III METHODOLOGY

The methodology of the study entitled, “Dietary Practices of Irula Tribes and the Impact of Intervention Programmes among Target Groups”, comprised of five phases:

Phase I: Study the background information
   A. Selection of venue and sample
   B. Collection of data on
      1. Socio-economic profile
      2. Dietary pattern and lifestyle practices

Phase II: Assessment of nutritional status
   A. Anthropometric measurements
   B. Clinical examination
   C. Dietary assessment
   D. Biochemical analysis

Phase III: Product development
   A. Development of iron rich supplementary mix
   B. Standardization and acceptability test for supplementary mix
   C. Analysis of nutrients of standardized supplementary mix

Phase IV: Intervention programmes
   A. Ethical issue
   B. Selection of subsample
   C. Dietary intervention
   D. Health and nutrition education

Phase V: Impact of intervention programmes
   A. Anthropometric measurements
   B. Clinical signs and symptoms of nutritional deficiencies
   C. Mean nutrient intake
   D. Haematological parameters
   E. Knowledge, Attitude and Practice score
   F. Analysis of data
PHASE I: STUDY THE BACKGROUND INFORMATION

A. Selection of venue and sample

A multi-stage sample is one in which sampling is done sequentially across two or more hierarchical levels such as first at the country level, second at the census track level, third at the block level, fourth at the household level and ultimately at the within-household level (www.srmo.sagepub.com/view/encyclopedia-of-survey-research.../n311.xml). In selecting the venue, multistage sampling method was followed. In the first stage, state level Tamil Nadu, second stage district level Coimbatore, third stage block level Karamadai, fourth stage Panchayat level Tholampalayam and finally at fifth stage settlements, 12 out of 19 tribal settlements that are easy access and convenience were selected.

Coimbatore District in Tamil Nadu geographically occupied by hilly areas and popularly known as “Manchester of South India” was chosen as the area for conduct of the study. Coimbatore is one of the largest cities in Tamil Nadu and neighbouring state of Kerala, named after the Rishi Koyam Pattur as Coimbatore and holds the fourth highest tribal population of Irula today.

The maximum tribe settlements are found at the foothills of Tholampalayam Panchayat of Karamadai block, which is 51 kilometres away from Coimbatore, and at an altitude of 372 metres above mean sea level were selected for the study.

According to Khan (2008), sampling method is the process or method of drawing definite number of individuals, cases or observations from a particular universe, selecting part of a total group for investigation. When dealing with people, it can be defined as a set of respondents (people) selected from a larger population for the purpose of a survey.

Mode of transport by road was accessible only for few settlements but for other settlements, it was only by walking through narrow passages. Tribal volunteer in the settlements were accompanied to have a proper and better rapport, communication and to study the situation effectively. A census is the procedure of systematic acquiring and recording information about the...
members of a given population and it is a regularly occurring and official count of a particular population. Sometimes the entire population will be sufficiently small; the researcher can include the entire population in the study (http:www.statpac.com/surveys/sampling.htm).

Among the 12 tribal settlements all the 705 tribal families with a total population of 2665 from Tholampalayam Panchayat, Karamadai Block, Coimbatore District of Tamil Nadu State were selected by following census method. The name of the selected settlements and number of families in each settlement are given in Figure 1.

B. Collection of data

The purpose of data collection is to obtain information to keep record, to make decisions about important issues and to pass information to others. Primarily, data is collected to provide information regarding the specific topic (Australian Bureau of Statistics, 2011).

A schedule may be defined as a proforma that contains a set of questions, which are asked and filled by an interviewer in a face to face situation with another. It is a standardized devise or tool of observation to collect the data in an objective manner (Depak, 2006).

