ORIGINAL ARTICLE

Challenges and interventions in meeting delivery of nutrition in mid-day meal scheme: a pilot in district Faizabad, Uttar Pradesh

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Abstract

Background: Providing cooked food to about hundred million children under mid-day meal scheme has been accomplished. Focus has now shifted to delivery of nutrition since the National Food Security Act specifies statutory quantities of protein and calories. **Aims & Objectives**: Delivery of nutrition requires comprehensive overhaul to include interventions in area of storage, preparation and practices, stoves, human resource development and community participation. **Methodology**: Based on a baseline survey of 70 schools through random selection in two blocks of Faizabad, Uttar Pradesh these concerns were investigated in details for specific interventions. **Results**: *Nutrition*: Both Faizabad and MHRD's all India data establish that net quantities consumed by a child (quantity served minus plate waste) cannot provide prescribed nutrition. It reiterated the fact that mid-day meal is first and major meal for most rural children. Experiments conducted to standardize quantities, consistencies and splitting meal into snack plus meal improved nutritional delivery. *Hygiene and food safety*: In both blocks food was delivered at high temperature enabling food safety standards to be met with improved hygiene and Standard Operating Procedures (SOPs). *Human Resource*: A pictorial training manual was prepared to train master trainers as well as cooks. Location specific training using local idiom and practices were used and campaign was conducted to enhance community participation in 45 villages. *Fuel efficiency*: Low cost smokeless chullahs (stoves) designed locally resulted in fuel savings. High efficiency cook stoves were also tested, however their cost limits reproduction. **Conclusion:** Accomplishing comprehensive improvement within existing cost of conversion per child is a challenge particularly since there are no economies of scale in rural areas. The methodologies created in the pilot for hygiene and food safety, awareness and capacity building through campaigns and training, locally designed smokeless chullahs can be scaled up for improving delivery of nutrition under the scheme.

Key Words

Mid-day meal; Human resource development; Standard Operating Procedures; Fuel Efficiency; Campaigns; Smokeless challahs; Food safety

Introduction

The National Programme for Nutritional Support to Primary Education (NP-NSPE) launched as a centrally sponsored scheme on 15th August 1995 was universalized following the landmark order of the Supreme Court on 28 November 2001. The order directed the state governments to introduce cooked mid-day meals in all government and government-assisted primary schools within six months. Today, the scheme is covering 10.68 crore children in 12.12 lakh schools.

Having achieved the delivery of cooked food in all states and reaching out to children (6-14 yrs) through mechanisms of centralized and decentralized delivery model the scheme requires a comprehensive review for achieving its own mandate of delivery of nutrition. Due to the speed of expansion dictated by the dateline of six months for

compliance with the framed guidelines, the scheme has not been able to address the qualitative issues for delivery of nutrition.

Though many reports testify that mid-day meal increases attendance, improves quality of education, brings social and gender equity however various drawbacks have also been listed: lack of information on the NP-NSPE guidelines; inadequate funds for utensils and infrastructure; low and delayed reimbursement of salaries; lack of support from school staff and poor working conditions leading to low motivation in the MDM staff members (Robinson, 2007; Verma, 2008; Nambiar, 2012). Reports also reveal limited usage of vegetables in MDM, unhygienic cooking and working conditions, lack of variety in the menu and interrupted services with compromised quality (Jain, 2005; Khera, 2006; fifth joint review mission reports, 2013)

Food Security Act (Schedule II) the legal designates the quantities of protein and calories to be delivered per child through cooked food (Table 1). However, ensuring compliance in the delivery of protein and calories is complex and requires a comprehensive review of all aspects of MDMS.

The fifth joint review commission report under MHRD have also registered that there is no compliance either in terms of quantity of cooked food and in terms of nutrition (Table 2).

The delivery of nutrition in a large scale feeding programme is dependent on many factors. These factors under MDM can be defined on the basis of monitoring as “Valued” and “Non- Valued” areas (Figure 1). Review of MDM has revealed that as accountability in system is based on monitoring of only “valued” areas and thus, the scheme has not been fully able to achieve the objective of nutrition delivery. The gaps remain as the “non-valued” areas have not been defined for their monitoring.

