AN EVALUATION OF THE RECOMMENDED DIETARY ALLOWANCES BY ICMR (1981) FOR WOMEN DOING MODERATE WORK.

By

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LIST OF CONTENTS

LIST OF CONTENTS (Contd....)

LIST OF TABLES

LIST OF TABLES (Contd....)

LIST OF FIGURES

LIST OF APPENDICES

Introduction

I. INTRODUCTION

"Why build these cities glorious if man unbuilded goes
In vain we build the work unless the builder also grows".

- Edwin Markham.

Man can live in happiness without many possessions and previlages but once health fails everything is lost. The same is stressed by the old saying "Health is Wealth".

Health is defined by the World Health Organisation (WHO) of the United Nations (1976) as the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

For a healthy life the need for good food has been well recognised long ago and has been referred to in ancient scriptures also. "Mahabharatha" a Hindu scripture rightly describes the importance of good food as -

> "He who takes food in proper measures lives a long life and lives without any disease, get strength and has alertness of mind. Moreover his children are born healthy and without any deformity or disease".

A healthy diet includes various food items such as cereals, pulses, green leafy vegetables, roots and tubers, other vegetables, milk, fruits, oil and fat and sugar and jaggery.

All these foods should be included in the diet in proper proportions to form a balanced diet.

An adequate diet or a balanced diet is one which provides all the essential nutrients in sufficient quantities and proper proportions to meet the needs of the body (Devadas and Easwaran, 1975). Gopalan (1982) states that a balanced diet is one which not only provides energy and proteins but also the essential vitamins and minerals. In other words a balanced diet supplies all the nutrients required by the body in optimum levels.

Malnutrition results when the nutrients required by the body are not supplied in the correct quantities. Both increased and decreased quantities of nutrient supply leads to malnutrition. In India, among the poor communities 70 to 80 per cent of the caloric requirements are supplied by cereals alone amounting to the negligence of the intake of all the other foods (Gopalan et al. 1984).

A knowledge on adequate diets has been recognised as a pre-requisite for the optimal growth and development (Cravioto, 1978; and Venkatachalam and Rebellow, 1978). Knowledge on the food requirements for various age groups is important for policy makers also who make decisions on food production, food imports and exports, and distribution systems in the country.

Dietary allowances officially came into being in May 1941 at the National Nutrition Conference which met in Washington at the call of President Franklin, D. Roosevelt (Roberts, 1958).

From that time till now there had been various national and international dietary standards which remain as a basis for planning diets in different nations. These recommendations on foods as well as nutrients are periodically revised by the national and international bodies based on the newer knowledge on their metabolism in the body.

The levels of intake of foods as well as nutrients recommended are not meant simply to meet minimal requirements of average persons but rather to provide additional intake to cover individual variation in requirements and to permit other potential benefits in health. In a real sense these dietary and nutrient recommendations plan for "optimum nutriture" for healthy individuals although precise description of this state cannot be given and will perhaps remain elusive (Shank, 1958 and Campbell, 1974).

Based on the research work carried out in various parts of India the nutrient as well as food requirements of the different segments of the population namely children, women, men and other groups are recommended by the Nutrition Expert Group of the Indian Council of Medical Research (ICMR) (Gopalan et al. 1971). The food and nutrient requirements of ICMR given in 1968 were revised lately in the year 1981. Though the new Recommended Dietary Allowances (RDA) has been given by a national body it is imperative that their validity is tested in different parts of the country with different groups of population. A research

along this line would be of great use to strengthen the present knowledge on RDA and revise further when need arises. Hence a study along this line was planned in the present investigation.

In this investigation, the adequacy of the recommended food and nutrient allowances were tested for women of child bearing age since women are considered to be the builders of a nation. It is estimated that women in the reproductive age group comprise about 37 per cent of the total population in India and constitute the largest vulnerable group in society (ICMR, 1984). Among pregnant and lactating mothers 50 to 60 per cent are suffering from anaemia and over 30 per cent have B-complex and vitamin-A deficiencies (Thimmayamma, 1983). Maternal mortality stands at a staggering figure of 370 per 100,000 births accounted for by malnutrition and post partum infections (Rao, 1979).

Based on the foregoing discussions the present investigation was carried out on women of child bearing age with the following objectives:

1. To plan diets based on the ICMR recommended food allowances for normal, expectant and nursing mothers engaged in moderate work
2. To prepare the diets and test their adequacy through feeding
3. To calculate the nutrient content of the planned diets and compare with the recommended nutrient allowances of the ICMR and
4. To suggest modifications (if any) in the recommended allowances based on the findings of this investigation.

Review of Literature

II. REVIEW OF LITERATURE

The literature pertaining to the present investigation entitled "An Evaluation of Recommended Dietary Allowances by ICMR (1981) for Women Doing Moderate Work" is presented under the following heads:

A. Balanced diets and good nutrition

B. Role of different foods in human nutrition

C. Nutrition in pregnancy and lactation

D. Food consumption pattern of women in India and

E. Recommended Dietary Allowances.

A. Balanced diets and good nutrition:

1) Importance of the balanced diet:

Henry Wallace stated that on a foundation of good food we could build anything but without it we could build nothing.

Food is not just eaten to satisfy hunger but also to provide the nutrients necessary for growth and maintenance (Patel, 1972; Clarence, 1974). A normal diet should confirm to the following basic criteria: 1) It should supply all essential nutrients in adequate amounts. 2) It should supply a physiologic quantity and bulk and fluids and should be easily digestible and confer a feeling of satiety. 3) It should be readily available from the stand point of both supply and cost. 4) It should live up to the gustatory expectations of the prospective consumer and conform to the gastronomic customs of the groups (Burton, 1976).

A balanced diet is one which contains different types of foods in such quantities and proportions that the need for calories, minerals, vitamins and other nutrients is adequately met and a small provision is made for extra nutrients to withstand short durations of leanness (Gopalan et al, 1984).

Devadas and Easwaran (1975) are of opinion that a balanced diet is one which provides all the essential nutrients in sufficient quantities and proper proportions to meet the needs of the body. Thus a balanced diet or a nutritious diet is one which is balanced in quantity and quality catering to the requirements of growth, development and maintenance of health and regulation of the body functions (Gopalan, 1982).

Banik (1977) states that the importance of balanced food in ensuring positive health and the extent to which malnutrition affects the national health need to be brought known to the community.

A balanced diet can be formulated by providing sufficient amounts of all the foods from the different food groups namely cereals, pulses, green leafy vegetables, other vegetables, roots and tubers, milk, fruits, oil and fat and sugar and jaggery in order to provide all the nutrients in the amounts prescribed for a day. These foods may vary from region to region depending on the food habits of the people (Clarence, 1974; English, 1982 and Thimmayamma, 1983).

2. History of food guides

Today many countries throughout the world are developing dietary guidelines to improve the nutrition of their people. This action is the result of a growing acceptance of the fact that a nutritious diet is 1) essential for good health, 2) a key factor in both the prevention and recovery from any illness and 3) helps to improve the quality of life (English, 1982).

The 1941 Recommended dietary allowances tested specific daily intakes of calories, protein, iron, calcium, vitamin A, vitamin D, thiamine, riboflavin, niacin and ascorbic acid for healthy persons for seventeen age and sex categories. Because the lay person could not translate these recommendations into foods, several committees designed food guides with four to ten food groups.

At the time the first recommended dietary allowances were officially accepted, the food guide "Eat the Right Food to Help Keep You Fit" was published by the Bureau of Home Economics. The theme of the 1942 National Industrial Programme became the title of the food guide, "U.S. Needs Us Strong-Eat Nutritious Food". In the summer of 1943 Wilson and Sebrell announced that "The National Wartime Nutritional Guide" was available. In a poster in colour "Eat the Basic Seven Everyday" was distributed. In 1946, post war version of the seven food groups was published as the "National Food Guide" by the Human Nutrition Research

Branch of the Agricultural Research Service. The circular format was sometimes called as the "Wheel of Good Eating". In 1954, following a review of the discrepancies between nutrient intakes estimated from dietary surveys and recommended nutrient intakes nutritionists began to consider the need for a new food guide. In 1956, the four food groups were prescribed in the USDA publication, "Essentials of an Adequate Diet". In 1957, "Food for Fitness - A Daily Food Guide" was designed as a nutritionally reliable teaching device. Names of the food groups were those most likely to be used by home-makers in meal planning and shopping (a) milk (b) meat (c) vegetables and fruits and (d) bread cereal. The basic four can meet the differing nutritional needs of nearly all individuals (Hertzler and Anderson, 1974).

Proper nutrition is a popular concern. Meal planning guides will make it easy to include all the nutrients listed in the RDA in the meals planned. Various food guides would take one to the finishing point in a short cut (Medved, 1973 and Gordon, 1983).

3. Planning balanced diets:

Menu is a French word meaning minute details as applied to programme of a meal (Philip, 1965). It was first used for table use in 1541 at a banquet given by Duke Henry of Brumswick.

The various factors which influence menu planning are the nutritional needs, time, money and energy available, size of the family, age and sex of the members, their activity, customs, seasons, food preferences and attractiveness of the meal. Knowledge and skill in food preparation and the equipment which is available will limit the menu planning. The first and foremost responsibility while planning is the nutritional adequacy of the diet (Hegsted, 1972; Medved, 1973, Devadas et al, 1973) Devadas and Easwaran (1975) explain that while planning menus all the above factors should be kept in mind. Moreover, all the meals should be planned together as one unit so that the total food needs are distributed evenly.

Breakfast is the first meal of the day and it breaks the fast of the long night. It should supply from one-fourth to one-third of the total daily nutrients and calories. Lunch should supply one-third of the nutrient needs and it should not be so heavy that it interferes with the activity of the rest of the day. The dinner should be planned first which makes it easier to include the foods in breakfast and lunch that will complete the daily nutrient needs (Medved, 1973).

B. Role of different foods in human nutrition:

Malnutrition and undernutrition are serious problems for a majority of our population (Choudhury and Sivakami, 1978; Ra, 1979 and Nagarajan, 1983). The latest estimate shows that

41.5 per cent of the population are below the poverty line (Chakravarty, 1983). India is self sufficient in food grains but in terms of nutrition it is yet to achieve self sufficiency (Srikantia, 1976; Swaminathan, 1980 and Thukral, 1983).

Food stuffs may be broadly classified under three heads, energy yielding, body building and protective food stuffs according to the predominant role they play in sustaining life (Venkatachalam and Rebello, 1978). In order to obtain adequate amounts of each of the different nutrients our daily diets should include appropriate quantities of a variety of different food stuffs as described below:

Cereals:

The word cereal, derives from the name of the Roman grain or harvest goddess 'Ceres'. Cereals are the seeds of grasses (Charley, 1982). Rice, wheat and millets are the main cereal grains, consumed in India. They are the cheapest sources of calories and they contribute as much as 70 to 80 per cent of the calories in the diets of a majority of population in India and so form important sources of nutrients in an average Indian diet (ICMR, 1978; Dutta and Barua, 1978 and Gopalan et al, 1984).

Cereals as a group have approximately 75 per cent carbohydrate, 10 per cent protein, one to two per cent fat, 10 per cent moisture and one to two per cent ash. The main carbohydrate in cereals is starch. Cereals are deficient in the essential amino

acid lysine and low in tryptophan and methionine. But the level of these essential amino acids can be increased in cereals by the introduction of certain mutant genes (Gopalan, 1973 and Charley, 1982).

All the cereals except ragi are deficient in calcium and iron. All excepting the yellow variety of maize are deficient in vitamin A. All are short of vitamin C (Devadas and Easwaran, 1975). Whole grains are good sources of iron, thiamine, niacin and fair sources of riboflavin and proteins (Charley, 1982).

Pulses

The potential of the pulses to promote the protein quality of the predominantly cereal based diets have been well recognized (Deosthale, 1983). Protein content of pulses ranges from 20 to 25 per cent (Yadav and Bharadwaj, 1971 and Clarence, 1974).

Bengalgram, red gram, green gram and black gram are the four pulses which are important both in terms of production and consumption. Studies have shown that the poly phenolic compounds such as tannous which interfere in the absorption of iron are mostly located in the seed coat of the pulses. Bio availability of iron in pulses was found to be about two to four folds higher in the dhal when compared with whole grains (Madhukar, 1982 and NIN, 1984). Pulses are also important contributors of carbohydrates, minerals and vitamins (Seth, 1977). Vitamin C which is almost negligible in the dry seed is synthesised in fair amounts

in the germinated seed which can thus form a good substitute for fresh fruits and vegetables, when these are not available (Chandrasekhar and Jayalakshmi, 1978).

Pulses are fair sources of the minerals also. They are rich in calcium and have fair amounts of iron. Pulses have a high digestability of about 85 to 95 per cent after cooking. They make substantial contributions towards protein intake for those who have religious or social objection to animal protein and also deprived due to poverty (Jegannathan, 1979 and Seth, 1977).

Green leafy vegetables

Green leafy vegetables are the only cheapest source of vitamin A. They also provide much needed calcium, iron and folates. The inclusion of even small quantities of green leafy vegetables in the current Indian dietaries can make a significant impact in the nutritional status of the populations (Gopalan, 1973 and Rao et al, 1980).

Leafy vegetables also form a good source of roughage which helps in maintaining the normal mobility of the gastro intestinal tract and thus prevents constipation. Apart from providing all the nutrients leafy vegetables contain an attractive natural pigment chlorophyll which adds to the colour appeal of the food (Jain, 1979 and Nagarajan, 1983).

Other vegetables:

Vegetables form an important part of a balanced food. They contribute vitamins and minerals for the daily diet (Gopinath, 1980). Vegetables show a greater range in carbohydrate, vitamin and mineral content than those of fruits. They are rich in iron, thiamine, riboflavin, ascorbic acid and carotene. The calcium in spinach and other plants of this family is unavailable because the oxalic acid present binds the calcium in an insoluble form (Charley, 1982).

Roots and tubers:

They are rich in carbohydrates and hence they yield mainly energy. Foods like carrots and yellow varieties of yam are also rich in carotene and foods like potato contains significant amounts of vitamin C (Gopalan et al, 1984).

Fruits:

At present India produces annually about 32 million tonnes of fruits and vegetables (Radhakrishnaiah and Patwardhan, 1981). Fruits are valued for their attractive colours, for their pleasing aroma mainly due to aldehydes, alcohols, and ethers, for their sweet tart taste, for their crisp, crunchy texture from water inflated cells and for the nutrients that they contribute to the diet.

Citrus fruits are excellent sources of ascorbic acid. Yellow fruits are fairly good sources of carotene. Included are sugar and starches in addition to celluloses, hemicelluloses and pectic substance and relatively small amounts of protein (Charley, 1982).

Milk:

Milk is the most precious item and the most wholesome food which is a must in the daily diet of everyone (Gopalan, 1982). The protein of milk are of high biological value and are readily digested. The sugar present in milk is called lactose which is found only in milk. Two cups of milk provide 1/6 and 1/2 the requirements of proteins and calcium to an adult.

Although milk is an excellent food it is important to remember that it is not a complete food for adults as it contains very little iron and no vitamin C especially by the time it reaches the consumer (Surya Valli, 1979).

Oil and fat:

Fats are an integral part of almost every food. They contribute tenderness and texture, modify the flavour of foods and influence their mouth feel (Charley, 1982). Fat provides energy to the body which in turn carries out different functions and to maintain the body temperature and one should take at least

22 kg of fat per year. They supply about 9.3 Kcal per gram, and also supply the body with essential fatty acids and fat soluble vitamins A, D, E and K which are essential for keeping the body fit (Sood, 1974).

Sugar and jaggery:

Sugar and jaggery are used as sweetening agents in beverages and other foods to increase their palatability. They are the main sources of energy, although jaggery contains iron in addition (Gopalan et al, 1984).

Eggs:

The nutrient composition of egg is as follows (Charley, 1982).

Nutrient	Egg white (per cent)	Egg yolk (per cent)
Water	88.0	48.0
Proteins	11.0	17.5
Fat	0.2	32.5
Minerals	0.8	2.0

In addition to being cooked and served in variety of ways, eggs perform a number of functions in products in which they are used as ingredients. Egg is used as an emulsifier, as a jelling agent, as a coating material, as a thickening agent and as a structural material.

C. Importance of adequate nutrition in pregnancy and lactation:

It is estimated that women in the reproductive age group comprise about 37 per cent of the total population in India and constitute the largest vulnerable group in society (ICMR, 1984). At any point of time every sixth women aged 15 to 49 years in a developing country is pregnant compared with one in seventeen in developed countries (Morio, 1985). Gibson (1985) expresses that women in developing countries are caught in the web of pregnancy, lactation, malnutrition, infections and exhaustion.

The life time dietary habits of the mother and her nutritional status before the onset of pregnancy may be more influential than the diet followed during it. The women who had either good or poor dietary habits in the past were likely to continue the same pattern during pregnancy (Sebastian, 1977; Devadas et al, 1978 and Darwish, 1982).

Since the nutritional requirement of a child starts from the time he is conceived, good nutrition during pregnancy is very important to solve the widespread nutritional deficiency in children (Israel, 1974; Sood, 1974 and 1977; Bhaskaran, 1975; NIN, 1976; Madhu Nath, 1978; Subramanian, 1978; Devi, 1980 and Haque, 1981). During the months of pregnancy, mother should eat properly and gain an increase in weight by 10 kg which is an indicator of normal growth of the baby (Damodaran, 1975; Devadas et al, 1975; Asuri, 1979 and Bhatt et al, 1980).

The lactation performances of an average poor socio-economic Indian mother is found to be quite satisfactory. Even when a mother is malnourished herself she can generally produce enough milk for her child for the first 4 to 6 months of life (Darwish et al, 1982). The estimated volume of milk secreted is 480 to 600 ml per day per woman (Rao, 1974). Though breast milk is easily available from the mother, breast feeding is a greater strain on the mother than in pregnancy because the mother nourishes a fully developed and rapidly growing baby whose food needs increase day by day. In order to breast feed her infant without any undue strain on her own body she must continue to eat more foods than the non-pregnant and non-lactating women (Guthrie, 1975; NIN, 1976 and Robert, 1979). If these demands are not met the health of the mother and the quality of her milk are bound to suffer (Gopalan, 1973; Prema, 1980 and Chatley, 1983).

