

**THE IMPACT OF THE APPLIED NUTRITION PROGRAMS ON EXPECTANT
MOTHERS IN TERMS OF THEIR NUTRITIONAL
STATUS AND INFORMATION**

By

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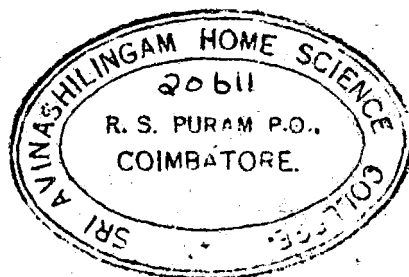


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I. INTRODUCTION

The present period is one of remarkable changes in India because of the promise of better lives for the millions envisaged by the Five Year Plans. The Community Development Programme which is the agency for implementing the Five Year Plans has thrown open many new horizons for social welfare. Through the Applied Nutrition Programme* (ANP), it has provided unprecedented opportunities for effecting changes in the food patterns of rural communities. As Griffith (1959)¹ pointed out, no spectator on the Indian scene today can be insensitive to the stirring evidences of India's determination to overcome the biologic and socio economic obstacles that deny healthier and more prosperous lives to her millions.

Food is one of the basic necessities of life, one of the few joys of human life, according to Lin Yu Tang (1957)². Aykroyd (1948)³ has stressed that in all stages of life, particularly during the period of rapid growth, good diet is essential for health. When the diet does not furnish the essential nutrients in proper proportions and adequate quantities, deficiency diseases result.

The diet and nutrition surveys conducted in the different parts of the country by several workers, Radhakrishna Rao et al (1953)⁴, Tasker (1956)⁵, Gopalan (1957)⁶ and Patwardhan (1958)⁷ have revealed that a considerable portion of our population suffers from

* The Applied Nutrition Programme or ANP, as popularly known, has been sponsored by the Government of India in collaboration with the UNICEF, FAO, and WHO.

malnutrition, which is a multi-deficiency complex. Inadequately fed women deteriorate under the stress of work and child bearing, and children born to such mothers would be heir to disease and brief life expectancy. Prinit et al (1960)⁸ pointed out that the basic defect in the Indian diet is a preponderance of cereals and an insufficiency of protective foods such as milk, meat, fruits and vegetables.

Rice and wheat unquestionably provide calories, but calories alone will not suffice. Without adequate quantities of protein and other nutrients, which cereals lack, vigour and vitality for continued physical work, mental stamina and capacity for happiness will be impossible. Hence Griffith's (1959)¹ warning that unless India's dietary of cereal grains is fortified with more of the protective foods, her people will continue to be ill-fed, could not have been more timely and pertinent.

Devadas (1957)⁹ emphasises that among the many problems which developing India needs to overcome, malnutrition and under-nutrition are the most pressing. According to Sen (1963)¹⁰, under-nutrition is the condition in which just more food is the need, and malnutrition is the state in which one or more nutritional essentials are lacking in the diets, in quantity or quality, or both.

Proteins play a vital role in the eradication of malnutrition. Sufficient quantities of proteins in the dietaries are important in the nutrition of man. While plants synthesise proteins for their needs from simple inorganic elements, animals depend on ready-made proteins for the synthesis and maintenance of their tissues. Kapraswamy et al (1958)¹¹ expound that the quality of

proteins in terms of their biological values and the quantity and degree of their utilization, determine their efficacy in human nutrition. Comparing the meat eaters with cereal eaters, McCarrison (1932)¹², as early as in 1932, had demonstrated the superiority in health and physical development of those who consumed high quality animal proteins. Cahill (1945)¹³ and Yoshimura (1960)¹⁴ brought out the fact that protein influences the processes of reproduction and lactation.

As against the knowledge that proteins are important in the daily diet, particularly of the expectant mothers and other vulnerable groups, Pasricha (1958)¹⁵ noted ^{that} the diets of both expectant and nursing women were deficient with regard to proteins, calories and calcium. Venkatachalam and Rebelo (1962)¹⁶ warn that the damage inflicted on the new born babies by severe protein malnutrition during pregnancy results in deficiency diseases such as anaemia and rickets. Hence efforts must be directed towards establishing and maintaining the nutrition of the mother in order to ensure that the infant and young child are well fed and consequently capable of healthy growth.

The task of preventing malnutrition is engaging the attention of the Government of India. Their efforts to combat malnutrition, through the recognition of the nutritional needs of the rural people, have been strengthened, by the contributions of several international and national organisations including the United Nations agencies (1964)¹⁷. Among the United Nations agencies which assist developing countries achieve their goals in the economic and social fields, UNICEF (1960)¹⁸ has focussed world attention on the needs of the vulnerable groups and on the practical ways in which international

aid can help to meet them. UNICEF stimulates governments, through the provision of supplies and equipment, and schemes to train local personnel to plan programmes of permanent benefit to the vulnerable groups.

The Applied Nutrition Programme in India is one such integrated scheme started on a nation wide scale to combat malnutrition, by the Ministry of Community Development, Panchayati Raj and Cooperation of the Government of India with the assistance of the UNICEF in collaboration with the FAO and WHO. The ANP is based on a (1964)¹⁹ three fold approach: (a) increased production of protective foods, (b) improvement of the nutritional standards of the people through the consumption of the protective foods, particularly the vulnerable groups expectant mothers, nursing mothers and children under the age of five in the rural areas, who are known as the 'Beneficiaries' in this programme, and (c) nutrition education.

Inadequate nutrition in pregnancy leads to many problems, not only to the mother but also to the child from the very beginning of his life. But, for generations, scores of millions of expectant mothers in India have been on deficient diets due to ignorance about nutritional facts. The FAO/WHO/UNICEF Nutrition Seminar for South and East Asia (1961)²⁰ has noted with concern the high incidence of pregnancy wastage...abortion, miscarriage and still births in the member countries. Among the several factors responsible for the wastage, malnutrition was considered the major one, hard physical work during the last trimester, diseases and environmental factors being the other causes. Hence the seminar stressed the need to determine the effects of many aspects of nutrition on pregnancy.

Since "the hand that rocks the cradle rules the world" (1953)²¹, and it is from the kitchens of the families that the citizens of the world are fed (1963)²², the responsibility of the home maker to meet the nutritional problems of the community must be recognised. Therefore, any attempt towards the betterment of nutrition of expectant mothers is bound to bring up a strong citizenry, if planned on sound foundations of nutrition information.

The Government of India, UNICEF and other international organisations have invested large sums of money, equipment and personnel for the Applied Nutrition Programme. UNICEF's assistance alone for the projects amounts to ₹ 10,00,000 (1963)²³ apart from the national commitments. A study of the impact of the programme on the beneficiaries will throw light on how far this investment is fruitful. Such an evaluation will help in formulating the policies and plans for the future.

Therefore this investigation was undertaken in two villages in Bhavanisagar Block with the following aims:

1. To study the Applied Nutrition Programme in operation and its impact on the Beneficiaries.
2. To locate and effect the possible changes, including nutrition education which would help to make the programme more effective.
- and 3. To evaluate the impact of the changes effected on the 12 expectant mothers, who were participating in the ANP, constituting an important group among the Beneficiaries.

It is hoped that the findings of this study, although limited to a small population, will be of interest to the personnel in the ANP, Community Development Blocks, State and Central Governments, and the United Nations agencies, UNICEF, FAO and WHO, all of whom have made possible the initiation and operation of the nation wide ANP in India.

II REVIEW OF LITERATURE

The literature pertaining to this study of the impact of the Applied Nutrition Programme on expectant mothers is reviewed under the following heads:

- A. The problem of hunger.
- B. Deficiencies in Indian diets.
- C. Role of proteins in the diet.
- D. Nutrition in pregnancy.
- E. Methods of studying the nutritional status of expectant women.
- F. The role of international organisations in raising the nutritional status of the vulnerable groups.
- G. The Expanded Nutrition Programme and Applied Nutrition Programme in India.
- H. Need for nutrition education.

A. The Challenge of Hunger

Obtaining adequate food has been mankind's challenge from time immemorial. Stare (1950)²⁴ attributes the savagery of the prehistoric times to early man's struggle for satisfying hunger and finding food for survival.

Never in the history of the world have all the people had enough to eat. Even today, 'more food' is the most pressing need in the developing countries, where a major part of the population subsists on less than 2150 calories per head per day (1962)²⁵. The pangs of hunger strangle the potential future of children (1962)²⁶, and retard the moral, social, political and economic development of nations (1963)²⁷.

The problems of hunger have been further aggravated by the world's exploding population. Dr. B.R. Sen, the Director-General of the Food and Agriculture Organization of the United Nations, FAO (1962)²⁸, (1965)²⁹ predicts that the world population would be doubled by the year 2000. According to Sax (1963)³⁰, "The most tragic aspect of the population explosion is that the greatest rate of growth is in Asia, Africa and Latin America, where most of the people are already living at or near bare subsistence levels with inadequate food, housing, education and medical care." Thus in most of the under developed countries food production is barely keeping pace with the rapidly growing population. If the world's expanding population is to be well fed, and economic development is to be achieved, the relationship between the present trends of population growth and food production need to be reversed. Food production therefore has to be stepped up at a rate faster than that of population, along with simultaneous efforts to control the increase of birth rates. A world wide campaign is called for as Freeman (1963)³¹ exhorts, "Let it never be said of this generation that we were able to orbit the earth with satellites, but that we were unable to put bread and rice into the hands of hungry children, unable to reach for and grasp the potential for plenty and progress that is at hand."

B. Deficiencies in Indian Diets

In order to eradicate hunger one needs to know the basic defects in existing diets. Diet surveys carried out in India and reported by Aykroyd (1948)³, Mitra (1953)³², Rao (1954)³³, (1957)³⁴

Pandit and Rao (1960)³⁵ and Pandit (1964)³⁶ reveal that the diet of an average villager is ill-balanced and defective with a predominance of cereals, lacking in protective foods such as milk, fish, eggs and fruits. Children's diets (1959)³⁷ are particularly deficient in vitamins A and of the B group, calcium and protein both in quality and quantity. Outward manifestations of deficiencies of vitamin A and B complex such as angular stomatitis and cheilosis are common.

In a survey in South India on children under five years of age, 85 per cent of whose parents had a monthly income of Rs.100/-, Swarup et al (1959)³⁸ observed signs of protein malnutrition. For every case ^{of} Kwashiorkor, two cases of marasmus, two to five of vitamin A deficiency, and five of anaemia were located. While anaemia occurred in all the age groups, expectant and nursing women and children appeared to be particularly prone to it.

The Third World Food Survey of the FAO (1963)³⁹ has revealed that in the developing regions, the daily per capita consumption of animal protein is nine grams which is 1/5 of the consumption in the developed areas. Sielder (1963)⁴⁰ has stressed that such low consumption of animal proteins results in the prevalence of a high degree of protein malnutrition. This is particularly common in India, where milk, which is almost the only source of animal protein (1963)⁴¹ in family diets, is produced in limited quantities, being 50 kilograms per person per year, as against more than 200 kg. in France, and 300 Kg. in the U.S.A.

The FAO (1955)⁴² observed that the critically low amounts of proteins in the diets of a large part of the world's population is a serious nutritional problem because of (a) its effects on health, and (b) difficulties involved in increasing the world supplies of protein rich foods, specially animal protein foods, in the immediate future.

C. Role of Proteins in the Diet

The role of proteins in growth has been clearly demonstrated by Osborne and Mendell (1914)⁴³ (1919)⁴⁴ and Swaminathan (1937)⁴⁵. Rippon (1939)⁴⁶ proved that tissues synthesis depended on the quality and quantity of the proteins in the diet. Madden and Whipple (1946)⁴⁷ showed that the production of normal serum globulin was influenced by the adequacy of proteins and their utilisation. Since globulins are responsible for antibody synthesis, proteins play an important role in developing resistance to disease. Arnell (1945)⁴⁸ proclaimed that many anaemias were caused by longstanding deficiencies of proteins and iron in the diet. Davidson (1957)⁴⁹ stated that protein was an essential component of haemoglobin which is needed for the Red Blood Cell formation. That dietary lack of protein causes inactivation and degeneration of the enzyme in the liver and thus affects the normal functioning of all organs has been demonstrated by Wanio et al (1953)⁵⁰ and Srinivasan and Patwardhan (1955)⁵¹.

Dubes (1962)⁵² states that resistance to tuberculosis decreases whenever the diet does not contain adequate protein. Haurowitz (1963)⁵³ points out that proteins and nucleic acids are primarily involved in the phenomena of growth and reproduction and that the enzymes involved in growth and reproduction are made up of proteins.

Brock (1961)⁵⁴ remarks that animal proteins are superior to plant proteins. Kuppaswamy et al (1958)⁵⁵ are of the view that proteins of vegetable origin are not ideally suited to meet the needs of the "growing." Hence in order to overcome protein malnutrition, diets need to include protective foods such as milk, meat, fish and eggs.

D. Nutrition in Pregnancy

Today's children are tomorrow's citizens. Therefore it is necessary to ensure that they are adequately fed in order to become good citizens. According to Venkatachalam and Rebello (1962)¹⁶, the nutrition of a child starts from the time he is conceived, and born. The new born infant draws his nourishment from the mother's body, and builds up a store of valuable nutrients in his body to back him during the first few months. Macy (1952)⁵⁶ and Burgess and Bierman (1957)⁵⁷ point out that the child depends for his survival, growth and protection on the quality and quantity of food he receives from the first moment of his life. Therefore feeding the mother adequately during pregnancy is a tremendous asset in the attempts to solve the widespread nutritional problems which affect child health. Venkatachalam and Rebello (1962)¹⁶ state that from the early stages, until the twelfth week, the embryo in the uterus which is about two inches long, relies wholly on the surrounding tissues for nourishment. Thereafter the embryo known as the fetus, grows at a tremendous pace increasing in weight. In order to provide for this rapid growth which includes formation of bones, blood, brain and other tissues, nutrients are needed. Therefore the

expectant mother needs to be fed wholesome food in adequate quantities. In addition to meeting the needs of her growing baby, nourishment is required by the mother also for other purposes.

Hapier and Majumdar (1933)⁵⁸ observed anaemia among 57 expectant mothers, with inadequate dietaries. Klevin *et al* (1964)⁵⁹ noted that low protein diet resulted in a reduction in iron absorption. Warkany (1960)⁶⁰ and Barohenko and Kryshanskaya (1960)⁶¹ induced congenital malformation which resembled, morphologically, malformations of genetic origin, by maternal dietary deficiencies. Rebellow and Rajaratnam (1963)⁶² point out that inadequate diet during pregnancy may result in the incidence of prematurity and still births. Hytten (1964)⁶³ states that diet is only part of the wider environmental picture that affects the foetal growth during pregnancy.

Venkatachalam and Rebello (1962)¹⁶ consider that a poor maternal diet will not only increase the risk of serious complications during gestation, but may result in a difficult and prolonged labour. The maternal mortality rate was about 200/1000 in a study conducted by Rao (1963)⁶⁴ in four states in South India.

Despite the knowledge that adequate diet is essential in pregnancy, Aaricha (1958)¹⁵ noted that the diets of the 100 expectant women and 70 nursing women were lacking in calories, proteins and calcium. Five expectant women and two nursing mothers had an intake less than 1000 calories, while the rest had caloric intakes ranging from 1000 - 2000. Nineteen expectant mothers and 14 nursing mothers had a daily protein intake less than 30 grams, out of which only one fifth was derived from animal sources.

In a survey of 300 expectant mothers belonging to the poor socio economic groups in south India, Gulen (1961)⁶⁵ observed that

their daily intake of calories ranged between 1400 - 1900 with a mean protein intake of 40 grams from vegetable sources. He concluded that protein malnutrition originating from maternal malnutrition constituted the major nutritional hazard in infancy and childhood.

2. Methods of Studying the Nutritional Status of Expectant Women.

Morgan (1955)⁶⁶ defines nutritional status as, "The state of health of the individual or group as conditioned by the choice and amounts of foods, or the nutrients taken." Many methods have been developed to study the nutritional status of expectant women and to correlate their dietary intakes with the changes occurring during pregnancy, as well as the health of the mother and the new born infant. Davidson et al (1963)⁶⁷ recommend the following as methods for assessing the nutritional status:

1. Diet surveys
2. Anthropometric measurements
3. Biochemical determinations
- and 4. Clinical examinations

Schaefer (1960)⁶⁸ and Ansell (1963)⁶⁹ advocate biochemical and clinical methods as primarily objective.

1. Diet Surveys

Burke (1947)⁷⁰ stressed that only through information on the average dietary intake over a considerable period, correlation with clinical and laboratory findings could be obtained for assessing nutritional status. Morris (1949)⁷¹ recommended seven day surveys to be conducted in the different seasons. Srinivasu (1957)⁷² and

Moyer et al (1954)⁷³ consider the determination of dietary intakes by means of careful dietary histories as an important tool of nutrition research. Appalan (1961)⁷⁴ points out that diet surveys directed towards the vulnerable segments of the population are an essential prerequisite to obtain base line information for any programme designed towards the betterment of their nutritional status. Billingsworth (1941)⁷⁵ emphasises that from the data obtained from the dietary surveys, the nutrient intake of families, groups or individuals can be assessed by calculations using figures from accepted tables of food values, or by direct analysis. Work done by Dewadas (1949)⁷⁶ in India and the Bureau of Human Nutrition in the USA (1947)⁷⁷ show agreement between the calculated and analysed values of foods.