However, any interventions in the area would require an understanding of the issues and study feasibility of implementation to understand impacts which can then be replicated for a larger scale implementation

Rationale: From the gaps registered in various review studies (Fifth Joint Review Mission Reports, 2013) it was evident that delivery of nutrition requires comprehensive overhaul to include interventions in area of physical infrastructure-kitchens, storage, stoves; development of human resource and community participation. The review of the scheme in many districts in Uttar Pradesh have been rated for poor performance in many areas of implementation requiring more focused attention (MHRD, 2013). Thus, a pilot study was undertaken in two blocks of Faizabad district, Uttar Pradesh to develop methodologies for specific interventions and guide implementation for improving delivery of nutrition.

Aims & Objectives

A pilot study to improve delivery of nutrition was undertaken in two blocks of Faizabad district of Uttar Pradesh to understand various aspects interventions and create templates for systematic improvement of MDM Scheme.

The pilot comprised of the following objectives:

1. Baseline study to review the practices and implementation in the selected area
2. Create templates for systematic improvement of delivery of nutrition under MDM in areas of:
   a. Nutrition and food safety
   b. Fuel efficiency and energy conservation
   c. Development of human resources
   d. Awareness building through campaigns

Material and Methods

Selection of Blocks: Blocks Masodha and Sohawal were selected for the purpose of the pilot based on their clustering for differential characteristics as urban and rural sectors, presence of variety of schools, industries/mills, and other social structures. The list of primary and upper primary schools was collected from the BSA (Basic Shiksha Adhikari) office. From the list of 367 primary and upper primary schools in both blocks, a sample of 70 schools was selected based on random selection criteria of probability proportional to size sampling. Baseline survey was undertaken to gather and analyze data on the current practices, resources used and outcomes of the full array of activities associated with implementation. Furthermore, the specific information regarding nutritional assessments, resources and services available, perceptions of scheme in the village was also carried out to analyze the gaps and assess the location specific needs. Written informed consents were taken wherever required and anonymity of responses was guaranteed to the respondents.

The methodological framework for conduct of the pilot followed a simple flow of work (Figure 2). Different tools used for assessment criteria were statistically analyzed guiding interventions in the areas.

Results

Nutritional assessments: The study revealed that children were consuming much lower intakes from the regular diet when compared to the RDAs (Table 3) and majority (63%) of students were coming empty stomach to school (n=140). Thus, not only mid- day meal was their first meal but was contributing to larger calorie and protein intake in a day.

The lower intakes of food in children can be attributed not only limited access to food but also to factors as dental carries, ulcers, gastric disorders, worms and others which largely affect food intakes . Clinical assessments also flagged the need for linkage between health and nutrition (Table 4).

Anthropometric assessments carried out for 597 children (273 boys and 324 girls) and analyzed for: Weight for age WAZ (weight for age) for children up to age 10 years (as per WHO reference standard); HAZ (Height for age) up to 19 years and BAZ (BMI for age) revealed that:

- 45.7 percent of children (5-9 yrs.) were underweight (with a mean and S D of -1.38 and 1.18 respectively).
- Underweight was more prevalent in boys (47.5 %) than the girls (44.2 %)
- Girls (57.4%) showing lower height for age than the boys (48.7 %)
- In the age group 15-19 yrs more boys (62.5 percent) were seen to be having lower height for age.
- BMI for age also reflected a skewed distribution pattern towards left showing more malnourished population for both boys and girls
- 4.9% of boys and 3.8% of girls were severely malnourished
- 24.6 % of boys and 15.6% of girls were moderately malnourished.
- 10-14 yr age group reflected higher percentage of malnourished boys (32.7%) than girls (18.1%).

The results of the survey pointed out the following which requires due consideration:

1. Extent of malnutrition tallies with NFHS-3 data even after so many years of implementation
2. Nutrition cannot be handled at MDM unless there is a continuum from conception to class VIII –there is a stronger need for convergence (which was beyond the scope of study in the pilot)
3. The baseline survey revealed an average gap of 23-28 percent in calories and 45-52 percent in proteins as observed even when quantities consumed were sufficient (table 5). Also from the joint review commission reports (table 2) it is evident that with the present execution design of menus the required quantities of proteins and calories can't be met.
4. Understanding of nutritional impact on cognition needs to be studied well where we have children coming on empty stomach attending schools and later fed with larger quantities of food at one go. The study calls for stronger linkages with school health programme and not just based on mere presence of child attending school.
5. The study also emphasized on role of hot cooked meal amounting to sufficient intake both by primary (average consumption of 400g) and upper primary (average consumption of 550g). Also, it being the first and major meal in a child's daily intake in larger population.

