Malnutrition with its 2 constituents of protein–energy malnutrition and micronutrient deficiencies, continues to be a major public health problem throughout the developing world, particularly in southern Asia and sub-Saharan Africa (Müller & Krawinkel, 2005)

The school-going ages have high significance because this is the chief period for growth and nutrition of children and adolescents. In these age groups deficiencies of protein/calorie in diet result in underweight, wasting, stunted growth, low immunity, (Banik & Chatterjee, 2010) and even severe micronutrient deficiencies often occur in apparently normal or even well-nourished children, causing several subtle but important functional disturbances (Bhaskaram, 2002).

Growth and nutrition are the best indicators of well-being of children and adolescents. Hence, the present study was undertaken, to assess the nutritional status of municipal school children of urban Vadodara and to evaluate the impact of MDM provided by The Akshaya Patra Foundation (TAPF). The ongoing MDM programme has been strengthened in Vadodara by entering into Public Private Partnership with TAPF to improve the nutritional status of the school children. TAPF has set up a centralized kitchen to meet the challenge with the help of 3 industries namely GACL, GSFC and GIPCL.

In the execution of the present study following methodology was adopted keeping in view the objectives of the study.

MEDICAL ETHICS AND APPROVALS

The study was approved by the Institutional Medical Ethics Committee (Approval no. FCSc./FND/ME/42 dated 30/11/2009).

The following approvals were obtained for the study:

1. Permission from Dy. Collector and Additional Commissioner Mid Day Meal Programme, Vadodara.
2. Permission from District Education Officer, Vadodara.

3. Permission from President Akshay Patra, Vadodara.
4. Permission from Principals of schools.
5. Individual consent from parents of school children for biochemical estimation.

The study was conducted in 6 phases with specific objectives:

PHASE 1: FORMATIVE RESEARCH

Specific Objectives

- To assess the nutritional status of the school children in urban Vadodara in relation to
  - Undernutrition
  - Iron Deficiency Anaemia

PHASE 2: PROCESS EVALUATION

- To investigate the cooking practices in the central kitchen of TAPF for MDM programme.
- To assess the consumption of MDM by Children through spot observations in Schools

PHASE 3: IMPACT EVALUATION

- Impact of TAPF supported MDM programme on the following
  - Growth using anthropometric indices
  - Iron deficiency anaemia
  - Morbidity profile
  - Attendance
  - Scholastic performance

PHASE 4: WORKSHOP ON MID DAY MEAL PROGRAMME FOR MUNICIPAL SCHOOL TEACHERS OF VADODARA

- Feedback from Teachers
- Feedback from Akshay Patra

PHASE 5: KAP OF PARENTS, TEACHERS & CHILDREN

- To assess perceptions of municipal school teachers on MDM programme provided by TAPF
- To assess perceptions of children on MDM programme provided by TAPF and
- To assess perceptions of parents on MDM programme provided by TAPF.

PHASE 1: FORMATIVE RESEARCH:

In this descriptive cross – sectional study, situational analysis was carried out to elicit the baseline data regarding the socio-economic status; anthropometry, morbidity profile, and biochemical profile of the school children. The formative research was done to get an over view of the school children with regard to the percent prevalence of undernutrition among the urban school children along with Iron Deficiency Anemia.

School Selection

There were in all 110 schools operated by the Vadodara Municipal Corporation. The list of all the government primary schools in urban Vadodara was provided by the Department of Education. Among the listed schools only Gujarati medium and co-ed schools (70) were selected. The selected schools were then stratified according to the geographic area. A total of 16 schools, equal number of schools (4 from each zone) were selected from North, South, East and West zones of Vadodara, using random sampling method **(Figure 3.1)**. The list of selected schools is given in **Table 3.1.**

Criteria for Sampling

1. To enable pooling of data, schools with same medium of instruction (Gujarati medium) were considered
2. To enable gender comparison, co-ed schools were considered

From all the 16 schools, 6574 children studying from 1st to 7th standard were enrolled for the study. Those children who could not be contacted after three successive visits were excluded from the study. Based on this the final sample

Figure 3.1: Map of Schools Selected From Urban Vadodara (Zone Wise)