2. Anthropometric Measurements

Anthropometric measurements are those which measure the physical growth of an individual. They comprise: weights, heights, abdomen measurements and chest measurements. Kural (1961)⁷⁸ considers checking the weights of people as the most obvious method of checking their nutritional status.

a) Anthropometric measurements of the expectant mother

Mallins (1962)⁷⁹ regards a weight gain of 24 - 28 pounds during pregnancy as normal. Venkateshwar and Shankar (1960)⁸⁰ studied the changes in the body weight in 130 expectant women belonging to the low income group in relation to their diets. They found that the mean weight gain during pregnancy was 6.02 kg. Venkateshwar et al (1960)⁸¹ found

that the gain in body weight did not show a significant correlation with the birth weight of the infants. In another study Venkatachalam (1962)⁸² noted a weight increase of 25 per cent of the initial body weight in expectant women. According to this author, a low gain in weight may be due to a greater loss of body fat occurring through a low intake of proteins and calories. Srikantia et al (1964)⁸³ observed that the rate of gain in body weight of expectant mothers was significantly influenced by optimal intakes of protein and calories.

b) Anthropometric measurements of the new born

The investigation of Ebbs et al (1941)⁸⁴ and Burke et al (1949)⁸⁵ show the important relationship between maternal diet on one hand, and the condition of the foetus at birth on the other. Gopalan (1961)⁸⁵ regards the birth weight in a community as an index of neonatal viability. He points out that low birth weights in the low socio-economic groups are also associated with pre-maturity and infant mortality.

In the 284 cases studied, Burke et al (1949)⁸⁵ found that when maternal diet was excellent or good, 95 per cent of the infants were in "excellent or good" physical condition at birth. In contrast, when the maternal diet was "poor to very poor", 65 per cent of the infants were in the poorest physical condition at birth. Wilkin and co-workers (1955)⁸⁶ and Wellin (1955)⁸⁷ have also indicated that the health of the offspring suffers from maternal malnutrition. Thomson (1957)⁸⁸ postulates that the vitality of the baby is readily influenced by maternal nutrition. After studying 1129 cases of

infants from a low economic group in Bombay, Arora et al (1963)⁸⁹ have concluded that maternal diet does not affect the birth weight of the child.

Thomson (1957)⁸⁸ attributed the dramatic reduction in the rate of still births during the 1939-1945 war to improved nutrition during pregnancy. Maachanra and Sachdeva (1962)⁹⁰ studied the mortality and morbidity in children, within one month to one year, in North India and found that nutritional deficiencies accounted for 4.1 per cent of the total morbidity, and five per cent of the total deaths in 1956-61, 41.4 per cent of which were due to malnutrition and 18.1 per cent due to marasmus.

The international definition of 'prematurity' recommended by the World Health Assembly of 1948, marks any infant weighing 2500 grams or less as a premature baby, regardless of the period of gestation (1963)⁹¹. Moyer et al (1954)⁷³ have set 2500 grams weight and 47 centimeters length as the limit. Park et al (1963)⁹² cited that a study of the records relating to child birth at Narora Primary Health Centre from 1949-1963, shows that the average birth weight of 1091 babies, was 2742 grams, 21.5 per cent being lower.

A set of ten anthropometric measurements were taken on 266 new-born babies within 48 hours after birth by Singh and Venkateshian (1962)⁹³. They observed that the male babies showed higher mean values for all the measurements than the females. All the measurements in both sexes, showed significantly high positive correlation with the weight of the baby, confirming the findings of Thomson (1959)⁹⁴.

3. Biochemical Determinations

Arroyave (1960)⁹⁵ has defined the biochemical methods as those which measure directly the supply of nutrients and those which detect the biochemical changes indirectly reflecting metabolic alterations.

a) haemoglobin values

The concentration of haemoglobin and total serum protein are among the commonly used biochemical determinations to assess the nutritional status in population groups. According to Enai (1961)⁷⁵ the level of haemoglobin in the blood is a useful index for assessing the nutritional status.

Haemoglobin levels during pregnancy

Ghosh *et al* (1949)⁹⁶ reported that alterations in the blood picture are the natural results of increases in the plasma volume during pregnancy and that the haemoglobin percentage decreases during pregnancy. The normal haemoglobin value for Indian expectant mothers as recorded by Ghosh and co-workers was 10.5 grams per cent.

Vaidi and Gopalan (1955)⁹⁷ found that the haemoglobin levels in two socio-economic levels ranged from 8.6 to 14.2 grams per cent with a mean of 10.2 grams per cent. Guggenheim *et al* (1940)⁹⁸ noted that the mean haemoglobin level was 11.3 grams, with 12 per cent of the expectant mothers registering values below 10 grams. Srinathan *et al* (1947)⁹⁹ observed the average haemoglobin to be 10.9 grams per cent among 82 women in Andhra. Shankar (1962)¹⁰⁰ reported that the average haemoglobin level for 394 expectant mothers whose diets were inadequate was 11.4 grams per cent during the first, 10.3 grams per cent during the second and 9.9 grams per cent during the third trimester.

In his study with 42 subjects, Venkateshram (1962)⁶² found that the haemoglobin level was 11.2 grams per cent at the third trimester.

Opalan (1961)⁶⁵ noticed a progressive increase in the number of expectant women who showed decreased haemoglobin levels, as pregnancy progressed.

b) Plasma protein values

Kerr *et al* (1918)¹⁰¹ proved that the plasma protein estimation could serve as an effective measurement for evaluating protein nutrition, because dietary proteins affected plasma proteins. Hansi (1961)⁷⁸ found that the changes in the proportion of albumins and globulins is a valuable indication of protein nutrition. Therefore, analysis of serum protein and its fractions provide useful information on the nutritional and health status of expectant mothers.

Changes in plasma proteins during pregnancy

A high total serum protein with relatively low serum albumin was found by Sebrell *et al* (1949)¹⁰² in malnourished British patients. Allison and Fitzpatrick (1940)¹⁰³ noted a rise in globulins associated with a fall in plasma albumin concentration in body nitrogen of protein depleted animals. They also found that the concentration of globulins are never reduced below normal values under experimental conditions. Jayalakshmi *et al* (1957)¹⁰⁴ observed the mean total serum protein concentration in expectant mothers to be 6.2 grams per cent. According to Hansi (1961)⁷⁸ the loss of one gram of circulating serum protein corresponds to a loss of 30 grams of tissue protein.

Shankar (1962)¹⁰⁰ found a progressive fall in the concentration of total proteins and albumins in the plasma, as pregnancy

progressed in a group of women who received an inadequate diet. The fall of the albumin exceeded that of the total proteins in blood. Beaton (1964)¹⁰⁵ confirmed that the mean total serum protein concentration and albumin levels, and the albumin and globulin ratio fall during normal pregnancy.

Wacy et al (1954)¹⁰⁶ pointed out that the intensity with which the maternal body accumulates active body tissues, the rapidity with which the labile proteins and mineral reserves are built up, and the extent of alterations taking place in hormonal excretions may influence the levels of protein in blood. Therefore, they caution that low concentrations of proteins in the blood serum may indicate dietary protein deficiency, only if disease or any other associated conditions can be excluded. Hence the changes in the plasma protein and its fractions should be interpreted only in the light of other factors. One such factor is hookworm infestation. Tasker (1962)¹⁰⁷ estimated that the amount of blood lost by patients with hookworm infestation, was two milli litres per day, for an average of 100 worms. Therefore the individual might show a depleted blood protein and iron picture due to loss of blood inspite of being on a high intake of proteins. Another type of loss of large amounts of albumin into the intestinal lumen resulting in low albumin levels has been noted by Gordon (1962)¹⁰⁸ in patients with hypertrophic gastritis and ulcerative colitis.

Howard (1959)¹⁰⁹ studied the plasma proteins in relation to deficiency of vitamin C in pregnancy. He found that in acute SCURVY, a decrease in albumin by twenty-five per cent, an increase in fibrinogen by fifty per cent and an increase in alpha globulin by

ten per cent occurred, although the total protein concentration remained unchanged. These depletions in blood protein should be differentiated from the depletion due to dietary deficiencies.

4. Clinical Examinations

According to Davidson and Passmore (1963)⁶⁷ clinical examination provides a means of obtaining the estimate of the net state of nutrition. According to Alonso (1942)¹¹⁰, high blood pressure, medically called hypertension, is a disease condition and is the greatest killer of expectant women. Comparing two groups of expectant women, one on a low protein diet, and the other on a high protein diet, Williams (1955)¹¹¹ pointed out, that the high blood pressure of 140/85 was twice as frequent in the low protein diet group, as in the high protein diet group, thus indicating that a low protein diet increases the blood pressure.

F. Role of International Organizations in Raising the Nutritional Status of Vulnerable Groups.

Recognising the need for adequate food during pregnancy and other stages, several countries have developed community nutrition programmes to combat malnutrition and to improve the nutritional status of their people (1963)¹¹². On a world-wide basis, nations are united in their efforts to solve the problem of food, pooling their resources in the struggle against hunger and malnutrition (1961)¹¹³. In the successful planning and implementation of the programme, many international agencies and organizations have extended assistance.

The specialized agencies of the United Nations, namely FAO, UNICEF and WHO have been closely associated with India's nutrition programmes. Milk distribution schemes in schools and maternal child health centres is one such programme (1961)¹¹⁴ under the auspices of the UNICEF since 1949. Pandit et al (1960)⁸ point out that to date these supplies to the three vulnerable groups have amounted to a total of 7,577 tons.

United Nations Children's Fund (UNICEF)

UNICEF (1961)¹¹⁴ was established by the United Nations General Assembly in 1946, to give relief to children in the war devastated countries. UNICEF (1961)¹¹⁵ has now turned its attention to the needs of the children in the economically underdeveloped countries, through four types of programmes: increasing the production and consumption of protective foods in villages through aid to schools and community gardens; shipping skim milk powder for distribution through schools and health centres (1961)¹¹⁶; stimulating nutrition education; and encouraging local production of safe milk and conservation, pasteurisation, drying and sterilisation of milk. In areas where milk is not sufficiently available, UNICEF is helping to develop other high quality protein foods such as fish flours, soy milk and various high protein vegetable flours, based on local agricultural by-products which are not presently used for human consumption.

World Health Organisation (WHO)

The World Health Organisation (WHO) of the United Nations is an international cooperative for health. Its concern is the health

and well being of the world's people (1962-63)¹¹⁷. WHO gives assistance to member countries in many forms: strengthening the national health services; training health workers; fighting major diseases and protecting maternal and child health. The organization has assumed a primary role in giving warnings about epidemics, finding and publishing health statistics and sponsoring research on health problems. WHO works closely with UNICEF, FAO and other United Nations agencies associated with nutrition and health (1951)¹¹⁸.

The Food and Agriculture Organisation (FAO)

The Food and Agriculture Organisation (FAO) came into existence in 1945 (1962)¹¹⁹. The objectives of the FAO are: increasing food production, improving distribution and marketing of food, and raising the nutritional standards of people. Therefore it is concerned with all the earth's natural and renewable resources with land, water, forests, seas, crops and animals from the point of view of their service to man. It is working for the improvement of plants and livestock and for their protection against diseases and pests.

Aykroyd (1954)¹²⁰ records the valuable assistance of FAO to India in the fields of land and water development, plant protection and production, animal production and health, rural welfare, development of fisheries and forestry, and nutrition. The FAO (1962)¹²¹ in collaboration with the UNICEF, WHO and the Rockefeller Foundation is seeking to develop for wide consumption, the presently untapped additional sources of high protein foods. The FAO (1962)¹¹⁹ is now assisting several nutrition and feeding projects started in 1949 with UNICEF's assistance.

In addition to these regular and Technical Assistance programmes of the FAO, special programmes of world wide interest (1961)¹²² are now in operation through the Freedom From Hunger Campaign (FFHC) and the World Food Programme, initiated in 1960. The FFHC was organized by FAO with a view to eradicate hunger and improve the nutritional conditions of the world's people (1961)¹²², by helping them develop their resources for securing that primary freedom from want (1964)¹²³. The main objectives of the FFHC as stated by Sen (1963)¹²⁴ are: to inform and educate the public regarding the extent of undernutrition and malnutrition that still exist in the world, the threat that they pose to peaceful and orderly progress, and the need for renewed efforts to speed up economic development in the developing countries. The World Food Programme is based on the gifts of food from surplus countries for relieving hunger, as their contribution to the economic development of the under developed countries.

G. Expanded and Applied Nutrition Programmes in India

With the cooperation of UNESCO, FAO, WHO and the Government of India, the State of Orissa (1962)¹²⁵, (1963)¹²⁶, (1963)¹²⁷ launched in 1959 a four-fold Expanded Nutrition Programme (ENP) to demonstrate how the diets of the vulnerable groups in the villages, namely, the expectant and nursing mothers and preschool children can be greatly improved without the need to bring in supplies of food from abroad. Briefly, the Expanded Nutrition Programme is the integration of a "Nutrition Action" centered mainly on the diets of vulnerable groups. It consists of a poultry project, inland fisheries project and a

school garden project, to supply eggs, fish, vegetables and fruits free of cost to the vulnerable groups. The AMP thus started in Orissa has provided the inspiration for starting the larger Applied Nutrition Programmes on a national scale within the framework of India's Community Development Programme for implementation by the different states.

Egger (1964)¹¹⁸ regards the UNICEF-WFO-WFO assisted Applied Nutrition Programme as the first systematic attempt on a significant scale to develop a coordinated and comprehensive programme with a three-fold approach for nutrition education and training in the production, preservation and consumption of nutritionally valuable foods. The chief aim of the programme is to assist the people in the practical application of nutritional knowledge with the primary purpose of ameliorating malnutrition among the needy expectant and nursing mothers and preschool children in the villages. After the period of foreign aid for three years, it is envisaged that the programme will become self-generating and that the panchayats and the village committees will be able to maintain the vegetable and fruit garden, the poultry and fish culture, to meet the food needs of the vulnerable groups and lastly for the whole community. By then it is expected that the rural women would be sufficiently nutrition oriented to be induced to raise kitchen gardens and small poultry units in their own homes and thereby raise the standards of health of their families. The AMP has been (1963)¹²⁸ successfully operated in Orissa since 1959, in Andhra Pradesh since 1960,¹²² Uttar Pradesh since 1961, and in Madras ^{Since} 1962.

An evaluation (1961)¹¹⁴ of the experience with the milk distribution schemes was made by the Experts' Committee of the FAO, WHO and UNICEF in 1959. It revealed that there had been substantial benefits in health and other aspects to the mothers and children. The committee recommended that greater attention should be given to the nutrition education aspects as integral parts of the distribution schemes.

B. Need for Nutrition Education

The FAO (1940)¹²⁹ points out that the consumption of an unbalanced diet with its harmful effects may be directly attributed to lack of nutritional knowledge and to ignorance of the special needs of vulnerable groups. Pittison et al (1957)¹³⁰ remark that nutrition education is essential because nutrition which is a community concern is the cornerstone of health. Lockwood (1951)¹³¹ defined nutrition education as the retail end of nutritional research. Ritchie (1950)¹³² and the FAO Nutrition Committee for South and East Asia (1957)¹³³ consider education in nutrition as the key to the solution of many nutritional problems.

Lovenberg et al (1951)¹³⁴ regard community nutrition education as an attempt to influence favourably the food habits of individuals who constitute a specific community. Wigan (1964)¹³⁵ calls attention to the immediate need for spreading the basic knowledge of nutrition. The FAO (1963)¹³⁶ emphasises that nutrition education should go parallel to the food production schemes (1963)¹³⁶.

An important consideration in planning an effective nutrition education programme, is to determine just where the people of the community are in their thinking and in what direction they are to be

helped to move. According to Whitehead (1952)¹³⁷ changes in food habits are formulated by physical, mental and social factors. The dominant force which influences food habits is education. Williams (1953)¹³⁸ found that even in low economic groups, an effective and intelligent educational campaign was absorbed readily and used well. That nutrition education plays an important role has been revealed by Alvares and Biquelme (1953)¹³⁹ in whose study three groups of expectant women were involved as the control, experimental and the nutrition education groups respectively. The first group was studied as it was, the second group was given supplements like dry milk, egg and fruits and the third group was given nutrition education alone. In this study, the weights of the new born were as follows: control group - 2919 grams, supplemented group - 3334 grams, and group with nutrition education 3390 grams.

According to Lockhart (1954)¹⁴⁰, the individual's opinion and attitudes about food and eating, his thoughts, memory and learning processes play a dominant role in influencing what he eats and thus his total being. Therefore attitudes are basic to both educational activities and the products of education.

Emphasising the most favourable time for imparting nutrition education, Ramakrishna (1963)¹⁴¹ indicates that the young mother who is pregnant is in a susceptible mood for initiating new dietary practices. Malviya (1963)¹⁴² and Simpson (1963)¹⁴³ state that even when all the problems of food supply and purchasing powers of the consumers were solved, millions would still be barred from enjoying the benefit of good nutrition because of ignorance of the relationship of food and health. Allen (1963)¹⁴⁴ pointing out the

need for education, stressed that education for survival is no exaggeration - Clements (1956)¹⁴⁵ stresses that the goal of nutrition education should be to effect higher consumption of protein rich foods by pregnant and nursing mothers. Dantynski (1963)¹⁴⁶ states that the final answer to India's nutritional problems in the villages lies in the application of the knowledge in nutrition in the village homes. Women are responsible for feeding the family. Therefore, it is mainly through women that nutrition education can be carried to the families and their food consumption patterns changed (1961)¹⁴⁷.

III EXPERIMENTAL PROCEDURE

The experimental consisted of the following procedures:

- A. Selection of the Applied Nutrition Programme (ANP) Block and the villages.
- B. Study of the organisation and operation of the Applied Nutrition Programme in Bhavanisagar Block.
- C. Analysis of the problems encountered in the ANP at the village level.
- D. Conducting surveys in the selected villages.
- E. Selection of the subjects for this study.
- F. Assessment of the nutrient intake of the selected subjects.
- G. Assessment of the nutritional status of the selected subjects.
- H. Reorganisation of the Applied Nutrition Programme in one village, namely, Rajanagar.
- I. Conducting the nutrition education programme.
- and J. Evaluation of the reorganised Applied Nutrition Programme.