Worthington et al (1977) and Sims (1978) indicate that it is usually sufficient to stress to the new mother that additional amount of the same types of food that she normally consumes with special attention to fluid intake and sources of calcium and ascorbic acid will adequately provide the additional nutrient requirements in lactation.

D. Food consumption pattern of women in India:

According to the National Nutritional Monitoring Bureau the diets consumed by the people in several states of India are deficient in oils, fruits, green leafy vegetables and fleshy foods. On an average, they get more protein and less calories than the ICMR recommended quantities. The presence of some inhibitory substances in their diet limits the bio-availability of calcium and iron and their vitamin needs are unfulfilled due to the poor consumption of greens and vegetables (Gopalan, 1982). Similar reports have been given by Rasheed and Zaheer (1978), Devadas et al (1978) and Panikar (1979).

ICMR (1977), Gupta and Sharma (1980), Gordon (1983) and Thimmayamma (1983) report that the diets of pregnant and lactating women belonging to poor socio-economic groups are not only deficient in quantity but also in quality. These dietary inadequacies are mainly due to (1) poor purchasing power, (2) illiteracy and ignorance, (3) cultural taboos preventing intakes of nutritious foods, (4) large size of the family and the peculiar status of women in a society where food has first to be distributed to the husbands and other members in the family on a priority basis and (5) a superstition that larger babies will cause difficult delivery.

NIN (1981) indicates that the food intake of pregnant women is reduced during the first trimester and during the second and third trimesters it comes back to that seen in non pregnant and non lactating women. Sundararaj and Pereira (1973) in their study with women in the third trimesters of pregnancy found that their energy intake ranged from 585 to 2966 kcal per day with an average daily protein intake of 37.4 g (range 10.4 - 68.7 g). Intakes of retinol, riboflavin, ascorbic acid, iron and calcium were low but those of thiamine and niacin appeared adequate.

The influence of daily dietary intake pattern on anaemia in pregnancy was studied in Varanasi by Luwang and Gupta (1980) amongst 232 villagers. There was no significant difference in the prevalence of anaemia amongst the pregnant women belonging to the vegetarian and non-vegetarian families. They observed inverse significant association between daily dietary intakes of iron, folic acid and protein and prevalence of anaemia.

In a study conducted on 25 expectant women in Perianaicken-palayam Block, Coimbatore district, the mean intake of cereals by the expectant women was deficient by 21 per cent (Devadas et al, 1982). An urban study by Devadas et al (1980) showed that the intake of nutrients by the expectant mothers was more in low income families than in high income families. Similar observations were made by Kaur, et al (1982), and Devadas et al (1975).

Gujral and Rajbhandari (1981) note that the consumption of milk and fleshy foods is quite generous in lactating mothers until two months after delivery thereafter the intake of these foods is curtailed. Upto two months of infants age the mothers are not permitted to eat leafy vegetables, fruits and soyabean and after this period, they omit jaggery from their diet. Hence more attention needs to be paid towards the overall improvement of the diets of expectant and lactating mothers in India.

B. Recommended dietary allowances:

History:

Since all men and animals must be fed, since malnutrition does occur if inappropriate diets are consumed and since some people know more about nutrition than others, the need for nutritional standards has long been recognised (Hegsted, 1972).

The evolution of dietary standards was to prevent disease or to maintain health. In 1862, F. Smith in England conducted a research during the cotton famine in Lancashire to find out the least cost per head per week for which food can be bought in such quantity and in such quality as well avert starvation and disease from the unemployed population.

The British Medical Association Standards (1933) were formulated to maintain health and working capacity during the depression. The League of Nations Standards were designed "to Marry health and agriculture" (IUNS, 1982).

The first recommendations of the U.S. officially came into being in May 1941 at the National Nutrition Conference which met in Washington at the call of President Franklin D. Roosevelt (Roberts, 1958). The first Canadian Dietary Standard was prepared at the request of the Department of National Health and Welfare by the Canadian Council on Nutrition in 1938 (Dispatch, 1977).

In India, the Nutrition Advisory Committee (NAC) of the Indian Research Fund Association, now Indian Council of Medical Research formulated for the first time a schedule of recommended dietary allowances in 1944. The recommendations were based partly on the recommendations of the League of Nations, the N.R.C of the U.S.A., the Nutrition Research Council of Canada and the Medical Research Council (MRC) of the United Kingdom and mostly on data collected by the Indian workers (Gopalan et al. 1971 and 1977). The different revisions of food recommendations given by ICMR from the year 1944 is given in Table I.

TABLE I

THE DIFFERENT REVISIONS OF FOOD RECOMMENDATIONS GIVEN BY ICMR FROM THE YEAR 1944 (in grams)

Food items	1944 Aykroyd et al (1956)	1958 Gopalan et al (1963)	1968 Vegetarians Gopalan et al (1971)	1968 Non-vegetarians Gopalan et al (1971)	1981 Vegetarian Ramalingaswami (1981)	1981 Non-vegetarian Ramalingaswami (1981)
Cereals	396.89	400	350	350	440	440
Pulses	85.04	85	70	55	45	45
Green leafy vegetables	113.39	114	125	125	100	100
Other vegetables	85.04	85	75	75	40	40
Roots and tubers	85.04	85	75	75	50	50
Fruits	85.04	85	30	30	—	—
Milk	283.49	284	200	200	150	150
Oil and fat	56.69	57	35	35	25	25
Sugar and jaggery	56.69	57	30	30	20	20
Meat and fish	85.04	85	—	30	—	*
Egg	1 egg	40	—	30	—	

* If 50% pulse is deleted add

1) + 1 egg or 30 g of meat or fish 2) + 5 g oil.

If 100% pulse is deleted add

1) + 2 eggs or 50 g of meat or fish or
One egg + 30 g meat or fish. 2) + 10 g oil

The Nutrition Advisory Committee of the Indian Council of Medical Research revised their nutritional recommendations in 1958. The Nutritional recommendations in 1958. The Nutrition Expert Group of the Indian Council of Medical Research in 1968 made further revisions with regard to the requirements of all nutrients. It was felt that the recommendations made in 1968 needed revision and up-dating in the light of studies carried out during this decade and new recommendations were made in 1981 (Ramalingaswami, 1981).

Meaning and definitions:

"A recommended intake is taken as the dietary intake thought to be sufficiently high to meet the requirements of almost all individuals in a group with specified characteristics" (Canadian Council of Nutrition, 1982). The recommended intakes are defined in U.K. (1969) as the amounts sufficient or more than sufficient for the nutritional needs of practically all healthy persons in a population. The FAO/WHO Expert Committee has defined RDA as the daily amount of nutrients considered to be sufficient for the maintenance of health in nearly all people. Canadian Council of Nutrition (1964) and Murray (1983) also give explanation to RDA in similar terms.

The Food and Nutrition Board states that the allowances are designed to afford a margin sufficiently above average physiological requirements to cover variations among practically

all internationals in the general population. According to Damon (1964) in the nomenclature of 'dietary standards' the word 'dietary' can refer to eating in general to all foods related activities and a 'Standard' may be rule established by Public opinion, general usage or custom or it may be a mathematical expression denoting a mean measurement a relative or specific quantity.

Pike and Brown (1967) explain minimum requirements as the least amount of a nutrient that will prevent clinical symptoms of deficiency or support a well defined clinical response such as maintenance of nitrogen equilibrium in the adult, normal haemoglobin level or a specified level of a metabolite in blood or urine. Pike et al (1967) clarify that standards are not mere quantitative requirements but include reasonable estimations of the levels of nutrient intake that would support normal functions in most people.

The difference between different standards can be explained as different ideas of the meaning and they are recommended to different sub divisions of people of different age, sex and physiological groups using the foods available and preferred in each country (IUNS, 1982). There is no implication that these levels of intake should be ingested each day. Rather requirements are measured and the recommended nutrient intakes are expressed in terms of usual intakes, the average

intake of an individual over many days or weeks, will vary from day to day (Dispatch, 1983 and Mc Donald, 1984). Some persons may habitually consume less than the recommended allowances and yet have an adequate diet, simply because their requirements are below the allowances (Robinson and Lawler, 1977).

Uses of RDA:

The recommended dietary allowances are used in many different ways:- 1) For assessing food intake of groups or individuals (Hamilton and Whitney, 1979). 2) For planning therapeutic diets or constitutional meals. 3) Provide a target in planning food supplies and policies for developing nations. 4) They are used by International agencies for comparing different underdeveloped countries to see which has greater need for aid. 5) As the denominator for nutrition labelling. 6) As the basis for a nutrient density index to express the nutritional quality of foods (IUNS, 1982 and Harper, 1974). 7) Provide a basis for food selection . 8) Help government and industry formulate policies on nutrient fortification, manufacturing and advertising of foods (Dispatch, 1983). 9) Estimating the total needs of population for energy and nutrients and 10) Judging the validity of statements made about the nutritional qualities of food (Murray, 1983).

Limitations of RDA:

In certain situations, use of the dietary standard is not appropriate. Limitations of RDA are 1) Most recommendations are for nutrients as eaten after food processing and cooking. 2) They do not give allowances for illness or major stresses in life. 3) May be affected by a variety of drugs. 4) Are more than enough for most people and therefore too high themselves as criteria for inadequate food intake. 5) Do not have to be eaten every single day. A low intake on a day can be balanced by eating more than the recommendation the next day. 6) Do not say that one cannot eat more of the nutrients than the recommended amount but do not indicate at what higher level toxic effects might arise. 7) Assume a certain nutritive quality, biological value or availability in the body. 8) Assurance that enough of other major nutrients and energy are consumed. 9) Are for standard body size and range of usual exercise. 10) Are for oral intake of the usual foods of the country and not for intravenous nutrition. 11) Do not cover minor vitamins and trace elements they assume that if the intake of the main nutrients is adequate and the diet is mixed, the minor nutrients will take care of themselves. 12) Do not allow for interactions among nutrients. 13) Have a limited use in the evaluations of the results of surveys of the amounts of food eaten by the individuals (IUNS, 1982). 14) Should not be used as the sole basis for assessing the nutritional status of individuals, since individual needs for energy and for various nutrients show wide variation (Dispatch, 1977) and 15) Misused in assessing the adequacy of observed intakes of food (Murray, 1983).

Experimental Procedure

III. EXPERIMENTAL PROCEDURE

The experimental procedure for the present study entitled "An Evaluation of the Recommended Dietary Allowances by ICMR (1981) for Adult Women with Moderate Activity" consisted of the following steps:

A. Selection of subjects

B. Collection of baseline data from the subjects

C. Planning and standardisation of menus using the RDA

D. Evaluation of the menus through feeding and

E. Analysis of diets.

A. <u>Selection of subjects</u>:

Two groups of 15 adult women were selected for the present investigation from Vathinapuri area of Coimbatore City. Of the two groups, one group of 15 mothers were vegetarians and the other group of 15 mothers were non-vegetarians. In each group, five members were normal women five were pregnant and the other five were lactating mothers. All the subjects were housewives in the age range of 20 to 35 years engaged in moderate activity and belonged to low income families. Because of the limitations of resources and time, only the moderate activity group was taken up for this investigation. Factors such as health, absence of diseases or infection, and willingness to co-operate in the study were considered while selecting the subjects.

B. Collection of base-line data from the subjects:

From all the 30 subjects selected for the investigation, baseline data were collected through the following surveys:

1. Socio economic cum dietary survey
2. Food weighment survey and
3. Assessment of nutritional status.

1. Socio economic cum dietary survey:

Since the nutritional status of a family largely depends on its socio economic status and availability of nutritious food (Thimmayamma, 1985), the socio economic background of the subjects as well as their dietary pattern were determined. For this purpose, a simple questionnaire was evolved and administered to all the 30 selected subjects through interview method.

2. Food weighment survey:

Malnutrition in large population is measured primarily by comparing people's actual diets with what nutritionists regard as adequate diet (Berg, 1981). To ascertain the normal food habits of the population, in depth nutritional surveys should be made in which individual food intakes are measured (Darke, 1981). Hence in the present investigation a food weighment survey was carried out on selected subjects. From the six groups of five women each, two members were randomly selected and three days food weighment survey was carried out to find out their normal food intake pattern at home.

In all the houses, the total weight of the raw foods used for cooking, the total weight of the cooked foods prepared and the amount of cooked food consumed by the subjects were weighed accurately. The food waste and the food consumed outside were taken into account while conducting the survey. From the consumed quantities of cooked food, the raw food equivalents and the nutrient intake were calculated using the Food Composition Tables of ICMR (1984).

Assessment of nutritional status:

The body weights of all the subjects selected for the study were measured accurately using a portable spring balance correct to 0.5 kg.

For all the subjects, blood haemoglobin levels were also estimated from the finger prick bood samples suing the cyanmethaemoglobin method (Varley, 1980).

C. Planning and standardisation of menus using RDA:

Three days menu were formulated for the six groups of selected subjects namely normal women, pregnant and lactating women with moderate work, consuming vegetarian and non-vegetarian diets using the food allowances given by the ICMR (1981). The recommended food allowances of ICMR are given in Table I.

TABLE II

ICMR RECOMMENDED FOOD ALLOWANCES FOR WOMEN DOING MODERATE ACTIVITY

Food item	Normal women	Pregnant women	Lactating mothers
Cereals	440	475	500
Pulses	45	60	75
Green leafy vegetables	100	100	100
Other vegetables	40	40	40
Roots and tubers	50	50	50
Milk	150	250	250
Fruits	30	30	30
Oils and fat	25	25	35
Sugar and jaggery	20	30	30

SUGGESTED SUBSTITUTION FOR NON-VEGETARIANS

Food items deleted from non-vegetarian diets	Substitution used in place of deleted items
50% of pulses	1. One egg or 30 g of meat or fish 2. Additional 5 g of fat or oil.
100% pulses	1. Two eggs or 50 g. of meat or fish or one egg + 30 g. of meat or fish. 2. 10 g of fat or oil.

While planning the three days menu, cost of foods, food habits of people seasonal availability and likes and dislikes of the subjects were taken into account as suggested by Devadas and Easwaran (1975). The diets planned for the normal women were kept common for expectant as well as nursing mothers. Extra food allowances of expectant and nursing mothers were added to the main diet in the form of special preparations. The same vegetarian diets were modified for non-vegetarians by including one egg and additional 5 gm of oil in all the diets in place of 50 per cent of pulse allowance. The nutrient content of all the diets thus planned were calculated using the Food Composition Tables of the ICMR (1984).

The preparation procedures of all the planned menus were standardised in the laboratory and the serving quantities were also standardised in terms of cups and spoons, before conducting the feeding experiment. Peckham (1974) opines that standardisation of recipes will consistantly produce a high quality product in which the amounts and proportion of the ingredients and the methods of procedure are constant.

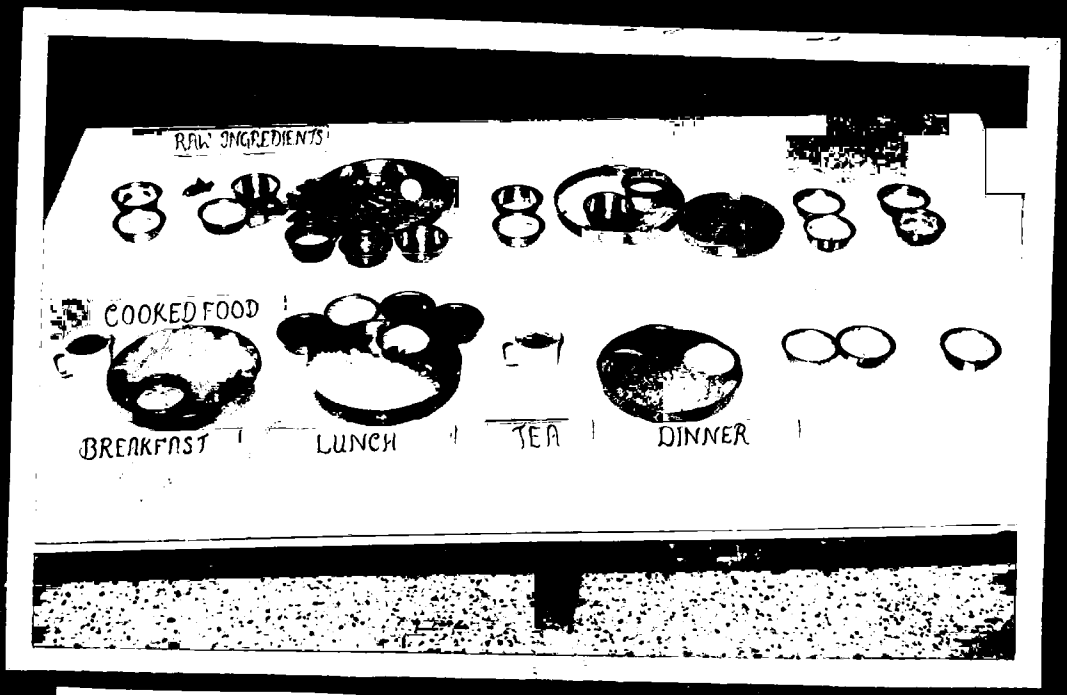
D. Evaluation of the menus through feeding:

The menus planned on the basis of RDA (ICMR, 1981) were tested on six groups of women selected for this purpose. Each subject was fed for a total period of six days. The first three days were considered as adjustment period, while the

consumption on the following three days were used for data collection. The menu followed for the first three days were repeated on the following three days. The feeding was carried out in two batches of six days each. During the first six days the three groups of vegetarian women were fed while during the following six days the non-vegetarian groups were fed.

The feeding was carried out in a church building in Rathinapuri area facilitating the subjects assemble in one place for all the four meals during the study period, without affecting their normal family responsibilities. During the experiment the cooking of foods were carried out carefully using the measured quantities of all the ingredients. The menus were prepared employing the desirable cooking methods to minimise cooking losses and at the same time care was taken to serve appetising and palatable dishes. Always extra quantities of the items were prepared to take care of the extra demands of the subjects.