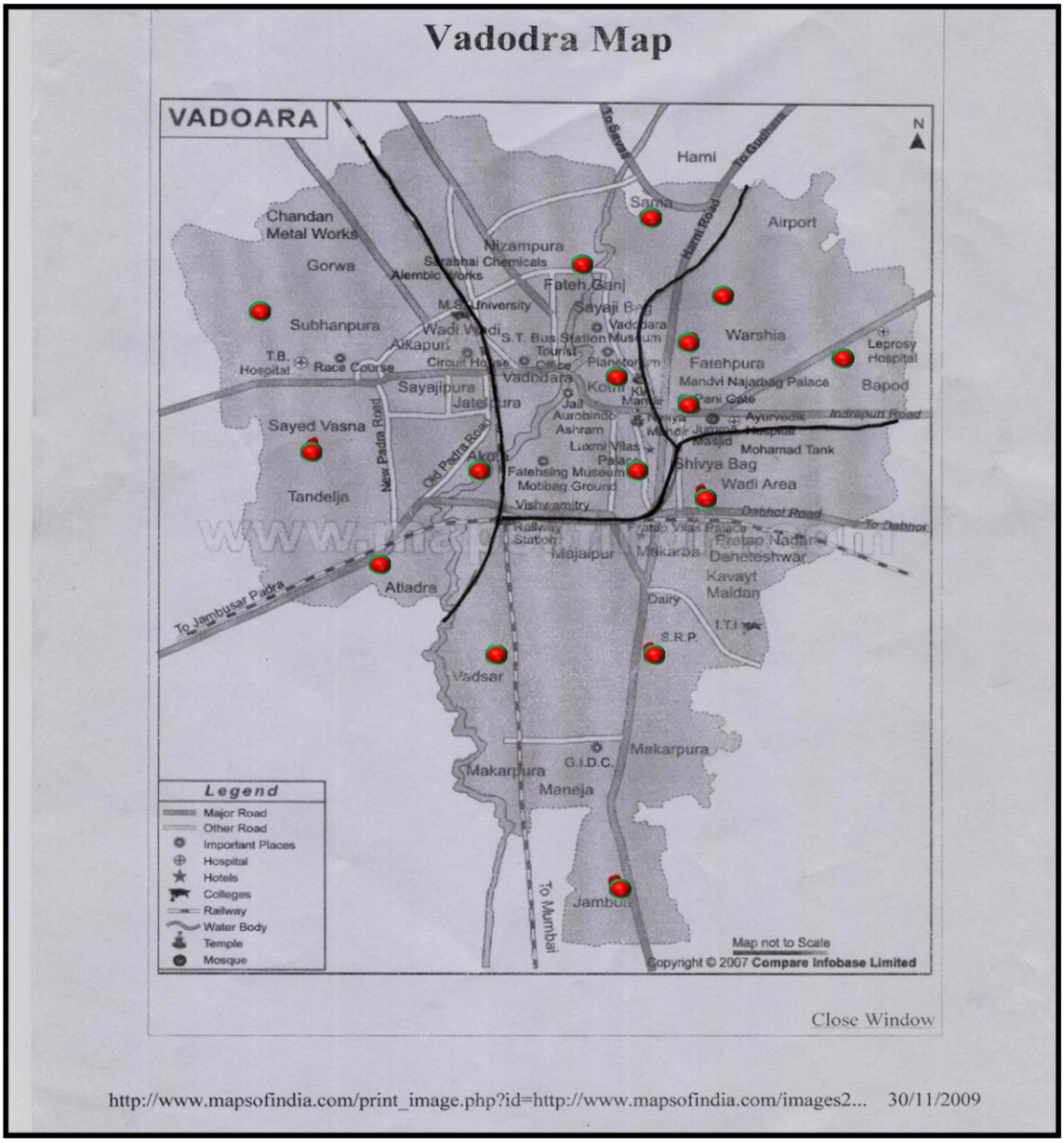


Table 3.1: List of Schools Covered for the Study

Sr. No.	Name of the School	Zone	Children Enrolled
1.	Sir SayajiraoGaekwad, Prathmik Shala	North	253
2.	Puj. Shri Rang AvadhootPrathmik Shala	North	422
3.	Maa Veer Bai M. Prathmik Shala	North	142
4.	Puj. DongrejiMaharajM.Prathmik Shala	North	648
5.	Jagdish Chandra Bose M. Prathmik Shala	South	315
6.	Chandrashekhar Azad M. Prathmik Shala	South	141
7.	Dr. Hansa Mehta M. P. Shala	South	333
8.	Vinobha Bhave M. P. Shala	South	175
9.	Dr. Baba Saheb Ambedkar Prathmik Shala	East	307
10.	RushiVishwamitra M. Prathmik Shala	East	549
11.	Swami Vivekanand M. P. Shala	East	622
12.	Zaverchand Meghani M. Prathmik Shala	East	256
13.	Dr. Rajendra Prasad Prathmik Shala	West	289
14.	Dr.HedgewarPrathmik Shala	West	504
15.	Rajaram Mohan Roy M. P. Shala	West	268
16.	Dr. Shyama Prasad Mukherjee Prathmik Shala	West	1350
	TOTAL		**6574**

size was 4905 children. Hence, 25.4% of the children could not be contacted. The detailed experimental plan is given in the **Figure 3.2.**

Description of Method Used for Data Collection:

This study used the multi-method approach wherein various quantitative and qualitative methods were employed to collect the data.

The following data was collected on all the children enrolled for the study:

- Socio-economic data **(Annexure 1)**
- Anthropometric Data (Weight, Height, Waist & Hip circumference)
- Bio-chemical Estimations - Hemoglobin estimations were carried out on a sub sample of 1217 children. For this children from 4th to 6th standard were selected and only those children whose parents had given the consent were included.
- Morbidity Profile **(Annexure 2)**

Data Collection

The tools used for data collection are given in **Table 3.2**.

Socio economic status

- A pre-designed and pre-tested semi-structured questionnaire was used to interview the school children to elicit information on family characteristics like religion, caste, type of family, education and occupation of parents **(Annexure 1).** The Performa also contained questions regarding consumption of Mid Day Meal (MDM). Information on individual characteristics like date of birth and sex was collected from the school records.

