Chapter 3

Methodology

Research Methodology is a way to systematically solve the research problem (Kothari, 2004). Many different methods and procedures have to be developed for a study to aid in the acquisitions for certain sources of data yielding information of the kind in the form that can be most effectively used (Best and Khan, 2001).

The methodology on different aspects pertaining to the present study entitled “Nutritional Profile and Impact of Nutrition Counseling on the Nutrition Knowledge, Mental Capacities and Physical Activity Level of Selected School Going Children of Kochi” has been presented in this chapter under the following categories.

3.1 Specific Objectives
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3.17 Processing of Data
3.18 Statistical Analysis

3.1 Specific Objectives

3.1.1 To assess the nutritional status of the selected school going children through anthropometry, clinical and dietary recall.

3.1.2 To assess the nutrition knowledge of the selected school going children.

3.1.3 To assess the mental capacities of the selected school going children.

3.1.4 To assess the physical activity level of the selected school going children.

3.1.5 To assess the KAP of the mothers.

3.1.6 To find out the impact of nutrition education on the nutrition knowledge of the selected school going children.
3.1.7 To find out the impact of nutrition education on the mental capacities of the selected school going children.

3.1.8 To find out the impact of nutrition education on the physical activity level of the selected school going children.

3.1.9 To find out the impact of nutrition education on the KAP of the mothers of the selected school going children.

3.2 Hypothesis Setting

H_{01}: There is no significant difference in nutrition knowledge of the selected school going children before and after counseling.

H_{02}: There is no significant difference in mental capacities scores of the selected school going children before and after counseling.

H_{03}: There is no significant difference in physical activity level of the selected school going children before and after counseling.

H_{04}: There is no significant difference in the KAP scores of mothers before and after counseling.
3.3 Selection of the Area

Figure: 1
Ernakulam District

Kochi City is in the Ernakulum District of Kerala, the State formed by the merger of the former kingdoms of Travancore, Cochin and Malabar (which was a part of the Madras Presidency under the British rule). The location of the city of Kochi is shown in Figure 1. The Corporation manages 94.88 km² of city limits of Kochi city. It is the most densely populated corporation in the state with a population of 601,574 as per Indian Census 2011. The schools selected are in the center of Kochi city and children from all classes of the society attend this school from different parts of the District. The city is surrounded by several rural pockets and one of them is Piravom.

The researcher belongs to the district and is familiar with the topography as well as with the governmental and nongovernmental organizations in the area. The children for the study were selected from Assisi Vidyanikethan Public school, Kakkanad, Kochi (Figure 2) and St Joseph Higher Secondary School, Piravom, Kochi (Figure 3). These schools were selected to represent both Urban and Rural area.
Figure: 2

Assisi Vidya Nikethan Public School

Figure: 3

St Joseph Higher Secondary School
3.4 Ethical Consideration

The study proposal was submitted to the Superintendent of Government General Hospital Kochi which has an Ethics Committee and has the authority to scrutinize and give permission for the conduct of the study in the Kochi Area. The committee scrutinized the proposal and the investigator was called for clarifications and thereafter the study was approved for research. A copy of the ethical clearance is given in Appendix 1.

The investigator also approached the school authorities of the private school and explained the purpose of the study and methodology involved. Written consent was obtained from the school principal. The children were also explained about the study and their consent obtained before data collection. The investigator also got permission from the National Rural Health Mission, District Programme Manager to collect the data from the public school to collect data of the school children of the rural area as this school is run by the state government. A copy of the consent from school principal and National Rural Health Mission, District Programme Manager is given in Appendix 2 A and B.

3.5 Research Design

Experimental research design was adapted in this study to test the hypothesis framed and stated above.

3.6 Selection of Subjects

Cluster sampling method was used for the selection of subjects. Two clusters of both rural and urban area in Kochi City were considered for the study. One out of 34 schools namely St Joseph Higher Secondary School from the rural area and one out of 62 schools namely Assisi Vidyanikethan Public school from the urban area were selected by lottery method. The students from class V, VI and VII (10-12 Years) who had regular attendance in school were
selected for the study. A total of 542 children were selected from the urban school and a total of 516 children from the rural school.

In this present study the urban school data were collected from the students studying from class V to VII of Assisi Vidyanikethan Public School, Kakkanad, Kochi. There were 310 boys and 255 girls in the age group of 10 – 12 years. Out of them 304 boys and 238 girls participated in this study.

Data from the rural school were collected from the students studying from class V to VII of St Joseph higher secondary school, Piravom, Kochi. There were 255 boys and 315 girls in the age group of 10 – 12 years. Out of them 221 boys and 295 girls participated in this study.