Figures 1 to 6 show whole days's diet prepared for one person as well as for the entire group.

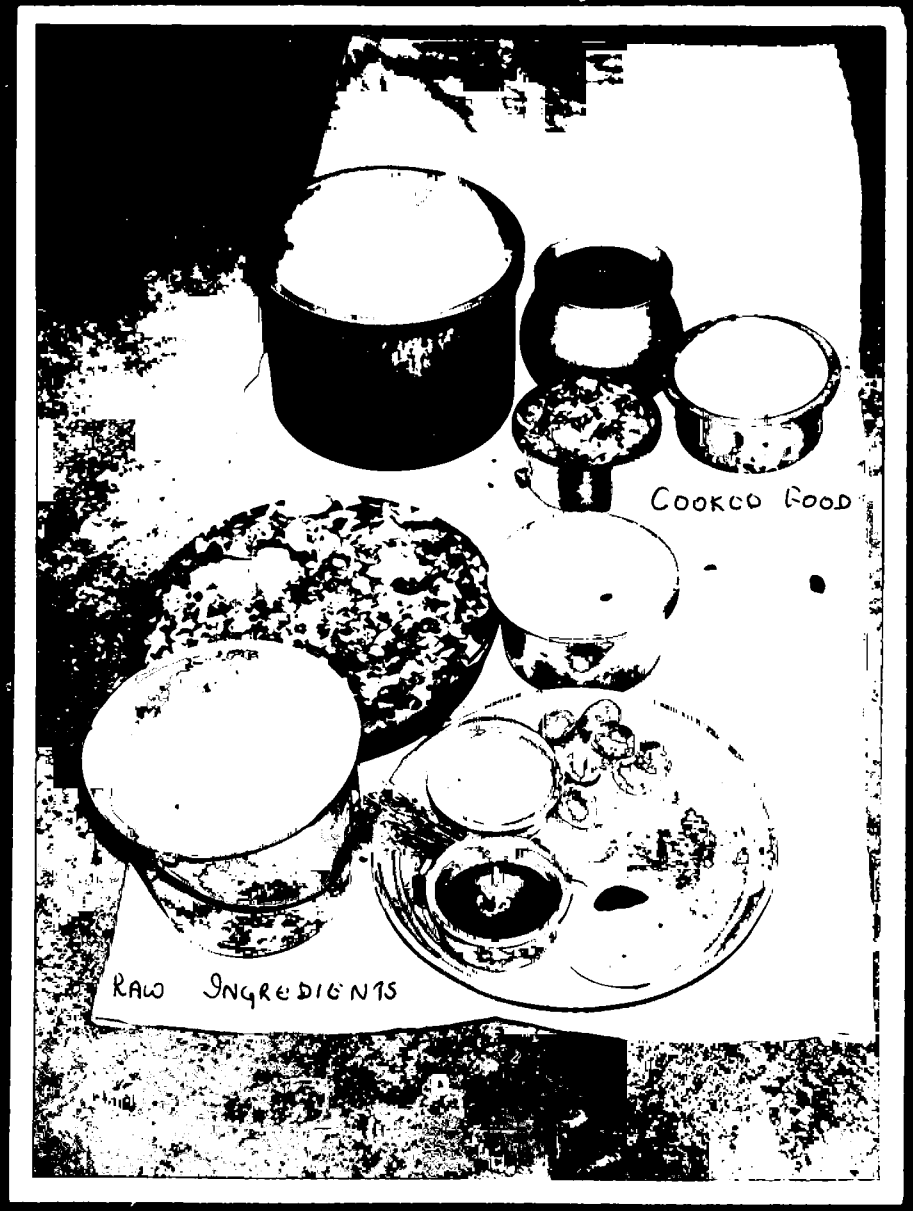


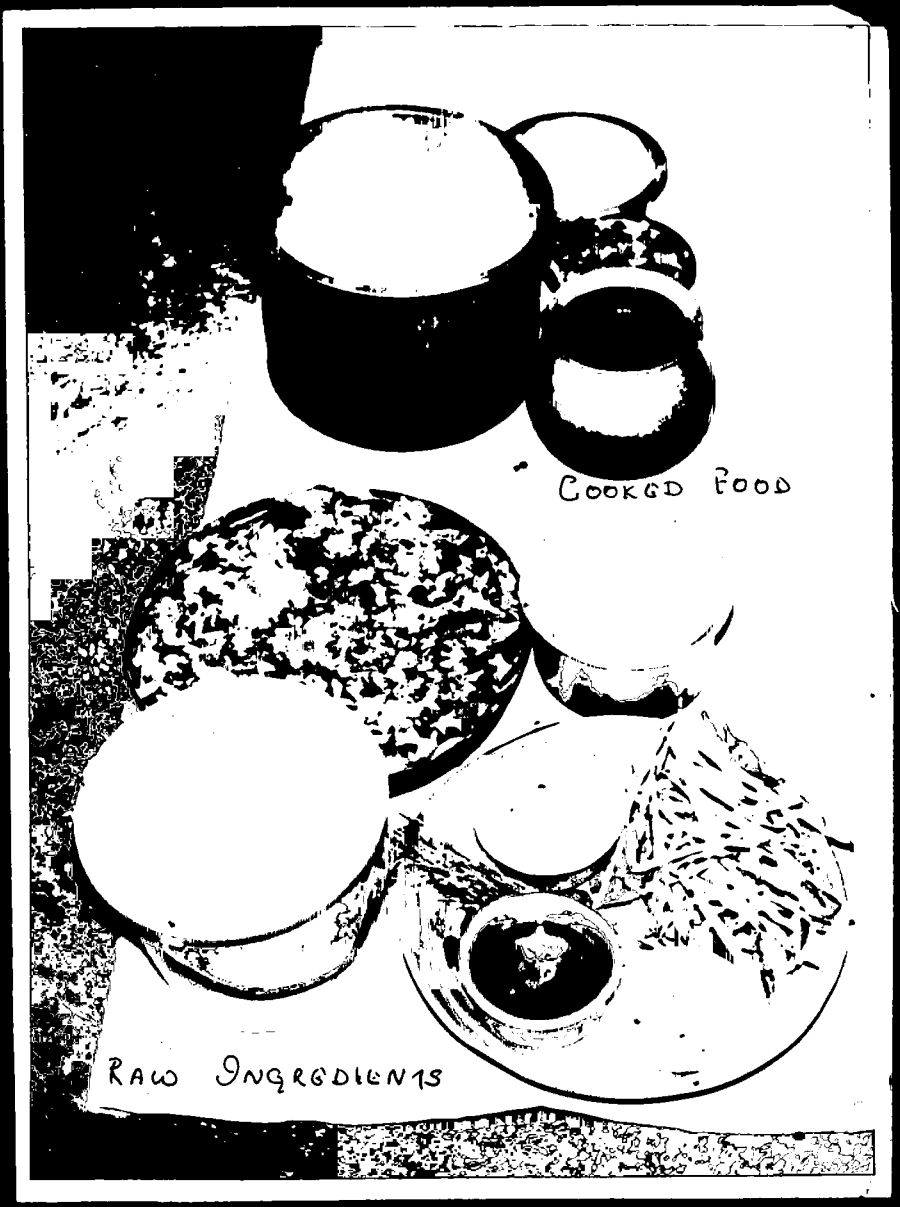
A DAY'S FOOD FOR A NORMAL SUBJECT WITH EXTRA ALLOWANCES FOR PREGNANCY AND LACTATION

FIGURE I

TOTAL FOOD USED FOR BREAKFAST - VEGETARIAN GROUP

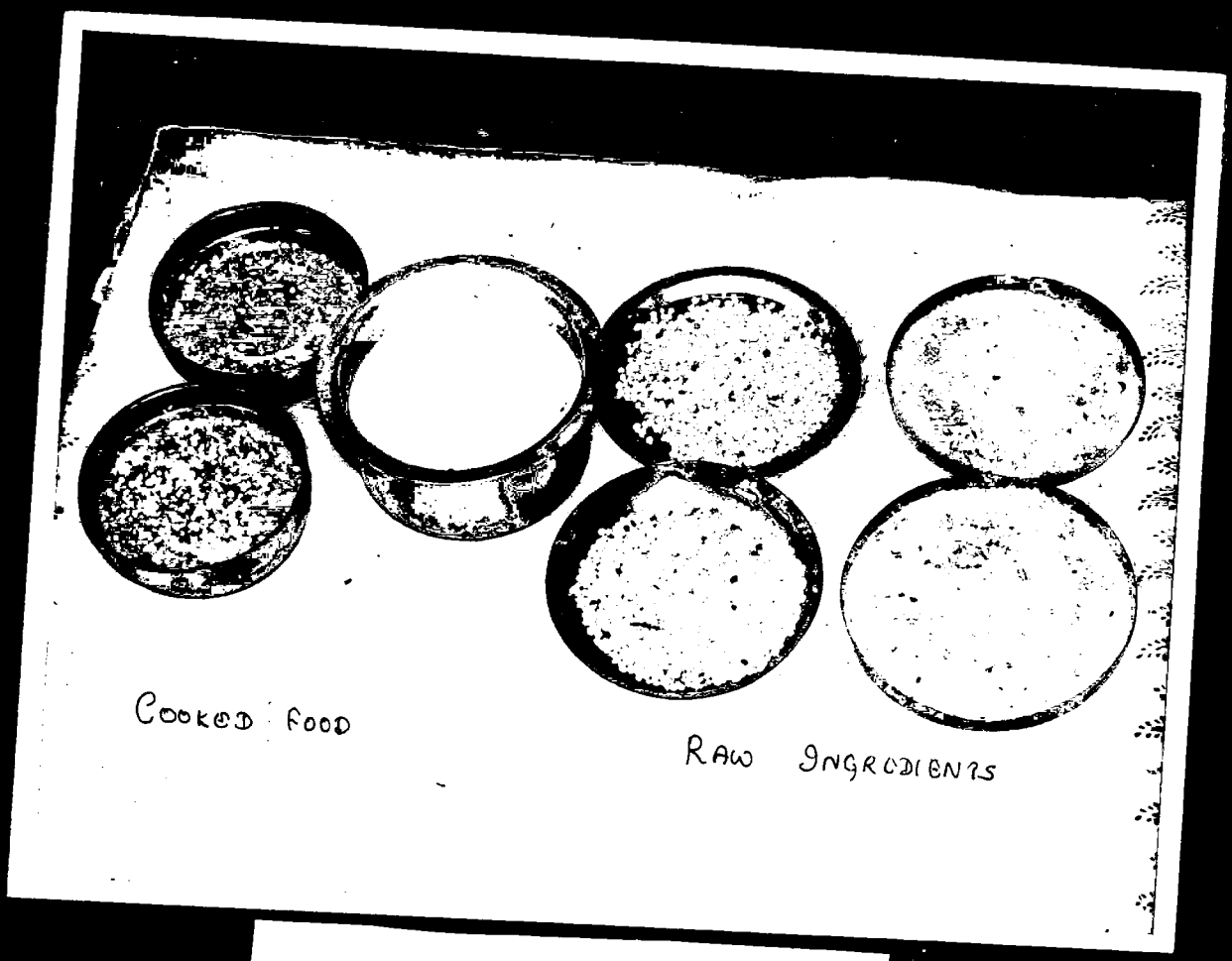
FIGURE II





TOTAL FOOD USED FOR LUNCH AND DINNER - VEGETARIAN GROUP

FIGURE III & IV



EXTRA FOOD ALLOWANCES USED FOR EXPECTANT AND LACTATING MOTHERS

Figure V & VI

After cooking the food, the total cooked weight of the dishes were found out and the amount to be served to each subject was verified with the already standardised quantities. Weighed quantity of the foods were served to the subjects for all the meals throughout the experimental period. When the subjects wanted extra amount of any item, weighed quantities were given and at the same time plate wastes were also noted. Records of exact food intakes were maintained during the last three days of feeding.

During the experimental period, the subjects were strictly instructed not to eat any food item outside other than what was supplied to them.

E. Analysis of diets:

The diets prepared for feeding were also analysed in the laboratory for their nutrients. One-tenth of the serving made to normal, pregnant and lactating women both for vegetarians and non-vegetarians during the three days of experimental feeding were measured out separately, homogenised in the laboratory and all the eighteen samples were analysed in triplicates for calories, protein, iron and calcium contents. Calories were estimated using the Bomb Calorimeter and protein, calcium and iron were analysed as per the procedure of Hawk and Oser (1968).

Using the data collected the applicability of RDA for the selected group of subjects was found out and suggestions for further investigation on RDA were arrived at.

Results and Discussion

IV. RESULTS AND DISCUSSIONS

The results of the present study entitled "An Evaluation of the Recommended Dietary Allowances by ICMR (1981) for Women Doing Moderate Work" are presented under the following heads:

A. Socio-economic background and nutritional status of the subjects studied

B. Three days menu planned for six categories of people

C. Nutrients supplied by the planned diets

D. Mean consumption of foods by the subjects and

E. Mean intake of nutrients by the subjects.

A. Socio-economic background and nutritional status of the subjects studied:

All the thirty women selected for the present investigation were from Rathinapuri area of Coimbatore city. All of them came from nuclear families with an average family size of four members. They belonged to an age range of 30 to 45 years. All of them had education upto elementary school level only. Their socio-economic background and nutritional status are discussed below:

1. Monthly income and expenditure pattern:

The total monthly income of the families is presented in Table III.

TABLE III

THE MONTHLY INCOME OF FAMILIES

Income (Rs.)	Number of families	Percentage of families
400 - 500	12	40.0
501 - 600	7	23.3
601 - 700	5	16.7
701 - 800	3	10.0
801 and above	3	10.0

The total monthly income of the families ranged from Rs.400 to above 800. However 80 per cent of the families had an income below Rs.700/month. The expenditure pattern of their income is presented in Table IV.

TABLE IV

THE EXPENDITURE PATTERN OF THE FAMILIES STUDIED

Item	Range of expenditure	Percentage of families
Food	30 - 50	30.0
	51 - 80	63.3
	> 80	6.7
Clothing	0 - 5	66.7
	6 - 10	33.3
House rent	0 - 10	70.0
	11 - 20	23.4
	> 20	6.6
Education	Nil	80.0
	< 5	20.0
Medicine	< 5	83.6
	> 5	16.4
Fuel and light	< 5	52.6
	>5	47.4
Transport	0 - 5	60.0
	6 - 10	40.0
Others (Pan Supari, tobacco and drinks)	< 5	20.0
	> 5	80.0

The income of the families was spent on various items such as food, clothing, shelter etc. A majority of the families 63.3 per cent spent 51 to 80 per cent of their income on food alone. Upto five per cent of the income was spent on clothing by two-thirds of the families. Since the area selected was an urban area, 70 per cent of the families had to spend upto 10 per cent of their income on house rent. Because of the same reason 6 to 10 per cent of the income was spent on transport by 40 per cent of the families. For education, medicine, fuel and others, around five per cent of the income was spent by all the families.

It was surprising that 80 per cent of the families did not spend on education at all. This was mainly due to two reasons. Education at lower level is given freely by the government and they did not send their children for higher education.

2. Details of food expenditure:

The details of food expenditure of the families studied is presented in Table V.

TABLE V

FOOD EXPENDITURE PATTERN OF THIRTY FAMILIES SURVEYED

Item	Range of expenditure	Percentage of families
Cereals	30 - 40	90.0
	50 - 60	10.0
Pulses	1 - 5	46.6
	6 - 10	53.4
Green leafy vegetables	0 - 3	60.0
	4 - 6	40.0
Other vegetables	0 - 3	56.4
	4 - 6	43.6
Roots and tubers	0 - 3	35.0
	4 - 6	65.0
Milk	3 - 6	20.0
	7 - 9	80.0
Fruits	0 - 3	56.6
	4 - 6	43.4
Oil and fat	4 - 8	66.6
	9 - 12	33.4
Sugar and Jaggery	0 - 3	72.3
Fleshy foods	4 - 6	27.7
	0 - 4	16.6
	5 - 8	83.4

It was observed that the expenditure on cereals was the main item in all the families studied. Around 30 to 40 per cent of the food expenditure was spent on cereals by 90 per cent of the families. While the rest of the families spent 50 to 60 per cent of their food expenditure on cereals. Around 50 per cent of the families spent one to five per cent of their food expenditure on pulses and the rest spent six to ten per cent of the food expenditure on pulses.

More or less five per cent of the food expenditure was on the food items namely leafy vegetables, other vegetables, roots and tubers, fruits and sugar and jaggery. Upto 10 per cent of the food expenditure was spent on milk, fats and oil and fleshy foods in all the families studied.

3. Menu pattern of the families studied:

The daily menu pattern of the families studied is presented in Table VI.

TABLE VI

THE DAILY MENU PATTERN OF THE FAMILIES STUDIED

Meal	Menu followed	Percentage of families
Breakfast	1. Left over rice, Sambar and Coffee	50.0
	2. Coffee alone	40.0
	3. Idli/Dosai/Uppuma etc., and Coffee	10.0
Lunch	1. Rice and Sambar	73.3
	2. Rice Sambar and Poriyal	26.7
Tea	1. Coffee	100.0
Dinner	1. Rice and Rasam	60.0
	2. Rice Poriyal and Rasam or Sambar	23.4
	3. Rice and Sambar	16.6

It was observed that four meals were consumed in a day in 60 per cent families studied. A majority of the families (50 per cent) had left over food for breakfast. Forty per cent of the subjects consumed only coffee in the morning while 10 per cent prepared items such as Idli, Dosai, etc. for breakfast. For lunch 75 per cent of the families had just rice and sambar and no one included curds or butter milk for lunch. In all the families studied, people consumed a cup of coffee in the evening. The night meal pattern was very simple with rice and rasam or sambar. Only 23.4 per cent included poriyal at night. Hence all the families followed a very simple and routine meal pattern in their families.

4. Nutritional status of the women studied:

All the 30 subjects selected for the study were free from diseases or obvious deficiency signs. Their mean body weights and blood haemoglobin levels are presented in Table VII.