MDM infrastructure and delivery: A detailed survey was conducted to understand various aspects of preparation and delivery of mid-day meals.

Baseline survey findings reported a few gaps and highlighted areas where interventions were required for improvement (Table 5).

Nutrition and Food safety: Certain interventions were conducted to design methodology to improve nutrition delivery. Table 6 provides the intervention conducted and concerns for implementation

In any feeding programme food safety is a serious and legal obligation. It is about enforcing the Food Safety and Standards Act, 2006. Food safety concerns should stretch from processing of raw material to cooked food, transportation and distribution and right up to the lack of water for children to wash their hands before eating the food. There is also a need to understand that lack of control of diseases like diarrhea defeat the purpose of providing nutrition. Therefore, the food safety study results need to be correlated to the epidemiological data relating to prevalence of diarrhea etc.

The present pilot of decentralized school based kitchen model indicated that as there is no time gap between preparation and consumption, thus food spoilage at point of delivery is controlled, however, spoilage can occur if hygienic practices are not followed during distribution and consumption.

The study also reflected that though the raw materials as water and spices were of satisfactory quality higher total plate counts in cooked food was there which may mainly due to lot of cross contamination taking place in the work processes. Also, practice of hand washing in between processes was not observed in the kitchens. Designing and training cooks for standard operating procedures helped in improving hygiene practices in preparation and delivery of meals.

Training and building capacities: Training of cooks and other functionaries at the delivery end cannot be universalized or taught outside context in which they function. It is important that the systems and facilities of cooking at the village school and the levels of understanding of the cooks must be understood while designing training programmes. Training material was developed in local language with pictorial representations along with pictorial process flows of standard procedures.

Training sessions were conducted with members of Nayya Panchayat Resource Centers (NPRC), teachers and cooks. Training sessions with the members of NPRC also highlighted the monitoring issues and training helped built the capacities of these members to observe the processes in schools which they were earlier not aware of. Along with training sessions community field meetings were taken up with Pradhans, mothers, members of SMC and others. Training sessions with various stakeholders did show an impact (Table 7) and reflected that regular training would not only improve effective delivery but also minimize the need for monitoring as it will aim for minimizing errors at all levels.

Building awareness and community involvement

Awareness is a prerequisite for bringing change. A Campaign "Sehatmand Ho Apna Jahan" was designed for building awareness regarding the prerequisites for achieving nutritional benefits from the scheme. The Kala Jatha campaign with "nukad natak and songs" covered 45 villages in a span of 12 days. Campaign material comprised of posters, stickers, pamphlets and slogans (Figure 3).

Fuel Efficiency and Energy Conservation: MDMS has not addressed either the macro or micro level issues relating to fuel efficiency and energy conservation. It was reflected as a major area of concern having an impact not only on preparation of food but also on health of cooks. The pilot attempted to place and monitor few fuel systems (Figure 4) which would not only result in better efficiencies and save fuel but also reduce the smoke emissions which mainly comprise of Carbon Monoxide (Table 8)

Discussion

The National Programme of Nutritional Support to Primary Education (NP-NSPE) - a Centrally Sponsored Scheme, popularly known as the Mid-Day Meals Scheme (MDMS), has to adhere to the following:

- The National Food Security Act Schedule II read with the Judgment of the Hon'ble Supreme Court defined the legal status of MDMS as "Mid-Day meal, in the form of cooked food, having the scheduled calories and proteins, shall be the legal right of the children studying in Govt. and aided Govt. schools"
- Mid-Day meals could only be a means to an end, and not an end in itself. The end being, a physically and mentally healthy child.

The review of the MDM in the area reported the following field facts which need to be considered for placement of any intervention.

Government schools are increasingly catering to the most under-privileged like the farm labourers who do not even possess any assets including house sites.