All the students who fulfilled the inclusion criteria were selected for the study.

3.6.1 Inclusion Criteria

Only those children in the age group of 10 – 12 years who were studying in the city of Kochi and attending schools as day scholars were selected for the study.

3.6.2 Exclusion Criteria

Children residing in the hostels or those whose parents are residing in other cities were excluded.

3.7 Tool and Techniques Used for Data Collection

3.7.1 Formulation of Schedule

Tools and techniques used for the collection of research data should be appropriate and accurate for ensuring credibility and reliability of information (Gupta, 2008). An interview schedule was constructed with closed ended
questions to cover the purpose of the study. According to Thanulingam (2000) interview schedule is a proforma containing a set of questions and is very useful in gathering information. It is generally gathered by either the researcher or the ones who are specially appointed for the purpose. The primary sources are that from which the information is gathered by the researcher by observation schedule and interview method.

A schedule was formulated to collect data, which included the full broad areas namely:

a. General information like name, age, sex,

b. Information pertaining to dietary pattern,

c. Nutrition Knowledge,

d. Information pertaining to mental capacities,

e. Information pertaining to physical activity level.

The survey participants were oriented about the purpose of this study and the interview schedule was administered personally by the investigator on the participants.

3.7.2 Pre Testing and Validation of the Tool

Pre testing is essential to construct a valid and reliable tool. The term validity means that something is logical and acceptable. An interview schedule is valid when it is usable by the researcher. It is usable by the researcher when it is accepted, approved and properly answered by the respondents. The term reliability means that something can be depended upon and trusted. An interview schedule is reliable when the respondent is able to understand and answer the questions clearly (Gupta, 2008).
A pilot study is a mini-version of a full-scale study or a trial run done in preparation of the complete study. The latter is also called a ‘feasibility’ study. It can also be a specific pre-testing of research instruments, including questionnaires or interview schedules (Polit, et al., 2001).

The pre testing or pilot study in the current research can be defined as mainly a try-out of research techniques and methods, but also of questionnaires and interviews. The researcher compiled a questionnaire and applied this to a pilot group of school children. During this process, the researcher also tested a short open-ended questionnaire on the cultures of the families of the children, questionnaires on their learning styles for the parents, a behaviour style instrument/questionnaire on the children in the pilot group and feedback reports on these to the parents. The pilot study of the current research can therefore be defined as both a feasibility study as well as a pre-testing of instruments, questionnaires and interviews.

Therefore, pre testing of the tool was done with twenty school going children from different schools in Kochi. Pretesting enables to answer and identify those items which are not relevant. The items which were not applicable for the study were deleted. Thus the interview schedule, consisting of questions on general information, dietary pattern, nutrition knowledge, mental capacities and physical activity level was finalized after modifications. The responses were validated with the help of a biostatistician.

A copy of the interview schedule is given in Appendix 3.

3.8 Data Collection

According to Kothari (2004) direct interview method was the technique adopted for data collection. This technique was preferred because
Interview method is a suitable way to collect the data as it proceeds systematically and enables to record the collected information quickly. Interview method provides opportunity for face to face contact with whom the information was collected. Interview makes possible inter stimulation between the interviewer and interviewee (Gupta, 2003). Best and Khan (2001) have also opined that this technique can be used effectively to gather information regarding an individual’s experience and knowledge, his or her opinion, beliefs and feelings and demographic data. Information obtained by this method is likely to be more accurate because the interviewer can clear up doubts of informants and thus obtain correct information (Singh, 1997).

Data was collected by personally interviewing the subjects.

3.9 Collection of General information

The interviewer personally visited the school and the selected school going children of classes V, VI and VII were interviewed at the school premises. The researcher interviewed the children regarding skipping of meals, intake of supplements, intake of nutrient rich foods like vegetables and fruits, picky eating and consumption of junk and processed foods.

The background information of respondents eg: income level, occupation of the parents etc was collected by referring to the school registers with the help of the school authorities. The socio economic history reveals factors that profoundly effect nutritional status as the ethnic background and educational level of the client influences food availability and food choices Whitney (2003). Kuppuswamy’s socioeconomic status which was proposed in 1976 is an important tool in hospital and community based research in India. This scale takes account of education, occupation and per capita income of the family to classify study groups into Upper, Upper middle, Lower middle, Upper lower, Lower socioeconomic status (Kumar et al., 2007). The updated Kuppuswamy scale of 2007 was used for this study purpose (Appendix 4).
Plate 1A and B shows the interviewer interviewing the school going child.