TABLE VII

MEAN BODY WEIGHTS AND HAEMOGLOBIN LEVELS OF SELECTED WOMEN

Details	Weight (kg)	Haemoglobin level (g/100 ml)
Vegetarians		
Normal	42.6	9.4
Pregnant (II and III trimesters)	47.8	9.2
Lactating (II half)	38.4	9.2
Non-vegetarians		
Normal	41.3	9.6
Pregnant (II and III trimesters)	48.5	9.0
Lactating (II half)	40.1	9.2

The body weights of the pregnant women were greater than the weights of normal as well as lactating mothers. All the women were in the second and third trimesters of pregnancy. All the lactating women were in the second stage of lactation with 6 to 12 months old infants. Their body weights were lower than the weights of normal women as well as pregnant women. All the six groups of women were found to be anaemic with less than 11 g of haemoglobin/100 ml blood.

5. Mean food intake of women through their home diets:

The mean food intakes of women through their home diets are presented in Tables VIII and IX with the individual values in Appendix A.

TABLE VIII

MEAN FOOD CONSUMPTION OF VEGETARIANS THROUGH HOME DIETS
(in grams)

Details	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and tubers	Fruits	Milk	Oil and fat	Sugar and jaggery
Normal women	439	24	66	20	30	45	25	9	49
RDA	440	45	100	50	40	150	30	25	20
Difference	-1	-21	-34	-30	-10	-105	-5	-16	+29
Expectant women	375	19	3	10	40	205	29	6	28
RDA	475	60	100	50	40	250	30	25	30
Difference	-100	-41	-97	-40	—	-47	-1	-19	-2
Lactating mothers	467	10	23	51	12	30	28	21	44
RDA	500	75	100	50	40	250	30	35	30
Difference	-33	-65	-77	+1	-28	-220	-2	-14	+14

TABLE IX

MEAN FOOD CONSUMPTION OF NON-VEGETARIANS THROUGH HOME DIETS
(in grams)

Details	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and tubers	Fruits	Milk	Fat and oil	Sugar and jaggery
Normal women	418	30	21	24	40	24	105	25	25
RDA	440	22.5 + 1 egg	100	40	50	30	150	30	20
Difference	-22	-7.5 + 1 egg	-79	-16	-10	-45	-6	-5	+5
Expectant women	425	32	5	32	45	55	28	23	23
RDA	475	30 + 1 egg	100	40	50	30	250	30	30
Difference	-50	+2 + -1 egg	-97	-8	-5	+195	-2	-7	-7
Lactating mothers	448	43	4	31	43	98	22	17	28
RDA	500	37.5 + 1 egg	100	40	50	30	250	40	30
Difference	-2	+ 5.5 - 1 egg	-96	-9	-7	+8	-152	-23	-2

It was found out that the cereal consumption was deficient in all the six categories of women studied. The consumption of pulses were so low that the deficit ranged from 21 to 65 gm among vegetarian women. In the case of non-vegetarians, they included non-vegetarian foods either once in a month or once in 15 days. None of them had included any non-vegetarian items during the weighment survey period and their intakes of pulses were also found to be very low. The intakes of leafy vegetables varied from 3 gm to 66 gm as against a recommendation of 100 gm/day. The mean intake of other vegetables were found to be adequate only in the vegetarian lactating women. The intake of sugar was greater in normal and lactating vegetarian women. Apart from these, the mean intakes of root vegetables, milk, fruits and fats and oils were found to be deficient in all the six groups of women studied.

6. Mean nutrient intake of women through their home diets

The mean nutrient supply of the home diets as calculated from their food intake are presented in Tables X and XI with the individual values in Appendix B.

TABLE X

MEAN NUTRIENT CONSUMPTION OF THE VEGETARIANS THROUGH HOME DIETS

Details	Proteins (g)	Calories (k. cal.)	Calcium (mg)	Iron (mg)	βCarotene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Normal women	37.6	1912	184	24.0	418	1.3	0.4	18.0	94
RDA	45.0	2200	400-500	32.0	3000	1.1	1.3	15.0	40
Difference percentage	-16.4	-13.1	-59.1	-25.0	-86.0	+18.2	-66.9	+20.0	+135
Expectant women	36.0	1678	362	20.0	507	1.0	0.6	16.0	15
RDA	59.0	2500	500-600	40.0	3000	1.3	1.5	17.0	40
Difference percentage	-38.9	-32.9	-34.2	-50.0	-83.1	-23.07	-60.0	-5.8	-62.5
Lactating mothers	3610	2101	253	25.0	2025	1.1	0.4	9.3	74
RDA	45.0	2600	400-500	32.0	4600	1.3	1.5	18.0	80
Difference percentage	-20.0	-19.2	-43.8	-21.9	-60	-15.4	-73.3	-48.3	-7.5

TABLE XI

MEAN NUTRIENT CONSUMPTION OF NON-VEGETARIANS THROUGH HOME DIETS

Details	Proteins (g)	Calories (k. cal)	Calcium (mg)	Iron (mg)	β Caretene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Normal women	40.0	2018	353	29.0	1880	1.2	0.55	18.0	60
RDA	45.0	2200	400-500	32.0	3000	1.1	1.3	15.0	40
Difference percentage	-11.1	-8.2	-21.5	-9.4	-37.3	+9.0	-57.7	+20.0	+50
Pregnant women	38.0	1953	219	23.0	765	1.2	0.4	18.6	15
RDA	59.0	2500	500-600	40.0	3000	1.3	1.5	17.0	40
Difference percentage	-35.6	-21.8	-60.28	-42.5	-74.5	-7.7	-73.3	+9.4	-62.5
Lactating women	43.0	2066	278	25.0	739	1.5	0.5	19.0	15.0
RDA	45.0	2600	400-500	32.0	4600	1.3	1.5	18.0	80.0
Difference percentage	-4.4	-20.53	-38.2	-21.9	-83.9	+15.4	-66.6	+5.5	-81.3

The deficiency observed in the intake of different foods was reflected in the intake of nutrients also. Except a few observations of excess intake in thiamine, niacin and ascorbic acid, the intake of all the other nutrients were found to deficient in women. The protein deficit varied from 4.4 to 38.9 per cent. The poor intake of vegetables had resulted in the deficit intake of calcium, iron and vitamins also.

B. Three days menu planned for six categories of people:

Three days menu planned for normal, expectant and lactating mothers consuming vegetarian or non-vegetarian diets are presented in Tables XII, XIII and XIV.

TABLE XII

FIRST DAY'S MENU FOR A NORMAL WOMAN DOING MODERATE WORK

Menu	Ingredients used (gm)
Breakfast	
Uppuma	Semolina 120
Tomato Potato Masala	Tomato 30, Potato 25, Bengal gram flour 2.5
Coffee	Milk 25, Sugar 10
Lunch	
Rice	Rice 180
Potato Sambar	Dhal 22.5, Potato 20
Rasam	—
Drumstick leaves Poriyal	Drumstick leaves 49, Onion 3
Curds	Milk 50
Tea	
Coffee	Milk 25, Sugar 10
Dinner	
Rice	Rice 140
Beans Sambar	Dhal 15, Beans 40
Rasam	--
Amaranth Poriyal	Amaranth 49, Onion 2
Curds	Milk 50

For the whole day use 5 gm of Bengal gram and 2 gm of curry leaves for seasoning purpose. Use 5 gm of oil for breakfast, 10 gm for lunch and 10 gm for dinner in the preparations.

Modifications suggested for pregnancy, lactation as well as non-vegetarian diets

Pregnancy*

Tea	
Rice flakes with roasted Bengal gram	Rice flakes 35, Roasted Bengal gram 15
Milk	Milk 100, Sugar 10

Lactation*

Tea	
Rice flakes with roasted Bengal gram (with 10 gm oil)	Rice flakes 60, Roasted Bengal gram 30, Oil 10.
Milk	Milk 100, Sugar 10

Non-vegetarian diet

Follow the same menu. Prepare egg Kolambu in place of Potato Sambar with the addition of one egg and removal of dhal alone retaining all the other ingredients. In the case of non-vegetarian pregnant and lactating women 7.5 g and 15 g of roasted Bengal gram added in tea were also deleted respectively.

*To be included along with the items provided in the normal woman's diet.

TABLE XIII

SECOND DAY'S MENU FOR A NORMAL WOMAN DOING MODERATE WORK

Menu	Ingredients used (gm)
Breakfast	
Pongal	Rice 120, Green gram dhal 15
Tomato Potato Kuruma	Tomato 30, Potato 25, Bengal gram flour 2.5
Coffee	Milk 25, Sugar 10
Lunch	
Rice	Rice 180
Carrot Sambar	Red gram dhal 22.5, Carrot 20
Rasam	--
Amaranth Poriyal	Amaranth 49, Onion 2
Curds	Milk 50
Tea	
Coffee	Milk 25, Sugar 10
Dinner	
Kali	Jowar 140
Bitter gourd Pulikolambu	Bitter gourd 40
Drustick leaves Poriyal	Drumstick leaves 49, Onion 5
Curds	Milk 50

For the whole day use 5 gm Bengal grams and 2 gm of curry leaves for seasoning purpose. Use 5 gm of oil for breakfast, 10 gm for lunch and 10 gm for dinner in the preparations.

Modifications suggested for pregnancy lactation as well as non-vegetarian diets

Pregnancy*

Tea	
Puffed rice with roasted Bengal gram	Puffed rice 35, Roasted Bengal gram 15
Milk	Milk 100, Sugar 10

Lactation*

Tea	
Puffed rice with roasted Bengal gram (with 10 gm oil)	Puffed rice 60, Roasted Bengal gram 30, Oil 10
Milk	Milk 100, Sugar 10.

Non-vegetarian diet

Follow the same menu. Prepare egg Kolambu in place of Carrot Sambar with the addition of one egg and removal of dhal, retaining all the other ingredients. In the case of non-vegetarian pregnant and lactating women 7.5 g and 15 g of roasted Bengal gram added in tea were also deleted respectively.

*To be included along with the items provided in the normal woman's diet.

TABLE XIV

THIRD DAY'S MENU FOR A NORMAL WOMAN DOING MODERATE WORK

Menu	Ingredients used (gm)
Breakfast	
Uppuma	Semolina 120
Tomato potato Massial	Tomato 30, Potato 25, Bengal gram flour 2.5
Coffee	Milk 25, Sugar 10
Lunch	
Rice	Rice 180
Dhal Kolambu	Red gram dhal 22.5, Onion 20
Rasam	--
Drumstick leaves Poriyal	Drumstick leaves 49, Onion 3.
Curds	Milk 50
Tea	
Coffee	Milk 25, Sugar 10
Dinner	
Kali	Jowar 140
Brinjal Sambar	Brinjal 40, Dhal 15
Amaranthu Poriyal	Amaranth 49, Onion 2
Curds	Milk 50

For the whole day use 5 gm Bengal gram and 2 gm of curry leaves for seasoning purpose. Use 5 gm of oil for breakfast 10 gm for lunch and 10 gm for dinner in the preparations.

Modifications suggested for pregnancy, lactation as well as non-vegetarian diets

Pregnancy*

Tea	
Rice flakes with roasted Bengal gram	Rice flakes 35, Roasted Bengal gram 15
Milk	Milk 100, Sugar 10

Lactation*

Tea	
Rice flakes with roasted Bengal gram (with 10 gm oil)	Rice flakes 60, Roasted Bengal gram 30, Oil 10
Milk	Milk 100, Sugar 10

Non-vegetarian diet:

Follow the same menu. Prepare egg Kolambu in place of dhal Kolambu with the addition of one egg and removal of dhal retaining all the other ingredients. In the case of non-vegetarian pregnant and lactating women 7.5 g and 15 g of roasted Bengal gram added in tea were also deleted respectively.

*To be included along with the items provided in the normal woman's diet.

The Tables present the menus planned for a normal woman along with the quantities of different food ingredients to be used in each preparation. The planning was done in such a way that the total quantities of different ingredients used in a day were similar to the recommended daily allowances as given by the ICMR (1981). Since the ICMR (1981) has not given any recommendation for fruits the 1968 recommendation for fruits has been used throughout this study. Regarding the use of oil and seasonings whole days allotments were weighed out and kept separately. They were distributed among the preparations as per the requirements.

For expectant woman and lactating mothers, utilising the extra recommendations of cereal, pulse, oil, milk and sugar an extra item was included in their evening tea. For non-vegetarians only one item namely egg kolambu was included in their afternoon menu in place of sambar retaining all the ingredients of the preparation except dhal.

The total cost of a days menu was worked out to be Rs.4.40, Rs.5.10 and Rs.5.60 for normal, expectant and lactating mothers on vegetarian diet respectively. The cost were found to be Rs.4.70, Rs.5.40 and Rs.5.75 for the three groups on non-vegetarian diets respectively.

When compared with their normal menu pattern, the newly planned menus included more number of items in all the four meals of the day and the planned menus were more balanced than their usual diets.

C. Nutrients supplied by the planned diets:

The mean nutrients supplied by the planned diets is presented in Table XV with the details of calculation in Appendix-C.

TABLE XV

NUTRITIVE VALUE OF PLANNED MENUS

Details	Protein (g)	Calories (k. cal)	Calcium (mg)	Iron (mg)	β Carotene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Vegetarian diets									
Normal women	56.7	2202	782	37.5	6619	1.39	0.76	16.7	188
RDA	45.0	2200	400-500	32.0	3000	1.1	1.3	15.0	40
% difference	+26.1	+0.8	+73	+17.1	+121	+26.26	-41.92	+11.5	+370
Expectant women	65.8	2483	919	44.5	6696	1.54	0.96	18.4	190
RDA	59.0	2500	500-600	40.0	3000	1.30	1.50	17.0	40
% difference	+11.5	-0.7	+67	+11.3	+123	+18.46	-36.35	+8.4	+375
Lactating mothers	70.9	2683	934	49.8	6718	1.62	0.97	19.6	190
RDA	45.0	2600	400-500	32.0	4600	1.3	1.5	18.0	80
% difference	+57.5	+3.2	+108	+55.8	+46	+24.61	-35.83	+9.1	+138
Non-vegetarian diets									
Normal women	58.5	2266	797	37.1	6890	1.35	0.98	18.2	189
RDA	45.0	2200	400-500	32.0	3000	1.10	1.30	15.0	40
% difference	+29.9	+3.0	+77	+16.0	+130	+22.63	-24.38	+21.1	+372
Expectant women	67.5	2547	934	44.2	6965	1.49	1.18	19.9	191
RDA	59.0	2500	500-600	40.0	3000	1.30	1.50	17.0	40
% difference	+14.4	+1.9	+70	+10.5	+132	+14.61	-21.13	+31.7	+378
Lactating mothers	72.3	2855	948	49.49	6882	1.56	1.36	21.1	191
RDA	45.0	2600	400-500	32.0	4600	1.30	1.50	18.0	80
% difference	+60.7	+9.8	+111	+54.7	50	+21.23	-9.33	+17.1	+139

The above Table shows clearly that the three days menu planned for six categories of people supplied more than the recommended allowances of nutrients, for all the groups studied. While the supply of all the nutrients were found to be in excess, the riboflavin content of the diets alone were found to be consistently deficient in all the planned diets.

The caloric content of the planned diets were found to be excess only to an extent of 10 per cent level. The protein content of the diets were greater to an extent of 60.7 per cent when compared with the RDA. The excess of the calcium varied from 67 to 111 per cent in the diets planned for six groups of people with a greater variation noticed in the diets of lactating women. This was mainly because in the second stage of lactation an additional calcium intake was not recommended by the ICMR (1981) due to improved retention capacity of the mothers though their food allowances have been increased. Because of the same reason, the iron supplies in the diets of lactating mothers also were found to be very high. Among the vitamins, the supply of vitamin C was found to be greater upto 375 per cent was noted when compared with the RDA. This higher content would be compensated by the cooking losses. Carotene content was greater upto 132 per cent when compared with the RDA. Thiamine and niacin levels were greater by around 20 per cent of RDA while riboflavin was found to be deficient in all the diets.

Comparison between the calculated and analysed values:

One serving of all the 18 diets prepared during the feeding experiment were homogenised in the laboratory and the samples were analysed for their calories, protein, calcium and iron contents. Table XVI gives the results of the analysis with the details in Appendix D.

TABLE XVI

NUTRITIVE VALUE OF DIETS AS ANALYSED IN THE LABORATORY

Details	Vegetarians				Non-vegetarians			
	Proteins (gm)	Calories (k. cal)	Calcium (mg)	Iron (mg)	Proteins (gm)	Calories (k. cal)	Calcium (mg)	Iron (mg)
Normal								
Calculated	56.8	2201	782.4	37.4	58.5	2265	796.4	37.1
Analysed	54.1	2149	706.4	33.8	55.3	2214	719.4	33.4
Difference	-2.7	-52	-76.0	-3.6	-3.2	-51	-77.0	-3.7
Expectant women								
Calculated	65.8	2482	919.6	44.5	67.4	2546	933.6	44.2
Analysed	62.7	2431	831.8	40.2	64.1	2494	841.8	39.7
Difference	-3.1	-51	-87.8	-4.3	-3.3	-52	-91.8	-4.5
Lactating mothers								
Calculated	70.8	2682	933.6	49.8	72.1	2856	947.5	49.4
Analysed	68.1	2630	840.3	46.2	69.7	2804	855.6	45.2
Difference	-3.5	-52	-93.3	-3.6	-2.4	-54	-91.9	-4.2

It was notedthat all the values obtained in the laboratory were lower than the calculated values. In proteins upto 3.5g difference was noted. Among calories a difference of around 50 calories was observed. In calcium 76.0 to 93.3 mg difference and iniron 3.6 to 4.3 mg difference were recorded. Those lower values might be due to the varietal differences of foods as well asthe cooking losses. Since the nutrient supply of the diets as calculated were greater than the RDA, the cooking losses would have been easily compensated and the fulfilment of the nutrient requirements would not have been affected.