The background information, dietary pattern and life style practices of 705 families of irula tribes were collected using a well-framed interview schedule given in Appendix I.
FIGURE 1
SELECTED TRIBAL SETTLEMENTS

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name</th>
<th>Number of Families</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Neelampachi</td>
<td>71</td>
</tr>
<tr>
<td>2.</td>
<td>Ukkapathi</td>
<td>55</td>
</tr>
<tr>
<td>3.</td>
<td>Motiyur</td>
<td>55</td>
</tr>
<tr>
<td>4.</td>
<td>Uggaynur</td>
<td>58</td>
</tr>
<tr>
<td>5.</td>
<td>Kaliyur</td>
<td>41</td>
</tr>
<tr>
<td>6.</td>
<td>Senkuttai</td>
<td>59</td>
</tr>
<tr>
<td>7.</td>
<td>Seenguli</td>
<td>92</td>
</tr>
<tr>
<td>8.</td>
<td>Colony Pudur</td>
<td>78</td>
</tr>
<tr>
<td>9.</td>
<td>Alankudi</td>
<td>54</td>
</tr>
<tr>
<td>10.</td>
<td>Alankudi Pudar</td>
<td>37</td>
</tr>
<tr>
<td>11.</td>
<td>Alankaduva</td>
<td>46</td>
</tr>
<tr>
<td>12.</td>
<td>Gopanari</td>
<td>59</td>
</tr>
</tbody>
</table>
1. Socio-economic profile

A pretested, structured interview schedule designed by the investigator was used as a tool for the conduct of the study at selected tribal settlements.

Personal interviews are those in which an interviewer obtains information from respondents in the face to face contact and is generally filled out by the research worker or enumerator who can interpret questions when necessary (Plate 1). The information obtained by this method is likely to become more accurate because the interviewer can clear up doubts, cross examine the information and thereby obtain correct information (Kothari, 2004 and Gupta, 2007). Thus by direct personal household interview and by observation, demographic and socio economic details related to age and gender, religion, type of family, size of the family, educational status of the family members, occupational status of the families, monthly income, basic amenities and facilities available for the selected tribal families, mean monthly expenditure pattern and on kitchen garden, vaccination, medical facility and hygiene were elicited from 705 tribal families.

2. Dietary pattern and lifestyle practices

Dietary pattern embracing type of diet, meal pattern, food consumption, food preservation techniques, fuel and utensils used for cooking, special foods used, food fads and believes, ceremonies, plant foods used for health problems also on lifestyle habits like smoking, chewing of tobacco, alcohol consumption, intake of coffee, tea and on waste disposal management were collected from all the 705 tribal families.
PLATE 1
DIRECT HOUSEHOLD INTERVIEW
PHASE II: ASSESSMENT OF NUTRITIONAL STATUS

The term “Nutritional Status” comes from a Latin word, “asses” which means ‘to sit by’ or ‘watch over’. Jelliffe, (1988), Bamji et al. (2009) and David (2003) stated that the process of measuring nutritional health is usually termed as nutritional assessment. It helps to evaluate nutrition related risks that may jeopardize a person’s current or future. The measures of nutritional status are usually valuable as much as they may be predictive of health outcomes (Christopher et al., 2012). Factual evidence of the exact magnitude of malnutrition is essential to sensitize administrators and planners to obtain allocation of material and human resources and to plan appropriate intervention strategies. Hence, nutritional assessment was done through the anthropometric measurements, clinical examination, dietary survey and biochemical analysis.

A. Anthropometric Measurements

Nutritional anthropometry is a non-invasive measurement of human body at different age levels and degrees of nutrition. Anthropometry is the measurement of physical dimension, which reveals the size, and shape of the body. Growth retardation may be the first response of the body towards nutritional deficiencies while appearance of clinical signs may be the final stage. It is the most valuable data when they reflect accurate measurements (Mohan, 2008).

Body weight and stature (standing height) are measures of body size, whereas ratios of body weight to height can be used to represent body proportions (Vivian and Dale, 2004).

Among the selected 705 families, there were 2665 members in which 59 infants (0-1 year), 72 pregnant and nursing mothers and 161 elderly (above 60 years of age) were excluded from the study group. Thus, 2373 subjects in the age group of 1-60 years were selected for the study.