**Plate: 1 A and B**

**Interviewing the urban school going child**

![Image of an urban school going child being interviewed.]

**Plate: 1 B**

**Interviewing the rural school going child**

![Image of a rural school going child being interviewed.]
3.10 Assessment of Nutritional Status

Growth assessment is the measurement that best defines the health and nutritional status of children. Growth monitoring is universally used to assess nutritional status, health and development of individual children, and also to estimate overall nutritional status. Physical measurements like body weight, height, circumference of arm and calf, triceps skin fold of children have been extensively used to define health and nutritional status (Srivastava, 2012).

3.10.1 Anthropometric Measurements

School children constitute one of the important segments of our population. Growth and development of the children is largely dependent on its nutritional status. The nutritional status of children is assessed by various methods viz., Anthropometry, Biochemical, Clinical and Dietary Intake. Nutritional status assessed by anthropometric measurements indicates physical growth of a child. Height and weight are the best to determine the growth pattern of a subject in a larger group. Anthropometry is a simple and reliable method for assessing the growth status progress of normal children. It helps to identify the abnormalities at the sub clinical level. Hence anthropometry is considered as one of the important tools for assessment of malnutrition (Suvarna, 2007).

Among the various techniques of nutritional assessment, nutritional anthropometry and dietary survey are the ones most popularly used by researchers. Nutritional anthropometry was adapted in the study because the pattern of growth and physical fitness of an individual as pointed out by Rao (1999) though determined genetically are profoundly influenced by diet. Importance of various anthropometric measurements in the assessment of nutritional status of an individual is also stressed by several investigators like Swaminathan (2003), Bamji et al.,(2003),Park and Park (1997), Ramalingaswami et al., (1997).
The present study used anthropometric measurements namely height and weight and these measurements were recorded by following the techniques suggested by Jelliffe (1996).

The standing height and body weight of the selected school children were measured and Body Mass Index (BMI) was calculated and age for BMI was compared with WHO (2007) for children from 5yrs– 19 yrs. A copy of WHO growth charts for Boys and Girls is given in Appendix 5 and 6.

3.10.2 Height

Height is a linear measurement made up of sum of the four components, legs, pelvis, spine and skull. Height of an individual is principally a measure of skeletal body tissue (Jelliffe and Jelliffe 1989). Height is a measure of nutritional status of community. Hence the height was measured using a stadiometer which was wall mounted. A stadiometer is a piece of medical equipment used for measuring height. It is usually constructed out of a ruler and a sliding horizontal headpiece which is adjusted to rest on the top of the head. Stadiometers are used in routine medical examinations and also clinical tests and experiments. This stadiometer that rolls up out of the way in its own compact case, just like a steel tape measure. It can be pulled down and read through the tape window instantly. The stadiometer has a measuring range of 0 inches to 220 centimeters measurements.

The child was made to stand on a flat floor with feet parallel and back of the head touching the wall. The head was held comfortably erect with arms hanging at the sides in a natural manner. The stadiometer was pulled down and making contact with the top of the head and height was measured accurately to the nearest 0.5 cm (Plate 2).
3.10.3 Weight

According to Swaminathan (2003) and Rao and Vijayaraghavan (1996) body weight is the most widely used and the simplest reproducible anthropometric measurement for the evaluation of nutritional status. Importance and reliability of weight as a measure to assess nutritional status was also emphasized by Bamji et al., (2003) Elizabeth (2002) and Rolfes and Whitney (2002).
A portable weighing machine with an accuracy of 0.5 kg was used to record the weight of the school going children. Checking the scale with a known weight was done frequently and an adjustment to zero was done every time for accurate reading. The weight was recorded following the techniques suggested by Jelliffe (1996). School going children were made to stand straight on a platform of the weighing machine barefooted with the school uniform clothing and the weight measured upto the nearest – 0.5 kg (Plate 3).

Plate: 3

Weighing the weight
3.11 24 hr dietary recall

Dietary recall is an interview in which the respondent is asked to describe all the foods and beverages consumed in the previous 24 hours. Recall method has the advantage of giving a qualitative evaluation of diet in a short time and it is the most commonly used assessment (Mohan, 2001). According to Swaminathan (2005) dietary survey constitutes an essential part of complete study of nutritional status of individuals providing essential information on nutrient levels, food habits and attitudes.