A. Selection of the Applied Nutrition Programme Block and the Villages.

Since the venue of this investigation which aimed at studying the impact of the Applied Nutrition Programme on expectant mothers, had to be an ANP Block, Bhavanisagar, which was the nearest Community Development Block with the Applied Nutrition Programme in action and the following three villages in its jurisdiction, Basuvapalayan, Velliampalayan and Rajanagar were selected for the study. These

three villages were selected because they:

- a) were in the same neighbourhood as can be seen from Figure 1 (The longest distance between any two of these villages was 10 kilometers).
 - b) had comparable socio-economic background, population and level of literacy*.
 - c) had the sympathy of the local leaders and Block authorities.
 - d) extended cooperation.
- and e) had expectant mothers who volunteered to be subjects in this study.

B. Study of the Organization and Operation of the Applied Nutrition Programme in Bhavanisagar Block.

The Applied Nutrition Programme in Bhavanisagar Block operated under the set up of the national, state, block and panchayat levels.

1. National Level

At the national level, the department of Community Development and Panchayati Raj in the Union Ministry of Community Development, Panchayati Raj and Co-operation, is responsible for the coordination of the programme. A Central Coordination Committee for the Applied Nutrition Programme has been appointed with representatives from the National Planning Commission and the following ministries of the

* The population of Basuvapalayam, Velliampalayam and Rajammagar were 940, 792 and 1132 respectively. The average income of the people in these villages ranged from Rs. 35/- - Rs. 45/- per month, and 90 per cent of that income was spent on food. The women in all the villages were illiterate.

MAP SHOWING THE LOCATION OF THE THREE VILLAGES
RAJANNAGAR, BASUVAPALAYAM AND YELLIAMPALAYAM



Figure 1

Union Government:

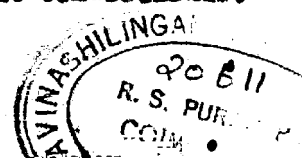
- a) Community Development, Panchayati Raj and Cooperation - department of Community Development and Panchayati Raj.
- b) Food and Agriculture - The department of Food.
- c) Food and Agriculture - The department of Agriculture.
- d) Health.
- e) Education.
- and f) Finance - Economic Affairs.

The UNICEF assists, through the central government, the participating Community Development Blocks and training institutions as well as selected State and Regional Production Centres in poultry, fisheries (inland and marine), horticulture, and milk and dairying. The total UNICEF commitment for the project is estimated at \$ 10,000,000, inclusive of freight charges.

The Government of India meets the local costs of the UN experts located at Delhi for assistance in the programme in the states, 75 per cent of the non-recurring and 50 per cent of the recurring grant expenditure out of this head under the existing pattern of assistance to state governments to the extent the block funds are used for ANP. At present 222 blocks have been covered by the Applied Nutrition Programme in the country (1966)¹⁹.

2. State level

In Madras, the Applied Nutrition Programme was started in August 1962 (1965)¹⁴⁵. At the state level, the responsibility rests with the department of Rural Development and Local Administration of the Government of Madras under the Joint Development Commissioner.



The state has appointed a Project Nutrition Officer to coordinate the nutritional aspects of the programme.

The State Coordinating Committee reviews the progress of the ANP periodically. It has representatives from the departments of; Rural Development, Agriculture, Animal Husbandry, Health, Education, Women's Welfare, Finance and Fisheries. The state government ensures that adequate technical guidance and supervision are available for the proper implementation of the programme, through the services of expert personnel trained in human nutrition, education, home science, agronomy, fisheries and development of teaching aids.

The ANP in Madras State (1965)¹⁴ is in operation in the seven Rural Extension Training Centres (RETC) and the blocks attached to them: RETC, Krishnagiri (Krishnagiri block); RETC, Bhavanisagar (Bhavanisagar block); S.V. Nagar (Arni block); RETC, T. Kallupatti (T. Kallupatti block); RETC, Athur (Thiruvaidanapur block); RETC, Pattukottai (Pattukottai block); and RETC, Kollipatti (Kollipatti block). The Home Science Wings at S.V. Nagar, T. Kallupatti and Bhavanisagar are actively associated with the implementation of the programme. The blocks serve as field training areas to the trainees in the RETCs and Home Science Wings, and as demonstration blocks with an on-going field extension programme in Applied Nutrition. The seven RETCs with an establishment of 77 members of staff and 750 trainees, and the three Home Science Wings with 12 members of staff and 120 trainees, play an important role in the training of the grasswives and grasswaks so that the ANP can eventually make an impact at all levels of the Community.

The ANP is planned to cover as many villages in the block as feasible in a phased manner during the project period of three years. At the conclusion of the three years, the programme is expected to be self-generating and self-sustaining under the local administration.

UNICEF (1962)¹⁴⁹ has provided the state with supplies, technical equipment, transport, stipend, and financial assistance to the extent of \$ 245,000, which includes: \$ 3,900 for equipment; \$ 57,400 for poultry; \$ 19,310 for pisciculture; \$ 99,900 for gardens and fodder; \$ 13,000 for information and education; \$ 46,625 for transportation; and \$ 8,365 for contingencies, freight at 10 per cent \$ 21,000, and stipends \$ 15,000. Over and above this assistance from the UNICEF, the state government is responsible for providing all the other equipment and supplies as well as the personnel and services necessary for the programmes.

The state government's financial commitments (1962)¹⁴⁹ for the three year period of the project are as follows:

Item	Non-recurring Rs.	Recurring Rs.
Poultry ..	15,00,000	3,37,050
Pisciculture ..	70,777	2,63,952
Orchard, gardens and fodder ..	3,20,000	3,72,000
Transportation ..	Nil	1,24,000
Education and training ..	Nil	63,000
	19,90,000	11,62,002

3. Block level

At the Block level, the Principal of the REC at Bhawanisagar is responsible for the supervision and guidance of the programme. The Commissioner of the Bhawanisagar Panchayat Union is in charge of its implementation in the villages. He is assisted by the block Coordination Committee consisting of the Chairman of the Panchayat Union (as Chairman), the Commissioner of the Panchayat Union (Block Development Officer), Principal of the REC, Chief Instructors of the Home Science Wing and Chief Instructor of the Workshop Wing of the REC. The main elements of the programme at the block level include: poultry keeping, pisciculture, school, home and community gardens, organisation of supplementary feeding programmes for the vulnerable groups, nutrition education and training.

The financial commitment (1964)¹⁵² of the state government to Bhawanisagar block for 1963-1965 is as follows:

Item	Non-recurring Rs.	Recurring Rs.
Poultry ..	1,46,300	49,150
Pisciculture ..	10,000	16,000
Garden, orchard and fodder ..	21,900	18,190
Transport ..	nil	27,000
Education ..	nil	4,500
Grand Total:-	1,78,100	1,13,830

There are 14 panchayats in the Bhavanisagar Panchayat Union. All except one, the Sathiamangalam panchayat, which is not willing, are included in the ANP. In these 13 panchayats, 24 milk feeding centres are functioning.

The entire stock of WINDSF milk powder obtained through the state government is stocked at the godown in the REFC. From September 1962 to June 1964, milk powder to the extent of 63,961 pounds have been distributed to the vulnerable groups consisting of expectant and nursing mothers, and preschool children, who are the "Beneficiaries" in the programme. The daily average attendance of the beneficiaries in all the feeding centres together was 200 expectant and nursing mothers and 1500 preschool children as per report of the Block Development Officer (1964)¹⁵⁰ for the period, August 1963 to August 1964.

The main Poultry Extension Centre is maintained at the Block level. For every 2000 population, the poultry extension Centre provides 40 hens and six cocks for the poultry units in the panchayat. In three villages, permanent deep litter houses have been constructed.

Twenty-six school gardens and three community gardens have been raised in the block. Fingerlings have been supplied to three panchayats which have taken up pisciculture.

4. Panchayat and Village levels

The Panchayats stock the skim milk powder supplied by the REFC. The distribution of milk to the vulnerable groups is carried out either through women's organisations or by the Panchayats themselves.

At Rajanagar, the gramsevak is responsible for the storage of the supplementary foods. The milk powder and eggs are stored at the distribution centre which is the president's residence-cum-office. As

the 'Matar Sangam'* of Rajanagar was not willing to undertake the responsibility of preparing and distributing the supplements, the Balsevika, who is the preschool teacher in the block team, was assigned the task. Identification cards had been issued to the beneficiaries in Rajanagar. Whosoever presented the card, could receive the supplements. The time of distribution was between 6 - 8 a.m.

As for the village Velliampalayam, the milk powder was sent from the Kothampanalam panchayat from time to time. The distribution centre was located at the house of one of the villagers. A man appointed by the panchayat was in charge of storage, preparation and distribution of the supplements in this village. There was no card system. Hence the milk was distributed to anyone who came, without any limit in terms of quantity until the supply of prepared milk was exhausted. The time of distribution was between 5 - 6 p.m. which was not convenient for the women.

C. Analysis of the Problems Encountered in/^{The} Programme at the Village Level.

The problems encountered in the programme in/^{The} two selected villages were with regard to the:

- 1) personnel in charge of the distribution of the supplements.
 - 2) production and storage of the supplements.
 - 3) preparation and distribution of the supplements.
 - 4) Consumption of the supplements.
- and 5) difficulties experienced by the Beneficiaries - the expectant women.

* Matar Sangam is the organisation of women in which membership is open to all the women who are interested to social welfare work at village level. The Block Funds are made available to Matar Sangams for approved activities.

1. Personnel in-charge of the distribution of the supplements

The Balasvika who was entrusted with distribution of the supplements at Rajanagar had to carry this work load- in addition to conducting the Balvadi. She was not given any remuneration for this assignment. This was not the case in Velliampalayam where a man had been specially appointed for the purpose.

2. Production and storage of supplements

In the panchayat gardens of both Rajanagar and Velliampalayam, the same type of vegetables such as brinjals were grown for the whole year. As such, the gardens were not in a position to provide a variety of vegetables throughout the year. Sometimes, the vegetables were not harvested at the proper time resulting in wastage.

The skim milk powder had been left exposed to the atmosphere. In the stock of 45 cartons stored for three months 16 cartons of the milk powder were found in a hardened condition, due to changes in temperature and humidity.

During a week, 13 out of 52 eggs had been thrown out due to spoilage, because the eggs had been kept for more than 20 days. Furthermore, the eggs from the leg-horns of the Applied Nutrition Programme poultry were exchanged with country eggs with a view to improve the quality of the country birds. Often the eggs thus exchanged were found to be rotten and unfit for consumption.

3. Preparation and distribution of the supplements

a) Preparation of milk:

For the reconstitution of milk from skim milk powder, there was

no standard proportion of the skim milk powder to water. It was approximately one part of the milk powder to four parts of water. Therefore, the reconstituted milk was of a thick consistency and not palatable. As for the method used, the water was first boiled. A portion of the boiling water was removed, slightly cooled, and ^{added to} the milk powder, mixed with hands and made into a paste. This paste was put into the rest of the boiling water, stirred and removed from the fire. This procedure resulted in the formation of lumps. Since the lumps had to be strained before serving, much wastage of precious nutrients occurred.

In Velliampalayam, children were required to bring fuel from their homes or outside for boiling the milk. This made the programme unpopular.

b) Preparation of Eggs:

Water was brought to boil and the eggs placed in the boiling water and allowed to boil for 15 - 20 minutes. This long duration of boiling led to the cracking of the shells and the formation of dark ferrous sulphide at the surface of the egg yolk, imparting an undesirable odour and colour.

c) Distribution of the supplements:

In Rajanagar, because the president's house was utilized for the distribution of the supplements, six families who were not on good terms with the president chose to forgo the supplements. In Velliampalayam, the distribution centre was away from the village and hence women found it difficult to go there.

The eggs were supplied once in a week, vegetables, twice and milk every day in the village of Rajanagar. In Velliampalayam milk was

distributed every day, and egg and vegetables once in a fortnight. The vegetables in both the places were neither weighed nor distributed equally. In Rajanagar, the distribution was carried out on all the days in the month, irrespective of the inconveniences to the Balasvika. But no distribution was done in Velliampalayan, when the person in charge had some other work.

4. Consumption of the Supplements

Consumption of the supplements on the spot by the beneficiaries was not urged. Hence the women who were otherwise busy, sent their children to get the supplements. These supplements were taken home and were either consumed by the children or the husbands. Thus the women did not always benefit from the programme.

5. Difficulties Experienced by the Beneficiaries - Expectant Women

The expectant women were questioned about the salient aspects of the programme and the problems they experienced. The difficulties expressed by the expectant women were:

<u>Difficulties</u>	<u>Number mentioning</u>
a) The frequency of distribution of the egg is not adequate.	10
b) No order is maintained at the distribution centre; the distribution is slow and there are usually unlimited crowds.	10
c) Do not like to consume greens	10
d) When the programme ceases, we will be helpless..	10
e) The distribution time is very late in the night and hence inconvenient	6
f) Milk is not properly prepared	4

Classification

Number of Villages

- a) Irrigation occurs if at all in a season 2
- b) Landless class occurs if at all in a season 3

7. Contacting Surveys in selected Villages

Four types of surveys were necessary to be able to study the basis for the subsequent manipulation of the VLP: (1) village surveys in order to understand the socio-economic factors which influence the dietary patterns and attitudes of the rural families, (2) family surveys to elicit information on dietary patterns and attitudes of families. When the family is the food production, processing and consumption unit, it is the most appropriate agency to furnish this information, (3) diet surveys to assess the actual intake of foods by the selected families, and (4) attitude surveys to understand the attitudes of the selected women towards foods and the VLP. The steps involved in designing these surveys were:

- a) Selection of the methods.
- b) Developing the survey forms.
- c) Establishing rapport with the families surveyed.
- d) Conducting the surveys.
- e) Analysis of the data.

a) Selection of the methods

For conducting the village, family and attitude surveys the interview method (195:15) was selected, because of the advantages in gathering the information from illiterate women and the possibility of casual observations. For the diet survey, the food diaries method

(1949)⁷¹ was used.

b) Developing the survey forms

For the village survey, a proforma as given in Appendix I was prepared, calling information on the background of the villages in terms of their population, castes, language, income levels, occupations and the crops raised. For the family survey, a schedule was developed to elicit information on the composition of the family, income expenditure patterns, meal patterns, foods commonly used, diets given for diseases and during special conditions such as pregnancy, and food likes and dislikes of the members. The schedule so developed was pretested with three families who were not included in the study and modified as given in Appendix II. For the diet survey, the proforma given in Appendix III was formulated to record the intake of foods in the selected families for a period of seven days. For the attitude survey, the proforma given in Appendix IV was drawn.

c) Establishing rapport with the families surveyed

Before the investigator could approach the expectant women to elicit the information required, it was necessary to get acquainted with them, establish rapport and apprise them the purpose of her study. In order to help her establish rapport with the people, a mass meeting was organised at which time, the investigator was introduced to the families by the village leaders to explain the purposes of her study, and appeal for their cooperation. That mass meetings are effective in motivating people's interest has been stressed by Ram (1959)¹⁵².

Chang (1962)¹⁵³ points out that the mass meetings make people aware of and interested in new ideas; group methods help in moving the people from the stage of awareness to interest and trial, and individual contacts (home visits) are most effective because learning at that stage becomes an individual process.

After the introductory meeting, the first two days in the village were spent in making individual contacts with the families through home visits and getting acquainted with them. These visits were initiated with a few courteous remarks, greetings and explanation of the purpose. They were concluded with assurances of repeating the visits again. Home visits according to Ritchie (1957)¹³² and Dantyagi (1963)¹⁴⁶ ^{are helpful} in establishing personal contacts ~~with~~ and confidence in people.

d) Conducting the surveys

(i) The village survey:

The details for the village surveys were obtained from the village leaders, panchayat clerks and school teachers.

(ii) Family surveys

For conducting the family surveys, the investigator halted in the villages. Forty three families were selected in Rajannagar for the survey at random, by taking every third house. About 25 minutes were needed for the investigator to interview one house-maker. The investigator met the house-maker always during the latter's leisure and interviewed her in a friendly manner.

e) Diet surveys

The diet survey was conducted in six families in Rajannagar selected on the basis of the availability of the expectant mother for the purpose and economic levels. The two families who cooked three meals a day, were visited early in the mornings, at noon, and in the evenings, for seven consecutive days, before they started cooking, for weighing the raw foods to be cooked. In the case of the other four families, the foods were weighed during the early hours of the noon, since cooking of their day's meals started with lunch. They were visited again in the evenings, to weigh the foods to be cooked for the night meals.

f) Attitude surveys

The attitude surveys were conducted by interviewing the selected ten expectant women in an informal atmosphere. The attitudes expressed by these subjects during conversations at other times were also noted.

3. Selection of the Subjects for This Study

The criteria for the selection of the subjects were that the expectant women:

1. Were of the age range between 20 - 25 years. It has been proved that the human needs for foods vary during the different stages according to physiological environment. Hence age is a variable to be controlled.
2. Had, not more than two or three children, in order to limit the parity to third or fourth. The reproductive organs appear to become efficient with repeated pregnancies according to May *et al* (1954)¹⁰. Therefore, keeping the differences in the parity minimum was necessary.

3. Were at the fifth or sixth month of pregnancy, since the demands of pregnancy are maximum at the second and third trimester according to Jayalakshai et al (1999)¹⁵⁴.
4. Stayed in the same village throughout the study. The continuity of residence and regular consumption of the ANP supplements were essential to study the impact of the programme on expectant women.
5. Were willing to cooperate in the study. As the selected women had to undergo many procedures, their cooperation was absolutely necessary.

F. Assessment of the Nutrient Intake of the Selected Subjects

The nutrient intake of the six selected expectant women was assessed through (1) calculating the nutrients from data on the intake of raw foods furnished by the dietary surveys and (2) chemical analysis of the foods consumed.

From the data on the raw foods obtained by the weighing method from the families, the average nutrient intake was calculated using the figures given by Aykroyd ^{et al} (1963)¹⁵⁵. The total quantities of the different foods consumed by each family for the number of days of weighing was calculated and divided by the number of days (seven or five as the case may be) to find out the average consumption per day. This value was divided by the number of Consumption Units (CU)* in the family to derive the intake per Consumption Unit. The figures obtained for the Consumption Unit were multiplied by .9 to arrive at the nutrient intake of the expectant mother according to the method of Aykroyd et al (1963)¹⁵⁵.