Anthropometric measurements such as body weight and height for the selected 2373 subjects comprising children, adolescents and adults were taken using standard procedures recommended by Jelliffe and Jelliffe (1989).
1. **Height**

The height of an individual is influenced both by genetic and environmental factors (Bamji *et al.*, 2004). Height is affected only by long term deprivation, it is considered as an index of chronic or long duration malnutrition. The subjects were asked to stand against a wall, barefoot and with heels, buttocks, shoulders and back of the head touching the wall with the arms hanging freely at the sides in a natural manner. So that the top of the external auditory meatus was in level with the interior margin of the body orbit. The height of the subject was taken with the help of a scale kept perpendicular to the wall. A mark was made on the wall. Height was measured (Plate 2) using a non-stretchable and flexible fibre glass measuring tape to the accuracy of 0.1 cm (Brahman *et al.*, 2005; and Deshmukh, 2005).

2. **Weight**

Weight is the most used anthropometric measurement and is time honoured, basic indicator in clinical practice. Body weight is a simple reproducible anthropometric measurement for the evaluation of nutritional status of the population. According to Whitney (2006), it is a more sensitive measure of nutritional adequacy than that of height and reflects recent nutritional status. Weight also provides a crude evaluation of overall fat and muscle stores.

Body weight was measured (Plate 2) to the nearest 0.1 kg with the subject standing motionless on the weighing scale. Weight was taken for each subject under basal conditions with minimum clothing, without footwear and on an empty stomach and bladder. The subjects were asked not to lean against or hold anything, while the weight was recorded. The weighing scale was checked and calibrated to zero every time prior to weighing the subjects.

3. **Body Mass Index (BMI)**

Body Mass Index provides a quick and relatively easy indication of obesity or underweight of individuals (Israel *et al.*, 2004). It is a simple index of weight for height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilogram divided by the height in metre square (kg/m²). BMI values are age independent and the
same for both sexes. The nutritional status of adults (men and women) were determined by computing Body Mass Index (BMI) and graded based on BMI as suggested by WHO (2004).

\[
\text{BMI} = \frac{\text{Weight in kg}}{\text{Height in m}^2}
\]

<table>
<thead>
<tr>
<th>BMI</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 18.4</td>
<td>Underweight</td>
</tr>
<tr>
<td>18.5 – 22.9</td>
<td>Normal</td>
</tr>
<tr>
<td>23.0 – 24.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>25.0 – 29.9</td>
<td>Obesity I</td>
</tr>
<tr>
<td>&gt;30</td>
<td>Obesity II</td>
</tr>
</tbody>
</table>

Body mass index for children and adolescents were calculated and classified based on age and gender specific BMI percentile as given below (ICMR, 2010).

- Underweight - BMI < 5th percentile
- Healthy weight – BMI ≥ 5th - < 85th percentile
- Overweight – BMI ≥ 85th - < 95th percentile
- Obese – BMI ≥ 95th percentile

B. Clinical Examination

Clinical examination is a commonly used method for assessment of nutritional status of communities, since it is relatively simple in community situation, does not call for sophisticated equipment and helps to reveal the anatomical changes by naked eye. It includes physical examination and medical history (Kenneth, 2002).

Clinical examination (Plate 2) was carried out for all the subjects in the age range of 1-60 years, using ICMR clinical assessment proforma (Appendix II) with the help of a physician in order to detect the presence of any nutritional clinical symptoms that is related to deficiency of one or more nutrients. The conduct of medical camps was intimated to each settlement by distributing handouts (Appendix III). Screening of the clinical manifestations among all the selected subjects were undertaken by organizing seven medical camps in 12 settlements.
PLATE 2
NUTRITIONAL ASSESSMENT OF THE SELECTED TRIBALS
Clinical examination has always been and remains a widely utilized practical direct method for assessment of nutritional status of individual and communities (Jeejeebhoy, 2000). Clinical signs of anaemia for a subsample of 90 tribal adolescent girls who were studying at Tholampalayam Higher Secondary School and 200 Irula tribal adult women (30-50 years) from 130 families of two settlements were carefully examined by trained medical practitioners. Assessment by clinical signs was based on examination for changes, believed to be related to inadequate iron intake that can be seen or felt in epithelial tissue, especially pallor of skin and nails, scaly hair, headache, dimness of vision and cheilosis.