Gopaldas and Seshadri (1987) have also said that diet survey constitutes an essential part of any complete study of nutritional status of individual or groups and provides essential information on nutrient intake levels, source of nutrients, food habits and attitudes in general. The best method for assessing nutritional intake is to ask for a typical day history or a 24 hr dietary recall to isolate usual patterns and possible nutritional risk factors (Pilliteri, 2007).

A 24 hr recall method was used to find out the amount and type of food consumed which was used to calculate the amount of nutrient intake using the nutritive value of Indian foods by Gopalan et al., (2004). Intake of five selected nutrients namely protein, fat, energy, iron, and calcium were calculated using Microsoft excel data analysis. The mean intake of various foods and nutrients were computed and compared with the dietary allowances recommended by (ICMR, 2010).

3.12 Clinical Assessment

Clinical assessment is the most essential part of all nutritional surveys to get information of the signs and symptoms of the dietary deficiency (Swaminathan, 1988). Physical examination assessments suggest a good nutritional intake or evidence of poor nutrition (Pillitteri, 2007).
According to Pillitteri (2007) there are various clinical symptoms associated with specific deficiencies which can be used as a valuable tool to assess the nutritional status. In the present study the deficiency symptoms were identified by examining the children from head to foot under bright illumination (Plate 4) using a rapid assessment and clinical examination questionnaire (ICMR) (Appendix 7) with the help of a qualified paediatrician.

Plate: 4
Paediatrician examining the school going child

3.13 Mental Capacity Test

Gottfredson (1998) stressed that intelligence is general mental ability and can be measured by intelligence tests. Individual differences in intelligence measured using psychometric tests usually cover cognitive domains such as reasoning, processing speed, executive function, memory and spatial ability. It has been frequently shown that people who perform well in
one domain also tend to perform well in the others. Upadhyaya et al., (2001) conducted a study on perceptual development in relation to nutritional status. The perceptual skills of each child were assessed with the help of Picture Ambiguity Test (PAT) on 180 children in the age group (5-10 years).

Raven's Progressive Matrices (often referred to simply as Raven's Matrices) or RPM (originally developed by Raven in 1936) is a nonverbal group test typically used in educational settings. It is the most common and popular test administered to groups ranging from 5-year-olds to the elderly (Kaplan and Saccuzzo, 2009).

Raven's Progressive Matrices is also known as Standard Progressive Matrices (SPM). The booklet comprises five sets (A to E) of 12 items each (e.g., A1 through A12), with items within a set becoming increasingly difficult, requiring ever greater cognitive capacity to encode and analyze information. All items are presented in black ink on a white background. The complete set of patterns used for the study is attached as a booklet (Appendix 8).

The SPM score also can be used for developmental purposes in occupational and educational settings. The nonverbal aspect of each test minimizes the impact of cultural or language bias. The Raven’s SPM produces a single raw score as well as percentile rank to indicate the candidate’s educative ability or the ability to think clearly and extract meaning out of events, compared to a norm group.

The tests were developed for research purposes. Because of their independence of language and reading and writing skills, and the simplicity of their use and interpretation, they quickly found widespread practical application.
It is made of 60 multiple choice questions, listed in order of difficulty. This format is designed to measure the test takers reasoning ability or, ("meaning-making") component of Spearman's g, which is often referred to as general intelligence. In each test item, the subject is asked to identify the missing element that completes a pattern. Many patterns are presented in the form of a 4x4, 3x3, or 2x2 matrix, giving the test its name. In one page only one test is given (Figure 4).

Plate: 5

Administering the Standard Progressive Matrices test

The selected school going children were given 25 minutes to complete the test. This test was administered in the class room setting (Plate 5). The children were initially brieflyed about the test and doubts clarified. Each child was given question booklet and answer sheet to complete this test. (Appendix 9).

In the present study the following is one example of the patterns used
3.13.1 Calculation of the Mental Capacity Score

The Standard Progressive Matrices Scale does not differentiate very clearly between young children or between adults of superior intellectual capacity. For practical purposes it is convenient to take certain fixed percentages of the population and to group as their scores fall between them. In this way it is possible to classify a person according to the score he obtains as:

Grade I or Intellectually Superior, if his score lies at or above the 95th percentile for people of his age.
Grade II definitely above the average in intellectual capacity, if his score lies at or above 90th percentile.
Grade III intellectually average, if his score lies between 25th and 75th percentiles.
Grade IV definitely below average in intellectual capacity, if his score lies at or below the 25\textsuperscript{th} percentile.

Grade V intellectually defective, if his score lies at or below the 10\textsuperscript{th} percentile for his age group.

The necessary percentile scores for the individual and group tests between the ages are shown in Table VIII.

