetic and environmental interactions determine metabolic rate, rate of ageing, onset and incidence of diseases of the elderly and longevity. Since nutrients obtained from food are metabolized intracellular and tissue components of the body, it has been speculated that nutrition may play some direct role in longevity (Ordy, 1984).

The increase in life expectancy being a global phenomena contributed to rise of the proportion of elderly in the population in most of the developing countries also. In India, there are 99 million people who are above 50 years (Dhillon, 1992) and this illustrates the magnitude of the problem of increasing numbers of the aged. Maintenance of a satisfactory nutritional status should be the goal of nutritional care of the elderly, since desirable nutritional and health status improve quality of life and decrease the dependency among the senior citizens.

The present study was taken up with the following objectives:

1. To assess the nutritional status of a sample of institutionalised elderly drawn from day care centres, non paying and paying old age homes in Chittoor district of Andhra Pradesh and in a sample of Non-Institutionalised (Home bound) elderly drawn from the same localities.

2. To assess the nutritional status of the elderly in the sample as influenced by living style, economic status and gender.
3. To assess the taste acuity of the elderly in a subsample and compare it with that of younger subjects.

4. To study interrelationships among various dietary constituents, biochemical parameters (haemoglobin, serum total proteins, albumin and zinc levels), anthropometric data, clinical examination and taste acuity (perception) data in the sample of the study.

The study was carried out in the Chittoor district of Rayalaseema, Andhra Pradesh. The sample comprised of males and females, above 60 years of age, of two categories, namely institutionalised and non-institutionalised. The institutionalised aged were drawn from day care centres, paying and non-paying old age homes of Rayalaseema Seva Samithi (RASS) and other welfare organizations in and around Tirupati, Chittoor (Dt.). The non-institutionalised sample was drawn based on their income level i.e. upper middle income group and lower income group.

A three day dietary survey was done among all the subjects. The subjects were administered a questionnaire and for those who were illiterates, the interview was conducted and the responses were recorded in the questionnaire. General information, dietary information like food habits, meal patterns, number of meals consumed etc. was obtained from the questionnaires. Food consumption record was maintained by each subject, in which for three days, the quantities of each and every food item consumed was recorded in terms of a standard cup or spoon provided. The raw weight equivalents for different recipes were determined in the laboratory. Based on this the mean nutrient composition of the diets consumed for three consecutive days by each subject was calculated by using tables of food composition (Gopalan, 1991).
Data pertaining to Height, Weight, Body Mass Index (BMI), Nutrition Index (NI), Mid Arm Circumference (MAC) and Triceps skin fold (TSF) were recorded using appropriate equipment. All the subjects were examined with the help of a physician to assess the intensity of different nutrient deficiency diseases as per the guidelines of Jelliffee (1966). The prevalence of nutrient deficiency disorders was recorded. The systolic and diastolic blood pressure of each subject was recorded.

Blood samples were collected for the estimation of haemoglobin, serum proteins, albumins and zinc.

Hemoglobin was estimated by the method of cyanmethamoglobin (Annual Report, NIN, 1974).

Total proteins and albumin level of the serum was estimated by the method of Reinhold as given by Raghuramulu et al. (1983). Serum zinc level was estimated by Atomic absorption spectrophotometry (Butrimovitz & Purdy, 1977). The results of biochemical analysis were tabulated.

Assessment of taste acuity was done by conducting detection and recognition threshold tests in a sub sample of elderly (age 60-75 years) and their performance was compared with that of young subjects (age 25-45). Males and females were included in old and young groups in taste acuity tests.

The associations and correlations among the dietary variables, anthropometric measurements and biochemical parameters were studied by subjecting the data to various statistical designs.
The results recorded in the present study were as follows:

**Results of Diet Survey**

- The grand mean values of total calories and protein were compared with Recommended Dietary Allowances (RDA) given by ICMR. It was observed that the actual intake values were lower than the RDA. The aged men and women satisfied only 79 and 86 percent of the requirement for total calories respectively. Regarding protein, men satisfied 73 percent and women satisfied 72 percent of the RDA respectively. From this, it is evident that diets consumed by the aged subjects of the sample were deficient in total calories and protein, even as per ICMR recommendations.

- The RDA given by NRC only are available for vitamin and mineral requirements. Therefore, the nutrient composition of the diets of the subjects of the sample was compared with the RDA for micronutrients. All the nutrients were much lower than the RDA for both categories of subjects i.e. institutionalised and non-institutionalised. Only 30-60 percent of the requirements of these nutrients like vitamin C, β-carotene, thiamine, riboflavin, niacin, pyridoxine, cyanocobalamine, iron and calcium were satisfied in the diets of the subjects. Zinc was met only by 20 percent, in the diets that there was a larger deficit of this trace element. When the two categories of subjects were compared, it was clear that the non-institutionalised subjects had significantly higher intake levels of most nutrients and thus were slightly better off.

- Among the institutionalised sample, men and women from day care centres consumed lower amounts of most of the nutrients compared to those of non-paying and paying old age homes. 't' test results indicated
significant differences in the nutrient intake between these three types of institutionalised subjects, among men and women.

- Among the non-institutionalised sample, men and women of upper middle income group were superior in their nutrient intake levels to the men and women of low income group. The differences were statistically significant.

- When the institutionalised and NInstd subjects with similar economic status were compared with regard to their dietary composition, the differences between subjects of paying old age homes and upper middle income group and the differences between non-paying old age homes and low income group were not statistically very significant.

ii) Results of anthropometric measurements

- The anthropometric measures of non-institutionalised men and women were higher than those of the institutionalised and the differences were statistically significant for measures like weight, BMI and NI.