Figure 3.2: Experimental Plan for Phase I: Formative Research

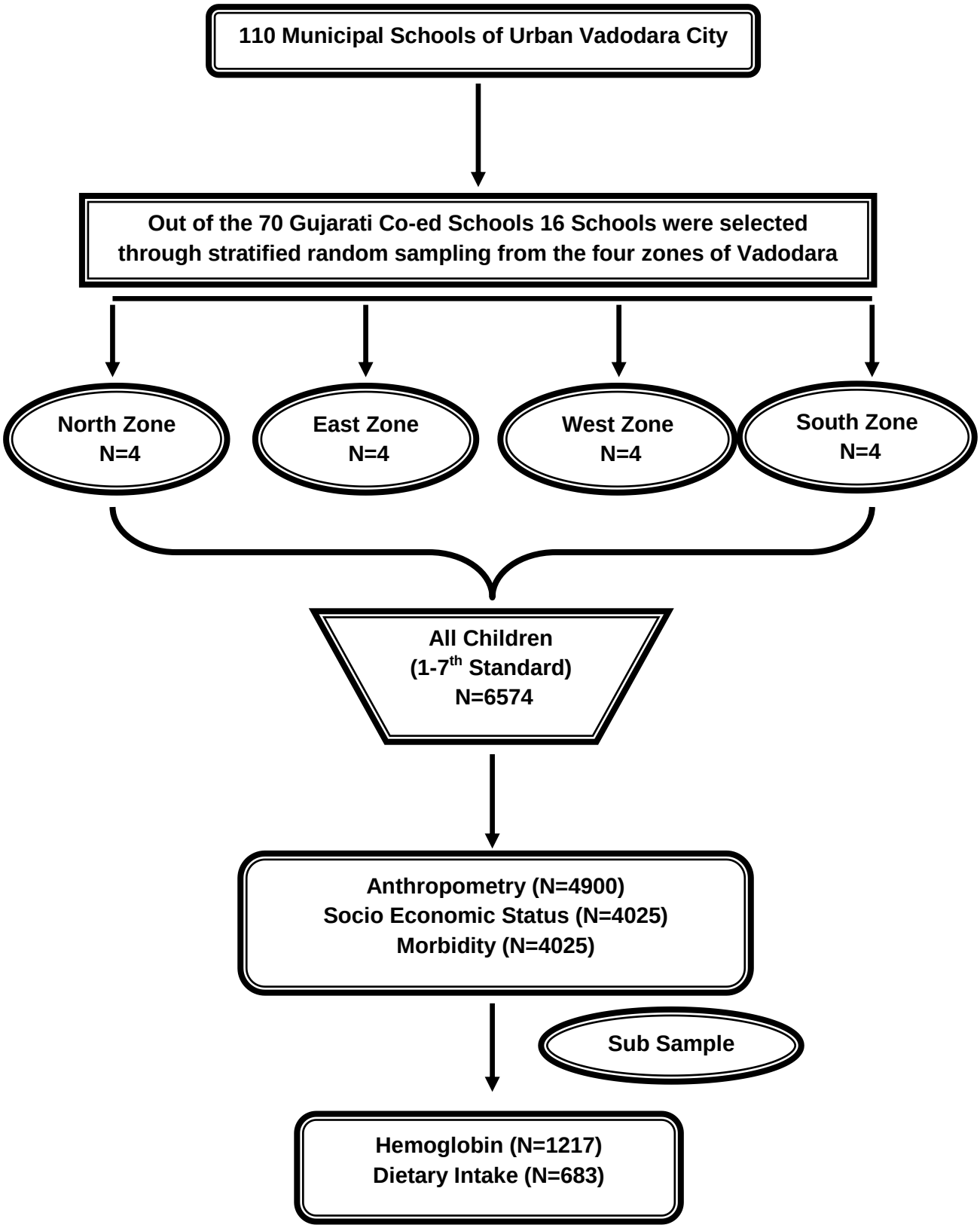


Table 3.2: Tools used for data collection for Formative Research

	Indicator	**Procedure**	**Sample Size**
Phase 1	Socio-Economic status	Structured Questionnaire	4507 children
	Anthropometry 1. Weight 2. Height 3. Waist 4. Hip circumference	Electronic and bathroom weighing scale for weight. Non stretchable fiber glass tape for height, Waist and hip circumference.	4905 children
	Hemoglobin estimation	Hematoanalyzer	1217 children
	Morbidity profile	Structured Questionnaire	4507 children

Principle: A semi-structured interview (SSI) is carried out on the basis of a question guide that enlists the questions pertaining to the topics that need to be covered. The researcher's queries follow a pre-determined pattern; however, the focus on the topics may shift according to the responses of the informant. Both structured and unstructured (open ended) questions are used in SSIs.

Anthropometry

Anthropometry is the single most universally applicable, inexpensive, and non-invasive method available and has become a practical tool for evaluating the nutritional status of populations, particularly of children (WHO, 1995).

- **Weight** – The children were weighed barefoot using portable Seca weighing scales which were validated with standard weights before actual weighing of the children commenced. The scales were placed on a hard flat surface. The children were asked to stand straight on the scale without touching anything and to look straight ahead. Height and weight were measured without footwear and in light school uniform. The instrument was calibrated daily with the help of pre-weighed (5kg) sand bags.

- **Height** – Height is a linear measurement of the body. Height measurements of all the children were taken using a flexible, non-stretchable fiber glass tape. The tape was fixed vertically on a smooth wall of the school, perpendicular to the ground, ensuring that the floor was smooth. The measurements were taken leaving 50cms from the ground and considering the 50cm mark as Zero making the total measuring capacity of the tape as 200cms. The child was asked to stand erect with the shoulder, hips and heels touching the wall and with no footwear, heels together and looking straight ahead. The head was held comfortable erect, arms hanging loosely by the sides. A thin smooth scale was held on the top of the child's head in the centre, crushing the hair at the right angles to the tape and the height of the

subject was read from the lower edge of the ruler to the nearest 0.5 cms.

- **Waist and Hip Circumference** – Waist and hip circumference were measured using a non-stretchable fiber glass tape. The children were asked to remove their belts and sweater. For waist circumference the children were made to stand facing the observer and then waist was measured at the right above the naval. The measurements were then taken when the abdomen was in normal position i.e. neither it was inflated not pulled inside. (Lohman, 1988). For hip measurement, children were made to stand sideways facing the observer and the maximal circumference of hip was taken (WHO, 1995). Both waist and hip circumference were recorded nearest to 0.1 cm. The waist to hip ratio was then calculated using these measurements.

  WHR (cm) = Waist Circumference (cm) / Hip circumference (cm)

- **Body Mass Index (BMI):** BMI is used to assess underweight, overweight, and obesity in children and adolescents and is calculated by the formula

  BMI =Weight (in kilograms) / Height (in meters) ^{2}

- **Anthropometric Indices** - For nutritional status analysis, height for age (HAZ), weight for age (WAZ), BMI for age (BMIZ) and waist to hip ratio (WHR) were calculated using the anthropometric measurements and age of the children. The prevalence of undernutrition in the sample was calculated using Z-scores for all the above mentioned indices. The criteria used for mapping the prevalence of undernutrition were CDC 2000 standards and WHO 2007 standards.