**Table: VIII**

The Self-Administered or Group Test (Children)

<table>
<thead>
<tr>
<th>Percentile Points</th>
<th>Chronological Age in Years</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>95</td>
<td>45</td>
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<tr>
<td>90</td>
<td>43</td>
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<td>75</td>
<td>37</td>
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<td>10</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
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</tbody>
</table>
3.14 Assessment of Physical Activity Level (PAL)

An important challenge in determining the relationship between health and physical activity is valid assessment. Various levels of physical activity participation are associated with health benefits and/or health risks. As a result, it is important that we have valid tools for assessing physical activity at various ages (Kowalski, 2004).

The Physical Activity Questionnaire for children (PAQ-C) is appropriate for elementary school-aged children (grades 4-8; approximately ages 8-14) who are currently in the school system and have recess as a regular part of their school week (Kowalski, 2004). The PAL can be administered in a classroom setting and provides a summary of physical activity score derived from nine items, each scored on a 5-point scale.

The Physical Activity Level (PAL) that was used in the present study was a self-administered, 7-day recall instrument developed by Kowalski (2004) to assess general levels of physical activity for school going children.

The questions were modified to make it suitable for the children under study. Some of the activities and games like baseball, ice skating, cross country skiing, rowing, in line skating, skateboarding, soccer, street hockey, floor hockey were replaced with skipping, dancing, hockey, football as these were not relevant to Indian setting. The investigator initially explained about all the aspects of the PAL questionnaire using the chalk and talk techniques to help them fill the questionnaire (Appendix 10).
The strengths of PAL are:

- The PAL is a cost and time efficient reliable and easy to administer, measure of general physical activity from childhood to adolescence in a large population.
- The strength of PAL is it utilizes the memory cues as lunch and evening items to enhance recall ability to measure intensity, frequency and duration of activities with self-report (Kowalski, 2004).

The Limitations of PAL are:

- The limitation of PAL is that even though it assesses the general level of physical activity it does not provide an estimate of calories expenditure or frequency, time, and intensity information.
- It also does not discriminate between the types of activities such as moderate and vigorous and it is useful only to assess during school hours (Kowalski, 2004).

Kowalski (2004) has stressed the following two points:

1. The filling up of the PAL questionnaire is regarding the actual activity during the last 7 days and that it is not an examination to test their knowledge.
2. That the researcher is not looking at their activity levels, but rather just making sure they haven’t missed any of the questionnaire.

The above points were affirmed to the selected children. The PAL questions consisted of 10 questions (Appendix 10). The investigator made sure that all the questions were answered and no blank response to any item (Kowalski, 2004).
The scoring pattern is as follows:

Overall process - Find an activity score between 1 and 5 for each item (excluding item 10)

**Five Easy Steps**

1) Item 1 (Spare time activity)

Take the mean of all activities (“no” activity being a 1, “7 times or more” being a 5) on the activity checklist to form a composite score for item 1.

2) Items 2 to 8 (PE, recess, lunch, right after school, evening, weekends, and describes you best)

The answers for each item start from the lowest activity response and progress to the highest activity response (the lowest activity response being a 1 and the highest activity response being a 5).

3) Item 9

Take the mean of all days of the week (“none” being a 1, “very often” being a 5) to form a composite score for item 9.

4) Item 10

Can be used to identify students who had unusual activity during the previous week, but this question is NOT used as part of the summary activity score. A sample scoring pattern is given in Appendix 10.

**3.14.1 Calculation of the Final PAL score**

When the school children are actively involved in physical activity, they would opt for 4\textsuperscript{th} or 5\textsuperscript{th} choice and if involved in moderate to poor physical activity they would have opted for the 3\textsuperscript{rd} or 2\textsuperscript{nd} choice. If they have
chosen the 5th they will get the maximum score likewise the scores will be obtained depending upon their physical activity. If the value from 1 to 5 is noticed once for each of the 9 items (items 1 to 9) used in the physical activity composite score, then mean of these 9 items have to be taken which results in the final PAL summary score.

- **Score of 1-2 indicates low physical activity level**
- **Score of 3 indicates Medium physical activity level**
- **Score of 4 - 5 indicates high physical activity level**

Plate 6 shows The Physical Activity Level Test being administered

**Plate: 6**

**Administering the Physical Activity Level Test**
3.15 Nutrition Counseling/Education

Nutrition knowledge is the tool available to measure knowledge attitudes and skills either in all or one or more of them (Reddy, 1996). School based educative programmes greatly influence children’s behavior towards healthy living. Nutrition counseling is one of the prerequisites for improving the nutritional status of any group.