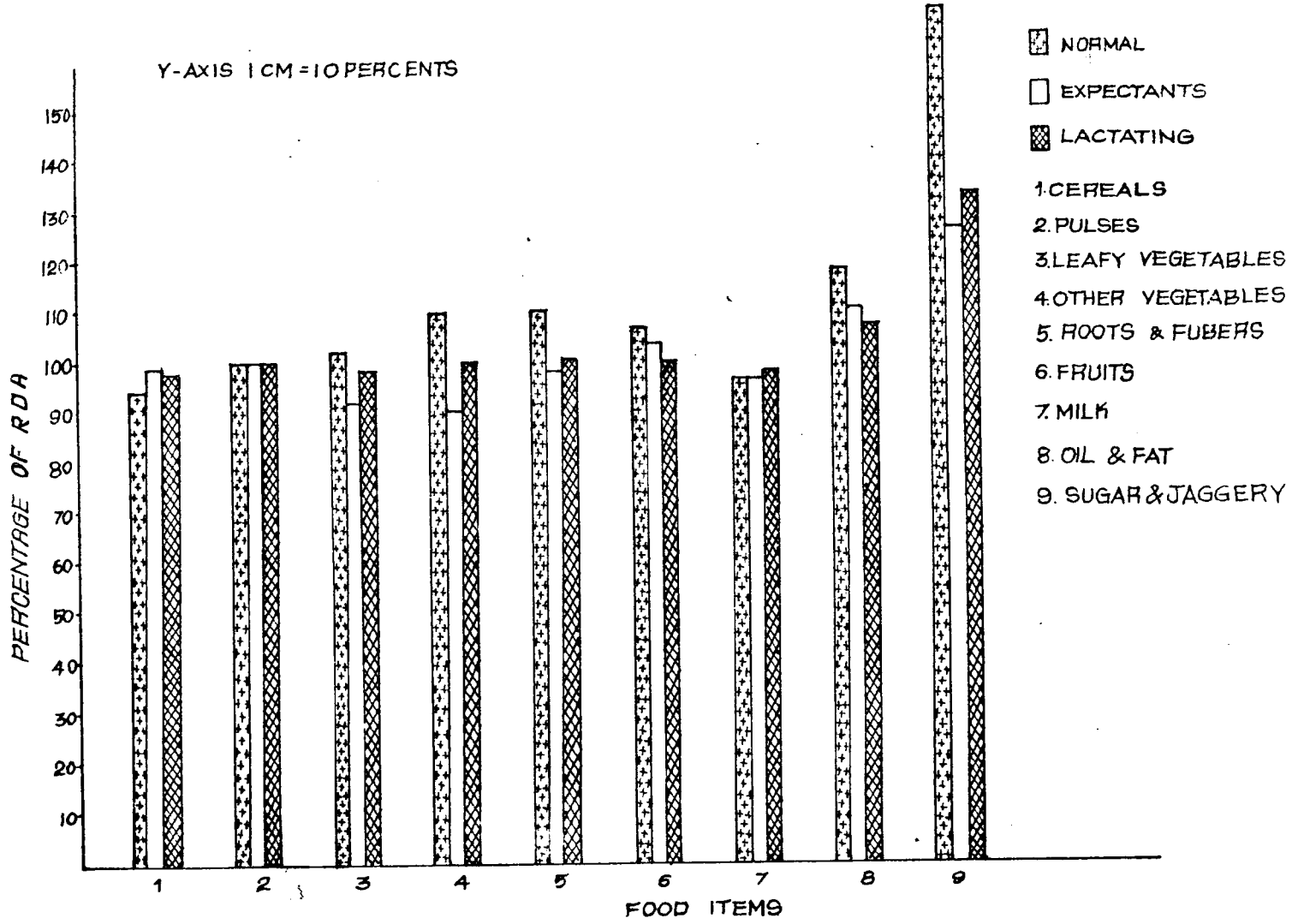
D. Mean consumption of foods by the subjects:

During the feeding experiment the subjects were served the recommended quantities of cooked foods for each meal. They were permitted to waste the extra food served and at the same time extra servings of any items were served as desired. Recordsof their intake were carefully maintained for three days of the experimental period. Mean food intake of the subjects in comparison with the RDA are presented in Tables XVII and XVIII and figures 7 and 8 with the individual values in Appendix E.

TABLE XVII

MEAN FOOD CONSUMPTION OF VEGETARIAN WOMEN
(in grams)

Details	Cereals	Pulses	Leafy Vege-tables	Other Vege-tables	Roots and tubers	Fruits	Milk	Oil and fat	Sugar and Jaggery
Normal women	415	45	102	44	55	32	145	27	35
RDA	440	45	100	40	50	30	150	25	20
Percentage difference	-25	0	+2	+4	+5	+2	-5	+2	+15
Expectant women	469	60	92	36	49	31	242	25	38
RDA	475	60	100	40	50	30	250	25	30
Percentage difference	-6	0	-8	-4	-1	+1	-8	0	+8
Lactating mothers	510	75	98	40	50	30	244	34	40
RDA	500	75	100	40	50	30	250	35	30
Percentage difference	+40	0	-2	0	0	0	-6	-1	+10



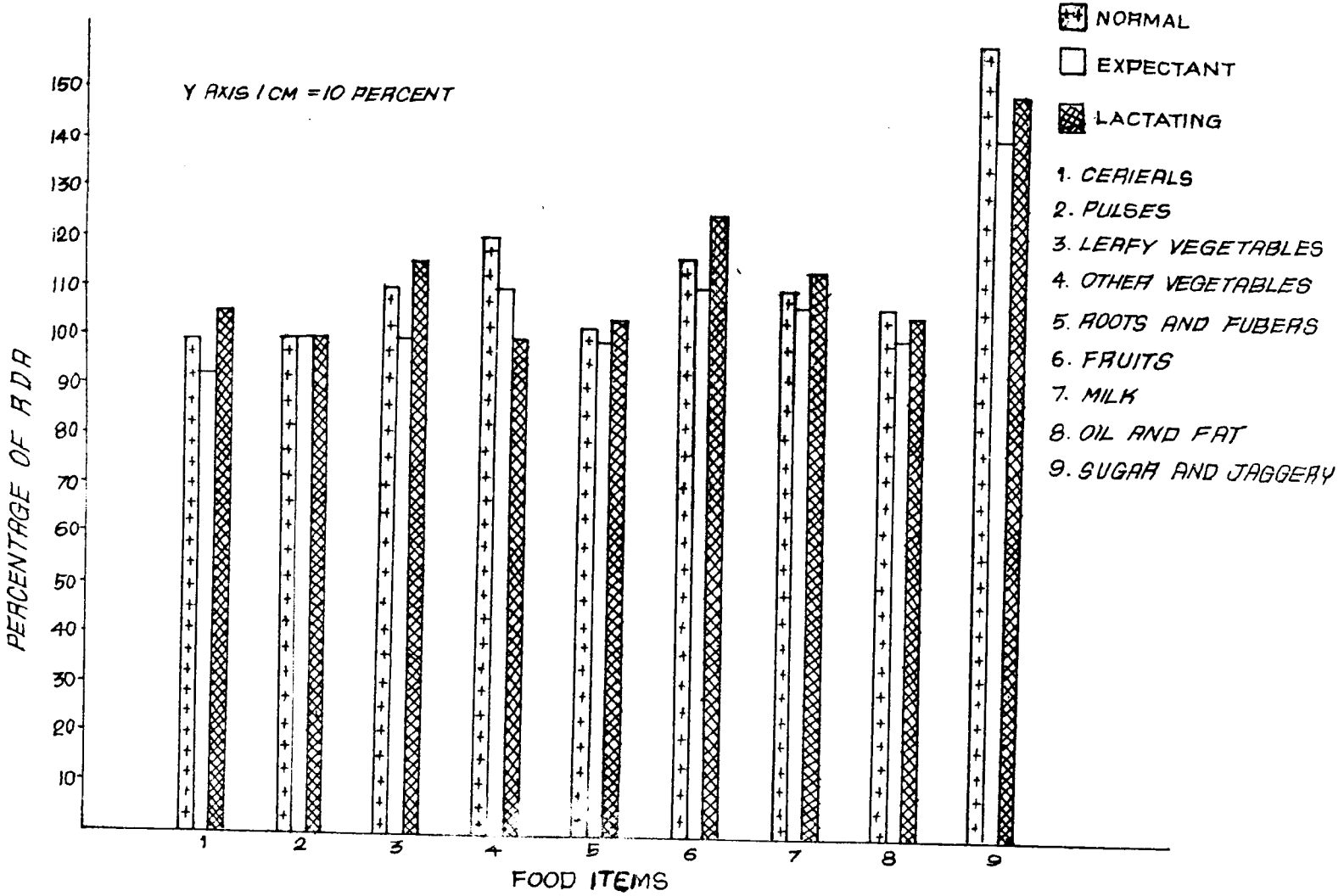
COMPARISON OF MEAN FOOD INTAKE BY VEGETARIAN GROUPS WITH RDA

Figure 7

TABLE XVIII

MEAN FOOD CONSUMPTION OF NON-VEGETARIAN WOMEN
(in grams)

Details	Cereals	Pulses	Leafy vege-tables	Other vege-tables	Roots and tubers	Fruits	Milk	Oil and fat	Sugar and jaggery
Normal women	437	22.5 + 1 egg	110	48	51	32	151	32	32
RDA	440	22.5 + 1 egg	100	40	50	30	150	30	20
Difference	-3	0	+10	+8	+1	+2	+1	+2	+12
Expectant women	438	30 + 1 egg	100	44	50	30	242	30	42.5
RDA	475	30 + 1 egg	100	40	50	30	250	30	30
Difference	-38	0	0	+4	0	0	-8	0	+12.5
Lactating mothers	525	38 + 1 egg	116	40	52	33	260	42	45
RDA	500	37.5 + 1 egg	100	40	50	30	250	40	30
Difference	+25	+0.5	+16	0	+2	+3	+10	+2	+15



COMPARISON OF MEAN FOOD INTAKE BY NON-VEGETARIAN GROUPS WITH RDA

Figure-8

Cereals

The normal women taking vegetarian diets could not consume 25 gm of cereals while the non-vegetarian women had a left over of 3 gm cereal. For expectant women in both the groups the cereal recommendation was found to be greater by 3 to 6 gm. In both the vegetarian and non-vegetarian groups of lactating mothers the cereal recommendations were found to be shorter by 10 gm and 25 gm respectively.

Pulses

Regarding the intake of pulses, all the six groups of women could consume the served quantities of pulses.

Leafy vegetables

The non-vegetarian women in general could consume more leafy vegetables than the vegetarian women. On the whole the per cent variation from the RDA ranged from -8 to +16 gm in all the sixgroups of women studied.

Other vegetables

In the case of other vegetables, the normal women could consume four to eight grams more than the RDA. All the lactating women could consume the recommended quantities of other vegetables. The vegetarian expectant women had a left over of four grams while the non-vegetarian expectant women consumed four grams in excess.

Roots and tubers

The servings of roots and tubers were found to be more or less adequate with a variation of -1 to +5 g in all the six groups studied.

Fruits

The serving of fruits were also found to be just adequate in all the six groups of women studied.

Milk

The milk consumption of the three groups of vegetarian women were found to be lesser by 5 to 8 gm than the RDA. In the case of non-vegetarian groups the observation were +1, -8 and + 10 g respectively, for normal, expectant and nursing mothers respectively.

Oil and fat

The consumption of fats and oils were almost in comparison with the RDA in all the six groups with a variation range of -1 to +2 gm.

Sugar and Jaggery

It was observed that all the women could consume more amount of sugar than the RDA. Among the vegetarian groups the consumption was more by 15, 8 and 10 gm respectively, for normal women, expectant and lactating mothers In the case of non-

vegetarian groups the increases were 12.0, 22.5 and 15.0 g. respectively among the three groups studied.

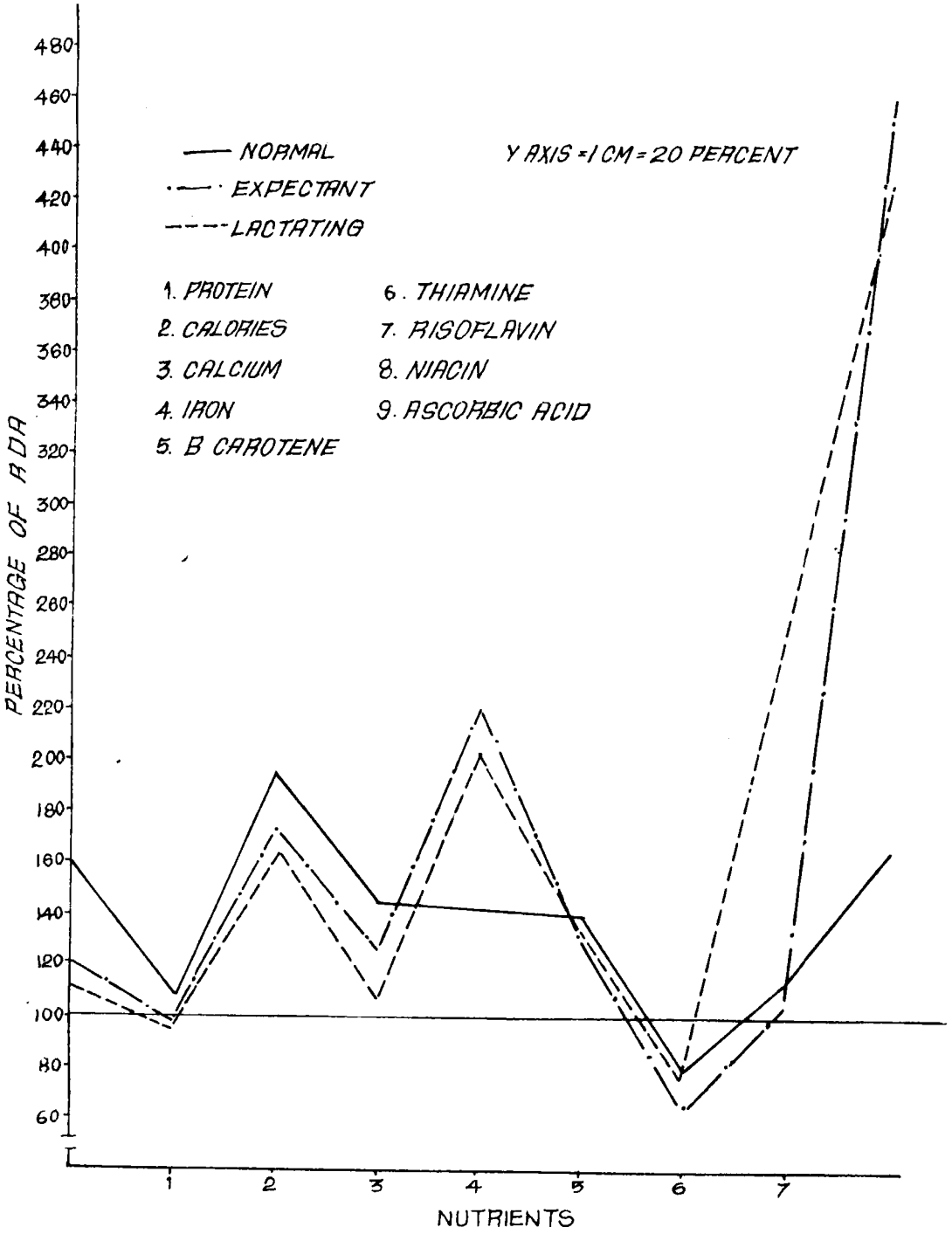
E. Mean intake of nutrients by the subjects:

From the quantities of food consumed by the subjects, the intake of nutrients were calculated. The values thus arrived at were compared with the RDA and presented in Tables XIX and XX and figures 9 and 10 with the individual values in Appendix F.