- Among the institutionalised sample, those from day care centres showed lowest values compared to those from non-paying and paying homes.

- In the non-institutionalised sample, upper middle income subjects showed higher anthropometric measurements than LIG subjects.

- The differences in anthropometric measures between the income matched institutionalised and non-institutionalised subjects were not significant.
Results of biochemical analysis

- The mean total serum protein levels were 5.93, 5.85, 6.18 and 6.24 g/dl among men and women, institutionalised and non-institutionalised respectively and these values compare favourably with the standard value of 6.0-7.5 g/dl. The differences between the two categories of subjects were statistically significant.

- The mean albumin levels were 2.84, 3.0, 3.12 and 3.14 g/dl in the men and women, institutionalised and non-institutionalised respectively and mean values were much lower than 3.9-4.5 g/dl of standard value. The old men and women have shown low serum albumin levels in the present study.

- The mean haemoglobin values of men, institutionalised and non-institutionalised, were 9.19 g and 10.92 g/dl. These were lower compared to the standard value of 14-16 g/dl. Women had 8.39 g and 10.92 g/dl in the two categories respectively and these two values are lower than 13-15 g/dl, which is the standard value.

- The standard value for serum zinc levels are 55-150 μg/dl. The estimated mean values were 51.14, 50.74, 58.74 and 57.35 μg/dl among institutionalised men and women and non-institutionalised men and women respectively and all these values are much lower compared to the standard value. The non-institutionalised subjects had higher biochemical parameters compared to the institutionalised and these differences were statistically significant.
• The differences in the levels of biochemical parameters of the aged within the sub groups of institutionalised did not indicate any significant differences in men, but in women the differences were significant for albumin and proteins among the aged from day care centres, non-paying homes and paying homes.

• Within the sub groups of non-institutionalised aged i.e. the UMIG aged had significantly higher biochemical parameters compared to the LIG aged. But the difference was not significant for zinc in men and for proteins in women.

• Between the aged from the paying homes and UMIG, the aged men of UMIG had higher serum levels when compared to the aged from payng homes. But the aged women of UMIG had significantly higher serum values when compared to those of the aged from paying homes.

• However, the differences in biochemical values between the aged from non-paying homes and LIG were not significant among men. But among women, the differences were significant for proteins (P<0.01) and zinc (P<0.5).

iv) Results of the clinical examination

• A high percentage of iron deficiency symptoms were seen among the aged women. Deficiency symptoms of calcium were the next in order of priority, followed by those of vitamin A, B complex and vitamin C. However, a higher percentage of aged men and women in institutions were suffering from the signs of deficiencies when compared to the non-institutionalised.
v) Results of taste acuity

- The taste acuity data of the detection thresholds indicated that a higher percentage of young (men and women) detected all the primary tastes at the given concentrations when compared to the aged (men and women). The aged men and women required higher concentrations of the solutions of the tastant in their recognition thresholds. The elderly/young ratio revealed that the average recognition thresholds elderly males was 3.38 times higher for sweet, 4.20 times higher for salt, 1.44 times higher for sour and 1.35 times higher for bitter taste than that of the younger subjects. Similarly the aged women required 2.73 times higher than that of the young for sweet, 4.87 times higher for salt, 1.29 times higher for sour and 1.34 times higher for bitter tastes, when compared with the younger subjects.

The relation between serum zinc levels and recognition thresholds (taste acuity) was very significant for all the 4 primary tastes in the aged men. But among the aged women, thresholds was significant for sweet taste only.

vi) Correlations between Diet, Anthropometric measures and Biochemical Analysis

- The correlation matrices indicated a number of significant 'r' values between dietary constituents and anthropometric measures and between diet and biochemical parameters in the institutionalised aged men and women. BMI and NI correlated with calories, proteins and fats in the institutionalised men and women.
However, these relationships among the non-institutionalised, aged men and women were not significant between the diet, anthropometric measures and biochemical parameters.

In summary, the findings of the present study revealed that the nutritional status in the aged in general and particularly the aged in institutions was not satisfactory. The dietary studies indicated zinc deficiency to a greater extent. The requirements were not only to the extent of 20 percent of RDA's, which is of serious concern. Zinc nutriture is related to the immune response in elderly men and women. Dietary deficiency of zinc contributes to decreased taste acuity and delayed wound healing. This condition should be set right by establishing large scale community nutrition intervention programmes (Education, counselling, food supplements etc). The role of home scientist/nutritionist is critical in creating an awareness about balanced diet ensuring better dietary intake of zinc, in particular and improving their overall nutritional status. Information on optimal cooking procedures for maximum bioavailability and on proper food selection should also be extended to the community.

Ageing is not a disease. It is a sequence of decrements in the body's functional capacity due to various physical changes. However, disease conditions and poor nutrition hasten the deteriorating changes and worsen the effects. To the extent the diseased conditions are prevented and a balanced nutrition is provided, the deleterious effects of ageing can be slowed, if not altogether stalled. Therefore it is important that good nutrition is provided and disease conditions are prevented. It is in this context, that the present study takes on relevance. It is an effort to understand the nutritional status with special reference to zinc. Therefore, the findings are of paramount importance and significance in geriatric nutrition.
India is fast greying. As per current statistics, nearly seven percent of Indian population are above 60 years. In other words, there are 99 million people who are above 50 years of age. A majority of this group are languishing in the rural areas and are unattended. They are ripe with wisdom and experience and constitute a very useful resource to the community if properly utilised. The attention given to the study of the target group is infinitely small compared to their proportion in population. Studies on their nutriture are hardly available. It is in this situation that the findings of this study become very important.