**C. Dietary Assessment**

Dietary assessment is done for obtaining qualitative details of diet and studying the pattern of food consumption. Diet surveys constitute an essential part of any complete study of nutritional status of individuals or groups, providing essential information on nutrient intake and sources of nutrients, food habits and attitudes. Under conditions, where frank signs of malnutrition do not exist, a survey of intake of nutrients may give an indication of the adequacy of the diet for promoting optimal nutrition of individuals or groups (Swaminathan, 2006). One tenth of the 2373 subjects constituting 122 males and 116 females belonging to different age groups were selected for the dietary assessment and the details are shown in Table I.

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of subjects</th>
<th>Male (N:122)</th>
<th>Female (N:116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toddlers (1-3 years)</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Pre-school children (4-6 years)</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>School going children (7-9 years)</td>
<td>11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Adolescents (10-18 years)</td>
<td>13</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Young adults (19-30 years)</td>
<td>72</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>Middle adults (30-60 years)</td>
<td>18</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
A 24-hour dietary recall survey was done for 238 subjects for three consecutive days using a dietary schedule as shown in Appendix IV. The amount of food used for the preparation and consumed was quantified from the concerned homemakers. The amount of raw ingredients used for each preparation, the total amount of food prepared for the family for each preparation and an individual intake of food was measured using a standard cups and measures. The cups were used mainly to aid the respondents to recall the quantities prepared and fed to the individual members. Then the mean raw equivalents of food consumed were computed and the mean nutrient intake was calculated using food composition table of ICMR (2011). Percent adequacy of nutrients was computed using the Recommended Dietary Allowances (ICMR, 2011) for Indians.

D. Biochemical Analysis

Biochemical tests can be conducted on easily accessible body fluids such as blood and urine, which help to diagnose disease at the sub-clinical stage, confirm clinical stage or confirm clinical diagnosis at the stage of the disease (Bamji et al., 2009).

The haemoglobin level was estimated (Plate 2) for all the 146 tribal adolescent girls in the age group of 13-15 and 16-18 years and 833 adult women by using cyanmethaemoglobin method for which the blood sample was collected by finger prick (Appendix V). A haemoglobin level of less than 12g/dl, the cut-off point suggested by WHO (2007) for anaemia was chosen as the indicator to identify the mild anaemic (11-11.9g/dl), moderate (8-10.9g/dl), and severe anaemic (<8g/dl) tribal adolescent girls and adult women.

PHASE III: PRODUCT DEVELOPMENT

The creation of products with new or different characteristics offer additional benefits to the customer. Product development may involve modification of an existing product or its presentation, or formulation of an entirely new product (http://www.businessdictionary.com/definition/product-development.html).
A. Development of Iron Rich Supplementary Mix

The product development is focused to formulate a supplementary mix rich in iron to promote the haemoglobin level among moderate and mild anaemic tribal adolescent girls. A combination of cereal, pulse, oil seed and jaggery was selected to develop an iron rich mix. The iron rich ingredients such as rice flakes (*Oryza sativa*), whole wheat (*Triticum aestivum*), roasted Bengal gram (*Cicer arietinum*), dry coconut (*Cocos nucifera*), white gingelly seeds (*Sesamum indicum*) and cane jaggery (*Saccharum officinarum*) were included. Each ingredient except jaggery was roasted separately and powdered to improve the sensory attributes. All the powdered ingredients at room temperature were thoroughly mixed (Plate 3).

B. Standardization and Acceptability Test for Supplementary Mix

The United States Department of Agriculture (USDA, 2010), defines a standardized recipe as one that “has been tried, adapted and retried several times for use by a given food service operation and has been found to produce the same good results and yield every time when the exact procedures are used with the same type of equipment and the same quantity and quality of ingredients”. Among the ingredients selected for the supplementary mix five variations with the quantity of 25g, 30g, 35g, 40g and 50g of rice flakes was made and adjusted the other ingredients at various levels to obtain the total amount to 100g. The five varied mixes were standardized and found out the most acceptable best combination of mix to supplement the anaemic adolescent girls. The method of preparation of mix was standardized so that portions obtained each time were consistent in volume, colour, texture and taste along with the time and cost of preparation.