* Consumption Unit (CU) is the requirement of an adult man or otherwise known as adult man value according to Aykroyd et al (1963)¹⁵⁵. Strictly speaking, the consumption unit is applicable only to caloric requirements. In this study, it is used for computing the daily food intake.

In four of the six selected families in Rajanagar, the house makers were willing to let the investigator weigh and take out the cooked foods for analysis. In those houses the cooked foods were weighed before serving to the expectant mother and again after consumption by the expectant mother. The difference gave the quantity of food consumed by the expectant mother. One fourth of this quantity, was taken from the foods left over, for chemical analysis. For this purpose, the women had been requested in advance to cook extra food, and were compensated with raw foods in exchange. This procedure was repeated for three days. The food samples thus collected were homogenised every day in a Waring blender and dried at 90°C in a constant temperature oven.

The dried food was used for the analysis* of: (a) calories, (b) proteins, and (c) minerals.

(a) Calories

Three grams of the dried sample were analysed for the calorie content using a Bomb Calorimeter as per procedure given in Appendix V (1960)¹⁵⁶.

(b) Proteins

Three grams of the dried sample were analysed for the protein content by the macro kjeldhal method as per procedure by Jacobs given in Appendix VI (1959)¹⁵⁷.

* Since the clinical picture showed the manifestation of anaemia in all the expectant mothers, the analysis for proteins and iron along with calories alone was undertaken.

(c) Minerals

Ten grams of the dried sample were ashed in the muffle furnace and analysed for calcium and iron. Calcium was determined by the method described by Hawk et al (1957)¹⁵⁸ as described in Appendix VII. Iron was determined by Wong's method described by Hawk et al (1957)¹⁵⁸ as given in Appendix VIII.

G. Assessment of the Nutritional Status of the Selected Subjects

Study of the nutritional status of the subjects included the study of the new born also.

1. Nutritional Status of the Expectant Mother

For the assessment of the nutritional status, the expectant women were examined by an experienced gynecologist every month as shown in Figure 2, until two months after delivery, during the period from June to December, using the proforma presented in Appendix II. The data recorded were: (a) heights (b) weights (c) haemoglobin level (d) plasma protein content and (e) blood pressure.

The feces of the expectant women were also examined for the presence of worms at the commencement of the study and two out of five were found to have hook-worms and given deworming treatment.

(a) Heights

The heights were recorded every month using a scale marked in centimeters pasted on the wall. The expectant women were helped to stand erect, barefooted with heels in contact with the wall. The head was held in such a way as to have the line of sight horizontal. The height was determined by keeping a scale in contact with the soles as shown in Figure 3, and recorded to the nearest centimeter.

(b) Weights

The weights were recorded every month until two months after delivery. The women stood barefooted on the platform of a human weighing machine, and the weights noted ~~into~~^{to} nearest quarter pound.

(c) Haemoglobin level

The haemoglobin level of the blood of the beneficiaries in Rajannagar and Velliampalayam where the ANP was operating, as well as, four non-beneficiaries in each of these villages was determined, along with that of the expectant women in Pasuvapalayam at the third trimester* using the method (1953)¹⁵⁷ as described in Appendix X.

(d) Plasma protein content

Six milliliter litres of blood from two beneficiaries and two non-beneficiaries each from Rajannagar ~~and~~ Velliampalayam ^{and Pasuvapalayam} were collected during the third trimester* in sterilized test tubes and packed in ice in a portable thermos flask, for analysis of total protein, albumin and globulin. The blood was centrifuged after two hours** and the serum separated. From the serum, the total protein albumin and globulin were determined using modified Howe's method (1953)¹⁵⁹ as given in Appendix XI. According to Datta (1947)¹⁶⁰, Howe's method gives fairly uniform results.

(e) Blood pressure

The blood pressure was measured for all the subjects in the three villages by the gynecologist during the third trimester as per

* As cooperation of the subjects for this determination was not forthcoming during the beginning of the study, the haemoglobin values and plasma protein values could be estimated only at the third trimester.

** As the laboratory for analysis was fifty miles away from the villages, two hours were necessary for the transportation.

method (1953)¹⁶¹ described in Appendix XII.

2. Nutritional status of the New Born

The following measurements were taken on the new born using the methods followed by Singh and Gopalan (1942)⁹³:

- (a) Birth weight
- (b) Head circumference
- (c) Length of the body
- (d) Chest measurement
- and (e) Abdomen measurement

(a) Birth weight

The weight was taken to the nearest ounce with the help of a baby weighing balance as shown in Figure 4.

(b) Head Circumference

The head circumference was measured to the nearest centimeter passing a tape round the superciliary ridges in front and occipital protuberance behind as shown in Figure 5.

(c) Length of the body

The baby was placed on a plain smooth surface with legs completely stretched, and head positioned in such a way that a line drawn from the infra orbital margin to the auditory meatus was perpendicular to the horizontal surface. Moderate pressure was used on the knees to straighten the legs as shown in Figure 6. The length was measured to the nearest centimeter with the upper most part of the tape touching the most protruding part of the head and the lowest part just touching the heels.

(d) Chest circumference

The circumference of the chest was taken to the nearest centimeter when the thorax was in a position without any skin folds, as shown in Figure 7.

(e) Abdomen circumference

The circumference of the abdomen was taken to the nearest centimeter at a level just above the umbilical cord, care being taken that the tape just touched the abdomen without pressing it, as shown in Figure 8.

4. The Reorganization of the Applied Nutrition Programme in Rajanagar.

Based on the observations of the Applied Nutrition Programme as it existed in the two villages, Rajanagar and Velliampalayam, certain reorganisational steps were taken in the village Rajanagar. Table I presents the practices as existed and the practices which were reorganised.

TABLE I

THE EXISTING AND REORGANISED PRACTICES AND PROCEDURE IN
ANP IN RAJANNAGAR

Item	Existing procedure	Problems in existing procedure	Reorganised procedure
1. <u>Production and storage of the supplements.</u>			
a) Cultivation - Variety in vegetables.	Only brinjals and cluster-beans were produced from the garden.	There was not much variety in the vegetables produced.	Different vegetables were produced during different seasons to give variety.
b) Time of harvest.	The produce was not harvested at the proper time.	This resulted in the wastage of vegetables.	This waste was avoided.
c) Checking the collection of eggs and vegetables.	Was not done	There were indications of pilfering.	Checking was done, and honest delivery ensured.
d) Storage of harvested vegetables.	The vegetables were harvested a day or two earlier to the day of distribution. Left over vegetables were kept till the next distribution time, upto even four days.	The vegetables were not fresh.	Harvesting was effected only on days of distribution and in the amounts required.
e) Skim milk powder.	The skim milk powder packets were left exposed to the atmospheric air.	Sixteen packets of the skim milk powder had hardened out of the 52 packets in one week.	The packets were removed from the cardboard box only during the time of mixing and only in necessary quantities.

Table I Contd:-

Item	Existing procedure	Problem in existing procedure	Reorganised procedure
f) Eggs	Long duration of storage, even upto 20 days.	Thirteen eggs were spoiled in one week due to long duration of storage.	Eggs were not stored for more than two or three days at a time
g) Exchange of eggs.	The eggs of the white leghorn variety were given to the women in exchange for country variety.	The eggs thus obtained were spoiled invariably.	The exchange was not allowed. Those interested in raising leghorns were helped to obtain the birds from the block.
2. Preparation of the supplements.			
a) Proportion of milk powder to water.	Not standardised.	Led to vomiting and diarrhoea because of the higher concentration.	The proportion of milk powder to water was standardised to 1 : 6.
b) Mixing milk powder.	The milk was mixed by hand.	Unhygienic	A wooden ladle was supplied to avoid the use of hands.
c) Method of reconstitution.	Lumps were formed.	Led to waste of milk in the form of lumps.	Better method* to avoid wastage of milk powder was taught and used.
d) Taste of reconstituted milk.	Not palatable	Women did not consume it.	Addition of jaggery made the milk palatable and acceptable.

* The skim milk powder was made into paste with just enough cold water and poured slowly into moderately hot water, stirring all the while. This mixture was then boiled and removed from fire.

Table I (Contd:-

Item	Existing procedure	Problem in existing procedure	Reorganised procedure
e) Long duration* for boiling eggs.	Led to cracking of shells and formation of ferrous sulphide	Wastage of the egg. Digestibility of egg was reduced.	The method was improved to avoid cracking and formation of ferrous sulphide**.
3. Distribution of supplements.			
a) Place of distribution.	Belonged to the Machayat President.	Six families who were not on good terms with the president chose to forgo the supplement.	The distribution centre in the premises of the preschool, convenient for all the beneficiaries.
b) Time of distribution.	From 4 p.m. to 8 p.m. in the evenings for all the beneficiaries.	Over crowded and long waiting to receive the supplements.	The time of distribution was fixed as mornings for children, and evenings for the mothers to avoid crowding and waiting.
c) The frequency of distribution of:			
1) Eggs	Was once a week in Rajanagar, and once a fortnight in Velliampalayam.	Frequency was not adequate.	The eggs were distributed on alternate days in Rajanagar.

* Eggs put in boiling water and allowed to boil for 15 - 20 minutes.

** The eggs were put in cold water which was brought to boiling. After this period of 5 minutes the eggs were removed.

Table I Contd:-

Item	Existing procedure	Problem in existing procedure	Reorganised procedure
ii) Vegetables	The vegetables were distributed two times a week in Rajannagar and once a fortnight in Velliampalayam.	Frequency was not adequate.	Spice and vegetables were distributed on alternate days in Rajannagar.
iii) Milk	Milk was given to be taken home for the non-beneficiaries [Six to eight cups]	Non-beneficiaries had the milk which was intended for the beneficiaries.	In the beginning for 15 days, a limited measured quantity of milk* was given to the expectant women to be taken home.* Thereafter this procedure was stopped.
iv) Green leafy vegetables	Green leafy vegetables were not distributed on the assumption that beneficiaries did not like them.	The beneficiaries did like the green leafy vegetables.	The women were given leafy vegetables and taught how to cook them to conserve the nutrients.
d) Attendance	Regular attendance of beneficiaries was not stressed.	Beneficiaries were absent very often.	Regular attendance of beneficiaries was insisted.
e) Receipt of the supplements by the beneficiaries.	Any one who came with the identification card was given the supplements.	The purpose of the programme to supply valuable foods to the vulnerable group was not fulfilled.	Only those who belonged to the vulnerable groups were given the supplements, if they came in person.

* Two cups of milk.

* * This was to enlist their cooperation.

Table I Contd:-

Item	Existing procedure	Problem in existing procedure	Reorganised procedure
4. <u>Consumption of Supplements:</u>			
a) Consumption by beneficiaries.	was not stressed	The vulnerable groups did not consume the foods supplied.	Consumption of the supplements on the spot by the expectant women was insisted.
5. <u>Maintenance of Cleanliness:</u>			
a) Provision for disposal of garbage like egg shells.	There was no provision for garbage disposal.	Surroundings were made dirty by children who consumed the foods.	Provision for disposal of garbage was made by keeping a basket.
b) Water for washing vessels.	No arrangements made.	The beneficiaries had their hands dirty before and after consuming the supplements.	Water was kept in one vessel for washing the hands.
6. <u>Health check up of the vulnerable groups:</u>	was not done.	Diet could not be correlated with health.	Clinical check up was done regularly by a gynaecologist.
7. <u>Nutrition Education Programmes:</u>	No regular programme was conducted.	There was no opportunity for the beneficiaries to learn the basic facts of nutrition and the objectives of the AWP.	A regular nutrition education programme was conducted after eliciting the problems and needs of the expectant women.

I. Conducting the Nutrition Education Programme

A nutrition education programme was planned as part of the reorganisation, based on the problems elicited through the family, diet and attitude surveys. The main problems located were: low intakes of protein, vitamin C and vitamin A rich foods; and improper methods of cooking green leafy and other vegetables. The objectives of the nutrition education programme were therefore to help the families understand the objects of ANP; emphasise the relationship between diet and health; introduce the Indian Multi Purpose Food diets; and teach proper methods of cooking leafy and other vegetables.

The approaches and methods used for conducting the nutrition education programme were: Mass contacts such as meetings, film shows and exhibitions; Group contacts through demonstrations and discussions; and individual contacts through home visits.

The programme consisted of:

- 1) The inaugural meeting,
- 2) Carrying out the activities,
- 3) The valedictory meeting,
- and 4) The follow up.

1. Inaugural meeting

An inaugural meeting was convened at which time the investigator explained the process of the nutrition education programme and solicited the help and cooperation of the families.

2. Carrying out the activities

The meeting was followed by personal contacts and home visits to carry out the programme, the highlights of which were: a) cooking

demonstrations with discussions; b) introduction of kitchen gardens and poultry; c) exhibition on the importance of diet during pregnancy; d) songs and skit on Food and Health; e) film shows; and f) competitions.

a. Cooking demonstrations with discussions

According to Rodhunter (1953)¹⁶², any device used for nutrition teaching must accomplish two facts: (i) Motivation - the device or material should help to bring about a change in attitude in the group and (ii) Information - the presentation should supply definite information. Having these facts in mind, demonstrations on cooking green leafy and other vegetables in minimum water using standard recipes were conducted. The investigator explained to the audience, each step of the demonstration and why it was being done so. Doubts were cleared during the demonstration and the subsequent discussions.

b. Introduction of kitchen gardens and poultry

During the cooking demonstrations the women were asked whether or not they would like to have a kitchen garden and/or a poultry, and the names of those who were interested were taken down. Later on, the investigator visited their homes and helped them in laying out the garden by supplying seeds and seedlings. Plans were supplied to those who wanted to raise poultry through the assistance of the Block authorities.

c. Exhibitions

Exhibitions are always appealing because people not only hear but also see things and facts. Posters with an emotional appeal are effective in arresting people's attention. Realistic pictures are better understood than symbolic ones. An exhibition was therefore arranged using charts, posters and models on the importance of nutrition in pregnancy. All the people in the village came to see the exhibition.

d. Songs and Skit

A skit, emphasising the importance of food to health, written by the investigator was enacted by the school children. The skit, with the songs included in and the summary, are given in Appendix XIII.

e. Film shows

The following films on the importance of diet for good health were shown:

<u>Name of the film</u>	<u>Source</u>	<u>Content</u>
1. <u>Balanced diet</u>	Film Division, Ministry of Information, and Broadcasting, Government of India.	The documentary brings home the advantages of a balanced diet and shows its various components.
2. <u>Food for thought</u>	Film Division, Ministry of Information and Broadcasting, Government of India.	This film brings to the screen the story behind a silent revolution in dietary habits that has taken place in Orissa since the introduction of the RFP. The film throws light on organising poultry farming, fish breeding and fruit and vegetable growing.

f. Competitions

To find out how far the families had grasped what the investigator had taught them, and to sustain their interest in the new methods and ideas, different competitions were held. The children were to sing the songs they had learned, and the women were to prepare food, by the methods demonstrated to them. The performances of both the groups were judged by three graduates in Home Science including the investigator.

3. Valedictory Meeting

On the last day of the programme, a mass meeting was arranged under the presidentship of the Rector of Sri Avinashilingam Home Science College when women and children sang the songs and staged the skit taught to them.

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A puppet show was carried out explaining to the people the importance of food to health. The speakers of the day the Chairman of the Panchayat Union and the Principal of the school, urged the people to continue to practise what was taught to them.

4. Follow up work

After the nutrition education programme, the investigator visited the families, once a fortnight to see that the reorganisational steps undertaken were carried out. The production and distribution of the supplements to the expectant mothers and the attendance records were looked into. Every month, the gynaecologist visited the expectant women

J. Evaluation of the Reorganised Applied Nutrition Programme

At the end of the period of six months an evaluation of the impact of the Applied Nutrition Programme on the expectant mothers was undertaken to study the effects of the reorganised programme in terms of:

- A. Nutrient intake,
- B. Nutritional status,
- C. Nutritional knowledge,
- D. Food habits and beliefs,
- and E. Adoption of improved practices.

IV RESULTS AND DISCUSSIONS

The results of this study on the impact of the Applied Nutrition Programme on the six expectant mothers in Rajannagar in terms of their nutritional status and information, are presented with regard to their:

- A. Nutrient intake
- B. Nutritional status
- C. Nutritional knowledge
- D. Food habits and beliefs
- and E. Adoption of improved practices.

A. Nutrient Intake of Expectant Mothers in the Three Villages

The mean nutrient intake of the six expectant women in each of the three selected villages at the commencement of the study and compared with the Recommended Allowances (1963)¹⁵⁶ in Table II.

TABLE 1

TABLE 1. Mean values of the parameters of the growth of the fish in the different diets.

Diet	No. of fish	Initial weight (g)	Final weight (g)	Survival (%)	Growth (g)	
					Mean	SD
Control	100	10.0	1.5	95	0.3	1.2
Low algae	100	10.0	1.4	95	0.3	1.1
High algae	100	10.0	1.6	95	0.3	1.3
Control + algae	100	10.0	1.7	95	0.3	1.4

It can be seen from Table 1, the diets of low growth of algae. In all three diets were defined in a low as, we did not find, within a and within 2. The addition of the diets with regard to food may be explained by the fact that for diets with low algae was not extended to the diets. However, the evaluation of food for diets was not a comparable factor.

The nutrients furnished per expectant women per day by the supplements of the reorganised Applied Nutrition Programme are presented in Table III.

TABLE III
CONTRIBUTION OF THE ANP SUPPLEMENTS TO THE DAILY NUTRIENT INTAKE OF WOMEN IN RAJANAGAR PER DAY.