- **Weight for Age:**

  Underweight is defined as low weight-for-age and the advantage of this index is that it reflects both past (chronic) and/or present (acute) under nutrition, although it is unable to distinguish between the two. Children

with z-scores < -2.00 SD are said to be underweight and those < -3.00 SD severely underweight.

- **Height for Age:**

  Stunting is defined as a low height-for-age for children, and it measures past (chronic) undernutrition. It cannot measure short-term changes in malnutrition. It is associated with chronic insufficient food intake, frequent infections and sustained incorrect feeding practices. For children below 2 years of age, the term is length-for-age; above 2 years of age, the index is referred to as height-for-age. Children with z-scores < -2.00 SD are said to be stunted and those < -3.00 SD severely stunted.

- **BMI for Age:**

  Thinness is defined as low BMI-for-age, and it is a measure of current or acute undernutrition. Children with z-scores < - 2.00 SD are said to be thin and those < -3.00 SD severe acute malnourished (SAM).

The following categories of WAZ, HAZ and BMIZ were used to determine the growth status of the children:

- Severe = ≤ -3 SD of CDC and WHO median
- Moderate = -3 SD < x ≤ -2 SD of CDC and WHO median
- Mild = -2 SD < x ≤ -1 SD of CDC and WHO median
- Normal = -1 SD < x ≤ +1 SD of CDC and WHO median

- **CIAF CLASSIFICATION OF CHILDREN WITH ANTHROPOMETRIC FAILURE**

While stunting reflects a failure to reach linear growth potential due to sub-optimal health and/or nutritional conditions, underweight reveals low body mass relative to chronological age, which is influenced by both, a child's height and weight. Stunting is an indicator of chronic undernutrition, the result of prolonged food deprivation and/or disease or illness. Underweight thus cannot distinguish between a child that is small in weight relative to his/her height and a child that is low in height relative to his/her age, but who may be

normal in weight-for-height. On the other hand, wasting is an indicator of acute undernutrition, the result of more recent food deprivation or illness; Undernutrrition is used as a composite indicator to reflect both acute and chronic undernutrition, although it cannot distinguish between them (WHO, 1995).

The advantages of the z-score system are that besides being sex specific and able to measure all the three indices, it allows comparison across indicators. Since these indices do overlap, none of them is able to provide a comprehensive estimate of the number of undernourished children in a population. Therefore for a comprehensive measurement of overall prevalence of under nutrition there is a need of a single aggregate indicator which would incorporate all undernourished children be they stunted and/ or wasted and/or underweight. Such an aggregate indicator was proposed by development economist Peter Svedberg and was named CIAF i,e Composite Index of Anthropometric Failure. The original model comprised of 5 sub-groups of anthropometric failure (stunted only, wasted only, wasting and underweight, stunted and underweight and lastly stunted, wasted and underweight) to which Nandy et al. (2005) supplemented one more sub-group (underweight only) making a total of 6 sub-groups of anthropometric failure. The CIAF excludes those children not having anthropometric failure (i.e., group A) and counts all children who have wasting, stunting, or are underweight (i.e., groups B to Y) **(Table 3.3)**.

The children on the basis of the z-score were then categorized as per the subgroups of Nandy's model in order to arrive at the CIAF to get the overall prevalence of under nutrition.

- **Hemoglobin Estimations** - Two trained laboratory technicians were taken to the school for collection of blood sample. Disposable syringes were used to draw blood sample. Blood sample was drawn from the intravenous vein in the elbow crease in vacutainer tubes containing EDTA and marked with child's ID, for automated blood analysis and for

Table 3.3: CIAF CLASSIFICATION OF CHILDREN WITH ANTHROPOMETRIC FAILURE*

Group Name	Description	Wasting	Stunting	Underweight
A	No failure	No	No	No
B	Wasting only	Yes	No	No
C	Wasting and underweight	Yes	No	Yes
D	Wasting, stunting & underweight	Yes	Yes	Yes
E	Stunting & underweight	No	Yes	Yes
F	Stunting only	No	Yes	No
Y	Underweight only	No	No	Yes

*** Classification following Nandy et al, 2005**

haemoglobin (Hb) count. After each set of samples was drawn, the blood was transported to the Anand laboratory, Vadodara in isothermic containers on the same day for estimation. Blood samples were taken from children studying in 4^{th}–6^{th} standards and from only those children whose parents gave written consent for it **(Annexure 3)**. Hematoanalyzer was used to estimate the hemoglobin level. WHO classification of anaemia was used as the criteria for evaluation based on Haemoglobin level and is given in **Table 3.4.**

- **Morbidity Profile** - A structured questionnaire was used to get information regarding morbidity profile. Information regarding common morbidities such as cough, cold, fever, headache, stomach ache, constipation, vomiting, diarrhoea, and toothache with the reference period of 15 days was obtained as a part of morbidity profile **(Annexure 2).** Morbidity Profile was obtained to study relationship to undernutrition and hemoglobin levels.

PHASE 2: PROCESS EVALUATION

The detailed experimental plan and tools used is given in the **Figure 3.3** and **Table 3.5** respectively**.**

A. Process Evaluation At Centralized Kitchen

The major objectives of this phase were

- To assess the nutritional content, quality of food provided by TAPF used for MDM programme.
- To assess the existing infrastructural facilities (viz. procurement, kitchen, storage arrangement, utensils, availability of potable water and fuel etc.) at TAPF.