A separate questionnaire with 12 questions was formulated to test the nutrition knowledge of the school children. The questionnaire is given in Appendix 11.

All the selected school children were imparted nutrition education. These children were tested for their nutrition knowledge with the help of a pretested questionnaire containing 12 questions at the start of the study. After imparting nutrition education their nutrition knowledge was tested once again with the help of the same questionnaire.

3.15.1 Framing of Schedule for KAP (Knowledge, Attitude and Practice)

There is an urgent need to educate mothers of school going children about the importance of balanced diet and promote the consumption of foods like cereals, pulses, green leafy vegetables, roots and tubers, sugar and jaggery, fats and oil, milk and milk products, fruits etc. in the children’s diet to improve their nutritional status so that children contribute in the well-being of the nation as children are the future of the nation’s prosperity (Sati et al., 2012).

According to Monde (2011) a KAP survey means Knowledge, Attitude and Practices. To properly carry out this type of survey it is important to establish a basic premise and provide definitions for each word.
**K: Knowledge** is a set of understandings, knowledge and of “science.” It is also one’s capacity for imagining, one’s way of perceiving. Knowledge of a health behaviour considered to be beneficial, however, does not automatically mean that this behaviour will be followed. The degree of knowledge assessed by the survey helps to locate areas where information and education efforts remain to be exerted.

**A: Attitude** is a way of being, a position. These are leanings or “tendencies”. This is an intermediate variable between the situation and the response to this situation. It helps explain that among the possible practices for a subject submitted to a stimulus, that subject adopts one practice and not another.

**P: Practices** or behaviours are the observable actions of an individual in response to a stimulus. This is something that deals with the concrete, with actions. For practices related to health, one collects information on consumption of tobacco or alcohol, the practice of screening, vaccination practices, sporting activities, eating habits etc.

KAP schedules were framed with ten questions each on Knowledge, Attitude and Practice for mothers. The investigator prepared multiple choice questions to facilitate easy understandability as the respondents were a mixed group of literates and semi literates. The number of mothers giving the correct answers before and after nutrition education was determined to assess the impact of nutrition education. The questions included in the knowledge section were designed to assess the extent of knowledge of the mothers. Questions included in the attitude section to ascertain the existing beliefs and attitudes of the mothers and the third set of questions included in the practice session to find out the dietary practices of the mothers. A sample copy of the KAP schedule is given in Appendix - 12.
As suggested by Monde (2011) testing of KAP was conducted twice, both pre and post intervention, in order to measure the impact of nutrition education. The post test was done three months after imparting nutrition education.

The children were also tested for the impact of nutrition education by performing the test both before and after intervention.

### 3.15.2 Collection of data for KAP

The validated KAP questionnaire was distributed to all the mothers, at the beginning of the study and explained about the questions included. Wherever necessary the questions were translated to vernacular language. The investigator patiently administered the questionnaire and collected them after their completion. Nutrition Education was imparted to the mothers after giving a time gap of three months, the same questionnaires was distributed to the mothers once again for finding out the impact of nutrition education. The time taken for filling up the questions at the pre-test session was more (nearly half an hour) while it took only 15 minutes to fill up the questionnaire in the post-test sessions. The impact of nutrition education on the KAP of the mothers of the selected children was assessed by extracting specific changes in post intervention of their learning, disposition and application using the specially designed proforma.

### 3.16 Development of Nutrition Education Aids and Imparting Nutrition Education

Nutrition education is the process by which people gain knowledge of nutrition and are persuaded to bring about required changes in their food habits (Contento, 2011). A participatory nutrition education was given to the respondents in the school setting. The school based healthy eating provides a great opportunity to enhance the health and wellbeing of children.
The children were initially oriented about the importance of consuming healthy foods and the list of some of the commonly consumed health foods including snacks and salads in the local area and later healthy food fest and salad competition were organized.

3.16.1 Healthy food fest

Healthy food fest was organized with the help of the staff and older students. Students prepared the healthy snacks in the school canteen and sold in the school campus. All students in the school participated in the healthy food fest and made it a grand success. The researcher aimed at imparting healthy eating message and students were exposed to the traditional healthy foods.