Items	Calo- ries	Prote- ins grams	Calci- um grams	Iron mg.	Vitamins		
					A I. I.	B ₁ mg.	C mg.
Skin milk	172	11.4	0.400	0.3	NIL		1.5
Egg	43	3.3	0.015	0.5	370	.025	-
Vegetables	36	2.1	0.027	1.3	186	.040	7.0
Jaggery	38	-	0.009	1.0	-	-	-
Total	295	16.8	0.450	3.1	496	.085	8.5

The Table III shows that the nutrients received by the expectant women in Rajanagar from the food supplements of the reorganised ANP were considerable in terms of animal proteins, calcium and vitamin A besides the other factors.

Table IV presents a comparison of the mean nutrient intake of the expectant women in Rajanagar before and after their participation in the reorganised ANP.

TABLE IV
MEAN NUTRIENT INTAKE OF EXPECTANT MOTHERS IN RAJANAGAR BEFORE AND AFTER THEIR PARTICIPATION IN THE REORGANISED ANP

	Calo- ries	Prote- ins grams	Calci- um grams	Iron mg.	Vitamins		
					A I. U.	B ₁ mg.	C mg.
Recommended Allowances	2300	100.0	1.59	20 to 30	3000 to 4000	1 to 2	5.0
Before Reorganization	2029	57.0	0.84	75.0	993	2.1	4.0
After Reorganization (Calculated)	2249	71.7	1.40	76.5	993	2.1	17.0
After Reorganization (Analysed)	2150	67.6	0.80	19.0	Not analysed		

As can be seen from Table IV, the intake of calories and all the nutrients except iron and vitamin B₁ by the expectant women had increased markedly after their participation in the reorganised ANP. However, the intakes, still do not meet the requirements with regard to calories and all the nutrients except iron and vitamin B₁.

The figures in Table IV further show that the analysed values ^{and} were the cooked foods/ ^{were} in agreement with the calculated values for the raw foods with respect to protein and calories, and to some extent in the case of calcium, but not so for iron. The high values for iron in the calculated basis may be due to the fact that the values given for iron, bajra, cholam and ragi in the latest edition of "The Nutritive Value of Indian Foods and Planning of Satisfactory Diets" by Aykroyd *et al* (1963)¹⁵⁵ are higher than those stated in the earlier edition, as shown below:

	Iron in milligrams per cent.		
	Bajra	Cholam	Ragi
Latest edition (1963) ¹⁵⁵	14.3	5.3	17.4
Earlier edition (1962) ¹⁵⁶	8.9	6.2	5.4

B. Nutritional Status of Expectant Mothers in the Three Villages

The nutritional status of the expectant women as assessed through changes in their (1) Weights, (2) Hemoglobin values, (3) Plasma protein content, (4) Blood pressure, (5) Clinical picture, and (6) Certain measurements on the new born are presented below with details in Appendix XIV.

(1) Weights

The mean weight increases of the expectant women in the three villages are shown in Figure 9 and Table V.

TABLE V

MEAN WEIGHT INCREASES OF THE EXPECTANT WOMEN IN THE THREE VILLAGES
[MEAN OF SIX EXPECTANT MOTHERS]

Villages	Mean Weights		Mean Increase kg.	Comparison between	't' value
	Initial kg.	Final kg.			
I. Masuvampalayam	45.9	48.2	2.3	I and III	4.39*
II. Vellampalayam	47.7	49.8	2.1	I and II	1.70
III. Rajamangar	43.3	47.9	4.6	II and III	6.10*

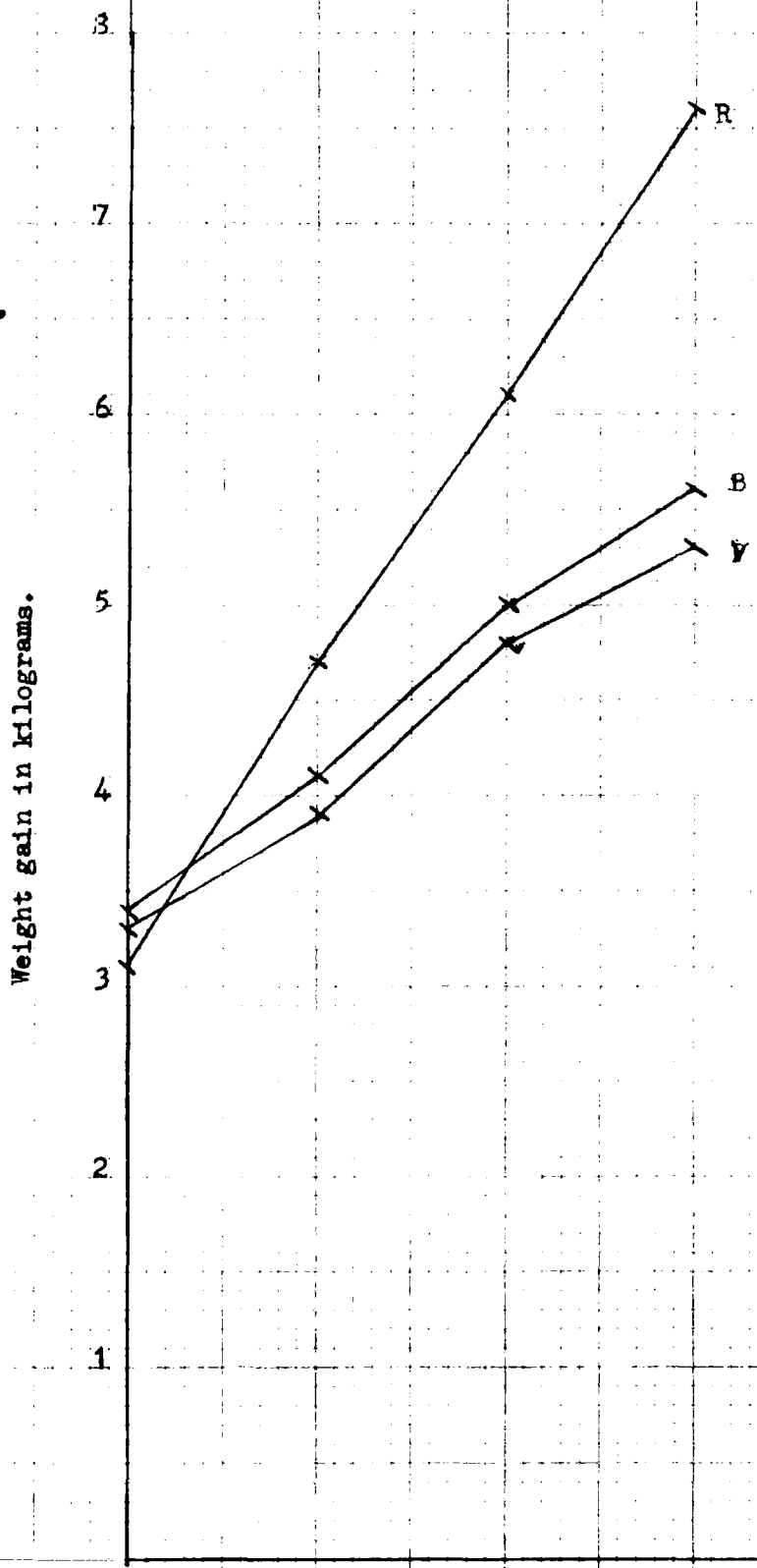
* Significant at 5 per cent level (1956)¹⁶³ by 't' test.

The 't' value is calculated by using the formula:

$$t = \frac{\text{Mean}_1 - \text{Mean}_2}{\sqrt{\frac{(n_1 \times S_{D1}^2) + (n_2 \times S_{D2}^2)}{n_1 + n_2 - 2} \times \frac{n_1 \times n_2}{n_1 + n_2}}}$$

where n_1 and n_2 are the number of subjects in each group S_{D1}^2 , S_{D2}^2 are the Standard Deviation squares.

MEAN WEIGHT GAIN IN PREGNANCY IN THE THREE VILLAGES



Key:
B. Basuvapalayam
V. Velliampalayam
R. Rajanagar

Till VI Month VI-VII VII-VIII VIII-IX
Stage of pregnancy.

Figure 9

From Table V it can be seen that the differences between the weight gains registered by the expectant women were statistically significant at five per cent level between Rajannagar and Basuvapalayan, and between Rajannagar and Velliampalayan. The difference between the weights gains of the expectant women in Basuvapalayan and Velliampalayan village was not however, statistically significant. The expectant women of Rajannagar had thus registered the highest weight gains during the period under study. These improved gains in weight may be due to the increase in the nutrient intake. These findings are in agreement with Gopalan's (1961)⁶⁵ view that the mothers with inadequate dietaries showed less increase in body weight during pregnancy.

2. Haemoglobin levels

The mean haemoglobin values estimated during the third trimester for the six beneficiaries (B) and four non-beneficiaries (N.B.) in each of the two ANP villages and six expectant mothers in Basuvapalayan are presented in Table VI.

TABLE VI

MEAN HAEMOGLOBIN LEVELS OF EXPECTANT MOTHERS IN THE THREE VILLAGES

Villages	Mean haemoglobin level per cent	Comparison between	't' value
I. Basuvapalayan	67.03	I and III B	3.56*
II. Velliampalayan B.	66.6	I and II B	1.27
N.B.	55.1	III B and II N.B.	3.43*
III. Rajannagar B.	74.7	III B and III B.	4.56*
N.B.	69.8	III B and III N.B.	4.17*
		I and II N.B.	.26
		I and III N.B.	1.33

* Significant at 5 per cent level.

As can be seen from the data given in Table VI, all the three groups namely, the expectant mothers in Sasuvapalayam (with no ANP) and the non-beneficiaries in the two ANP villages had nearly the same haemoglobin levels, 60.4, 55.1 and 61.8 per cent respectively, the differences between them being not significant. On the other hand, the haemoglobin levels were higher for the beneficiaries in both the ANP villages, as compared to the corresponding non-beneficiaries, the differences being significant. The beneficiaries in Rajannagar had the highest haemoglobin level. Furthermore the differences in the haemoglobin levels between the expectant mothers in Sasuvapalayam and the beneficiaries in Rajannagar, as well as between the beneficiaries in Velliampalayam and Rajannagar, were statistically significant, Rajannagar being the highest among all the groups. These data prove that increased nutrient intake during pregnancy, brings about a proportionate increase in the haemoglobin level.

3. Plasma protein content

The mean plasma protein content and its fractions of the four expectant mothers, two Beneficiaries (B) and two non-Beneficiaries (N.B.) in each of the two ANP villages as well as of two expectant mothers from Sasuvapalayam during the third trimester are presented in Table VII.

TABLE VII

MEAN TOTAL PLASMA PROTEIN CONTENT OF THE EXPECTANT
MOTHERS IN THE THREE VILLAGES

Village	Mean protein grams	Plasma level per cent	Comparison between	't' value
I. Basuvapalayan		6.23	I and III B	2.170
II. Velliampalayan B		6.42	I and II B	0.150
N.B.		6.06	II B and II N.B.	1.000
III. Rajannagar B		7.11	II B and III B.	1.500
N.B.		6.27	III B and III N.B.	2.170
			I and II N.B.	0.130
			I and III N.B.	0.006

As can be seen from the data given in Table VII all the three groups, namely, the expectant women in Basuvapalayan (with no ANP) and the non-beneficiaries in the two ANP villages had nearly the same plasma protein levels, 6.23, 6.06 and 6.27 grams per cent respectively, the differences between them being not significant. The plasma protein levels for the beneficiaries in both the ANP villages, were higher than that of the corresponding non-beneficiaries. These differences however were not statistically significant. The expectant mothers who were the beneficiaries in Rajannagar registered the highest level of plasma protein, when compared with the expectant mothers in Basuvapalayan and the beneficiaries in Velliampalayan(B) although the differences were not statistically significant.

Table VIII gives the mean albumin values in the blood plasma of the above 10 expectant mothers in the three villages.

TABLE VIII
 MEAN ALBUMIN CONTENT OF BLOOD PLASMA OF THE EXPECTANT
 MOTHERS IN THE THREE VILLAGES

Village	Mean albumin level grams per cent	Comparison between	't' value
I. Basuvapalayan	2.96	I and III B.	4.40*
II. Velliampalayan B	3.09	I and II B.	7.49
N.B.	2.01	II B and II N.B.	7.20*
III. Rajannagar B.	3.90	II B and III B.	1.20
N.B.	2.17	III B and III N.B.	3.07*
		I and II N.B.	3.90*
		I and III N.B.	2.3

* Significant at 5 per cent level.

As can be seen from Table VIII the non-beneficiaries (N.B.) in the two ANP villages had nearly the same plasma albumin levels 2.01, and 2.17 grams per cent respectively, those in Basuvapalayan had slightly higher levels at 2.96 grams per cent. The plasma albumin level, were higher for the beneficiaries in both the ANP villages, as compared with the corresponding non-beneficiaries those in Rajannagar being the highest. Furthermore, the group of beneficiaries in Rajannagar had registered the highest levels of plasma albumin, as compared with the other groups and the differences between beneficiaries in Rajannagar and expectant mothers in Basuvapalayan were statistically significant at 5 per cent level.

The mean serum globulin levels in the blood plasma of the above expectant mothers in the three villages are presented in Table IX.

Table XVI contd:-

Item	Views before reorganisation	Number expressing	Views after reorganisation	Number expressing
4. Milk	Milk is important in the diet because:		Milk is important in the diet because, it is good for:	
	It is good for health	10	The teeth	2
			Health	3
			Body growth	5
5. Foods necessary for the eye sight	None	10	Green leafy vegetables	3
			Milk and eggs	2
			Root vegetables	5
			Lack of good food	5
Relationship between diseases and food	We think that medicine alone can cure diseases	10	Food also matters in the maintenance of health	10

The statements in Table XVI reveal that the women had learned to relate the various food groups with health and prevention of deficiency diseases. This nutritional knowledge of the expectant women had definitely increased after the reorganisation of the programme.

TABLE II

MEAN GLOBULIN VALUES OF THE EXPECTANT MOTHERS IN THE THREE VILLAGES

Villages	Mean globulin values - grams per cent	Comparison between	't' value
I. Rasuvapalayan	2.97	I and III B.	0.70
II. Velliampalayan B	3.33	I and II B.	1.00
N.B.	4.04	II B and II B.	3.73*
III. Rajanagar B.	3.22	II B and III B.	0.40
N.B.	4.1	III B and III N.B.	3.40*
		I and II N.B.	2.40
		I and III N.B.	3.00

* Significant at 5 per cent level.

As can be seen from Table II, the two groups of non-beneficiaries from the two ANP villages had almost equal globulin levels 4.04 and 4.1 grams per cent respectively, the differences between them being not significant. The plasma globulin value for the expectant mothers of Rasuvapalayan was lower than the other two groups. The plasma globulin levels were lower for the beneficiaries in both the ANP villages, Velliampalayan registering a higher level.

Cohen and Hansen (1962)¹⁶⁴ have remarked, that the production of large amounts of gamma globulins by protein depleted subjects suggests that gamma globulin forming cells preferentially utilise the available amino acids, with the result that the synthesis of other biologically important proteins may be seriously limited.

Shankar (1962)¹⁰⁰ found that there was a progressive fall in the concentration of total proteins and albumins in the plasma as pregnancy progressed up to the 36th week of gestation in a group of women who received an inadequate diet. The fall of the albumin exceeded that of

the total proteins in blood. Benton et al (1964)¹⁰⁵ have confirmed that in normal pregnancy, the mean total serum protein concentration and albumin levels fall.

(4) Blood Pressure

The changes in the blood pressure are presented in Table X, and the details are presented in Appendix XIV.

TABLE X

THE MEAN INITIAL AND FINAL BLOOD PRESSURE OF THE EXPECTANT MOTHERS IN THE THREE VILLAGES.

Village	Blood Pressure		Comparison	't' value
	Initial	Final		
I. Masuvapalayam	103/70	123/73	I and III	.7/.20
II. Velliampalayam	109/75	125/78	I and II	.4/.09
III. Rajanagar	106/75	116/75	II and III	.2/.30

The results showed that the differences in blood pressure between the different groups were not significant although in general the blood pressure was higher in the groups of expectant women in Masuvapalayam and Velliampalayam as compared to the group in Rajanagar. As has already been reviewed low protein diets lead to high blood pressure which is a disease in itself. The benefits from the Applied Nutrition Programme might have been a contributing factor for the expectant women in Rajanagar for the comparatively less increase in the blood pressure, during pregnancy.

5. Clinical Picture of the Expectant Women

The clinical examination conducted at the beginning of the study showed that the women in all the three villages were severely anemic. Four expectant women, in Rajannagar, three in Basuvapalayan and two in Velliampalayan had bleeding gums. Three women in Rajannagar had angular stomatitis. The clinical examination showed that after six months of regular feeding two among the four expectant women of Rajannagar had got over anemia altogether and in the others two the anemia had become milder. In the other two villages the women were severely anemic to start with and continued to be so through out pregnancy and after delivery.

6. Measurements on the New-Born

a) Birth weights of infants:

The mean birth weights of the six infants in the study in each of the three villages are presented in Table XI.

TABLE XI

THE MEAN BIRTH WEIGHTS OF THE INFANTS BORN TO THE SUBJECTS OF THE THREE VILLAGES.

Village	Mean birth weight kg.	Comparison between	't' value
I. Basuvapalayan	2.57	I and III	6.4*
II. Velliampalayan	2.51	I and II	.5
III. Rajannagar	3.15	II and III	5.3*

* Significant at 5 per cent level.

The differences in the mean birth weights of the infants in the three villages were significant at five per cent level between Basuvapalayan and Rajannagar and between Velliampalayan and Rajannagar. The same was not significant between Basuvapalayan and Velliampalayan. This may be due to the fact that the expectant women of Rajannagar had a better nutrient intake during pregnancy. All infants born to the expectant women of Rajannagar were mature at birth as can be seen from Appendix XIV.