- A large number of children come to school on an empty or near empty stomach to school, for these children the Mid-Day meal is the first and the main meal in a 24 hour cycle.
- The Village Pradhan and the Head Master are the elite power in the village. The women cooks and children are the most, socially economically and politically, dis-empowered persons in the village. The two extremities create a gross imbalance in the power equation

In Faizabad, the rural schools provided 80 % of the quantity of food prescribed in the MDMS guidelines, but are unable to meet the calories and protein requirement. Standardization of work processes, training of cooks for standard operating practices and supervision resulted in an improvement in the delivery of nutrition.

Children coming on an empty or near empty stomach and/or eating about 350 to 450 grams of food in one sitting between classes is not desirable from a medical perspective, thus attempts were made to serve energy rich snack along with the meal at different times. However, this model of snack plus meal needs to be reviewed for budgetary and delivery aspects. Also, no manufactured snack or meal would be able to provide satiety and satisfaction to a child coming on empty stomach.

There is a lack of medical concerns in the design of the MDM menu b) There is no clarity regarding the role and responsibility of RBSK in matters relating to Mid-Day Meals Scheme c) There was no mechanism to get good medical management d) Teachers and parents, if they are made aware could detect several ailments such as poor eye sight due to Vitamin A deficiency, germs or cavities in the teeth, skin problems e) After identification of the deficiencies or ailments prevailing there needs to be a roadmap for corrective actions.

To ensure safe delivery of meals it is imperative for the Food Safety Standards Authority to prescribe specific standard specifically designed and relevant to the Mid-Day Meal Scheme both in centralized and decentralized meal preparation and distribution. It was observed that most of the problems in the school based kitchens are due to cross-contamination. Cross contamination could be overcome by (a) simple modifications in physical structures as provision of a tap inside or near the kitchen (b) demarcation of kitchen for cooking, washing and storage (c) educating and training the cooks on the importance of hand washing between operations (d) enforcing covering of head and tying of clothes (such as dupatta or pallu of saree) during cooking (e) regular health check-ups of the cooks (f) testing and certification of water (g) Procurement and proper storage of raw material particularly spice (h) awareness of food safety measures during work processes

The Food Corporation of India has a system of certification of quality of the grain delivered but, there are no systems either of certifying quality or enforcing proper storage in downstream chain of Kotedars and Pradhans. Their capacities should be built for grain checks and storage.

Improvements in delivery of nutrition especially micronutrients would require accounting and monitoring of all ingredients as dals, vegetables and oil listed in guidelines and not only just reporting of grain usage.

Conclusion

The study distinctly highlighted that food security is not coterminous with nutritional security The methodologies created in the pilot for specific interventions in areas of : Hygiene and food safety; awareness and capacity building through campaigns and training; locally designed smokeless chullahs can be scaled up for improving delivery of nutrition under the scheme.

Recommendation

MDMS is only a means and not an end in itself. Undeniably the end can and should only be a healthy child. Without proper support structures it is not possible for rural schools to provide safe and nutritious food or provide smokeless and healthy working conditions for the cooks. There is a need to transform and create participatory role for community to understand importance of nutrition and food safety in growth of their children. Training and capacity building needs to be taken up for professionalizing an army of more than twenty two hundred thousand human being participating in the system. Systemic changes like replacing the system of reimbursement to a system of advance payment is required for effective implementation.

Limitation of the study

The study due to lack of necessary permissions could not undertake cost effective infrastructural innovations in the kitchens except constructional models of smokeless chullahs.

Relevance of the study

The study created templates for effective implementation of MDM which can be easily replicated. It focused on ensuring nutritional delivery through defining processes and practices, constructing cost-effective smokeless chullahs, designing training manual and pedagogy after assessing the needs in the area and developing campaigns for effective community participation and reach.

Authors Contribution

The pilot study in Faizabad District involving comprehensive review and interventions in MDM was led by IC and KAR was the advisor for the same.

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Tables

TABLE 1 MDMS GUIDELINES REQUIRE THAT COOKED MID-DAY MEAL SHOULD SERVE THE QUANTITIES PROVIDING THE PRESCRIBED NUTRITIONAL CONTENT FOR BOTH PRIMARY AND UPPER PRIMARY CLASSES

Nutritional Content	Primary	Upper Primary
Calories	450	700
Protein	12 g	20g
Micronutrients	Adequate quantities of Micro nutrients like Iron, Folic Acid and Vitamin A and deworming medicines etc.	