The investigator taught the recipe of the various foods on a planned day. The children were then divided into groups and each group was given the responsibility of preparing one recipe. The ingredients were brought to the canteen the following day and the children of the each group prepared the allotted recipe. Posters were displayed in the school premises to encourage the other children to visit the canteen to have a taste of the healthy foods prepared. Plates 7 to 17 depict the pictures of healthy food fest.
Plate: 7
Food Fest Menu

Plate: 8
Preparing Chapathi
Plate: 9
Vegetables for Sandwich

Plate: 10
Idiyappam Preparation
Plate: 11
Ready with Puttu

Plate: 12
Preparing Sandwich
Plate: 13
Whole wheat Sandwich

Plate: 14
Dosa and Chutney
Plate: 15
Kozukatta

Plate: 16
Children Serving Kozhukatta
The prepared foods namely special Fruit Juice, Fruit Salad, Jaggery Ada, whole Wheat Vegetable Sandwich, Idiyappam, Dosa with Chutney, Puttu, Kozhukatta, Chappathi and Chicken curry were prepared. The foods that were chosen for the study are commonly consumed ones in the local area. The nutritive value of the prepared foods is given in the Table IX.
Table IX

Prepared food (With Nutritive Value) for the Healthy Food Fest

<table>
<thead>
<tr>
<th>Prepared Food</th>
<th>Nutritive Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mix Fruit Juice 50 ml (1 cup)</td>
<td>Calorie: 165.60 Kcal</td>
</tr>
<tr>
<td></td>
<td>Protein: 0.81 gms</td>
</tr>
<tr>
<td></td>
<td>Fat: 0.27 gms</td>
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<tr>
<td></td>
<td>Iron: 2.53 mgs</td>
</tr>
<tr>
<td>Fruit Salad (1 cup)</td>
<td>Calorie: 164 Kcal</td>
</tr>
<tr>
<td></td>
<td>Protein: 4.81 gms</td>
</tr>
<tr>
<td></td>
<td>Fat: 0.27 gms</td>
</tr>
<tr>
<td></td>
<td>Iron: 2.53 mgs</td>
</tr>
<tr>
<td>Jaggery Ada 1 No</td>
<td>Calorie: 151.9 Kcal</td>
</tr>
<tr>
<td></td>
<td>Protein: 1.98 gms</td>
</tr>
<tr>
<td></td>
<td>Fat: 4.3 gms</td>
</tr>
<tr>
<td></td>
<td>Iron: 1.07 mgs</td>
</tr>
<tr>
<td>Whole Wheat Vegetable Sandwich 1 No</td>
<td>Calorie: 194 Kcal</td>
</tr>
<tr>
<td></td>
<td>Protein: 3.20 gms</td>
</tr>
<tr>
<td></td>
<td>Fat: 14.10 gms</td>
</tr>
<tr>
<td></td>
<td>Iron: 0.50 mgs</td>
</tr>
<tr>
<td>Idiyappam 1 No</td>
<td>Calorie: 74.20 Kcal</td>
</tr>
<tr>
<td></td>
<td>Protein: 0.22 gms</td>
</tr>
<tr>
<td></td>
<td>Fat: 2.08 gms</td>
</tr>
<tr>
<td></td>
<td>Iron: 0.20 mgs</td>
</tr>
<tr>
<td>Dosa 1 No</td>
<td>Calorie: 85 Kcal</td>
</tr>
<tr>
<td></td>
<td>Protein: 2.10 gms</td>
</tr>
<tr>
<td></td>
<td>Fat: 14 gms</td>
</tr>
<tr>
<td></td>
<td>Iron: 0.90 mgs</td>
</tr>
<tr>
<td>Recipe</td>
<td>Calories</td>
</tr>
<tr>
<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td>Chutney</td>
<td>21 Kcal</td>
</tr>
<tr>
<td>Puttu</td>
<td>80 Kcal</td>
</tr>
<tr>
<td>Kozhukatta</td>
<td>165 Kcal</td>
</tr>
<tr>
<td>Chapathi</td>
<td>74 Kcal</td>
</tr>
<tr>
<td>Chicken Curry</td>
<td>148.62 Kcal</td>
</tr>
</tbody>
</table>

### 3.16.2 Salad Competition

Salad Competition was conducted among the school children. In order to encourage eating of vegetables, the study participants were asked to prepare healthy salads. The researcher and the selected staff were the judges. The winning salad recipe was selected as per the appearance, taste, presentation skills and the nutritional value. Both boys and girls participated in the event (Plates 18 A and B).
Plate 18A

Healthy Salad Competition

Plate 18B
3.16.3 Nutrition Education through Presentation

A PowerPoint is a complete presentation graphics package. It is a slide based presentation program which offers enormous customized scope for word processing, graphics and animations. It is a powerful audio visual aid that helps to reach out to the masses.