The following information regarding programme implementation was collected from TAPF functionaries to obtain an overall understanding of TAPF mid-day meal programme:

Table 3.4: Haemoglobin Concentrations (mg/dl) For the Diagnosis of Anaemia and Assessment of Severity According to the World Health Organization

Population	Non Anemia	Anemia		
		Mild	Moderate	Severe
Children 6-59 months of age	≥ 11.0	10.0-10.9	7.0-9.9	<7
Children 5-11 years of age	≥ 11.5	11.0-11.4	8.0-10.9	<8
Children 12-14 years of age	≥ 12.0	11.0-11.9	8.0-10.9	<8
Non pregnant women (≥15yrs)	≥ 12.0	11.0-11.9	8.0-10.9	<8
Pregnant women	≥ 11.0	10.0-10.9	7.0-9.9	<7
Men (≥15yrs)	≥ 13.0	11.0-12.9	8.0-10.9	<8

(Source: WHO. *Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity.* Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011)

Figure 3.3: Experimental Plan for Phase 2: Process Evaluation

Process Indicators: Spot Observation at School
(N= approx 13-14/school)

- Sitting arrangement at the time of food consumption
- Supervision by teachers at the time of food consumption
- Motivation and tasting of food by teachers
- Responsibility of serving food
- Disposal of plate waste and Leftover food management
- Hygiene and cleanliness
- Regular water supply and Separate space for drinking and washing

Process Indicators: Spot Observation at Akshay Patra Kitchen
(N= approx 1/month)

- Infrastructure facilities
- Machinery and equipments
- Storage facilities
- Manpower
- Sanitation and Hygiene
- Food Handling
- Menu
- Cooking process
- Transportation

Table 3.5: Tools used for data collection for Process Evaluation

Indicator	Procedure	Sample Size
Observations 1. Direct observations of MDM consumption schools 2. Direct observations of kitchen	Structured observation checklists	229 observations 23 observations
Average consumption of MDM meals	Standard cups and spoons	1404 children

- Details of the program guidelines and process of implementation
- Type of meals provided and its nutritional content and caloric value, systems for variation in `menu', estimated unit cost of each meal, etc.
- Delivery mechanism established for making the cooked meal available to schools, processes and manpower involved, etc.

Spot Observations in Kitchen

Direct observation is an underused and valuable method for collecting evaluation information. Key to observation are “Seeing” and “listening”. Observation provides the opportunity to document activities, behavior and physical aspects without having to depend upon people’s willingness and ability to respond to questions (Powell, Steele and Douglah, 1996).

In the present study, the centralized kitchen observations were done once every month. Initial observations for a period of 3 months (January, February and March, 2010) were done in the temporary kitchen at GIDC, Makarpura. The newly upgraded centralized kitchen located at Subhanpura became functional from June 2010, where the rest of the observations were done until the end of the study period. A total of 23 observations were made at centralized kitchen.

Data Collection

A structured observation checklist **(Annexure 4)** was used in order to record the various indicators for kitchen evaluation like process of procurement, meal preparation, cost, man power, storage, infrastructure, sanitation and hygiene, cooking process, packaging and delivery which are described in **Table 3.6.**

B. Process Evaluation Of MDMP At Schools

In this phase, the execution of the MDM programme at the schools was studied.

Table 3.6: Indicators used for kitchen evaluation

Indicators	Aspects
Kitchen	Basic supplies, Machinery, Storage facilities
Menu	Cyclic menu, Quality of food items, Standardization and Cooking process
Cost	Cost per child
Manpower	Number of staff, Education level, Experience, Training
Sanitation & Hygiene	Cleanliness of cooking area, Cleanliness of food handlers, Food handling, Pest control.
Delivery system	Mobile unit, Distribution challenges

Spot Observations

Direct observation of meals is often considered the “gold standard” by which dietary assessment tools are validated because it is practical, economical, independent of the child’s memory, and can provide unbiased information about the child’s actual intake. For direct observation of meals, observers typically watch children throughout a defined period (eg, school lunch) and take notes on the child’s eating behaviors regarding items and amounts consumed, traded (received/given away), and/or spilled (Baglio et al., 2004).

Spot Observations were made in all the schools once in a month to observe the execution of the MDM programme at the schools. A total of 229 spot observations were made during the study period.

Data Collection

A detailed pre-tested questionnaire **(Annexure 5)** was used to elicit information regarding total number of children present, number of children consuming MDM, serving of food, role of teachers, supervision, sanitation and hygiene, plate waste and left over management. Indicators used for process evaluation are given in **Table 3.7.**

Also, quantity of MDM consumed by children was measured on a sub sample. Every month one girl and one boy were selected from each standard in each school making the sample size 14 from each school. The amount of food served to them and the amount of leftover food i.e. plate waste was measured using standard cups and spoons. Plate waste is defined as the quantity of food served but not eaten. Also, extra servings served to them were noted. A total of 1404 children were observed during the spot observations. After measuring the quantities consumed by the children, the nutritive values of the quantities of the food items were calculated using Nutritive Value of Indian Foods (NIN, 1989). Thus, consumption of food provided under the MDM programme was quantified and mean nutrient intake was calculated and dietary intake was converted into percent RDA. The % RDA for all nutrients was calculated by dividing the given nutrient content of the meal/snack by

Table 3.7: Indicators for process evaluation of MDMP

Indicators	Aspects
EXECUTION OF MDMP	
Basic information	No of days executed in a year, No of children fed, % beneficiaries, Supervision and Availability of utensils.
Sanitation & Hygiene	Source of water and Hygiene practices promoted by school.
Consumption of MDM	Average supply and consumption of MDM in schools.
Impact indicators	Attendance, Drop outs, Enrollment of girl child, Scholastic performance, Caste differences.
SPOT OBSERVATIONS	
Spot observations	Role of teachers, Cleanliness of serving area and utensils, Waste disposal, Left over management, & Plate waste. Quantity of food consumed by children (sub sample).

1/3rd of the RDA given by NIN – ICMR (2009) which are age and gender specific.