The sensory characteristics of colour and appearance, taste, texture, flavor and overall acceptability of five mixes were assessed by 30 taste panel members using a five point score to find out the suitable combination of ingredients for the supplementation. The maximum desirable and acceptable amount of supplementary mix for a day’s serving was identified by undertaking quantity acceptability trial test among adolescent girls. It is identified that the quantity of upper limit consumption of mix was 50g.
PLATE 3
DEVELOPMENT OF IRON RICH SUPPLEMENTARY MIX
C. Analysis of nutrients of standardized supplementary mix

The most accepted standardized supplementary mix was selected for analysing iron as well as energy, protein, carbohydrate, fat, calcium, dietary fibre, moisture, ash, total carotene, thiamine, riboflavin, niacin, folic acid and vitamin C using the standard procedures as shown in Appendix VI to understand the total nutritional contribution.

PHASE IV: INTERVENTION PROGRAMMES

A. Ethical issue

Anaemic subjects who volunteered to participate in the supplementation and willing to give blood samples for biochemical analysis were only selected for the dietary intervention programme. Consent was obtained from both parents, anaemic adolescent girls and headmistress of the school to undertake the supplementation study and from adult women to conduct health and nutrition education intervention. Institutional Human Ethics Committee, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, reviewed, approved the study protocol and appended a copy of the certificate in Appendix VII.

B. Selection of Subsample

A sub sample of 90 moderate and mild anaemic adolescent tribal girls in the age group of 13 to 17 years out of 146 adolescents and 200 anaemic adult women in the age group of 30-50 years out of 833 adult women were selected on the voluntary basis for dietary and health nutrition education interventions. Further the anaemic tribal adolescent girls were divided into two groups constituting 30 in control and 60 in experimental group. The experimental group was divided into two groups comprising 30 each in experimental group A and B. Experimental group A was for dietary and health nutrition education intervention and experimental B was only for health nutrition education intervention. The subjects in experimental group A was further divided into three groups based on haemoglobin level. Those with haemoglobin level of 8-9.9g/dl were experimental group A1, 10-10.9g/dl experimental group A2 and 11-11.9g/dl experimental group A3. A subsample of
200 anaemic adult women was divided into control group with 100 and experimental group with 100 for health and nutrition education intervention.

C. Dietary Intervention

Healthy generations are possible to be created by strengthening the adolescent girls who will be the future mothers. In the past decade, the widespread prevalence of anaemia in adolescent girls the greatest nutritional problem in India is gaining increasing recognition (Devaney, 2005). Iron deficiency is the most common nutritional disorder in the developing world. About one third of the global population (over 2 billion) is anaemic (Antelman, 2000). In the present study it was identified that iron deficiency anaemia was more common among adolescents especially girls of 13 to 17 years. It is essential to improve the haemoglobin status of anaemic subjects by increasing the total iron intake (Khanduri et al., 2000). Pelto et al. (2003) suggested that the use of locally available iron rich foods and modified dietary practices would favour iron absorption. One way to improve the absorption of iron food is to increase the intake of vitamin C (Konje et al., 2001). The most accepted standardized and the low cost iron rich mix was used for supplementation for a period of seven months to increase the level of haemoglobin status of anaemic adolescent girls.

Dietary studies are generally an integral part of most nutritional surveys. The main objective of any dietary assessment is to discover what the person under investigation is in habit of eating over the long range and in the short run (Millen et al., 2001).

In nutrition, diet is the sum of foods consumed by a person. A healthy diet is one that is arrived at with the intent of improving or maintaining optimal health. This usually involves consuming nutrients by eating the appropriate amounts from all of the food groups, including an adequate amount of water (WHO, 2003).