TABLE XIX

MEAN NUTRIENT INTAKE BY THE VEGETARIAN GROUP OF WOMEN

Details	Proteins (g)	Calories (k.cal)	Calcium (mg)	Iron (mg)	βCarotene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Normal women									
Consumed amount	54.3	2136	773	40	6601	1.4	0.85	17.0	222
RDA	45.0	2200	400-500	32	3000	1.1	1.3	15.0	40
Percentage difference	+20.8	-2.9	+72	+24.1	+120	+27.3	-35.0	+16.0	+454
Expectant women									
Consumed amount	65.0	2457	895	42	6053	1.7	1.1	20.0	210
RDA	59.0	2500	500-600	40	3000	1.3	1.5	17.0	40
Percentage difference	+8.6	-1.7	+63	+4.8	+102	+31.0	-27.0	+15.0	+423
Lactating mothers									
Consumed amount	71.3	2800	872	46	6540	1.8	1.2	21.0	213
RDA	45.0	2600	400-500	32	4600	1.3	1.5	18.0	80
Percentage difference	+59.0	+7.6	+94	+44	+42	+39.0	-20.0	+17.0	+166.3



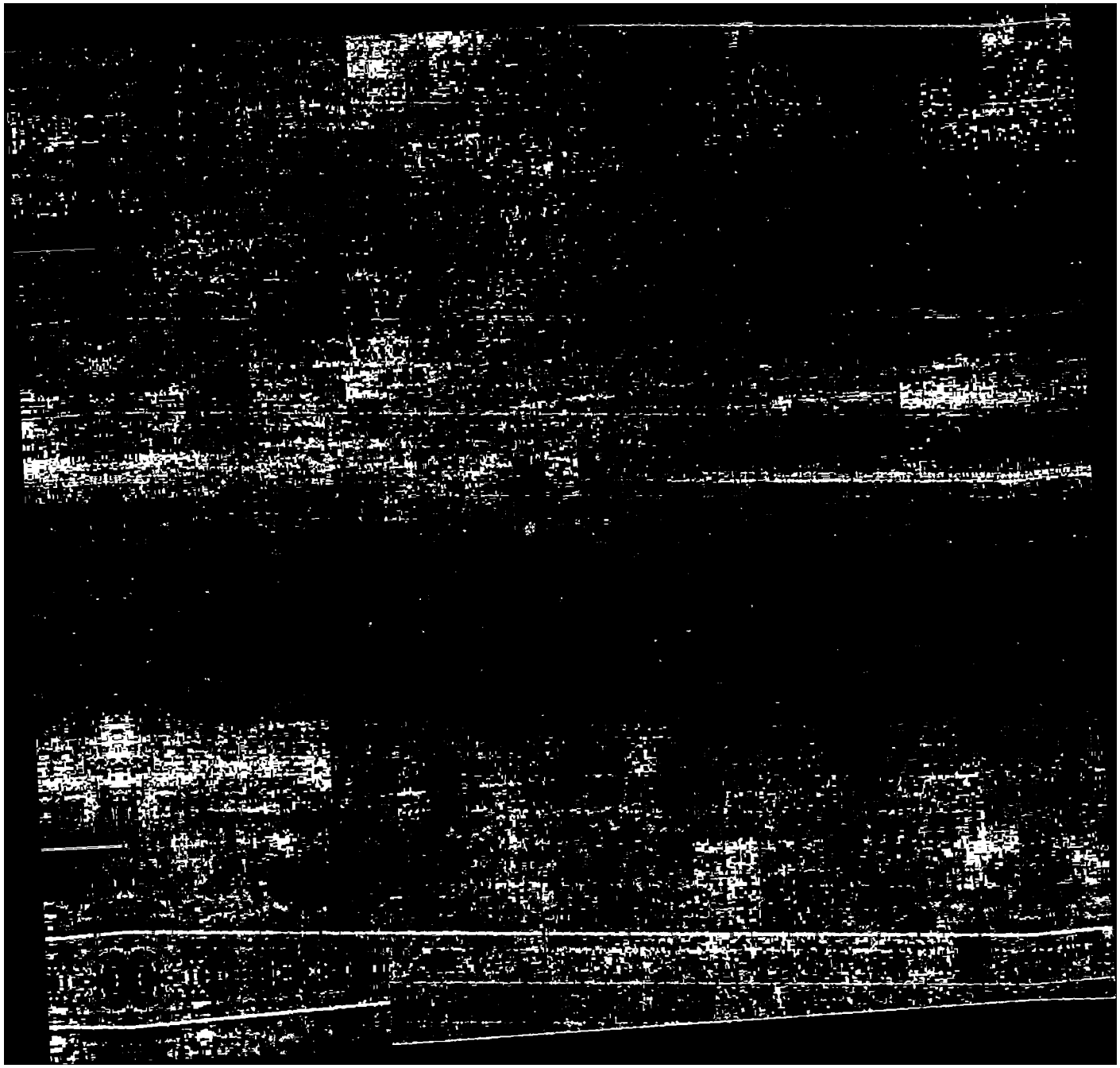
COMPARISON OF MEAN NUTRIENT INTAKE BY VEGETARIAN GROUPS WITH RDA

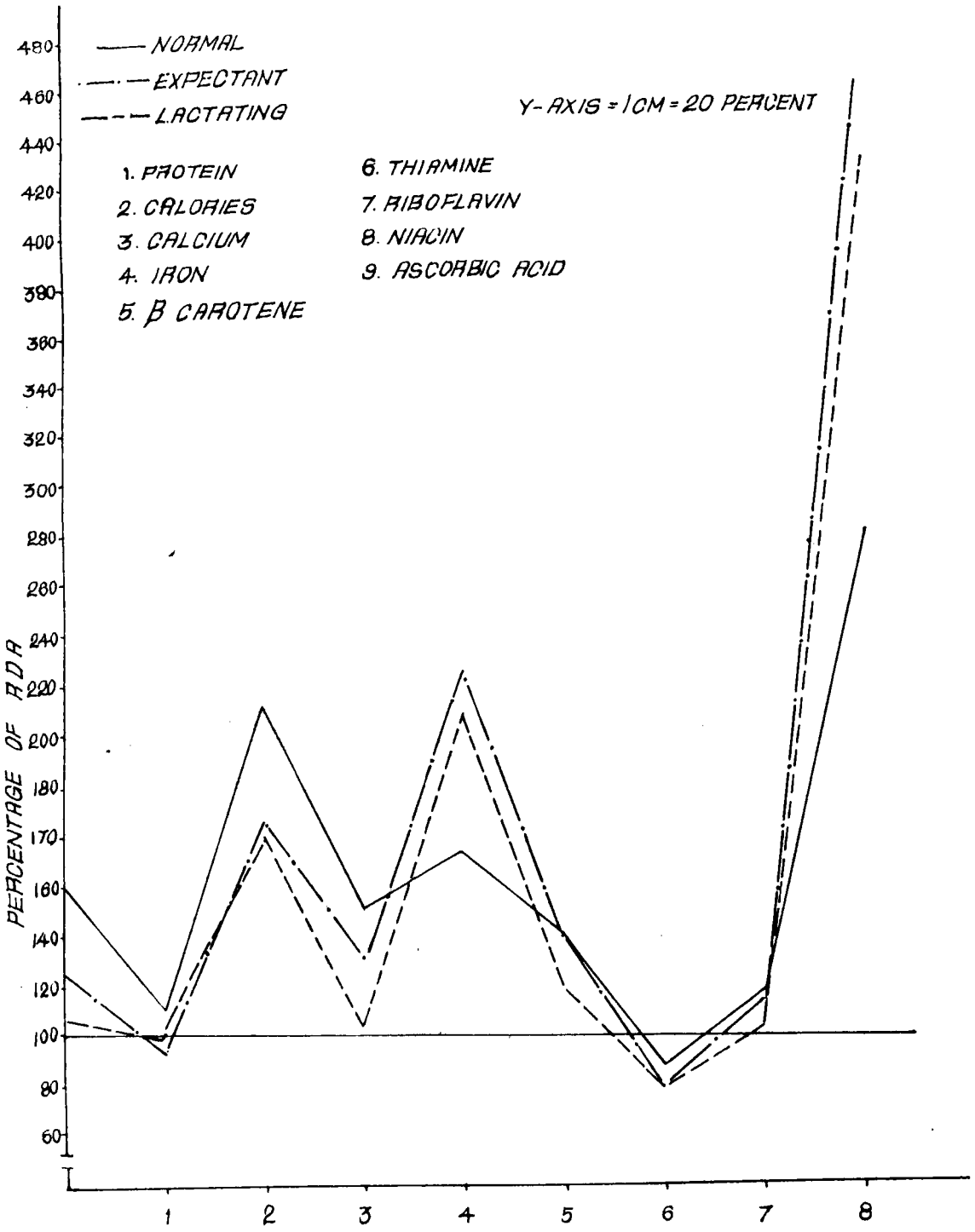
Figure. 9

TABLE XX

MEAN NUTRIENT INTAKE BY THE NON-VEGETARIAN GROUP OF WOMEN

Details	Proteins (g)	Calories (k·cal)	Calcium (mg)	Iron (mg)	β Carotene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Normal women									
Consumed amount	57.4	2343	834	42.0	7385	1.5	1.1	17.5	232
RDA	45.0	2200	400-500	32.0	3000	1.1	1.3	15.0	40
Percentage difference	+27.44	-6.5	+85.4	+31.2	+146.2	+37.2	-19.0	+16.5	+481
Expectant women									
Consumed amount	61.7	2484	980	41.0	6830	1.6	1.2	18.0	220
RDA	59.0	2500	500-600	40.0	3000	1.3	1.5	17.0	40
Percentage difference	+4.6	-0.64	+78.1	+1.5	+128.0	+20.8	-22.0	+5.5	+450
Lactating mothers									
Consumed amount	72.5	2655	1050	48.2	7839	1.8	1.3	21.2	243
RDA	45.0	2600	400-500	32.0	4600	1.3	1.5	18.0	80
Percentage difference	+61.0	+11.9	+133.3	+50.2	+70.4	+40.8	-13.0	+17.7	+203.





COMARSION OF MEAN NUTRIENT INTAKE
BY THE NON-VEGETARIAN GROUPS WITH RDA

Figure. 10

Though the food consumption of the subjects did not deviate very much from the recommended quantities it was surprising that the intake of almost all the nutrients except riboflavin were excessively consumed by all the subjects.

The excess observed in protein intake ranged from 4.6 to 61.0 per cent in the six groups of women studied. The caloric intake varied from -6.5 to +11.9 per cent when compared with the RDA. The excess observed for both calcium and iron were found to be the highest in lactating women. In both the normal and expectant women, the carotene intakes were found to be more than 100 per cent of RDA. Thiamine and niacin intakes were also more than the RDA. Riboflavin intakes were found to be consistently deficient in all the six groups of women by 13 to 35 per cent. It was interesting to note that the intake of ascorbic acid was 454, 423 and 166 per cent more than the RDA for the normal, expectant and lactating mothers consuming vegetarian diets. In the case of non-vegetarian groups the excess observed were 481, 450 and 203 per cent respectively for the three groups studied. These excesses of nutrients would take care of the cooking losses. Hence it was found that when the recommended quantities of foods were consumed, they could get all most all the nutrients in required amounts except for riboflavin which showed a little shortage. This also could be overcome by including the foods rich in riboflavin such as wheat germ, green gram dhal, soyabean, amaranthus, brinjal, etc. in the menu without altering the RDA of foods.

Based on the foregoing discussions, it could be concluded that the normal, expectant and lactating mothers belong to low income families and engaged in moderate activity in Coimbatore could consume to a great extent all the foods as per the recommended allowances. In general all the six groups of subjects wanted to add more sugar in their diets varying from 5 to 22.5 gm per day. Lactating mothers in vegetarian and non-vegetarian groups could consume 10 to 25 gm more of cereals which resulted in an excess intake of calories. This might be due to their habit of consuming cereals based diets.

When the recommended quantities of foods were consumed their nutrient requirements also were fulfilled to a great extent excepting riboflavin. This could be overcome if little more attention is paid to include riboflavin rich foods in the meal planning.

Though the results of the weighment survey showed deficient intake of all the foods as well as nutrients through their home diets, the feeding experiment has proved that they would consume more foods, provided their economic conditions are improved and adequate nutrition education is imparted.

Summary and Conclusion

V. SUMMARY AND CONCLUSION

In the present investigation entitled, "An Evaluation of the Recommended Dietary Allowances by ICMR (1981) for Women Doing Moderate Work" had the main objective of testing the adequacy of the recommended food allowances of ICMR for normal, expectant and nursing mothers engaged in moderate work and consuming either vegetarian diets or non-vegetarian diets. The nutrient contribution of the recommended diets was also studied for its adequacy.

Three days menus were planned for the six selected categories of people - normal women, expectant women and lactating mothers consuming (1) vegetarian diets and (2) non-vegetarian diets - based on the RDA for foods. The calorie and nutrient supply of the planned diets were calculated. The three days menu were standardised in the laboratory. The cost of one day's menu was worked out to be Rs.4.40, Rs.5.10 and Rs.5.60 for a normal, expectant and lactating mothers on vegetarian diet. The cost of non-vegetarian diets were found to be Rs.4.70, Rs.5.40 and Rs.5.75 respectively, for the three groups studied.

Six groups of five women from an urban slum area of Coimbatore were selected for the feeding experiment. The base-line data were collected from the selected women through socio-

economic and diet surveys as well as food weighment survey. They were fed the standardized menu for a period of six days giving freedom for food wastage as well as consumption of extra quantities of any item served. Records of their intake were maintained for a period of last three days leaving an adjustment period of three days in the beginning. Their mean food and nutrient intakes were calculated and compared against the RDA. The prepared menus were also analysed in the laboratory for their calorie, protein, calcium and iron contents.

The results revealed the following:

1. The total monthly income of the selected women ranged from Rs.400 to above Rs.800. A majority of the families (63.3 per cent) spent 60 to 80 per cent of their income on food alone. Ninety per cent of the families spent 30 to 40 per cent of their food money on cereals.

2. The blood haemoglobin levels of all the women were found to be less than 11 g/100 ml. Their intake of foods and nutrients through home diets were found to be highly inadequate except a few exceptions.

3. When compared with the normal menu pattern of the selected women, the planned menus had more number of items in all the four meals of the day and the planned menus were balanced when compared to the home foods.

4. The planned menus were found to supply more than the RDA of all the nutrients excepting riboflavin which was found to be consistently deficient in all the planned diets. The calorie, protein, calcium and iron contents of the diets were found to be excess to an extent of 9.8, 60.7, 111 and 54.7 per cent respectively. The supply of vitamin C was greater to an extent of 378 per cent when compared to RDA.

5. When the prepared diets were analysed in the laboratory for calories, protein, calcium and iron, all the values were lower than the calculated values indicating the cooking losses as well as varietal differences.

6. With regard to the consumption of menus the followingwere observed:

   a) In both the vegetarian and non-vegetarian groups of lactating mothers the cereal allowance of RDA was found to be shorter by 10 and 25 gm respectively. For the others the recommendation was greater than their normal eating capacity.

   b) The serving of pulses, other vegetables, roots and tubers, fruits and fats and oils were found to be adequate with very minor variations in their intake.

   c) The non-vegetarian women in general could consume more leafy vegetables than the vegetarian women. The percentage variation from the RDA ranged from -8 to +16 gm in all the six groups of women studied.

   d) Milk consumption of vegetarian women were found to be lesser by 5 to 8 gm than the RDA. In the case of non-vegetarians they were +1, -8 and +10 gm respectively for normal, expectant and nursing mothers.

   e) All the women in general consumed more than the RDA levels of sugar, the quantities varying from 8 to 22.5 g/day.

7. Though the food consumption did not deviate very much from RDA, the intake of all the nutrients except riboflavin were excessively supplied by the diets consumed by the subjects. The excesses observed were upto 61.0 per cent for protein, 11.9 per cent fof calories, 133.3 per cent for calcium, 50.2 per cent for iron, 146.2 per cent for β carotene, 40.8 per cent for thiamine, 17.7 per cent for niacin, and 48.1 per cent for ascorbic acid.

It was concluded that the normal, expectant and lactating mothers engaged in moderate activity could consume all the foods to a great extent as per the recommended allowances. The excess quantity of cereals and sugar which they came forward to consume resulted in excess calorie supply when compared with the RDA. When diets were planned as per the recommended allowances of foods, the supply of nutrients by these diets was found to be very high, deviating very much from the recommended allowances of nutrients. Riboflavin requirements alone were not fulfilled by these diets. This could be overcome if more attention is paid to include riboflavin rich foods in the meal planning. Further research is needed to find out the bio availability of nutrients from such recommended diets which will account for cooking losses and other factors which prevent the availability of nutrients. Further testing of RDA with other age groups as well as people with different income levels would be of great value to strengthen the present findings.

Bibliography

BIBLIOGRAPHY

Asuri, P. (1979) "Not by love alone" Journal of Home Science, Vol. 17, No. 6, P. 19.

Aykroyd, W.R., Patwardhan, V.N., Ranganathan, S. (1956) "The Nutritive value of Indian foods and the planning of satisfactory diets", PP. 16 - 17.

Bhat, V.R., Balmur, V., Bhatt, P. and Jariwalam, (1980) "Pattern of weight gain in pregnancy". Proceedings of Nutrition Society of India, No. 26, P. 24.

Balasubramanian, S.C. (1975) "Nutrition and pregnancy" Nutrition, Vol. 9, No. 3, P. 1.

Banik, N.D. (1977) "Major nutritional problems" Swasth Hind, Vol. 21, No. 4, P. 121.

Berg, A. (1981) "Malnourished people - A policy view". Poverty and Basic Needs Series, World Bank, June, 1981, PP. 19, 35, 64, 117.

Bhaskaran, C. (1975) "Effect of maternal malnutrition on maternal health and the outcomes of pregnancy" Nutrition Vol. 9, No. 3, PP. 15 - 16.

Burton, B.T. (1976) "Human nutritional Requirements", Human Nutrition, III Edn., Published by H.J. Heins Co. McGraw Hill, 1976, P. 153.

Campbell, J.A. (1974) "Approaches in revising dietary standards" Journal of American Dietetic Association, Vol. 64, No. 2, P. 175.

Chakravary, S.K. (1983) "Differential growth of population by income class" Yojana, Vol. 27, No. 23, P. 17.

Choudhary, B. and Sivakami, N. (1978) "Living next to nutrition." Journal of Home Science, Vol. 16, No. 11, P. 19.

Charley, H. (1982) Food Science, II Edn., John Wiley and Sons, New York, Chichester, Brisbane, Toronto, Singapore PP. 218, 227, 274, 276, 314, 448, 468, 487.

Chatley, A. (1983) "There is no substitute for mother's milk". World Health, February-March, 1983, P. 151.

Chandrasekhar, U. and Jayalakshmi, K. (1978) "Evaluation of protein quality of sprouted, roasted and autoclaved legumes on albino rats". Indian Journal of Nutrition and Dietetics, Vol. 15, No. 12, PP. 414-421.

Clarence, I.D. (1974) "Balanced diets for different regions of India". Nutrition, Vol. 8, No. 2, PP. 22 - 24.

Crevioto, J. (1978) "Intersensory development as a function of age stimulation and antecedents of severe malnutrition" Proceedings of the Nutrition Society of India, No. 22, 1978, PP. 1 - 5.

Darke, S.J. (1981) "Assessing the nutritional status of the populations" Nutritional Problems in Modern Society. Ed. by Howard, A.N. John Libbey and Co. Ltd., London, PP. 128, 129, 131.

Darwish, S.A., Amine, E.K. and Abdulla, S.M. (1982) "Food habits during pregnancy and lactation in Iraq" Food and Nutrition Bulletin, Vol. 4, No. 3, PP. 14 - 16.

Damodaran, M. (1975) "Dietary requirements of pregnant women" Nutrition, Vol. 9, No. 3, PP. 2 - 8.

Damon, A. (1964) "The evalution of dietary standards". The Sun Flower, Vol. 19, No. 1, P. 1.

Devadas, R.P., Prema, N. and Vijayalakshmi, R. (1973) "Formulation preparation and evaluation of diets based on the recommended allowances of ICMR for low income groups". Indian Journal of Nutrition and Dietetrics, Vol. 12, No. 5, PP. 153 - 155.

Devadas, R.P., and Easwaran, P. (1975) "Recommended dietary Allowances" The Manual on Basic Principles of Foods and Nutrition, PP. 53 - 68.

Devadas, R.P., Vijayalakshmi, R and Jacob, M. (1975) "Relationship between diet during pregnancy and nutritional status of the new born" Indian Journal of Nutrition and Dietetics, Vol. 12, No. 8, PP. 235 - 237.