PHASE 3: IMPACT EVALUATION

The aim of this phase was to study the impact of the MDM programme provided by The Akshaya Patra Foundation on the growth, hemoglobin, morbidity profile, scholastic performance and attendance of the school going children. The detailed experimental plan of this phase is given in **Figure 3.4.**

The following data was collected on all the children:

- **Anthropometric Data** (Weight, Height, Waist and hip circumference)
  Bio-chemical Estimations - Hemoglobin estimations were carried out on a sub sample of 681 children. For this children from 5th to 7th standard who had given the blood sample previous year were selected and the blood sample was drawn only if the children and their parents had given the consent for it. The dropout rate was high (44.2%) for hemoglobin estimation as it is an invasive method and as the children had given blood during pre data collection, some of them refused to give consent second time.

- **Morbidity Profile** – Morbidity profile was collected on only those children on whom bio- chemical estimations were done.

The methodology of data collection for anthropometry, haemoglobin estimation, and morbidity profile has been described in detail in the first phase of the study. As this was a pre-post evaluation the final sample size for each parameter is given in **Table 3.8.**

- **School Attendance and Scholastic Performance –** Collection of secondary data on enrolment, attendance, marks / grades obtained was taken for all the schools from school registers. TAPF mid-day meal programme intended to achieve an increase in enrolment, retention, attendance of students and thus an improvement in their scholastic

Figure 3.4: Experimental Plan for Phase 3: Impact Evaluation

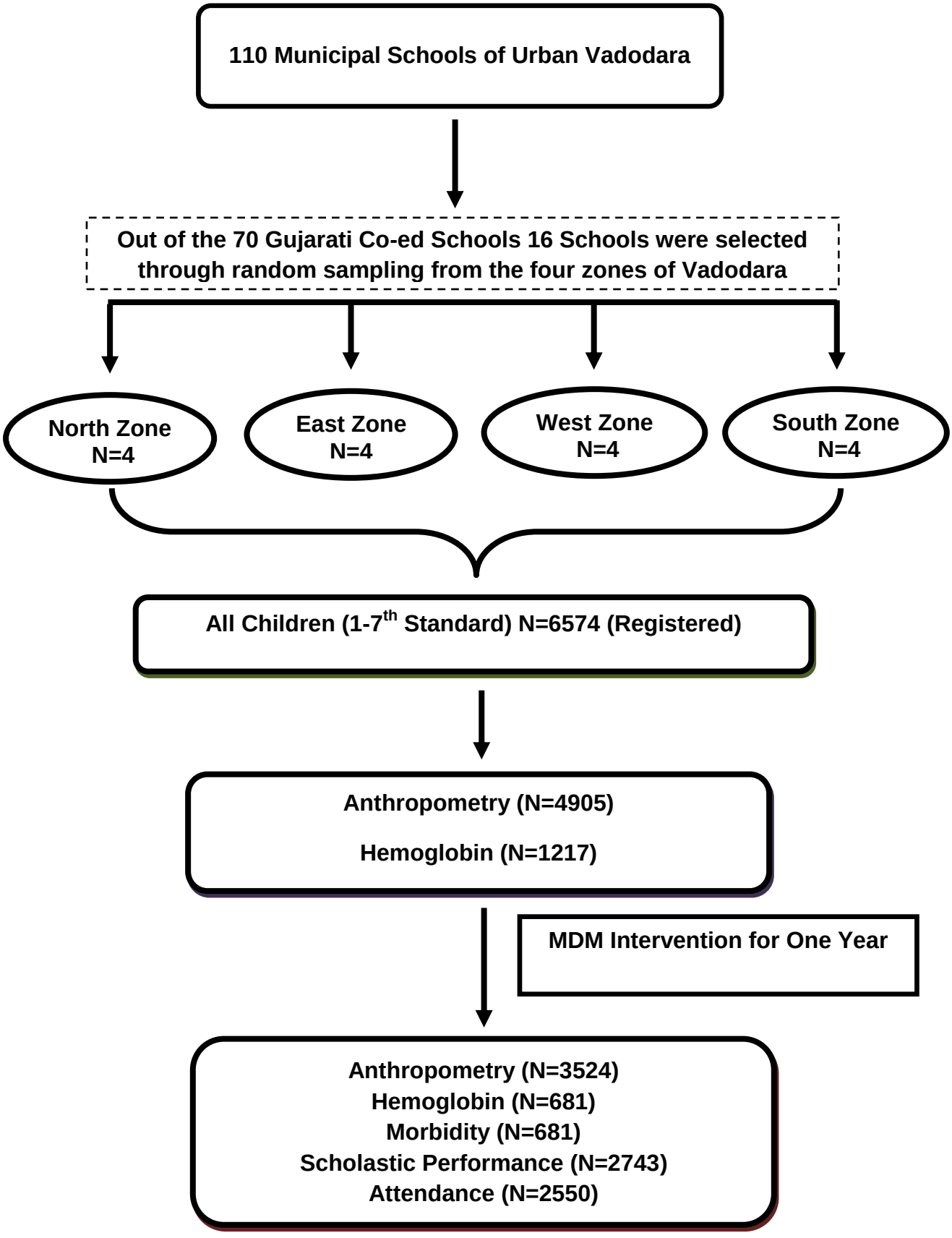


Table 3.8: Tools & Sample used for Impact data collection

Indicator	Procedure	Sample Size
Anthropometry 1. Weight 2. Height	Bathroom weighing scale for weight. Non stretchable fibre glass tape for height, waist and hip circumference	3522 children
Hemoglobin estimation	Hematoanalyzer	681 children
Morbidity profile	Structured Questionnaire	681 children

performance. Hence in order to gauge the impact of the program, the extent to which these key educational indicators have been influenced was examined.

- ***Impact on Enrolment -*** An examination of the status of enrolment of the children before and after TAPF intervention period was carried out to study the impact of TAPF mid day meal programme on enrolment. Details on enrolment were collected for one year prior to the implementation of the mid-day meal programme provided by TAPF and after the implementation of the programme for all standards from all the schools.