Hookworm infection is likely to be an important cause of anaemia. Stolzfus et al. (2000) found that 25 percent of all anaemic, 35 percent of iron deficiency anaemic and 73 percent of severe anaemic were attributed to hookworm infection. Hookworm causes intestinal blood loss by feeding on the intestinal mucosa. The most effective strategy for anaemia control is to
combine anti-helmenthic with iron and folate supplementation. Before initiating supplementation, as per the recommendation of the physician, deworming tablet (Albendazole 400mg) was administered to the sub-sample of 30 moderate and mild anaemic tribal adolescents in experimental group A for an effective absorption of iron (Plate 4).

Once in a week the supplementary mix (10½ kg) was prepared by the investigator in the food laboratory, packed in an airtight container and delivered to the headmistress of the school. Under the supervision of the headmistress, the supplementary mix in powder form was distributed to the subjects of experimental group A during mid-morning for a period of seven months. During weekends and on holidays it was packed and distributed to the subjects.

Three different levels of mix weighing 50g, 45g and 40g suitable to anaemic adolescent girls were distributed by measuring the mix using standard ladles. The experimental group A1 with haemoglobin level between 8 and 9.9g/dl were served 50g of supplementary mix contributing 6.0mg of iron. The experimental group A2 with haemoglobin level of 10-10.9g/dl was given 45g of mix with iron content of 5.4mg. The experimental group A3 with haemoglobin level of 11-11.9g/dl, 40g mix containing 4.8g of iron was provided. Amla (Emblica officinalis), a berry found in abundance in tropical countries and a rich source of vitamin C (600mg/100g) was selected to enhance the iron absorption. One amla fruit weighing 25 to 30g containing 150 to 180mg vitamin C was given along with the supplement every day.
PLATE 4
ADMINISTRATION OF SUPPLEMENTARY MIX
D. Health and Nutrition Education Intervention

The aim of the health and nutrition education is to guide people to choose optimum and balanced diets and thereby promote good dietary habits. Nutrition education is an educational measure for inducing desirable behavioural changes for the ultimate improvement in the nutritional status and is the major intervention for the prevention of malnutrition and promotion of health and to improve the quality of life. Isobel (2008) opined that nutrition education is any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food nutrition behavior conducive to health and well-being.

Nutrition education was imparted in local language to the selected 60 anaemic tribal adolescent girls and 100 anaemic tribal adult women in experimental group on principles of foods and nutrition, the basic food groups, importance of healthy and balanced diets, nutritive value of foods, conservation of nutrients while cooking, personal hygiene, kitchen garden, low cost recipes and the nutrients related to anaemia by using pamphlets and charts (Appendix VIII). Pamphlets were distributed and charts were displayed on the walls of the classrooms and at prominent and common places where people were meeting together for some talks. Demonstration of inexpensive, nutritious recipes prepared with locally available foodstuffs was undertaken (Plate 5). Nutrition education was given three times a week for two hours for a period of five months following a lesson plan (Appendix IX) to experimental groups of anaemic tribal adolescent girls in the school premises and for anaemic tribal adult women in the evenings in front of their houses (Plate 6).

PHASE V: IMPACT OF INTERVENTION PROGRAMMES

A. Anthropometric Measurements

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. Measures of subcutaneous adipose tissue are important because individuals with large values are reported to be at increased risks for hypertension, adult-onset diabetes, cardiovascular disease, gallstones, arthritis, and other disease, and forms of cancer. Combined with the dietary and related questionnaire data, and the biochemical determinations, anthropometry is essential
The anthropometric measurements like height, weight were measured for 90 adolescent subjects (30 control and 60 experimental) and for 200 adult women (100 control and 100 experimental). Assessment was done for experimental group A initially and after the supplementation period of 210 days whereas for the experimental group B 30 adolescent girls and 100 adult women who had nutrition education intervention alone, assessment was carried out before and after 150 days of intervention to observe the effect of health and nutrition education intervention programme.

**B. Clinical Signs and Symptoms of Nutritional Deficiencies**

The signs and symptoms of nutrient deficiencies among all the subsamples were assessed with the help of a physician after supplementation and nutrition education intervention.