TABLE 2 FIFTH JOINT REVIEW MISSION REPORT MDM

States	Kitchens surveyed	cooked meals for Primary#	cooked meals for upper primary #	calories served (avg)	proteins served (avg)	
Himachal Pradesh	school based	NA	NA	NA	NA	
Tripura	school based	250-300g	250-300g	392	10.4	egg is served
Gujrat	school based	200-300g	200-300g	392	7.3	
	central kitchen*	175-275g	175-275g	NA	NA	
Andhra Pradesh	school based	260-280g	290-465g	NA	NA	
	central kitchen	90-150g	200-300g	NA	NA	
Delhi	central	154-221g	154-221g	328	6.8	
Uttar Pradesh	NA	NA	NA	NA	NA	
Madhya Pradesh	school based	125-182g	115-165g	380-405	10.5-12.15	
Tamil Nadu	school based			400-690	10-18g	egg is served
# average amounts of the different menus being served						
*** quantities provided by the kitchen managers**						

TABLE 3 ENERGY AND PROTEIN CONSUMPTION FROM FOOD INTAKES BY DIFFERENT AGE GROUPS

			Based on Actual intakes*		RDAs	
Age group (yrs)	**children (n=140)**	**Gender**	**Energy (Kcal)**	**Protein(g)**	**Energy (Kcal)**	**Protein(g)**

4-6	5		1035	23.8	1350	20.1
7-9	15		1058	26.9	1690	29.5
10-12	20	Boys	1245	34.1	2190	39.9
	59	Girls	965	26.4	2010	40.4
13-15	14	Boys	1293	38.1	2750	54.3
	22	Girls	921	26.4	2330	51.9
16-17	5	boys	2194	46.5	3020	61.5

*The intakes excludes the energy and protein from MDM

TABLE 4 CLINICAL SYMPTOMS FOR DEFICIENCIES OBSERVED IN FAIZABAD FOR (N=97)

Symptoms	commonly associated deficiencies	percentage of subjects
Dry scaly skin	Vitamin A, zinc , essential fatty acids	41.4
Follicular hyperkeratosis	Vitamin A, Essential fatty acid	4.1
Dull thin sparse hair	Protein, Iron, Zinc, Essential Fatty Acids	46.4
Papillary hypertrophy	General under-nutrition and deficiencies	27.8
Hair depigmentation	protein	23.7
Dental caries	lack of oral hygiene, calcium	58.8
Bleeding gums	Vitamin C	23.2
Pale skin, spoon shaped nails	iron deficiency	5.1
White spotting -nails	Zinc deficiency	19.6
Bitot spot	vitamin A	1

TABLE 5 CONCERNS FOR INTERVENTIONS FOR VARIOUS PARAMETERS IN THE SURVEYED SAMPLE (N=70)

S.no.	Parameter	Schools (n=70) Percentage	Concerns for interventions Low-L, High-H
Infrastructure available			
	Presence of kitchen sheds	88.6	L
	Availability of separate stores	65.7	L
	Storage of grains done separately	16	H
	Inappropriate work space in kitchen	92	H
	Cooking carried out in open	47	H
	Separate washing area available	9	H
Raw material and storage			
	Kitchens satisfied with Grain quality	68.8	L
	Presence of measures	56	L
	Use of branded spices with quality assurance marks	61.8	L
	Quality of spices assessed on physical parameters	14.7- Good 58.8 Satisfactory	L
	Water used for cooking purposes	Satisfactory – as per IS 10500	L
Hygiene and safety at work place			
	Satisfactory Personnel hygiene and its awareness	14	H
	Hand washing followed before start of work processes	37	H
	Kitchen hygiene on various parameters- Satisfactory	22	H
	Storage of wood fuel in kitchens	79.7	H
	Excessive Smoke in kitchens	53 other kitchens were operating in open	H
Quantity and quality of food delivered			
	Quantity of food delivered –satisfactory	81	L
	Delivery of proteins and calories as per norms- (lab testing of samples from few schools revealed)	Average gap in calories is 23-28 percent Average gap in proteins 45-52 percent	H
	Quality of cooked food- satisfactory	36	H