Devadas, R.P., Vijayalakshmi, R and Vanitha, P. (1978) "Impact of nutrients on pregnancy lactation and growth performance of exterogestate foetus". Indian Journal of Nutrition and Dietetics, Vol. 15, No. 2, PP. 31 - 36.

Devadas, R.P., Vijayalakshmi, R and Chandy, A. (1980) "Nutritional status of the expectant mothers and their offspring". Indian Journal of Nutrition and Dietetics, Vol. 17, No. 8, PP. 275 - 279.

Devadas, R.P., Chandrasekhar, U and Bhooma, N. (1982) "Nutritional outcomes of a rural diet supplemented with low cost locally available foods. Impact on expectant women". Indian Journal of Nutrition and Dietetics, Vol. 19, No. 4, PP. 111 - 112.

Deosthale, M. G. (1983) "Pulses - Home processing and food value". Nutrition, Vol. 17, No. 3, P. 2.

Devi, P.K. (1980) "Maternal nutrition and foetal growth". Proceedings of the Nutrition Society of India, No. 26, 1980, PP. 20 - 21.

Dutta, L. and Barua, J.N. (1978) "Evaluation of nutritional quality of some rice varieties grown in Assam". Indian Journal of Nutrition and Dietetics, Vol. 15, No. 2, PP. 42 - 46.

Dispatch (1977) "A look at the dietary standard for Canada". Health and Welfare Canada, No. 39, Winter, 1977, PP. 1 - 4.

Dispatch (1983) "Recommended nutrient intakes for Canadians". Educational Services, Health Protection Branch, No. 54, Spring 1983, PP. 1 - 2.

English, R. (1982) "Dietary guidelines for Australians". Food and Nutrition, Vol. 38, No. 3, PP. 112 - 114.

Gopalan, C., Aykroyd, W.R and Balasubramanian, S.C. (1963). "The Nutritive Value of Indian foods and the planning of satisfactory diets" ICMR PP. 28 - 31.

Gopalan, C., Rama Sastri, B.V. and Balasubramanian, S.C. (1971) "Nutritive Value of Indian Foods", National Institute of Nutrition, ICMR, Hyderabad, India, PP. 26 - 32, 60 - 114.

Gopalan, C. (1973) "Malnutrition and its impact national development". Proceedings of the Nutrition Society of India, No. 13, PP. 68 - 72.

Gopalan, C., Rama Sastri, B.V. and Balasubramanian, S.C. (1984) "Nutritive Value of Indian Foods". National Institute of Nutrition, ICMR, Hyderabad, P. 26 - 32.

Gopalan, I. (1982). "Better nutrition at low cost". Nutrition, Vol. 16, No. 7, P. 21.

Gordon, B.M. (1983). "Why we choose the foods we do". Nutrition To-day, Vol. 18, No. 2, P. 8.

Gopinath, K. (1980). "Nutrition in a nutshell". Journal of Home Science, Vol. 18, No. 4, P. 3.

Gibson, D. (1983). "Women in the centre of the picture". World Health, July, 1983, P. 25.

Guthrie, H.A. (1975). "Introductory nutrition", III Edn. C.V. Mostly Co., St. Louis, P. 78.

Gupta, N. and Sharma, I. (1980). "An overview of the dietary consumption patterns of pregnant and lactating mothers of Haryana region, Hissar". Indian Journal of Nutrition and Dietetics, Vol. 17, No. 1, PP. 13 - 19.

Gujral, S. and Rajbhandari, R. (1981). "Dietary habits of Infant feeding practices of Nepalese lactating mothers". Indian Journal of Nutrition and Dietetics, Vol. 18, No. 10, PP. 365 - 371.

Hamilton, E.M.N. and Whitney, E.N. (1979) "Improving your diet". Nutrition Concepts and Controversies, West Publishing Co., Minnesota, PP. 301 - 306.

Harper, E.A. (1974) "Recommended Dietary Allowances. Are they what we think they are?". Journal of American Dietetic Association, Vol. 64, No. 2, P. 154.

Hawk, B.P., Oser, L.B. and Summerson, H.W. (1968) "Hawk's Physiological Chemistry", McGraw Hill Book Co., New York, P. 1123.

Haque, M. (1981) "Improving child nutrition". Journal of Home Science, Vol. 19, No. 2, P. 3.

Hegsted, D.M. (1972) "Problems in the use and interpretations of the RDA". Ecology of Food and Nutrition, An International Journal, Vol. 1, No. 4, P. 255.

Hertzler, D.A. and Anderson, H.L. (1974) "Food guides in U.S." Journal of American Dietetic Association, Vol. 64, No. 1, PP. 22-27.

ICMR (1977) "Maternal malnutrition and its effects on foetal nutrition". ICMR Bulletin, Vol. 7, No. 12, Report for the period 1977, P. 225.

ICMR (1984) "Biochemical research and the new twenty point programme - Maternal and Child Health". ICMR Bulletin, Vol. 14, No. 1.

IUNS (1982) "Recommended dietary intakes and allowance around the world". An Introduction of IUNS Committee Report, Foods and Nutrition Bulletin, Vol. 4, No. 4, PP. 34 - 43.

Israel, S. (1974) "Prenatal months: Mother and child care" Swasth Hind, Vol. 18, No. 11, P. 294.

Jain, S. (1979) "Look again at vegetables". Journal of Home Science, Vol. 17, No. 6, P. 5.

Jagannatham, M. (1979) "The prime need for pulses". Journal of Home Science, Vol. 17, No. PP. 23 - 24.

Kaur, Y.P., Sagar, V. and Khirwar, S.S. (1982) "Nutritional ecology and food consumption pattern of expectant mothers in selected villages and suburbs of Bhopal". Indian Journal of Nutrition and Dietetics, Vol. 19, No. 2, P. 50.

Lawang, N-C. and Gupta, V.M. (1980) "Anemia in pregnancy in rural community. influence of dietary intake in the multifactorial aetiology". Indian Journal of Nutrition and Dietetics, Vol. 17, No. 11, P. 414.

Madhukar, R.S. (1982) "Process pulses for better nutrition". Journal of Home Science, Vol. 20, No. 8, PP. 3 - 5, 8.

McDonald, B.E. (1984) "Commentry on the new recommended nutrient intakes for Canadians". Canadian Home Economics Journal, Winter 1984, Vol. 34, No. 1, P. 22.

Madhu Nath and Geer Vani. P. (1978) "Diet and nutrition of pregnant, lactating women and infants of urban slums of Hyderabad". Indian Journal of Nutrition and Dietetics, Vol. 15, No. 12, PP. 422 - 428.

Medved, E. (1973) "Planning". The World of Food. Gorr and Co., PP. 382 - 400.

Murray Keith, T. (1985) "Canadian dietary standards past and present". Prevention Preview, Vol. 4, No. 2, Winter 1985, PP. 5 - 6.

Nagarajan, V. (1983) "Nutrition at the door steps". Journal of Home Science, Vol. 21, No. 6, PP. 18 - 20.

NIN (1976) "Breast feeding". Nutrition, Nutrition Folders, Vol. 10, No. 3, PP. 15 - 18.

NIN (1976) "Care of pregnant women". Nutrition, NIN Folders, ICMR, Vol. 10, No. 2, PP. 13 - 16.

NIN (1981) "Nutrition and reproduction weight gains during pregancy in urban low income populations". Annual Report 1st January - 31 December, 1981 NIN ICMR, P.

NIN (1984) "Mineral composition of pulses". Nutrition News, Vol. 5, No. 2, NIN Hyderabad.

Osorio, P. (1985) "230 Million women in developing world suffer from nutritional anaemia". Swasth Hind, Vol. 27, No. 11, P. 264.

Panikar, P.G.K. (1979) "Employment income and food intake among selected agricultural labour households". Proceedings of the Nutrition Society of India, No. 23, PP. 21 - 31.

Patel, H.N. and Waghmare, S.K. (1972) "Audio visual aids as perceived and used by Mukhyasevikas of Applied Nutrition Programme. Indian Journal of Home Science, Vol. 6, No. 2, P. 114.

Peckham, G.C. (1974) "Foundations of food preparation". 3 Edn., Macmillan Publishing Co. Inc., New York. Macmillan Publishers, London, PP. 9 - 10.

Philip, T.E. (1965) "Planning of meals" Modern Cookery for teaching and trade, Vol. 1, Orient Longmans Limited, PP. 124 - 126.

Pike, R.L. and Brown, M.L. (1967) "Nutrition an integrated approach". John Wiley and Sons Inc., PP. 367, 373, 447, 449 - 450.

Prema, K. (1980) "Effect of lactation on maternal nutrition and fertility". Proceedings of the Nutrition Society of India, No. 26, P. 48.

Ramalingaswami, V. (1981) "Recommended Dietary Intakes for Indians". ICMR, New Delhi, P. 1.

Rasheed, P. and Mohammed, Z. (1978) "Health status of expectant women". Journal of the Indian Medical Association, Vol. 70, No. 4, PP. 73 - 76.

Radhakrishnabah, G.S. and Patwardhan, M.V. (1981) "Fruity freshness" Journal of Home Science, Vol. 19, No. 9 - 10, P. 16.

Rao, G.P., Mallikarjuna, K. and Rao, G.G. (1980) "Nutritional evaluation of some green leafy vegetables". Indian Journal of Nutrition and Dietetics, Vol. 17, No. 1, PP. 9 - 12.

Rao, V.K.R.V. (1979) "Purchasing power as determinant of food intake". Proceedings of the Nutrition Society of India, No. 25, P. 12.

Rao, N.P. (1974) "The Indian women". Nutrition Vol. 8, No. 2, P. 11.

Rao, K.S.J. (1979) "Attitudes to women and number of pregnancy in India". The Lancet, Vol. ii, P. 1357.

Robert, (1979) "Maternal and infant nutrition and health". Nutrition Reviews, Vol. 37, No. 2, P. 33.

Roberts, L.G. (1958) "Beginnings of the recommended dietary allowances". Journal of American Dietetic Association, Vol. 34, No. 9, PP. 905

Robinson, C.H. and Lawler, M.R. (1977) "Dietary guides and their uses". Normal and Therapeutic Nutrition, 15 Edn. MacMillan Publishing Co. Inc., New York, MacMillan Publishers, London, PP. 29 - 33.

Shank, E.R. (1958) "Revised recommended dietary allowances". Journal of American Dietetic Associations, Vol. 34, No. 9.

Seth, V. (1977) "Protein needs from pulses". Journal of Home Science, Vol. 15, No. 10 - 11, PP. 50 - 51.

Sebastian, E.V. (1977) "Maternal and child health". Swasth Hind, Vol. 21, No. 4, P. 104.

Sims, L.S. (1978) "Dietary hudier of lactating women". Journal of American Dietetic Association, Vol. 73, No. 2, PP. 139 - 140.

Sood, A. (1977) "Eating for Two" Journal of Home Science, Vol. 15, No. 10 - 11, PP. 53 - 57.

Sood, A. (1974) "Why do we need fats and how much". Journal of Home Science, Vol. 8, No. 2, PP. 14 - 15.

Sood, A. (1974) "Food for pregnant mothers". Journal of Home Science, Vol. 7, No. 12, PP. 12 - 15.

Srikantia, S.G. (1976) "Nutritional problems of rural people and corrective measures". Swasth Hind Vol. 20, No. 2, P. 44.

Suryavalli, K. (1979) "Your cup of milk". Journal of Home Science, Vol. 17, No. 7, PP. 5 - 6.

Sundararaj, R. and Pereira, S.M. (1973) "Diet of pregnant women in a South Indian community". Tropical and Geographical Medicine, Vol. 25, PP. 381 - 386.

Swaminathan, M.S. (1980) "Green power and freedom from hunger". Proceedings of the Nutrition Society of India, No. 26, PP. 8 - 15.

Thimmayamma, B.V.S. (1985) "Nutrition and welfare of the family". Nutrition, Vol. 17, No. 3, P. 11.

Thukral, R. (1983) "For more milk". Yojana, Vol. 27, No. 21, P. 14.

Varley, H., Gowenlock, A.H. and Bell, M. (1980) Practical Clinical Biochemistry, Vol. 1, Fifth Edn., PP. 973 - 978.

Venkatachalam, P.S and Rebello, L.M. (1978) "Nutrition for mother and child". Special Reports Series, No. 41, ICMR, Hyderabad, PP. 1 - 5.

Worthington, B.S., Vermeersch, J. and Williams, S.R. (1977). "Nutrition in pregnancy and lactation" C.V. Mosby Co., St. Louis, P. 88.

WHO (1976) What it is, what it does, how it works? Leaflet, Geneva, Switzerland.

Yadar, N.R. and Bharadwaj, (1971) "Biochemical studies on Indian wild legumes. (1) Chemical and nutritional constituents of some Indian wild legumes". Indian Journal of Nutrition and Dietetics, Vol. 8, No. 1, PP. 1 - 4.

Appendices

APPENDIX-A

HOME FOOD INTAKE OF VEGETARIANS AND NON-VEGETARIANS OBTAINED THROUGH WEIGHMENT SURVEY

Details	Subject Number	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and tubers	Fruit	Milk	Fats and oils	Sugar and jaggery
Vegetarians										
Normal	1	430	47	130	—	31	21	40	15	38
	2	448	—	2.0	59	8	29	50	3	42
	Mean	439	23.5	66	29.5	19.5	25	45	9	49
Expectant	1	369	—	—	—	—	18	365	1.2	35
	2	380	37	6	79	20	40	40	11	20
	Mean	374.5	18.5	3.0	39.5	10	29	202.5	6.1	27.5
Lactating	1	518	20	—	24	22	30	45	26	50
	2	415	—	46	—	80	26	15	15	38
	Mean	466.5	10	23	12	51	28	30	20.5	44
Non-vegetarians										
Normal	1	425	60.7	0.6	47.6	60	14.8	210	26.9	25
	2	410	—	36.0	—	20	33	—	23.0	25
	Mean	417.5	30.3	21.	23.8	40	23.9	105	24.9	25
Expectant	1	380	32	4	48	45	—	70	36	20
	2	469	32	2	16	45	55	40	9.5	26
	Mean	424.5	32	3	32	45	27.5	55	22.7	23
Lactating	1	448	40	6	62	40	22	143	20	28
	2	448	46	2	—	46	22	45	14	27
	Mean	448	43	4	31	43	22	97.5	17	27.5

APPENDIX-B

NUTRIENTS SUPPLIED BY THE HOME FOOD FOR VEGETARIANS AND NON-VEGETARIANS

Details	Subject Number	Proteins (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)	β Carotene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Vegetarians										
Normal	1	32.4	1800	187.0	23.0	447.0	1.03	0.4	18.0	17.0
	2	42.7	2023	181.0	15.0	389.0	1.5	0.5	18.6	170.5
	Mean	37.5	1912	184.0	24.0	418.0	1.3	0.4	18.0	94.0
Expectant	1	37.11	1685.	214.3	21.2	668.6	1.06	0.4	17.4	17.54
	2	35.5	1670	509.2	19.4	344.9	0.9	0.8	14.6	12.9
	Mean	36.0	1678.	362.0	20.0	507.0	1.0	0.6	16.0	15.0
Lactating	1	31.5	1854	327.0	21.6	3787.0	1.0	0.4	17.0	111.7
	2	40.2	2348	178.6	28.0	263.9	1.2	0.4	1.4	35.6
	Mean	36.0	2101	253.0	25.0	2025.0	1.1	0.4	9.3	74.0
Non-vegetarians										
Normal	1	50.9	2235	447.0	25.4	778.5	1.4	0.9	19.5	25.4
	2	29.7	1800	258.0	32.2	2900.6	1.0	0.3	16.5	94.3
	Mean	40.0	2018	353.0	29.0	1800.0	1.2	0.6	18.0	60
Expectant	1	40.6	1985	208.0	24.2	533.0	1.3	0.4	19.6	23.3
	2	35.6	1921.9	228.9	21.2	997.0	1.0	0.4	17.6	7.2
	Mean	38.0	1953	219.0	23.0	765.0	1.2	0.4	18.6	15.3
Lactating	1	41.6	2013	207.8	24.7	742.9	1.3	0.4	19.0	12.2
	2	43.8	2118.8	348.3	24.9	734.1	1.7	0.6	19.3	17.8
	Mean	43	2066	278	25.0	739	1.5	0.5	19.0	15

APPENDIX-G

NUTRITIVE VALUE OF PLANNED MENUS FOR VEGETARIAN AND NON-VEGETARIAN WOMEN

NUTRITIVE VALUE OF VEGETARIAN DIET - FIRST DAY'S MENU

Food item/Details	Gm	Proteins (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)	β Carotene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Cereals	440	32.96	1524.8	48.0	14.72	0	0.814	0.19	14.08	0
Pulses	45	10.03	150.7	32.8	2.61	59.4	0.20	0.085	1.3	0
Green leafy vegetables	100	5.36	69.29	426.7	15.97	6178.2	0.04	0.186	0.01	15 6.3
Other vegetables	40	0.16	4.0	12.0	0.32	0	0.024	0.004	0.16	0.4
Roots and tubers	50	0.625	36.2	22.5	0.72	478.5	0.035	0.001	0.45	5.0
Fruits	30	0.27	6.0	14.4	0.12	105.3	0.03	0.015	0.12	8.1
Milk	150	4.65	90.0	223.5	0.3	45.9	0.07	0.24	0.3	3.0
Oil and fat	25	—	225.0	—	—	—	—	—	—	—
Sugar and jaggery	20	0.02	79.6	2.4	—	—	—	—	—	—
Total		54.07	2185.7	782.3	34.76	6867.3	1.21	0.727	16.42	172.8
RDA		45.	2200	400-500	32	3000	1.1	1.3	15.0	40.0
Pregnancy extra		8.87	283.2	136.9	8.61	75.15	0.15	0.207	1.69	2.0
Total		62.96	2468.7	919.2	43.38	6942.45	1.36	0.934	18.11	174.8
RDA		59.0	2500	500-600	40	3000	1.3	1.5	17.0	40.0
Lactation extra		13.92	515.1	150.6	15.05	92.1	0.23	0.22	2.89	2.0
Total		67.99	2700.62	932.9	49.81	6959.4	1.44	0.947	19.31	174.8
RDA		45	2600	400-500	32.0	4600	1.3	1.3	18.0	80

NUTRITIVE VALUE OF VEGETARIAN DIET - SECOND DAY'S MENU

Food item/Details	Gm	Proteins (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)	β Carotene (μg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Cereals	440	33.76	1526.6	62.0	20.12	65.8	1.148	0.332	15.74	0
Pulses	45	10.30	152.7	33.15	3.01	46.95	0.205	0.087	1.25	0
Green leafy vegetables	100	5.63	69.29	426.3	15.97	6178.2	0.04	0.186	0.01	156.3
Other vegetables	40	0.84	24.0	9.2	0.8	50.4	0.02	0.02	0.16	38.4
Roots and tubers	50	0.8	48.5	5.0	0.35	12.0	0.05	0.005	0.6	8.5
Fruits	30	0.27	6.0	14.4	0.12	105.3	0.03	0.015	0.12	8.1
Milk	150	4.65	90.0	223.5	0.3	45.9	0.07	0.24	0.3	3.0
Oil and fat	25	—	225.0	—	—	—	—	—	—	—
Sugar and jaggery	20	0.02	79.6	2.4	—	—	—	—	—	—
Total		56.06	2221.6	775.6	40.67	6504.5	1.55	0.659	18.16	211.6
RDA		45.0	2200	400-500	32.0	3000	1.1	1.3	15.0	40.0
Pregnancy extra		9.2	275.85	137.95	3.93	75.15	0.15	0.19	1.72	2.0
Total		65.26	2497.45	913.55	44.6	6597.6	1.7	0.862	19.88	213.6
RDA		59.0	2500	500-600	40.0	3000	1.3	1.5	17.0	40.0
Lactation extra		14.46	412.5	152.4	7.01	92.01	0.25	0.196	2.95	2.0
Total		70.52	2634.1	928	47.68	6596.6	1.93	0.865	21.11	213.6
RDA		45.0	2600	400-500	32.0	4600.0	1.5	1.5	18.0	80.