- ***Impact on Attendance –*** Attendance of all children for all the standards was collected for one year prior to programme implementation and for one year post programme implementation to measure the extent to which the program had been successful in improving attendance.

- ***Impact on Scholastic Performance –*** Total grades obtained by each student in the annual examination were collected from the school records, for all standards for one year before the implementation of the programme and one year after the implementation of the programme.

PHASE 4: WORKSHOP ON MID DAY MEAL PROGRAMME FOR MUNICIPAL SCHOOL TEACHERS OF VADODARA

A one day workshop on MDM was conducted for the School Teachers of all the Municipal Schools of urban Vadodara to create awareness regarding undernutrition in school children and importance of MDM. Two teachers from each school – the Principal and the MDM liaison teacher (or other teacher) were invited for the workshop. Feedback of teachers regarding the MDM Programme was collected through self-administered semi-structured

questionnaires and group discussion **(Annexure 6)**. Information was elicited from 195 teachers, out of which half of the respondents were principals (96), 45.1% were teachers (88) and only 5.4% were MDM liaison teachers (11). The experimental plan for this phase is shown in **Figure 3.5**.

Semi structured Self Administered Questionnaire (SAQ)

Principle: This type of questionnaire is meant to be filled in by the respondent himself/herself and unlike qualitative interviews; there is no scope for the researcher to probe and get in depth information from the respondent.

***Purpose*:** The aim of SAQs with the teachers was to understand their perceptions regarding the objectives of the MDM Programme, quality of implementation, and to gather their feedback regarding the MDM Programme provided by TAPF.

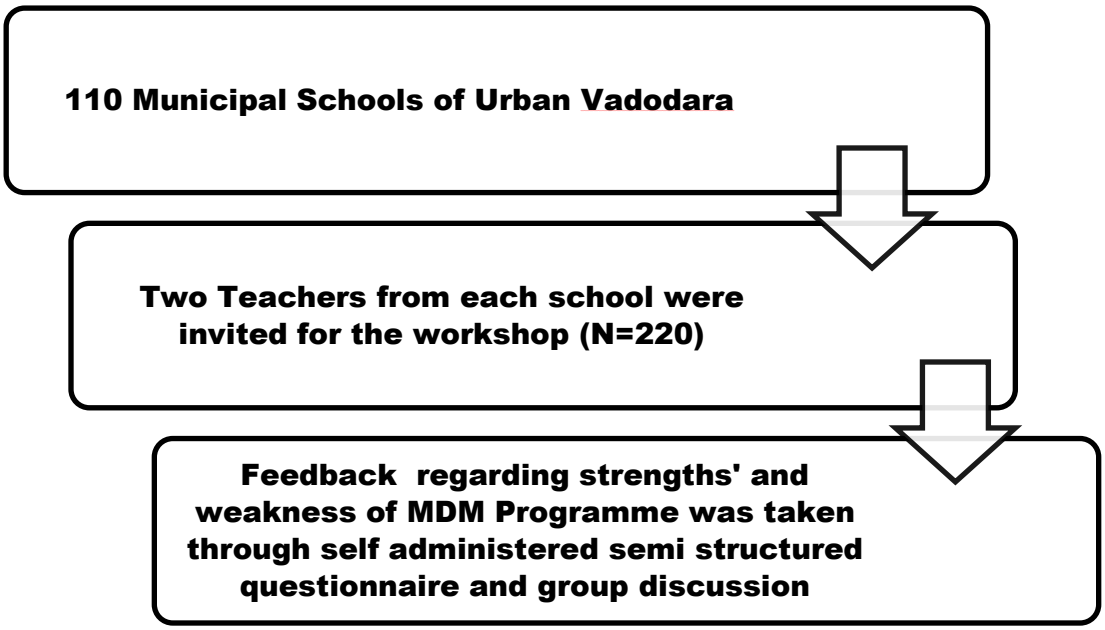
The teachers were given the self-administered questionnaire in the workshop. They were explained all the questions one by one. The researcher remained present while the questionnaire was filled up by the teachers. Any queries regarding the questions asked in the questionnaire were clarified by the researcher.

Focus Group Discussions (FGDs)

Principle: FGDs are in-depth discussions with a small group of informants, guided by a facilitator or a moderator and the participants talk freely and spontaneously about themes considered important to the investigation (Debus and Novelli, 1995).

In this study, for the group discussions, the teachers were divided in to 5 groups –each comprising of 35-40 teachers. Each group was given a topic related to MDM such as objectives of MDM, functioning of Akshay Patra, role of teachers in improving MDM, problems faced in implementing MDM and attitude of the parents towards MDM and their expectations from the programme. The groups were then asked to discuss the topic among them and a representative from each group had to present the highlights of the discussion.

Figure 3.5: Experimental Plan for Phase 4: Workshop on MDM Programme for Municipal School Teachers of Urban Vadodara



PHASE 5: KAP OF PARENTS, TEACHERS & CHILDREN

One day workshop on MDM was conducted for the Municipal School Teachers of urban Vadodara to create awareness regarding undernutrition in school children, importance of MDM, and to obtain their feedback regarding MDM provided by TAPF.