TABLE 6 INTERVENTIONS FOR STANDARDIZING QUANTITIES AND CONSISTENCIES

Intervention	Schools (strength)	cost	Outcome	Issues/concerns
Standardizing of quantities and processes - SOPs formed for given menu Provided uniformity and consistencies Controlled costs Controlled wastages Facilitated bulk buying and monitoring	Primary <100	Cost could be met only with savings on fuel	optimum delivery of calories and proteins	Conversion cost may increase for certain meals but the weekly cost can be within the norm. Headmasters and Pradhans to be made aware and involved for supervision of process and quantity for proper delivery of nutrition
	Primary (>170<200)	No extra conversion cost		
	Upper primary (<100)	Marginal increase in cost for secondary approx. 50p per child	conversion cost for the desired quantities need to be reviewed for upper primary	
Snack plus meal Tried with different snacks as channa, sweet rice, lapsi, daliya were tried (tried only for 10 days)	Primary n=100	Cost of snacks ranged from 0.84-1.2/child Cost can be lowered when grains are served say 15g for snacks and 85g in meals instead of 100 g in one sitting.	Small serving portion sizes of 25- 30g filled the calorie and protein gap form the present meal pattern	Snack preparation required time of 10-15 min. Model should be reviewed for budgetary and delivery aspects

TABLE 7 IMPACT OF TRAINING FOR VARIOUS PARAMETERS

parameters	Pre- training feedback (%) n=75	Post-training feedback (%) n=75
Knowledge about nutrients from food	20	64
Amt. of ingredients in MDM except grains	28	87
Any three checks on raw material	29	87
Any five good practices for work process for MDM delivery	32	96
Naming two nutritional deficiencies	33	72
Understanding quality of cooked food	17	73
Knowledge of procedure and consistency for meal preparation	30	74

TABLE 8 MONITORING OF PLACED FUELS IN FIELD

Type of Stove	Natural Draft	Forced draft	Customized Smokeless chullah
Fuel Savings %	32.72	42.74	36.5
Effective saving in cooking time (in min)	40	60	45
Reduction in smoke	Yes	Yes	Negligible smoke
Requiring training for use	yes	yes	No
Ease of operation	moderate	minimum	maximum
Cost of implementation	medium	high	low