Ruth Woods (1940)¹⁶⁵ put 2900 grams as the limit for maturity. According to this limit, two new born babies in this study were premature when they were born, one belonging to Basuvapalayan and one to Velliampalayan. Two from each of these villages were on the marginal level of 2900 grams. One child from Basuvapalayan group died ten days after birth. Variki *et al* (1955)⁹⁷ record that the poor nutritional status of the South Indian, belonging to the low socio economic group is reflected in the low birth weight and high incidence of prematurity and infant mortality. In their study the average birth weight of the infants in the poor socio economic group was 2.7 kilograms as against 3.1 kilograms in the well to do group. Similar observations have been made by Bagchi and Bose (1962)¹⁶⁶. According to Gopalan quoted by Venkatachalan (1962)⁸² the infant mortality in Madras city per 1000 live births was 136 in the year 1954. An analysis of the causes of death revealed the startling information that seventy-three per cent of all deaths within one month, were the direct result of "debility and prematurity."

b) Birth length of the infants:

The mean birth length of the six infants in each of the three villages are presented in the Table III.

TABLE III

COMPARISON OF MEAN BIRTH LENGTHS OF INFANTS BORN TO EXPECTANT MOTHERS IN THE THREE VILLAGES.

Village	Mean Birth length centimeters	Comparison between	't' value
I. Basuvampalayan	46.1	I and III	1.30
II. Vallampalayan	47.0	I and II	.51
III. Rajanagar	50.0	II and III	2.07

* Significant at 5 per cent level.

As the figures in Table III indicate the difference in the mean birth lengths of infants born to expectant mothers in the three villages, was significant between Basuvampalayan and Rajanagar. The infants of expectant mothers of Rajanagar have recorded the highest birth lengths. This may be due to the improved diet in pregnancy.

The head circumference recorded for the new born babies is presented in the Table VIII.

TABLE VIII
MEAN HEAD CIRCUMFERENCE OF THE NEW BORN BABIES IN
THE THREE VILLAGES

Village	Mean birth head circumference cm.	Comparison between	't' value
I. Rasuvapalayan	32.1	I and III	1.7
II. Velliampalayan	29.0	I and II	2.6*
III. Rajanagar	34.5	II and III	5.3*

* Significant at 5 per cent level.

The mean head circumference of infants was registered to be the highest in Rajanagar, and the difference between Rasuvapalayan and Velliampalayan and between Velliampalayan and Rajanagar were statistically significant, at five per cent level.

The observed equilibrium constant for the reaction is in agreement with the value of 1.7×10^7 .

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Reaction	Equilibrium constant	Concentration between	Temperature
1. $\text{C}_2\text{H}_5\text{OH} + \text{H}_2\text{O} \rightleftharpoons \text{C}_2\text{H}_5\text{O}^- + \text{H}_3\text{O}^+$	10^{-14}	1.0 M	25°C
2. $\text{C}_2\text{H}_5\text{OH} + \text{H}_2\text{O} \rightleftharpoons \text{C}_2\text{H}_5\text{O}^- + \text{H}_3\text{O}^+$	10^{-14}	1.0 M	25°C
3. $\text{C}_2\text{H}_5\text{OH} + \text{H}_2\text{O} \rightleftharpoons \text{C}_2\text{H}_5\text{O}^- + \text{H}_3\text{O}^+$	10^{-14}	1.0 M	25°C

As seen in Table II, the observed equilibrium constants, which are in agreement with the values of 1.7×10^7 and 1.7×10^7 are not statistically significant. The observed equilibrium constants are in agreement with the values of 1.7×10^7 and 1.7×10^7 .

The mean chest measurements of the six new born babies in each village recorded and statistically analysed are given in Table XV.

TABLE XV
MEAN CHEST MEASUREMENTS OF THE NEW BORN IN THE
THREE VILLAGES

Village	Mean chest measurement cms.	Comparison between	't' value
I. Basuvampalayam	30.0	I and III	1.6
II. Velliampalayam	29.0	I and II	1.3
III. Rajanagar	31.9	II and III	2.6*

* Significant at 5 per cent level.

As can be seen from Table XV, the chest measurement of the new born was highest in Rajanagar. The differences in the mean chest measurements showed significance at 5 per cent level between Velliampalayam and Rajanagar. This may be due to the better nutrient intake of the expectant women of Rajanagar.

C. Nutritional Knowledge of the Expectant Mothers in Rajanagar

The nutritional knowledge of the expectant mothers in Rajanagar before and after reorganisation of the ANP in terms of their views on nutritional principles, feeding people in special conditions and the ANP are presented in Tables XVI, XVII and XVIII and discussed.

TABLE XVI

COMPARISON OF THE NUTRITIONAL KNOWLEDGE OF EXPECTANT MOTHERS IN
RAJANIGAR BEFORE AND AFTER THEIR PARTICIPATION IN THE
REORGANIZED ANP.

Item	Views before reorganization	Number expressing	Views after reorganization	Number expressing	
1. Cereals	It is not enough if we eat just one cereal:	6	Because it is not good for health	3	
	because there won't be any change		6	There will not be variety	2
	cannot get the same cereal	2		We can not get the nutrients from other foods	2
	always			4	We can not afford
				If available would eat only rice	1
2. Vegetables	Vegetables are included in the diet because that is the custom	10	Because they are good for health-help regular bowel movement	6	
	Can not be eaten raw	10	prevent disease	3	
			They can be eaten raw	4	
			Root vegetables like potato can not be eaten raw	4	
			Eating raw vegetables is good for teeth	4	
		No answer	6		
3. Eggs	We should eat eggs because:		We should eat eggs because they are:		
	All rich people eat them	10	Important for health	4	
	Food	5	Necessary for the growth of the body	5	
	They are a rare food	5	Necessary to prevent illness	1	

TABLE XVII

COMPARISON OF VIEWS OF EXPECTANT MOTHERS REGARDING DIET
IN SPECIAL CONDITIONS.

Item	Views before reorganisation	Number expressing	Views after reorganisation	Number expressing
Who are the vulnerable groups and why are they called vulnerable?	Could not give any reason	10	Preschool children, expectant and nursing mothers	10
			Because they need extra protection	10
Do expectant women need special food?	Yes (no reason)	3	Yes, because they are eating for two people	6
	No	7	Yes, because they need to be strong to bear the strain of delivery	4
Is the health of the baby affected by the food you take during pregnancy?	Yes	10	Definitely yes	10
What are the foods to be specially given to expectant mothers?	Mirikku, Vadai, Oppattu	10	Milk, egg, meat and fish	6

Table XVII reveals ^{that} the expectant women ^{had} started to realize the need for additional nutrients during special conditions like pregnancy and childhood; and the relation between food and health.

TABLE XVIII

COMPARISON OF KNOWLEDGE OF EXPECTANT MOTHERS IN RAJANMAGAR
REGARDING THE ANP

Item	Views before reorganization	Number expressing	Views after reorganization	Number expressing
What is Applied Nutrition Programme?	Under this programme they give camels milk	2	Under this programme milk, eggs and vegetables are given to the three vulnerable groups regularly	10
	Distribution of milk and other supplements for poor people	4		
	Distribution of milk, vegetables and eggs to people	4		
When was the programme started?	Two or three years back	10	Two years back	6
			2½ years back	4
Who are benefiting from the programme?	We, the villagers	10	The three vulnerable groups	10
What are the benefits of the Applied Nutrition Programme?	It is good for poor people like us	10	We are able to get good and costly foods which we cannot get otherwise.	4
			We get a regular supply of good foods that are necessary for expectant women	6
			Milk is very good after the addition of jaggery	6

Item	Views before reorganisation	Number expressing	Views after reorganisation	Number expressing
Who provides milk powder and eggs?	The government	10	Milk powder is given by foreign countries, eggs by government and vegetables produced in the village itself	10
Do you think such a programme is necessary?	Do not know	6	It will be good if we can have the programme	10
	Yes	4	Because, we learn new methods of cooking -	3
			have vegetables and poultry unit of our own -	6
What will you do after the discontinuation of ANP?	We will be brooding over the good old days	1	We can produce eggs and vegetables at home, but can not do anything about milk	7
	Cannot do anything of our own	4	We will produce these foods ourselves, consume half and sell the rest	3
	Do not know	1		
	Not much worried about it	1		
	We will be as we were when there was no programme	3		
Clinical check up in the ANP	We do not like to show our bodies to the doctor	10	We welcome the idea of being checked by a doctor	10

The table XVIII brings to light the fact that the expectant women had a greater awareness of the ANP, its aims and objectives and hence had a greater appreciation for the programme.

D. Food Habits and Beliefs of the Expectant Women of Rajanagar

The changes in the food habits and beliefs are discussed under the following heads:

- 1) Foods used before and after reorganisation of ANP.
- 2) Beliefs before and after reorganisation of ANP.

1. Foods Used Before and After Reorganisation of ANP

Table XIX presents the food habits of the expectant mothers before and after the reorganisation of the Applied Nutrition Programme in Rajanagar.

TABLE XIX

THE FOODS USED BY THE EXPECTANT WOMEN IN RAJANAGAR

Foods used	Before reorganisation	After reorganisation
1. Vegetables	Brinjal, pumpkin, plantain (raw) and snake gourd.	Tomato, green leafy vegetables, ladies finger, bitter gourd, amthi leaves, and brinjal.
2. Fleasy foods	Beef, poultry and mutton once a month.	Beef, poultry and mutton more frequently.
3. Eggs	Once in a month	Every other day
4. Milk and other products	Only diluted bitter milk with cereal.	Skim milk was consumed regularly by the subjects.

From the Table XIX it can be seen that the expectant women had started consuming more vitamin B rich foods, skim milk, eggs and other animal foods whenever possible, as a result of the reorganised ANP.

2. Beliefs of the Expectant Women Before and After Reorganisation

The common beliefs of the expectant women regarding some foods, and diets for some special conditions are given in Table XI.

TABLE XI

THE BELIEFS OF THE EXPECTANT WOMEN REGARDING DIET

Beliefs regarding	Before reorganisation	After reorganisation
1. <u>Leafy vegetables:</u>		
a) Greens in general	If greens are taken very often, keeral poochi*, which is capable of causing forgetfulness grows in the stomach.	Greens are good for health; Keeral poochi does not grow in the stomach.
b) Drumstick leaves		Eating drumstick leaves is good for production of milk
2. <u>Fruits:</u>		
Papaya	Causes abortion	Papaya fruit does not cause abortion
3. <u>Milk:</u>		
	If the mother eats almonds during pregnancy, her child will be intelligent	All the essential foods should be eaten to get a healthy and intelligent baby.
4. <u>Diets of children:</u>		
	For a child below three years old if cereals are given stomach will enlarge and result in potbelly	There is no harm in giving well cooked cereals to the children.
	The child below three cannot digest the foods eaten by adults.	The child can be given normal diets alongwith milk.
5. <u>Diet of expectant mothers:</u>		
	'Valai kan' (night blindness) is a normal symptom of pregnancy.	'Valai kan' is a deficiency disease.

* Keeral poochi - one kind of worm.

As can be seen from Table XI some of the beliefs of the expectant mothers were changed during the six months of the study period. The direction of these changes is significant in that green leafy vegetables and papaya became acceptable, feeding children with normal diets was recognized and the awareness about deficiency diseases was increased.

2. Adoption of Improved Practices by the Expectant Mothers in Rajanagar

The improved practices adopted by the expectant women in Rajanagar are given in Table XII.

TABLE XII

ADOPTION OF IMPROVED PRACTICES BY THE EXPECTANT WOMEN IN RAJANAGAR

Practice	Before reorganization	After reorganization
1. Home production of vegetables and fruits.	None produced any food at home.	All the ten women raised vegetables like snake-gourd, bitter gourd, ladiesfinger, beans, tomato, papaya and greens in the gardens at home.
2. Poultry raising in the home.	Except one, none of the other families had poultry at home. No family considered it essential to have a poultry at home.	All the ten women questioned considered that poultry was essential. Seven had started poultry at home, and the rest were waiting to get birds from the block.
3. Consumption of eggs and milk.	Eggs and milk were not consumed regularly, only once in a way.	Eggs and milk were consumed regularly by six expectant mothers.
4. Consumption of green leafy vegetables.	Did not consume.	Consumed regularly.
5. Method of cooking.	Excess water method was used. The excess water was discarded.	Excess water method was used but the water used for consumption as usual.

As revealed by Table XII the reorganised ANP had initiated a *Series* sense of improvements in the production and consumption of protective foods by the expectant mothers. It brings out also the desirable changes effected in the methods of cooking.

V SUMMARY AND CONCLUSIONS

The impact of the Applied Nutrition Programme on expectant mothers, in terms of their nutritional status and information, was studied in two selected villages in Bhavanisagar Block. Based on the observations of the problems and needs of the vulnerable groups, the Applied Nutrition Programme was reorganised in one of the villages, namely Rajanagar, to increase the frequency of distribution of the food supplements, improve the organisational set up and to include nutrition education. The nutritional status and information of the expectant mothers, both beneficiaries and non-beneficiaries in the reorganised ANP, were compared during the period of six months with those of corresponding groups in the other villages as well as with those in a third village where there was no ANP.

The findings of this study are:

1. The nutritional status of the expectant mothers who were the beneficiaries in the ANP in the two villages, was higher than that of the corresponding non-beneficiaries, as well as that of the expectant mothers in Basurmalayam where there was no ANP, as shown by the total weight gain in pregnancy, haemoglobin values, total plasma^{protein}/content and its fractions and clinical picture.

2. Among the expectant mothers who participated in the ANP in the two villages, the nutritional status of those in the reorganised programme was significantly higher than that of the others.

3. The intake of calories, protein, calcium, vitamin A and vitamin C, by the expectant mothers in the Rajanagar had increased from 2028 to 2249, 57 to 71.7 grams, .84 to 1.4 grams, 993 to 993 I. U. and 4 to 17 mg.

respectively, due to the reorganisation of the Applied Nutrition Programme.

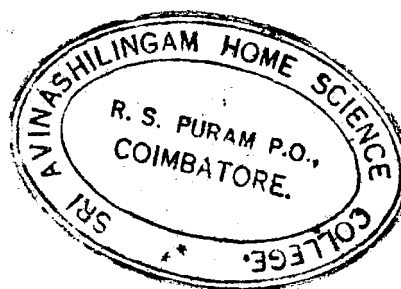
4. The expectant mothers who had participated in the reorganised ANP, registered significant gains in nutritional knowledge during the six months of the study period. They had changed, to some extent, their food beliefs and habits resulting in higher intake of nutrients by including valuable food items like green leafy vegetables, carrots and papaya in their diets. Their appreciation for the ANP was also strikingly evident.

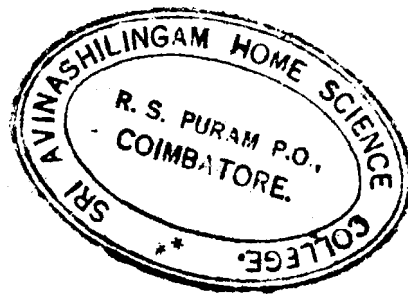
Thus, it is concluded that:

(1) The ANP contributes significantly towards improving the nutritional status of the expectant mothers,

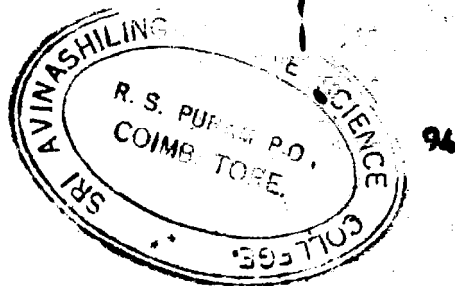
(2) The benefits of ANP could be greater if it is reorganised as done in this study,

(3) Food production and distribution alone cannot ameliorate malnutrition, but they need to be built on a strong foundation of nutrition education to have an effective impact on the dietary habits, nutritional status and knowledge of the expectant mothers, and on their appreciation for the Applied Nutrition Programme.





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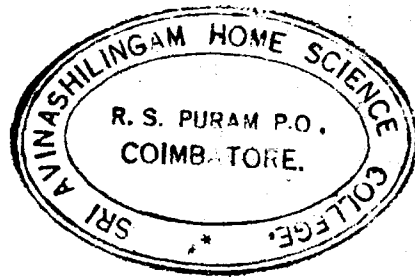
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APPENDICES



APPENDIX I

PROFORMA FOR THE SOCIO ECONOMIC SURVEY OF THE VILLAGE

A

1. Date ..
2. Name of the village surveyed..
3. Situation ..
4. Nearest town ..
5. Panchayat ..
6. Block ..
7. District ..

B. Type of village:

- a. Nucleated ..
- b. Bilateral ..

C. Population:

- a. Total population in the village
- b. Men ..
- c. Women ..

D. Caste distribution:

S.No.	Caste	Member		Total
		Number	Women Children	
1.				
2.				
3.				

Appendix I (cont'd)

I. Institutions:

- a. Number of inmates male ..
- b. Number of school going children ..
- c. Adult education centres ..
- d. Number of scholars ..

II. Occupations:

	Main	Subsidiary	No. of men	No. of women	Total
.....					

III. Income:

- a. Average per capita income ..
- b. Sources of income

Source	Per-capita of people
.....	

in the morning

- i.
- ii.
- iii.
- iv.

Part. 2. 1940-1945:

- i.
- ii.
- iii.

Part. 3.

- i. 1940-1945
- ii. 1945-1950

1. The year was only a year and a half.

2. The year was in the non-uniform

... ..

... ..

3. **General Facilities :**

i. Health facilities :

ii. General problems :

APPENDIX II

STANDARDIZATION OF THE RECORDS OF THE BIRDS AND MAMMALS
 HABITS OF THE BIRDS

1. Serial number of the family ..
2. Date ..
3. Name of the bird of the family ..
4. Description of sex ..
5. Date of collection ..
6. Where caught ..
7. Size and composition of the family:

No.	Sex	Relationship to the head of the family	Age	Sex	Compo- sition	Vegetation or sea locality

Appendix II Contd:8. ⁿ Annual income of the family through:

- a) Occupation ..
 b) Other sources ..
 c) Total income ..

9. Distribution of income per month:

Item	Amount spent
Food	
Clothing	
Shelter	
Transport	
Education	
Entertainment	
Health	
Miscellaneous	

10. Expenditure on food items:

Food items	Weekly		Monthly	
	Quantity	Value	Quantity	Value
<u>Cereals</u>				
Rice				
P.B.Rice				
Wheat				

Appendix II

Year	1961	1962	1963	1964
...