NUTRITIVE VALUE OF VEGETARIAN DIET - THIRD DAY'S MENU

Food items/Details	Gm	Proteins (g)	Calories (K. Jul)	Calcium (mg)	Iron (mg)	β Carotene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Cereals	440	38.56	1529.0	70.4	17.24	65.8	1.04	0.302	13.1	0
Pulses	45	10.03	150.7	32.8	2.61	59.4	0.20	0.08	1.30	0
Green leafy vegetables	100	5.36	69.29	426.3	15.97	6178.2	0.44	0.186	0.01	156.3
Other vegetables	40	0.72	38.1	12.30	0.35	0.72	0.046	0.005	0.44	7.3
Roots and tubers	50	0.56	9.6	7.2	0.36	29.6	0.016	0.044	0.36	4.8
Fruits	30	0.27	6.0	14.4	0.12	105.3	0.03	0.015	0.12	8.1
Milk	150	4.65	90.0	225.5	0.3	45.9	0.07	0.24	0.3	3.0
Oil and fat	25	—	225.0	—	—	—	—	—	—	—
Sugar and jaggery	20	0.02	79.6	2.4	—	—	—	—	—	—
Total		60.17	2196.2	789.3	36.95	6485.0	1.43	0.87	15.63	179.5
RDA		45.	2200	400-500	32.0	3000	1.1	1.3	15.0	40
Pregnancy extra		7.89	283.2	136.9	8.6	75.15	0.15	0.207	1.69	2.0
Total		69.06	2481.4	926.2	45.57	6560.2	1.58	1.07	17.32	181.5
RDA		59	2500	500-600	40.0	3000	1.3	1.5	17.0	40
Lactation extra		13.92	515.1	150.6	15.05	92.1	0.25	0.22	2.89	2.0
Total		74.09	2713.3	939.9	52.0	6577.2	1.66	1.09	18.52	181.5
RDA		45	2600	400-500	32.0	4600	1.3	1.5	18.0	80.0

NUTRITIVE VALUE OF NON-VEGETARIAN DIET - FIRST DAY'S MENU

Food items/Details	Gm	Protein (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)	β Carotene (µg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Cereals	440	32.96	1524.8	48	14.72	0	0.814	0.19	14.08	0
Pulses	22.5	5.12	77.05	16.79	1.33	30.3	0.103	0.94	0.66	0
Egg	1 egg	6.65	86.05	30.0	1.05	300	0.05	0.2	0.05	0
Green leafy vegetables	100	5.36	69.29	426.7	15.97	6173.2	0.04	0.186	0.01	156.3
Other vegetables	40	0.16	4.0	12.0	0.32	—	0.024	0.004	0.16	0.4
Roots and tubers	50	0.625	36.2	22.5	0.72	478.5	0.035	0.007	0.45	5.0
Fruits	30	0.27	6.0	14.4	0.12	105.3	0.03	0.015	0.12	8.1
Milk	100	4.65	90.0	225.5	0.3	45.9	0.07	0.21	0.3	3.0
Oil and fat	30	—	270.0	—	—	—	—	—	—	—
Sugar and jaggery	20	0.02	79.8	2.4	—	—	—	—	—	—
Total		55.81	2243.4	796.29	34.53	7138.2	1.16	0.882	15.63	172.8
RDA		45	2200	400-500	32.0	3000.0	1.1	1.3	15.0	40
Pregnancy extra		8.89	283.2	136.9	8.62	75.15	0.15	0.207	1.69	2
Total		64.7	2526.6	933.19	43.15	7213.35	1.31	1.089	17.32	174.8
RDA		59	2300	500-600	40	3000	1.3	1.5	17.0	40
Lactation extra		13.92	515.1	150.6	15.05	92.1	0.23	0.22	2.89	2
Total		69.7	2758.5	946.09	49.58	7220.3	1.39	1.102	18.72	174.8
RDA		45	2600	400-500	32.0	4000.0	1.3	1.5	18.0	80

NUTRITIVE VALUE OF NON-VEGETARIAN DIET - SECOND DAY'S MENU

Food items/Details	Gm	Proteins (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)	β Carotene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Cereals	440	33.76	1526.6	62.0	20.12	65.8	1.148	0.332	15.74	0
Pulses	22.5	5.34	77.3	16.72	1.70	17.25	0.10	0.04	0.517	0
Egg	1 egg	6.65	86.5	30.0	1.05	300.0	0.05	0.2	0.05	0
Green leafy vegetables	100	5.36	69.29	426.3	15.97	6178.2	0.04	0.186	0.01	156.3
Other vegetables	40	0.84	24.0	9.2	0.8	50.4	0.02	0.02	0.16	38.4
Roots and tubers	50	0.8	48.5	5.0	0.35	12.0	0.05	0.005	0.6	8.5
Fruits	30	0.27	6.0	14.4	042	105.3	0.03	0.015	0.12	8.1
Milk	150	4.65	90.0	223.5	0.3	45.9	0.07	0.24	0.3	3.0
Oil and fat	30	—	270	—	—	—	—	—	—	—
Sugar and jaggery	20	0.02	79.6	2.4	—	—	—	—	—	—
Total		57.69	2297.7	789.5	40.41	6774.8	1.508	1.038	17.515	214.3
RDA		45	2200	400-500	32.0	3000.0	1.1	1.3	15.0	40.0
Pregnancy extra		9.2	275.85	137.95	3.93	75.15	0.15	0.193	1.72	2.0
Total		66.86	2573.5	927.45	44.34	6849.9	1.65	1.231	19.267	216.3
RDA		59	2500	500-600	40.0	3000.0	1.3	1.5	17.0	40.0
Lactation extra		14.46	412.5	152.4	7.01	92.1	0.23	0.196	2.95	2.
Total		72.15	2710.2	941.9	47.41	6866.9	1.73	1.23	20.5	216.3
RDA		45	2600	400-500	32.0	4600.0	1.3	1.5	18.0	80.0

NUTRITIVE VALUE OF NON-VEGETARIAN DIET - THIRD DAY'S MENU

Food items/Details	Gm	Protein (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)	β Carotene (µg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Cereals	440	38.56	1529	70.4	17.24	65.8	1.04	0.302	13.1	0
Pulses	22.5	5.12	77.05	16.79	1.33	30.36	0.103	0.04	0.66	0
Egg	1 egg	6.65	86.5	30.0	1.05	300.0	0.05	0.2	0.05	0
Green leafy vegetables	100	5.36	69.29	426.3	15.97	6178.2	0.04	0.186	6.01	156.3
Other vegetables	40	0.56	9.6	7.2	0.36	29.6	0.016	0.044	0.36	4.8
Roots and tubers	50	0.72	39.1	12.38	0.35	0.72	0.04	0.005	0.44	7.3
Fruits	30	0.27	6.0	14.4	0.12	105.3	0.03	0.015	0.12	8.1
Milk	150	4.65	90.	223.5	0.3	45.9	0.07	0.24	0.3	3.0
Oil and fat	30	—	270	—	—	—	—	—	—	—
Sugar and jaggery	20	0.02	79.6	2.4	—	—	—	—	—	—
Total		61.91	2256.14	803.3	36.45	6755.88	1.38	1.03	21.13	179.5
RDA		45	2200	400-500	32.0	3000.0	1.1	1.3	15.0	40
Pregnancy extra		7.89	283.2	136.9	8.6	75.15	0.15	0.207	1.69	2
Total		70.8	2539.3	940.2	45.05	6831.0	1.53	1.237	22.82	181.5
RDA		59	2500.0	500-600	40	3000	1.3	1.5	17.0	40
Lactation extra		13.92	515.1	150.6	15.05	92.1	0.23	0.22	2.89	2
Total		75.11	3099.4	953.9	51.5	6847.98	1.61	1.25	24.02	181.5
RDA		45	2600	400-500	32	4600	1.3	1.5	18.0	80.0

APPENDIX-D

NUTRITIVE VALUE OF THREE DAYS MENU AS ANALYSED

Details	Vegetarians				Non-vegetarians			
	Proteins (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)	Protein (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)
Normal women								
First Day	51.35	2130.5	704.1	31.36	58.6	2205.1	723.3	33.4
Second Day	52.75	2170.5	702.5	36.8	54.6	2246.7	718.5	35.3
Third Day	58.25	2147.5	712.5	33.5	52.6	2192.4	716.3	31.5
Mean	54.1	2149	706	33.8	55.3	2214	719.4	33.4
Expectant women								
First Day	59.5	2417.0	828.4	39.3	61.5	2474.6	843.1	39.1
Second Day	62.3	2447.0	832.3	40.2	63.6	2521.7	837.3	38.5
Third Day	70.0	2430.0	835.0	41.3	67.2	2488	845.2	41.5
Mean	62.7	2431	831.8	40.2	64.1	2494	841.8	39.7
Lactating women								
First Day	64.5	2649	839.0	46.5	67.2	2706	851.7	45.4
Second Day	68.3	2582	836.0	43.2	69.3	2658	846.5	43.3
Third Day	71.6	2661	846.5	48.8	72.7	3047	868.5	47.3
Mean	68.1	2630	840.3	46.2	69.7	2804	855.6	45.2

APPENDIX-E

DETAILS OF FOOD CONSUMPTION BY THE SUBJECTS

CONSUMPTION BY VEGETARIAN WOMEN (g)

Details of women	Subject Number	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and tubers	Milk	Fruits	Oil and fat	Sugar and jaggery
Normal	1	409.3	49.5	115.0	53.3	58.3	150	30	33.3	38
	2	397.6	40.0	85.0	26.6	50.0	150	30	23.3	28
	3	405.3	40.3	100.0	40.0	50.0	100	40	25.0	30
	4	465.5	51.0	107.6	46.6	58.3	150	30	27.5	34
	5	378.3	46.6	100.0	40.0	58.3	175	30	25.8	32
	Mean	415.3	45.4	101.5	44	55	145	32	31.8	32
Expectant	1	417.8	55.0	74.3	13.3	52.6	216.6	33.3	21.6	30
	2	566.3	65.0	85.0	46.6	50	275.0	30.0	26.6	40
	3	464.5	58.6	100.0	40	50	250.0	30.0	25.0	32
	4	409	60.0	100.0	32.3	41.6	216.6	30.0	25.0	45
	5	461.4	61.3	100.0	46.6	50	250.0	30.0	25.0	43
	Mean	468.8	60.0	91.8	35.8	48.8	30.6	241.6	24.6	38
Lactating	1	460.6	75.6	100.0	39.3	50	225	30	35	40
	2	511.3	75.0	100	40.0	50	250	30	35	38
	3	558.4	75.0	93.3	39.3	50	250	30	34.3	46
	4	511.6	75	100	40	50	250	30	35	41
	5	511.2	74.8	99.3	39.8	50	250	30	35	35
	Mean	510.4	74.6	98.3	39.6	50	243.7	30.	34	40

CONSUMPTION BY NON-VEGETARIAN WOMEN (g)

Details of women	Subject Number	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and tubers	Fruits	Milk	Oil and fat	Sugar and jaggery
Normal	1	415	22.5 + 1 egg	100.0	40.0	50	30	162.6	30.0	30
	2	440	22.5 + 1 egg	100.0	66.6	50	30	125.0	30.0	28
	3	395	22.5 + 1 egg	100.0	40.0	50	30	150.0	30.0	38
	4	507.6	22.5 + 1 egg	131.3	40.0	54.3	35	150.0	34.3	40
	5	428.3	22.5 + 1 egg	116.6	53.3	50	30	166.6	35.0	24
	Mean	437.2	22.5 + 1 egg	109.6	48	50.8	32	150.8	31.8	32
Expectant	1	451	30 + 1 egg	100	40	50	30	250	30	44
	2	453.3	30 + 1 egg	100	50	50	30	250	28	38
	3	408.3	30 + 1 egg	100	40	46	30	225	34	47
	4	450	30 + 1 egg	102	30	54	30	275	28	46
	5	452	30 + 1 egg	98	53.3	50	30	250	30	35
	Mean	437.5	30 + 1 egg	100	44.4	50	30	241.6	30	42
Lactating	1	564.3	40.3+ 1 egg	149.3	40	54.3	35	283.3	44.3	55
	2	454.3	37.5+ 1 egg	100	40	50	30	225	40	33
	3	509.3	37.5+ 1 egg	100	40	50	30	250	40	42
	4	585.3	37.5+ 1 egg	131.3	40	52.6	35	300	44.3	38
	5	510	37.5+ 1 egg	100	52.6	35	40	241.6	40.5	57
	Mean	524.6	38 + 1 egg	116.1	40	51.6	33	260	41.8	45

APPENDIX-F

DETAILS OF NUTRIENT INTAKE BY THE SUBJECTS

INTAKE BY VEGETARIAN WOMEN

Details of women	Subject Number	Proteins (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)	β Caretene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Normal	1	54	2150	760	38.8	6548	1.5	0.93	18.0	220
	2	48	2120	777	36.7	6559	1.1	0.82	16.3	218
	3	48	2128	787	37.3	6601	1.5	0.82	16.6	213
	4	64	2350	783	42.0	6700	1.3	0.90	19.2	233
	5	53	2129	743	39.0	6500	1.4	0.80	17.4	228
	Mean	54.37	2136.1	772.77	39.8	6605.5	1.4	0.85	17.34	221.7
Expectant	1	58.2	2383	870	39	6003	1.6	1.1	18.8	199.3
	2	69.3	2615	910	45	6095	1.9	1.1	20.3	226.1
	3	66.8	2600	908	43	6028	1.8	0.98	21.6	218.3
	4	57.3	2313	878	38	6105	1.5	0.99	17.3	188.0
	5	63.8	2412	899	41	6111	1.7	0.9	18.9	208.3
	Mean	64.06	2457.4	894.57	41.92	6053.3	1.7	1.05	19.62	209.18
Lactating	1	67.8	2750	871.6	43.8	6438.6	1.7	0.9	18.6	200
	2	78.8	2833	868.6	46.7	6800	1.9	1.4	23.4	223
	3	75.3	2810	881.4	48.3	6788	2.0	1.2	22.3	218
	4	73.1	2760	878.0	44.5	6200	1.6	1.1	23.9	216
	5	65.3	2768	860.3	41.2	6386	1.8	1.1	20.8	208
	Mean	71.35	2800	872	46	6539	1.8	1.2	21.0	213

INTAKE BY NON-VEGETARIAN WOMEN

Details of women	Subject Number	Proteins (g)	Calories (K. Cal)	Calcium (mg)	Iron (mg)	β Carotene (μg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Normal	1	49.6	2980	828.6	40.8	7376	1.4	1.0	16.2	238
	2	59.3	2302	838.3	41.3	7368	1.38	1.36	17.6	242
	3	58.6	2388	834.8	41.9	7468	1.6	0.9	19.5	228
	4	61.3	2368	834.0	42.3	7363	1.5	1.1	17.3	227
	5	57.8	2408	838.0	40.6	7378	1.7	0.9	16.4	225
	Mean	57.32	2343	854.2	41.97	7304.6	1.509	1.05	17.47	232.3
Expectant	1	61.8	2488	979.3	39.8	6820	1.4	1.0	17.3	197
	2	60.3	2530	988	41.0	6800	1.5	1.2	18.8	239
	3	63.8	2628	968	39.0	6819	1.8	1.4	18.7	226
	4	58.3	2400	985	41.6	6839	1.6	1.0	16.6	231
	5	64.6	2384	976	42.5	6870	1.5	0.9	18.2	204
	Mean	61.71	2485.9	979.46	40.58	6829.8	1.57	1.17	17.93	219.9
Lactating	1	69	2868	938	45.3	7884.5	1.8	1.3	19.0	238
	2	78	2900	1075	47.6	7831.5	1.5	1.0	16.0	252
	3	73	2898	1216	52.3	7900	2.1	2.1	22.8	241
	4	68	2945	1020	50.1	7739	1.6	1.2	26.1	236
	5	72.6	2938	1001	45.5	7836	2.0	1.0	21.0	243
	Mean	72.47	2909.4	1050	48.17	7838.5	1.83	1.32	21.0	242.68