**C. Mean Nutrient Intake**

Collection of information on frequency of food consumption and the three day food weighment survey was done after the supplementation of iron rich mix to adolescent girls for a period of 210 days. The impact of nutrition education intervention among both the adolescent girls and adult women were assessed after 150 days of intervention programmes. With the help of dietary weighment schedule (Appendix X) the precise amount of food both raw and cooked consumed daily, at each meal by a sub-sample of 30 adolescent tribal girls and 30 tribal women in the age group of 30 to 50 years were recorded for a period of three consecutive days. From this the mean daily food intake of the individual female subject was calculated and the day’s mean nutrient intake was computed and compared with the ICMR recommended dietary allowances (2010) to note the adequacy of diet before and after the intervention programmes.

**D. Haematological Parameters**

The haemoglobin level of the selected anaemic tribal adolescent girls and anaemic tribal adult women were assessed before and after 210 days of supplementation mix and 150 days of health and nutrition education intervention.
PLATE 5

DEMONSTRATION OF INEXPENSIVE, NUTRITIOUS RECIPES
PLATE 6
HEALTH AND NUTRITION EDUCATION INTERVENTION
A subsample of 15 adolescent tribal girls each in experimental and control group and 50 adult women each in experimental and control group were selected for further biochemical analysis of serum iron, Total Iron Binding Capacity, serum ferritin, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration were carried out by Sysmah auto haem procedure (WHO, 1998) by drawing 5ml of blood. During collection of the blood sample, 500mg of Ethylene Diamine Tetra Acetate (EDTA) was transferred into vials as an anticoagulant and the haemoglobin level was estimated within a few hours of blood collection.

**E. Knowledge, Attitude and Practice Score**

A detailed questionnaire constituting 91 questions were framed (Appendix XI) to assess the dietary Knowledge, Attitude and Practices (KAP) of 60 anaemic tribal adolescent girls and 100 anaemic tribal adult women before and after imparting health nutrition education. The questions related to foods, nutrients and their functions and the best methods of cooking were included to assess the knowledge, while to assess the attitude, the aspects on breast feeding and importance of nutrition during deficiency diseases like PEM, anaemia, vitamin A deficiency and AIDS were included.

In order to assess the health nutrition practices, the details of questions related to methods of cooking and importance of personal hygiene were included. Score was allotted for each question giving equal weightage. In the case of yes/no questions the correct alternative was given full scores and the other was awarded zero score. The knowledge scores of pre and post intervention programme were analyzed statistically to understand improvement of the KAP level of all the selected anaemic tribal adolescent girls and anaemic tribal adult women.
F. Analysis of Data

Data are the basic input to any decisions making process. The process of statistical data gives importance to the study. After data collection, proper tools and techniques should be used for classification and analysis and interpretation of data (Ader, 2008).

Data collected were classified, tabulated and analysed. The statistical tools used for analysis were mean, standard deviation, correlation analysis, ‘t’ test and results were interpreted.

The research design of the study is given in Figure 2.
Dietary practices of selected tribal population and impact of intervention programmes

Study Area

Tamilnadu State
Coimbatore District
Karamadai Block
Tholampalayam Panchayat
Settlements

Irula tribal settlements (12)

Baseline data

No. of families (n=705)
Total population (n=2373).

• Socio-economic survey
• Anthropometry
• Clinical examination
• Dietary assessment
• Biochemical analysis

NUTRITION INTERVENTIONS

Dietary Supplementation
(7months – Mix and Amla)

Health Nutrition Education
(5 months – Thrice a week for 2 hours)

Adult women (n=200)
Control-100  Experimental-100

Details / Group
A1  A2  A3
Hb level (g/dl)  8-9.9  10-10.9  11-11.9
Qty. of mix (g)  50  45  40

Parameters to assess intervention programmes

Anthropometric measurements
Clinical examination
Mean nutrient intake
Haemoglobin level
Other haematological parameters
KAP score

Estimation of serum iron, total iron binding capacity, serum ferritin, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration.

Sub sample

Adolescents (N:30)
Experimental (N:15)  Control (N:15)

Adult women (N:100)
Experimental (N:50)  Control (N:50)

FIGURE 2: RESEARCH DESIGN