...

...

...

...

...

...

...

...

...

...

...

...

Appendix II (cont'd)

Year	1970	1971	1972	1973	1974
Total stores	1,000	1,000	1,000	1,000	1,000

Stores

1,000

1,000

1,000

Stores

1,000

1,000

Stores

Stores

11. Frequency of foods used

Foods	Daily	Monthly	Occasionally	Reason
-------	-------	---------	--------------	--------

Cereals

Pulses

Leafy vegetables

Roots and tubers

Other vegetables

Spices

11. Frequency of foods used - contd:-

<u>Food</u>	<u>Daily</u>	<u>Monthly</u>	<u>Occasionally</u>	<u>Reason</u>
<u>Fruits</u>				
<u>Milk and milk products</u>				
<u>Fleshy foods</u>				
<u>Buts and oils</u>				

12. Preservation of foods

<u>Food Stuff preserved</u>	<u>Quantity per year</u>	<u>Reason of the preserved item</u>	<u>Reason for preserving</u>	<u>Method of preservation</u>	<u>Method of using preserved item</u>

13. things of value

to be stored	of	location of	quantity
	storage	storage	

14. Special preparations for special occasions

Special	Special food	Special occasions
preparation	preparation	

17. Home production of foodsa. From vegetable garden -

Amount	Per
--------------	----------------

b. From dairy -

Number of cattle ..	
---------------------	--

Quantity of milk per day..	
----------------------------	--

Amount sold per day ..	
------------------------	--

c. From poultry -

Number of eggs per month..	
----------------------------	--

Number sold ..	
----------------	--

Reasons for selling ..	
------------------------	--

APPENDIX III

PROFORMA FOR DIET SURVEY OF IMPORTANT MOTHERS BY THE WEIGHMENT METHOD

- 1. Name of the head of the family .. S.No:
- 2. Caste .. Date:

3. Meal matters of the family:

Meals	Time	Menu commonly used	Whether or not members sit together and eat
-------	------	--------------------	---

Breakfast

Lunch

Dinner

Snacks if any

4. Methods of cooking:

Item	Boiling	Methods Absorption	Used Steaming	Frying	Stewing	Others
------	---------	--------------------	---------------	--------	---------	--------

Cereals

pulses

Leafy vegetables

Appendix III - 4. Method of cooking contd:

Item	Boiling	Methods Absorption	Used Steaming	Frying	Stewing	Others
Non-leafy vegetables						
Fruits						
Fleshy foods						
Milk and milk products						
Miscellaneous						

5. Menu for seven consecutive days

Days	Breakfast time	Lunch and time	Evening snacks if any - time	Supper and time
1. Monday				
2. Tuesday				
3. Wednesday				
4. Thursday				
5. Friday				

Appendix III - 5 Years for seven consecutive days - contd:-

Days	Breakfast time	Lunch and time	Evening snacks if any - time	Supper and time
6. Saturday				
7. Sunday				

Any remarks:

6. Quantities of foods used for a week by the Log Book method

Food stuff	Stock on hand	Additions and removals							Total Consumption
		1	2	3	4	5	6	7	

Cereals

ulses

Leafy-vegetables

Non-leafy vegetables

Roots and tubers

Fruits

7. Special foods taken by women during pregnancy

Special food	State at which first given	Reason	Food substituted	State at which avoided	Reason
--------------	----------------------------	--------	------------------	------------------------	--------

8. Foods given when the expectant mother is ill

Illness	Foods given	Foods avoided	Reason for	
			Giving	Avoiding

fever

colic
xxx

varicella

9. Beliefs about foods in pregnancy.

APPENDIX IV

**PROFORMA FOR SURVEY OF THE ATTITUDES OF WOMEN TOWARDS
FOODS AND ANP**

S.No.

Date:

1. Name of the head of the family ..
2. Name of the expectant mother ..
3. Information about the Applied Nutrition Programme ..
 - a) Are you a beneficiary in the Applied Nutrition Programme? ..
 - b) If not, your reasons for not joining the ANP ..
 - c) If yes, since when ..
 - d) Views about the Applied Nutrition Programme ..

Benefits

Drawbacks

Reasons for the existing problems	Suggested solutions
-----------------------------------	---------------------

f) Would you like the programme to continue? If so why? If not why?

g) When the supply is stopped what will be your next step?

1. The first part of the document is a list of names and addresses.

John Doe
123 Main Street
New York, NY 10001

John Doe
123 Main Street
New York, NY 10001

John Doe
123 Main Street
New York, NY 10001

John Doe
123 Main Street
New York, NY 10001

John Doe
123 Main Street
New York, NY 10001

2. The second part of the document is a list of names and addresses.

3. The third part of the document is a list of names and addresses.

1. How does the author describe the
author like to use "log"?

2. Why do we have to do it?

3. In these sections, he writes
"because"

to explain?

to explain "log"?

to explain, and to write

4. How does the author describe
the author like to use "log" in
the first part of the
book?

11. Knowledge about ANP

- a. In this village is there any special programme for giving additional foods? ..
- b. Do you know the name of that programme? ..
- c. Who operates it? ..
- d. Why is this programme sanctioned?
- e. What are the agencies who finance the programme? ..
- f. What foods are distributed under this programme? ..
- g. To whom? ..
- h. Are the foods given regularly? ..
- i. Frequency of distribution of ANP foods:

<u>Food</u>	<u>Weekly once</u>	<u>Weekly twice</u>	<u>Daily</u>
Eggs			
Milk			
Vegetables			

- j. Do you go to get the supplements regularly? If so why? If not why? ..

12. General questions regarding foods

1. Is it enough if we eat just rice or any other cereal alone? If so why? If not why? ..
2. Why is milk important in our diet? ..
3. Does the way of cooking affect the quality of food? How? ..
4. According to you who are the vulnerable groups? ..
5. According to you do expectant women need special food? If so why? If not why? ..
6. If you think they need special foods what are the foods which should be specially given? ..
7. Do you think that the health of your baby is affected by the food you take during pregnancy?..

13. Methods of cooking vegetables

1. What are the vegetables you commonly use? ..
2. How many of these you produce at home? How many do you buy? ..
3. Which vegetables can be eaten raw? ..
4. What is the advantage of eating raw vegetables? ..
5. How do you cook vegetables? ..

14. Poultry and kitchen garden

- a. Do you eat eggs? ..
- b. Do you like them? ..
- c. Do you have a poultry at home? .. Yes/No - Reasons
- d. Do you think it is good to have poultry at home for family use? ..
- e. Do you have any trees in your kitchen garden? ..
- f. Do you have carrot in your garden? ..

15. Others

- a. What are the foods that are necessary for good eye sight? ..
- b. How is nightblindness caused? ..

APPENDIX V

ESTIMATION OF CALORIES

Procedure

Filled the calorimeter vessel with 2000 CC of the distilled water. Then took 1 gm. of powdered sample of fuel in capsule and hung it in position. Took a definite length of fuse wire (about 11 cms) and attached it to the terminals inside the bomb, such that it just touched the surface of the powdered sample in the capsule. After putting on the cover and tightening the screw cap by means of hand only and not by wrench, slowly admitted oxygen inside the bomb until the gauge pressure read 25 atmosphere. The bomb was then ready for firing. Then kept it inside the vessel of water and made the necessary electrical connections. Then closed the jacket lid, inserted the thermometer in position to read the temperature of the water in vessel. Started the motor and took the initial readings of the thermometer at intervals of 1 minute for about 4 minutes. Before switching on the ignition, checked the circuit carefully. Then ignited the charge and took the temperature readings at intervals of 30 seconds. Once the maximum temperature was reached, allowed the calorimeter to cool for the same amount of time taken for the rise and added half the fall in temperature on the maximum recorded temperature to give the correct maximum temperature. The correction was not done as there was no fall in temperature.

Calculations

Total water equivalent of the calorimeter : $2000 + 418 = 2418$
where 418 is the water equivalent of calorimeter vessel alone.

Correction for fuse wire

The correction is 2.8 calories per cm. of wire burnt. Subtract this from the total heat liberated.

$$\frac{2412 K (T_1 - T_2) - 2.8 (L_1 - L_2)}{\text{Wt. of grams of sample used}}$$

Where T_1 and T_2 are the maximum and minimum temperatures after correction and L_1 and L_2 are the initial and final length of the fuse wire.

Titration

Titrate basic solution with standard .1N Hydrochloric acid.

Calculations

One ml. of .1N of Hydrochloric acid reacts with		.0014 gram of nitrogen
So X ml. of Nal would react with		X x .0014 gram of nitrogen
1 gram of nitrogen		6.25 gram of protein
So X x .0014 gram of nitrogen contains		X x .0014 x 6.25 gram
3 gram contain		X x .0014 x 6.25 gram of (1) protein
Therefore 100 gram contain		$\frac{X \times .0014 \times 6.25}{3} \times 100$ gram per cent protein

APPENDIX VII

ESTIMATION OF CALCIUM

Principle

Calcium is precipitated as oxalate and then titrated against potassium permanganate when hot.

Procedure

Pipet out 20 c.c. of the ash solution into a clean 250 c.c. beaker and render alkaline by the addition of ammonium oxalate. Heat the solution to boil, when it is still hot, add a few drops of strong acetic acid and allow the precipitate to settle for $\frac{1}{2}$ an hour, or preferably over night.

Filter the precipitate using quantitative filter and pour all the washings into the filter paper. The washing is continued until the filtrate no longer gives a precipitate with silver nitrate solution.

When the filtration is over a hole is made in the filter paper with the help of a glass rod and all the precipitate is washed down with 20 c.c. of 6 N. H_2SO_4 into a clean conical flask. Heat it over the bunsen burner flame to 60 - 70° c. and while it is hot, it is titrated against 1N potassium permanganate taken in the burette.

Calculations

$\frac{\text{Reading of the standard} \times .002 \text{ mg. of calcium}}{\text{Reading of the unknown}}$

APPENDIX VIII

ESTIMATION OF IRON

Procedure

10 ml. of the test solution was pipetted out in a 25 ml. of volumetric flask. To this .5 ml. of the potassium persulphate solution was added followed by 2 ml. of 3 N. Potassium thiocyanate solution. It was mixed thoroughly by inversion and made up to 25 ml. with glass distilled water. In the same manner triplicates were prepared for each sample.

For the standard 2, 4, 6, 8 and 10 ml. of the standard iron solution were pipetted out in 6 separate flasks and then treated similarly as the test solution.

The colorimeter was set to zero with blank solution. The samples were left for 30 minutes for colour development and the colour was read in Klett Summerson Colorimeter using 540 m. filter (green).

A graph was drawn to read the concentration of the unknown solution.

APPENDIX I

STANDARD LIST OF QUESTIONS FOR THE

Name:

Date:

1. Age of the head of the family ..
2. Age of the expectant mother ..
3. Age of the expectant father ..
4. Stage of pregnancy ..
5. Weight about entry ..
6. Number of children conceived ..
7. Number of children born ..
- alive ..
8. Marital status of the expectant mother:
 1. Single ..
 2. Married ..
 3. Separated ..
 4. Divorced ..
9. Insurance:
 1. Health ..
 2. Life ..
 3. Accidents ..
10. Eyes:
 1. Sight and color ..
 2. Best blindness ..
 3. Any other action ..

Appendix II contd:-

1. Mouth:

- 1. Lips normal ..
- 2. Angular stomatitis ..
- 3. Cracked ..

2. Excretion of bowels:

- 1. Normal ..
- 2. Constipation ..
- 3. Diarrhoea ..

APPENDIX X

ESTIMATION OF HAEMOGLOBIN

Procedure

The diluting chamber and the pipette are cleaned well and allowed to dry. The ball of the finger is sterilized and with a sterilized needle it is pricked deeply to allow the blood flow freely. The pipette is applied in a standing direction to the top and such up to two cubic milli meters.

Fill the diluting tube with $\frac{1}{10}$ hydrochloric acid upto the mark 10. The blood in the pipette is blown gently into the tube, the pipette being rinsed out several times with acid solutions contained in the tube. This tube is then allowed to stand exactly for five minutes. Thereafter the procedure of adding water and matching are carried out. The water is added in drops by means of a pipette. After thorough mixing the colour is compared with the coloured glasses against a white paper. After the colour matches that of the glasses the mixing tube is taken out and reading noted down.

Calculations

The standard reading	..	14.5
The reading on the diluting tube	..	X
The per cent of the haemoglobin	..	$\frac{X}{14.5} \times 100$ per cent

APPENDIX XI
DETERMINATION OF PLASMA PROTEIN CONTENT
BLOOD ANALYSES

Total protein

Pipette 1 c.c. of serum into a 20 c.c. volumetric flask and dilute to volume with .85 per cent sodium chloride solution.

Mix and transfer 1 c.c. to a pyrex test tube graduated at 25 - 50 c.c. (do in duplicate). Add 1 c.c. of 1 : 1 sulphuric acid solution and add 3 glass beads.

Digest by heating over a micro-burner in a hood, until dense white fumes (SO_3) fill the tube. Remove the flame and allow the tube to cool for 30 seconds - 1 minute. Then add two drops of 30 per cent hydrogen peroxide (superoxyl) allowing it to drop into the solution.

When the bubbling stops heat to boiling. If the solution has not cleared completely repeat the addition of hydrogen peroxide. Boil gently for five minutes. Remove the tube from flame and cool. Continue under nesslerization step - 5.

Albumin (King'sley method)

Place 20 c.c. of 20 per cent sodium sulphate solution in a 20 c.c. centrifuge tube without a lip. Add 1 c.c. of serum, stopper and mix by investing several times. Add 8 c.c. of ethyl ether, stopper and slowly invest twice. Take out stopper for a second, then replace and shake vigorously for 30 seconds. Remove, stopper and centrifuge for 10 minutes at 2200 revolutions per minute. Stand the tube so that the tightly packed globulin layer floating on the sodium sulphate solution is separated from the walls of the tube, insert in a volumetric 10 c.c. pipette through ether layer along the lower wall of the tube, remove approximately 10 c.c.

Appendix XI contd:

of the clear fluid. Place the fluid in a test tube leaving the last c.c. in the pipette to be discarded.

Pipette two 1 c.c. portions into each of 2 pyrex test tube graduated at 35 and 50 c.c. Add three beads and 1 c.c. of 1 : 1 sulphuric acid to each tube. Digest as for total prote'n continue under nesslerization step 5.

Standard

Place 5 c.c. of ammonia sulphate standard solution (5 c.c. : .2 mg. of nitrogen) in a test tube, graduated at 35 - 50 c.c. Add three beads and one c.c. of 1 : 1 sulphuric acid solution.

Nesslerization

Dilute unknowns, and standard, to 35 c.c. with water and place in an ice water bath for atleast 15 minutes. Blow 15 c.c. of Nessler's solution into each using a 15 c.c. pipette. Insert a rubber stopper and mix by inverting 3 times. Compare in a colorimeter with standard set at 27 mm.

CalculationsTotal protein nitrogen:

$$\frac{\text{Reading of the standard}}{\text{Reading of the unknown}} \times .2 \times \frac{100}{.02} : \text{mg. per cent of nitrogen}$$

Albumin nitrogen:

$$\frac{\text{Reading of the standard}}{\text{Reading of the unknown}} \times .2 \times \frac{100}{.323} : \text{mg. per cent of nitrogen}$$

Conversion of nitrogen to protein:

The nitrogen of the total protein and albumin includes the non-protein nitrogen which must be subtracted. If the non-protein nitrogen was not determined, subtract an average value of 30 milligrams.

Since one gram of nitrogen represents 6.25 grams of protein transform each of the above to protein by the following formula, except fibrinogen which does not have the non-protein nitrogen.

$$6.25 \times \frac{\text{milligrams of nitrogen} - \text{milligrams of non-protein nitrogen}}{1000}$$

= grams of protein.

Globulins : grams of total proteins - grams of albumin.

APPENDIX XII

MEASURING THE BLOOD PRESSURE

According to the auscultatory method certain sounds heard during auscultation of the brachial artery below the cuff are taken as the criteria for the systolic and diastolic pressures. Under ordinary circumstances if a stethoscope is placed upon the brachial artery, no sound can be heard, the flow of blood along the arterial channels being inaudible. If however the artery is compressed by the manometer cuff so as to completely arrest the flow of blood for a moment, a sharp high tapping sound in rhythm with the heart beat will be heard when the pressure in the cuff is again released and falls just sufficiently to permit the arterial lumen to open and allow a jet of blood to pass beyond. Four phases of the sound, each having its distinctive character may be heard in succession. The beginning of the first sound is taken as the index of systolic pressure. The pressure at the time of complete disappearance of the fourth sound is taken as the index of the diastolic pressure. Thus the blood pressure is measured indirectly in human subjects for clinical purposes.

APPENDIX XIII

Songs and Skit on Food and Health - Summary in English
FOOD AND HEALTH

Marakka the illiterate village woman is expecting and she suffers from anaemia and mal-nutrition. She sends her first child to her mother since she did not have milk to breast feed the child. She and her husband feel that God is angry with them for not paying their offer on behalf of the first child. Marakka has been dismissed from her job due to her inefficiency. Fortunately she meets Dr. Sivakami who is none but her mistress's daughter. She examines Marakka and advises her to eat food items like milk, egg, vegetables, leafy and non-leafy. She says that her financial condition should not allow her to consume those foods, but she is encouraged to produce them at home. The mistress of the house also complains to her daughter regarding her general weakness. She advises her mother over the importance of mixed diet. In the meantime a Gram Sevika visits her house to collect beneficiaries for ANP programmes. Since Dr. and Marakka are inquisitive about the programme, the Gram Sevika explains to them about the programme in detail and induces Marakka, the expectant mother, to become one of the beneficiaries, along with her pre-school child who also can be a beneficiary. Days pass on. After six months Marakka is appreciated by the mistress for doing the household task efficiently. Marakka frankly admits that the reason for her efficiency and vigour and that of her child's are due to their participation in ANP.