Figures

FIGURE 1 VALUED" AND "NON-VALUED" AREAS IN MDM FOLLOWED FOR ITS DELIVERY OF NUTRITION

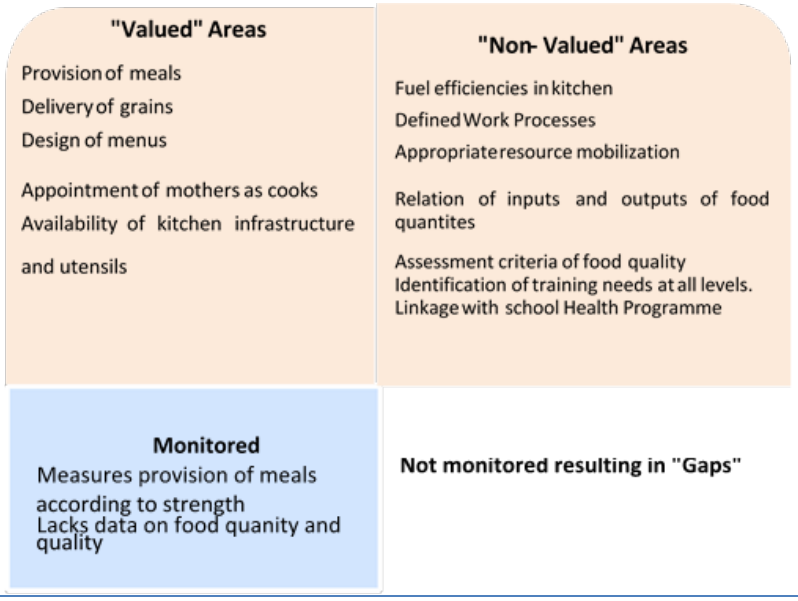

FIGURE 2 THE METHODOLOGICAL FRAMEWORK FOR CONDUCT OF THE PILOT

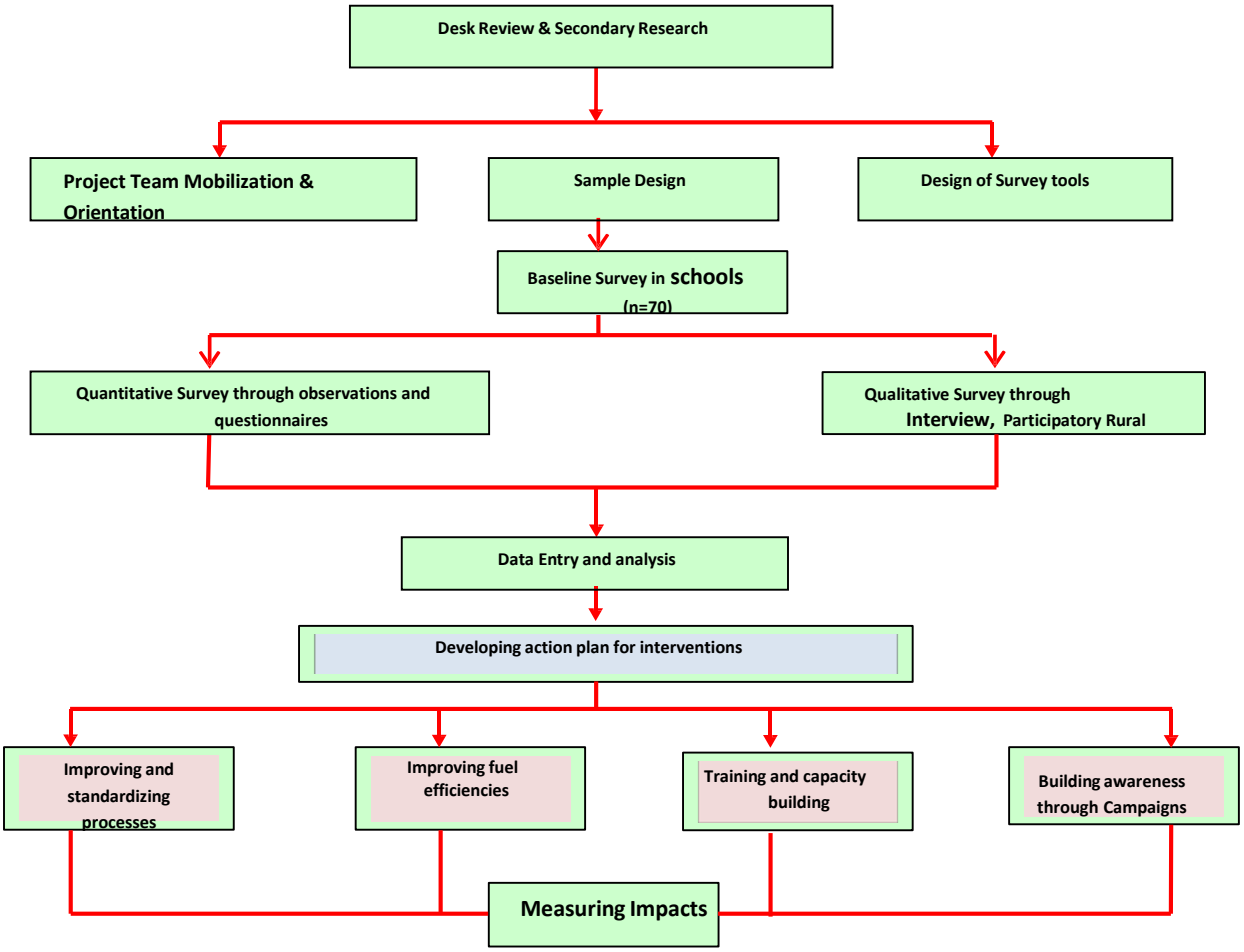

FIGURE 3 SOME OF THE CAMPAIGN MATERIAL USED IN KALA JATTHA

FIGURE 4 NATURAL DRAFT, FORCED DRAFT AND SMOKELESS CHULLAHS PLACED UNDER THE PIL