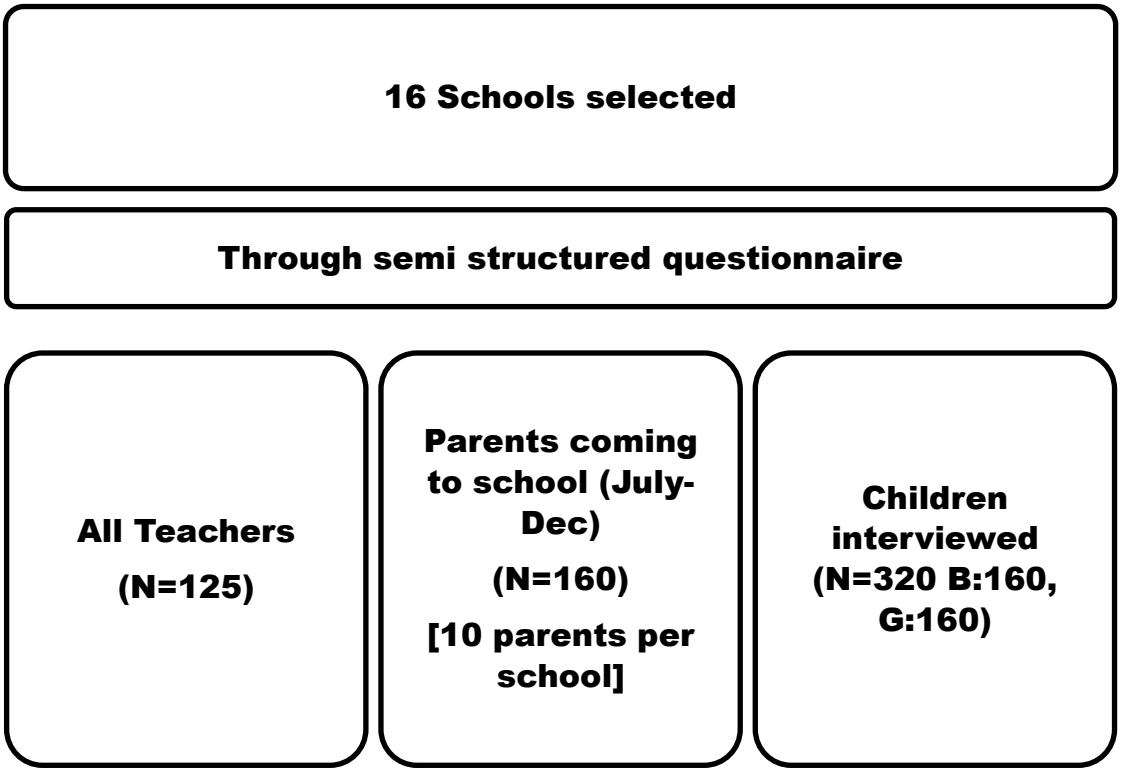
The workshop was conducted in the month of March'2011, after that, in the new academic year, teachers, school children and their parents were interviewed using a semi structured questionnaire. Knowledge, Attitude and Practices questionnaire (KAP) was used for assessing the perceptions, knowledge and awareness of the beneficiaries of MDM with respect to the MDM functioning and its importance. The objective was also to obtain their feedback regarding the changes observed after the workshop in the implementation of the MDM programme at the school level as well as variety in the menu provided by TAPF. The questionnaire was made in the local language i.e. Gujarati making it easier for the respondents to understand and answer it **(Annexure 7)**. The experimental plan for this phase is shown in **Figure 3.6**.

Principle of KAP:

A KAP survey is a representative study of a specific population to collect information on what is known, believed and done in relation to a particular topic. A KAP survey is a representative study of a specific population to collect information on what is known, believed and done in relation to a particular topic. **(WHO, 2008)**

All teachers (n=125) from 16 schools, along with 301 children, (20 children/school with equal distribution of boys and girls, representing from 3^{th}-4^{th} standard and 5^{th}-7^{th} standard) and all the parents (n=71) who could be contacted at the school, were interviewed to assess their views and perceptions which are as follows

Figure 3.6: Experimental Plan for Phase 5: KAP of Teachers, Parents and Children



- **Perceptions of Teachers towards the MDM**

Semi-structured interviews were conducted with the teachers to obtain a comprehensive analysis of the program.

- Opinion on the quality of meals provided by TAPF
- Acceptability of mid-day meals among the children
- Opinion on impact of the TAPF mid-day meal on enrolment /retention and attendance of children with special reference to girls
- Impact of TAPF mid-day meal on health of the children
- Opinion and suggestions for strengthening the scheme

- **Perceptions of Parents towards the MDM**

Semi-structured interviews were conducted with the parents of the children and following information was collected:

- Awareness regarding mid day meal received by the child in school
- Awareness regarding food items liked or disliked
- Opinion on mid-day meal received by the child/impact on health
- Perception on benefits of the programme
- Extent of acceptance and satisfaction/dissatisfaction with the mid-day meal programme and the reasons for the same.

- **Perceptions of Children towards the MDM**

Semi-structured interviews were also conducted with the children benefitting from the MDM programme provided by TAPF. The following topics were covered:

- Opinion of the children regarding MDM delivered by TAPF
- Regularity of the consumption of MDM
- Likes/Dislikes of the food items provided by TAPF.

DATA ANALYSIS:

The data was entered into Microsoft excel spreadsheet and then subjected to appropriate statistical analysis. All statistical analyses were performed using SPSS software trial Version 16.0. Epi Info version 3.5.1. and WHO Anthro Plus Software were also used as a part of statistical analysis for obtaining the z-score values for weight-for age, height-for age and BMI-for-age. Stunting, underweight, and thinness were defined as height-for-age z-score (HAZ) < −2SD, weight-for-age z-score (WAZ) < −2SD, and BMI-for-age z-score (BMIZ) < −2SD, respectively.

Estimation of the frequencies of descriptive variables (Gender, level of education of parents, and age) was done. Descriptive statistics of Means and standard deviations were calculated for weight, height and BMI across gender and age groups. Cross tabulation was used to compare between two variables. Student's t-tests and Paired t tests were used to see the significance of differences in means between the gender at each age group as well as between gender on an overall basis. One-way ANOVA tests were done to evaluate the significance of differences in means for each gender as well as for the combined mean values across the age groups.

Fisher's exact test was used to examine differences with categorical variables. Values were presented as mean (±SD). Pearson correlation coefficient was calculated to explore the relationships between the measured parameters. For all statistical analyses, $P<0.05$ was considered statistically significant.