திராசு வழங்குதல் மூலம்
Tamil Version

தலைவரே புகழ் அளிப்பீடு

பாடல்களைப் போலக் கொடுக்கி

தமிழன் ஓர் அன்பு கொடுக்கி நீ

தமிழன் ஓர் அன்பு கொடுக்கி நீ

பாடல் அடங்கியும் தருவார் தலை

நம் பாடல்கள் கொண்டு வருவாரே

பாடல் அடங்கியும் திறை அளிப்பீடு - பாடல்

அன்பு கொடுக்கி?

பாடல் அடங்கியும் திறை அளிப்பீடு அன்பு

அன்பு கொடுக்கி?

உள்ள அன்பும் அன்பு அடங்கியும்

அன்பு அளிப்பீடு அளிப்பீடு

அன்பு அளிப்பீடு அளிப்பீடு அளிப்பீடு

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உள்ள அளிப்பீடு அளிப்பீடு அளிப்பீடு

உள்ள அளிப்பீடு அளிப்பீடு அளிப்பீடு

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கொழிந்தவையற்றவர்கள் உயர்ந்தவர்கள் வளர்ந்தவர்கள்
 பல சந்தையடி அபிமானம் பல சிவனின் உயர்ந்தவர்கள்
 சிவனின் பரிசுறுமே நாமே உயர்ந்த அபிமானங்கள்
 காய்ச்சின சைவத்தினால், சோதிப்பவர்கள்
 சைவத்தினால்.

செட்டினால் அம்மாத செட்டினால் உயர்ந்த

சந்தையடி அபிமானம் (2)

சந்தையடி அபிமானம் நாமே உயர்ந்த அபிமானங்கள்

நாமே உயர்ந்த அபிமானம் (2)

நாமே உயர்ந்த அபிமானங்கள் (2)

செவ்வாய் - (கவிதை) உயர் பள்ளி மாண்புமிகு அமைச்சர் உட்கார்ந்து
செய்துள்ள சம்பவம், சம்பவம் தொடர்பாக சம்பந்தம்
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செய்துள்ள சம்பவம், சம்பவம் தொடர்பாக சம்பந்தம்

உயர் பள்ளி மாண்புமிகு அமைச்சர் (கவிதை)

மாண்புமிகு - அமைச்சர் ...

செவ்வாய் - பரமசிவன் அமைச்சர் மாண்புமிகு அமைச்சர்
(கவிதை)

(மாண்புமிகு அமைச்சர் உயர் பள்ளி மாண்புமிகு அமைச்சர்)

(சம்பந்தம் காட்டி)

கவிதை 3

கவிதை - அப்படியான சம்பவம்: உயர் பள்ளி மாண்புமிகு அமைச்சர் உட்கார்ந்து

மாண்புமிகு - அமைச்சர் அமைச்சர் மாண்புமிகு அமைச்சர்
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கவிதை - அமைச்சர் அமைச்சர் அமைச்சர் அமைச்சர்
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(அமைச்சர் அமைச்சர் அமைச்சர் அமைச்சர் அமைச்சர் அமைச்சர்)

காறி - சாப்பிடுதா? நாசிநோசி சிக்கிப்பிடிக்க சும்மா வெட்டி
கொட்டிக்கொடுக்கிறார்களே

கி - தாய்மக அகலாதிமேளாதி நீ நடுகு வந்தபின்ன உடம்பை சாப்பிடு
தடுவ தடுவ. சந்திரன் உதாரணமாகவும் உய்யும் செந்திரன்
கொடுக்க. பாகம், வெட்டி, பிச்சி, கொண்டு போகிற நல்ல
சாப்பிடுகிற சந்திரன்சாப்பிடு வெட்டிக்கொடுக்க, சந்திரன்சாப்பிடு
கொடுக்க உதாரணமாகவும் உய்யும் உதாரணமாகவும்
செந்திரன்சாப்பிடு. சாப்பிடுகிற சந்திரன் உதாரணமாகவும்
பெட்டிக்கொடுக்க. பிச்சி கொடுக்க நீ உதாரணமாகவும் செந்திரன்
சந்திரன்சாப்பிடு. உதாரணமாகவும் நீ செந்திரன் கொடுக்க கொடுக்க

காறி - சந்திரன், செந்திரன், சந்திரன், நாசி, நாசி, நாசி, நாசி :
சந்திரன் கொடுக்க கொடுக்க

கி - உதாரணமாகவும் செந்திரன் கொடுக்க கொடுக்க

காறி - சந்திரன் நாசி கொடுக்க கொடுக்க :

கி - சந்திரன் நாசி கொடுக்க கொடுக்க : உதாரணமாகவும் நீ செந்திரன் சாப்பிடுகொடுக்க

காறி - சாப்பிடுதா : உதாரணமாகவும் : சந்திரன்சாப்பிடு கொடுக்க கொடுக்க
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கி - உதாரணமாகவும் சந்திரன்சாப்பிடு கொடுக்க கொடுக்க
சந்திரன்சாப்பிடு கொடுக்க கொடுக்க கொடுக்க கொடுக்க கொடுக்க
சந்திரன்சாப்பிடு கொடுக்க கொடுக்க கொடுக்க கொடுக்க கொடுக்க

காறி - சந்திரன்சாப்பிடு கொடுக்க கொடுக்க : உதாரணமாகவும் சந்திரன்சாப்பிடு கொடுக்க
கொடுக்க கொடுக்க, சந்திரன்சாப்பிடு கொடுக்க கொடுக்க, உதாரணமாகவும்
சந்திரன்சாப்பிடு கொடுக்க கொடுக்க கொடுக்க கொடுக்க கொடுக்க கொடுக்க

அம்மா - இது என்னடி கத்து? அறிவிச் சாதந்தாட் சாப்பிட்டுண்டு

அம்மா - அங்கேதான் இயற்கை பாயிவிட்ட அறிவி காதந்திரம் சாப்பிட்டு
சொல்பத்தியு, அம்பு, சேய்மரம், சோலை உப்பியு பற
தாடியும் சேர்த்துத் தொட்டால் உடம்புக்கு சத்துச் சரியாக
விசுத்தும் சேலம். இயற்கை தாடிய வகைகளையே அறிவியல்
தான் சது சுகந்தம். நீ அறிவியை சாப்பிட்டால் உடம்புக்கு பற
யின்களையே போயிடுச்சு, பச்சை விட்டு வெட்டுகாரி அக்கையே
சாப்பிட்டா துத்தக்காம போச்சு. என்ன தாடியவிசுத்தியும்
சாப்பிட்டாந்தான் உடம்புக்கு பச்சை தெரியுமா அம்மா
(இந்த சமயத்தில் ஒரு விநாடிகள் கையில் விட்டு கையுடன்
சுமந்துவிட்டாள்)

அம்மா - அக்கா

அம்மா - மாநா : அட பொருத்தியா! எப்பிதான் எந்தே?

பொரு - உப்பித்தான் அக்கா! பச்சை வந்திட்டிவிட்டே சொல்லிச்சு
பார்த்திவிட்டு போகலாம் என்று சொன்னே

அம்மா - அப்படியா? சாப்பிடுகின்ற பொருத்தியே நீ உப்பிபோ எந்தை
அக்காவை படிக்கிறே?

பொரு - சும்மா அக்காவே

அம்மா - இது : அக்கா! உனக்கு விட்டா அப்பாடத்தியை அறிவித்த
உனக்கு ஒரு பாடல் இயற்கையே படிக்கிறாயா

பொரு - நீ பச்சை படிக்கிறாயேயே!

அம்மா - பார்த்தியாய்மா! அக்கா அயலையே கடுமீ சுகந்தியை
உனக்குப் பதிவிட்டிருக்கிறாயே அடச் சொல்லித்தந்திச்சு, பொரு
என்ன அக்காவே உனக்கு தெரிந்தபடி அம்மாவுக்குச் சொல்லி
பாப்பிப்பாக்கி.

(பொருள் வகைகள்)

கலப்புக்கு உட்கு வெள்ளம் : மக்கள்

செய்க்கு உட்கு வெள்ளம் - வெற்றிக் வெள்ளம் (மக்களால் வர)

புறநாட்டில் காடுபொருள்வகைகள், பொருள், நாடு உட்கு
வெள்ளம் (புறநாடு உட்கு உட்கு (செய்க்கு வகைகள்))

காடுகள் பொருள் உட்கு வெள்ளம்

செய்க்கு வெள்ளம் தீமை வகைகள் வெள்ளம் (காடு) (நீர்வகை பொருள்)

காடுகள் காடுகள் தீமை உட்கு வெள்ளம்

செய்க்கு வெள்ளம் வெள்ளம் வெள்ளம் வெள்ளம்

பாடுகள் பழங்கள் உட்கு வெள்ளம் - பழங்கள்

காடு வெள்ளம் வெள்ளம் - வெள்ளம்

நாடு காடுகள் உட்கு

காடுகள் உட்கு வெள்ளம் (பாடுகள் பழங்கள் வெள்ளம்)

காடு - செய்க்கு: காடுகள் நாடுகள் காடுகள்

பொருள் - காடுகள் வெள்ளம்: காடுகள் வெள்ளம் காடுகள் பொருள்
காடுகள் காடுகள் காடுகள்: காடுகள்

காடு - காடுகள் (பொருள் பொருள்)

(காடுகள் காடுகள் காடுகள் உட்கு வெள்ளம்)

காடுகள் - காடுகள் காடு?

காடுகள் - காடுகள் காடுகள் காடுகள்

காடு - (காடுகள்) காடுகள் காடுகள் காடுகள், காடுகள்
காடுகள், காடுகள்

(காடுகள் காடுகள் காடுகள் உட்கு வெள்ளம்)

മുന - അടിക്കടവ്:

മു - അടിക്കടവ് എങ്ങനെ, എന്തെല്ലാം?

മുന - ഇപ്പോൾ എപ്പോഴാണ്, പണ്ട് നോക്കുമ്പോൾ എങ്ങനെ, എന്തെല്ലാം
അടിക്കടവ് എങ്ങനെ എന്നൊക്കെ അറിയാമോ?

മു - എന്താണ് അടിക്കടവ് എന്ന് അറിയാമോ?

മുന - അടിക്കടവ്: - ഇത് അധികമായിട്ടാണ് അടിക്കടവ് എന്ന്
എന്നാൽ അടിക്കടവ് എങ്ങനെ, എങ്ങനെ എന്ന്
എന്നാണ് അടിക്കടവ് എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്

മു - അടിക്കടവ് എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്
എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്

മുന - അടിക്കടവ് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്
(അടിക്കടവ് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്)

മുന - അടിക്കടവ്

മു - അടിക്കടവ് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്

മുന - അടിക്കടവ് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്
എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്

മുന - അടിക്കടവ് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്

മു - അടിക്കടവ് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്

മുന - അടിക്കടവ് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്
എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്
എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്
എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്

മു - അടിക്കടവ് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്

മുന - അടിക്കടവ് എങ്ങനെ എന്ന് എങ്ങനെ എന്ന്

யார - ஆயாத்தா அந்த கரம்பிச்சை சர்க்காரை எதிர்த்து
 உங்கிட்டாவும் தலை எங்கா! உன் வாழ்க்கையை மாதிரி
 உயம்பத்தினமே தைக்கெடுத்தி வைச்சு அப்பத்தி அிட்டத்தெ எங்கெனது
 புண்ணத்தையம் சரிதாத்தா;

செயா - உங்க அந்தா மரணத்தினமே திரையாடிட்டு நெருக்கி
 கொடு கொடுக்க ஒரு உயம்பத்தெ என் உயம்பத்தயா?

யார - ஆயாத்தாவுமே மெய்யா அது காண் கும்பிச்சி அடந்த
 உயம்பத்த உயிர்பா எப்படி தந்தமென்று தக்காணிப் பழம் போல்
 நெருக்கிப் பார்த்திவிட்டா;

செ - யாவி ழ்டு! உன் கும்பென உயம்பத்தெ பழம் போலுக்கெ!
 உங்காவி அந்த மட்ட உயம்பத்திட்டத்திவி அந்த கும்பெனயாடி!

யார - அந்தெனக் கேள்விதயா?

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APPENDIX XIV

INCREASE IN WEIGHT DURING PREGNANCY
IN PASIVAPATAYAM (I)

Weight in kilograms						
Sl. No.	VI Month	VII Month	VIII Month	IX Month	Non-pregnant weight	Total weight gain
1.	51.0	52.2	52.9	54.0	48.0	6.0
2.	47.6	48.6	49.5	50.0	44.8	5.2
3.	41.6	42.2	42.4	43.4	37.8	5.6
4.	49.6	49.1	50.5	51.4	44.9	6.5
5.	43.4	43.6	44.6	45.0	40.1	4.9
6.	43.6	44.0	45.2	45.4	49.6	5.8

INCREASE IN WEIGHT DURING PREGNANCY
IN VELLAMPALAYAM (II)

Weight in kilograms						
Sl. No.	VI Month	VII Month	VIII Month	IX Month	Non-pregnant weight	Total weight gain
1.	49.6	49.1	50.0	50.4	44.6	6.0
2.	45.4	45.9	46.5	47.2	40.9	6.3
3.	54.1	54.5	55.4	55.9	51.4	4.5
4.	49.5	50.2	51.9	51.8	46.3	5.5
5.	45.0	45.3	47.7	49.4	47.4	6.0
6.	43.6	44.2	44.5	45.4	40.9	4.4

Appendix VII contd.

**INCREASE IN WEIGHT DURING PREGNANCY
IN RAJANNAGAR (III)**

Sl. No.	Weight in kilograms				Non-pregnant weight	Total weight gain
	I Month	II Month	VIII Month	IX Month		
1.	46.7	46.3	49.0	49.5	41.3	8.2
2.	43.5	45.9	47.0	49.3	41.4	7.9
3.	40.9	42.5	44.1	45.0	38.2	7.8
4.	45.4	46.3	47.5	49.7	42.5	7.2
5.	40.4	41.9	43.3	44.5	37.6	6.9
6.	45.0	46.0	47.2	49.4	42.4	7.0

**CHANGES IN BLOOD PRESSURE OF THE EXPECTANT MOTHERS IN
THE THREE VILLAGES**

Sl. No.	Manuvallayan		Vellianrajan		Rajannagar	
	Beginning	End	Beginning	End	Beginning	End
1.	100/70	110/70	100/70	130/90	100/70	120/80
2.	100/70	130/70	120/90	120/90	100/70	115/70
3.	100/70	140/70	100/70	130/80	110/70	110/70
4.	100/70	110/70	110/90	120/70	100/90	120/90
5.	110/70	120/80	100/70	130/90	120/90	110/70
6.	110/70	130/90	120/90	120/90	110/90	120/90

Appendix IV contd:

HAMOGLOBIN LEVELS IN THE EXPECTANT MOTHERS OF THE THREE VILLAGES IN THE THIRD TRIMESTER BENEFICIARIES

S.No.	<u>Erumpalayam</u>	<u>Velliengalayam</u>	<u>Rajamangar</u>
	Per	Cent	
1.	77.2	75.9	77.2
2.	96.5	63.4	75.2
3.	55.8	63.5	73.1
4.	67.2	65.5	82.9
5.	47.7	70.3	82.9
6.	55.8	61.4	49.0

HAMOGLOBIN LEVELS IN THE EXPECTANT MOTHERS OF THE TWO AMP VILLAGES, IN THE THIRD TRIMESTER NON-BENEFICIARIES.

Sl. No.	<u>Velliengalayam</u>	<u>Rajamangar</u>
	Per	Cent
1.	96.5	67.6
2.	53.6	99.3
3.	54.5	65.5
4.	55.8	62.7

Appendix XIV contd.

**PLASMA PROTEIN LEVELS IN EXPECTANT MOTHERS IN THE THREE VILLAGES
BENEFICIARIES**

Sl. No.	Fractions	In grams per cent		
		Rasuvanayakan	Valliammalayan	Poisanagar
A	1. Total protein	7.07	6.60	7.20
	2. Albumin	3.73	3.08	4.07
	3. Globulin	3.34	3.52	3.13
B	1. Total protein	5.90	6.25	7.03
	2. Albumin	2.90	3.10	3.71
	3. Globulin	2.60	3.15	3.32

**PLASMA PROTEIN LEVELS IN EXPECTANT MOTHERS IN THE TWO VILLAGES
NON-BENEFICIARIES**

Sl. No.	Fractions	In grams per cent	
		Valliammalayan	Poisanagar
A	1. Total protein	6.06	6.30
	2. Albumin	2.03	2.40
	3. Globulin	4.03	3.90
B	1. Total protein	6.06	6.25
	2. Albumin	2.00	1.95
	3. Globulin	4.06	4.30

Appendix XIV contd:

ANTHROPOMETRIC STUDIES OF THE NEWBORN

RASIVA PATAYAM I

Sl. No.	Sex	Birth weight kg.	Length cms.	Head circumference cms.	Chest measurement cms.	Abdomen measurement cms.
1.	Girl	2.72	43	30	27	26
2.	Girl	2.72	50	30.5	32.5	34.0
3.	Boy	2.5	45.0	34.0	28.0	30.0
4.	Boy	2.5	49.5	30.0	30.0	29.5
5.	Girl	2.72	42.0	34.9	32.2	29.0
6.	Girl	2.27	47.0	34.0	30.5	29.0

* Died 10 after birth.

ANTHROPOMETRIC STUDIES OF THE NEWBORN

VELLAMPATAYAM II

Sl. No.	Sex	Birth weight kg.	Length cms.	Head circumference cms.	Chest measurement cms.	Abdomen measurement cms.
1.	Boy	2.40	43	29	26	25
2.	Boy	2.72	49	30	30	28
3.	Girl	2.90	45	27	27	26
4.	Girl	2.90	47	30	28	27
5.	Girl	2.72	45	23	27	25
6.	Girl	2.04	45	31	28	27