Efficacious and informatory power point was prepared with 30 slides containing the following slides:

1. Introduction to nutrition
2. Balanced Diet
3. Importance of Breakfast
4. Why Good Nutrition
5. Nutrition and Cognitive Development
6. How Much Water is needed
7. Do you need supplements
8. What are the benefits and how much physical activity needed daily.

The power point was presented to the school going children classroom setting and the investigator explained each slide to the school going children and classified all the queries and doubts raised by them. Computer aided power point presentation for improving the healthy eating habits and physical activity were developed. The power point slides are given in Appendix 13.
3.16.4 Pamphlets

A pamphlet is a folded paper that has information about the particular subjects. The definition given by Wikipedia is that a pamphlet is an unbound booklet. It may consist of a single sheet of paper that is printed on both sides folded in half, in thirds or in fourths to make a simple book.

A colorful, informative, attractive and easy to carry pamphlet was prepared focusing on the following:

1. Balanced diet
2. Breakfast
3. Packed Lunches
4. Tips for Healthy Eating
5. Suggested Packed lunches
6. Nutritious Menu

The pamphlets provided were easy to follow food and nutrition tips in a convenient format for school going children. The layout of the pamphlets was designed with the help of a graphic designer and printed in a colorful format and distributed to the selected school children and their mothers. A pamphlet on healthy diet for your child is attached in Appendix 14. School children of the class 5, 6, 7 were also asked to prepare food pyramid pamphlets (Plates19Aand B).
Food Pyramid Pamphlet preparation

Plate 19A

Plate 19B

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3.16.4 Oath Taking

At the end of the class the selected school going children took an oath on healthy eating in order to ensure that they follow this in their daily life (Plate 20).

Plate 20
Oath Taking

3.16.5 Healthy Cooking demonstration to mothers

Healthy cooking demonstration was conducted to the mothers (Plate 21) of the selected school going children. Healthy Breakfast foods like Spinach Chapathi, Broken wheat upma, sprouted salad, Aval Laddu, Groundnut Burfi (Plate 22) were prepared and given for tasting. In the present study the investigator selected the above recipes as these are commonly consumed in the local area.
Plate: 21
Mothers viewing the Cooking Demonstration

Plate: 22
Spinach Stuffed Chapathi
3. 17 Processing of Data

The collected data was entered in Excel format, consolidated and analyzed statistically. The data were edited for completeness, accuracy and uniformity. They were coded and transcribed in the computer in a readable form. After coding and classification, the data were transcribed using the statistical package for social sciences (SPSS) version 16 for windows and tabulation analysis of the interpretation of the data.

3. 18 Statistical Analysis

The following statistical tests were conducted:

Percentage analysis was done for describing the socio demographic variables of the school children and the assessment of other study variables like Dietary Habits, Nutrient Intake, Meal Skipping, Picky Eating, Time Schedule, Home Made Foods, Restaurant Foods, Comparison of BMI with WHO Standards and Dental Caries.

For categorical data, chisquare test for association was used to find out the impact of intervention. Fischer exact test was used instead of chisquare test when expected values were considerably small.

For continuous variables normality, Pre and Post Nutrition Counseling, Mental Capacity, PAL and KAP, Sapiro Wilk test was used to check the normality.

Non parametric test, Wilkoxon Signed Ranks Test was used to find out the significant difference in Nutrition Counseling, Mental capacity, Physical activity level, KAP scores between pre and post scores since all variables were not following normal distribution. P value of <0.05 were considered to be statistically significant result. The study design is shown in Figure 5.
**Figure: 5**

**Study Design**

**Phase I**

- School Children Urban (n = 542)
- School Children Rural (n = 516)

- General Information
- Assessment of Nutritional Status
- Mental Capacity
- PAL

**Anthropometry**

**Clinical**

**Dietary**

**Phase II**

**Intervention**

- School Children Urban (n = 542)
- School Children Rural (n = 516)

- Nutrition Education/Counseling of Children
- Nutrition Education and Cooking Demonstration to Mothers

**Phase III**

Post Assessments of Nutrition Knowledge, Mental Capacity, PAL and KAP of Mothers
Limitations of the study

1. Only one school each from the urban and rural area could be selected for the study as the Directorate of School Education granted permission for the same.

2. Biochemical tests were not conducted as the children and their parents refused to give their consent.

3. Nutrition Counseling could not be given to the school canteen staff as they were not prepared to attend classes at the assigned time.

4. Mothers or female care givers could only be given counseling, however if both the parents were given counseling the reach would have been greater.