

# Nutritional Contribution of Mid-Day Meal (MDM) as per quantity norms at Upper Primary Classes in Delhi

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**Abstract-**Mid-Day Meal Scheme (MDMS) is the World largest school feeding programme in the nation. It has been reported that MDMS has catered to the nutritional needs of school children in both rural and urban areas. The present study was, therefore, an attempt to evaluate the nutritional contribution of MDM norms at Upper primary Classes. For the purpose, sixty school children in the age group 10-12 years were randomly selected with equal number from both Girls and Boys schools. It was observed that a cyclic menu for six days provided by mid- Day Meal Cell was uniformly followed by both schools. The data revealed that Aloo Sabji with Poori was the most liked meal (45%) followed by Sambhar Rice (35%), Poori Chole (30%), Khadi Rice (30%) and Rice Chole (29%). The least preferred meal was Halwa with Black Chana (26%). The Mid day meal was found to be a substitute rather than a supplement for the home meal. The energy and protein content of six days menu varied from 350-386 Kcal and 10.9- 11.9 g protein per day which was below the recommended norms of 750 Kcal and 20 g protein. Attempts were made to replicate MDMS recipes at Institute to compute their nutritive contribution. These recipes were modified to include 75g seasonal vegetables (including GLVs), increasing pulses to 30g and also adding 10g soyabean (granules/ flour) to meet suggested protein norm (20g). Cereal amount was kept as 75g as consuming 150g was not possible by the children.

The findings suggested to increase the amount of fat, green leafy vegetables and vitamin C rich fruits to improve the calorie and micronutrient contribution of mid- day meal. Teachers and parents felt MDMS had a positive impact on health, attendance but demanded better quality cereals, inclusion of fruits/milk while some felt that safe water supply/ proper toilet facilities was more important. None knew about the source of supply of MDMS.

**Index terms-** MDM: Mid-Day Meal, GLVs: Green Leafy Vegetables.

## I. INTRODUCTION

Mid-Day meal programme is a promising strategy to bridge dietary inadequacies of beneficiaries and improve their performance. It is the world largest school feeding programme.

Improving the conditions of the underprivileged and backward has been the major issues while forming the policies of India as a welfare state. The target is children in many policies, acts and also in schemes. The Government of India started Midday meal (MDM) scheme in the government primary schools which is now intended upto Upper primary with the objective of improving health of the poor children. MDM scheme is one of the largest centrally funded schemes which provide free one time meal to the students in government schools. 11 crore of children are being provided one time meal every day. 10.45 Crore children were covered in 11.58 lakh Schools during 2013-14. A Mid-Day Meal (MDM) is an important instrument for combating class room hunger and promoting better learning. MDM is effective in improving physical and psycho-social health for disadvantaged school children in lower income and higher income countries. It increased the school attendance in lower income countries and increased the height of younger children in both lower and higher income countries.

From 2008-09 i.e. w.e.f 1st April, 2008, the programme covers all children studying in Government, Local Body and Government-aided primary and upper primary schools and the EGS/AIE centres including Madarsa and Maqtabs supported under SSA of all areas across the country. In October 2007, the scheme has been further revised to cover children in upper

primary (classes VI to VIII) initially in 3479 Educationally Backwards Blocks (EBBs). Around 1.7 crore upper primary children were included by this expansion of the scheme.

The calorific value of a mid-day meal at upper primary stage has been fixed at a minimum of 700 calories and 20 grams of protein by providing 150 grams of food grains (rice/wheat) per child/school day.

Under the scheme, school children are being provided cooked food viz. Aloo Sabji with Poori, Sambhar Rice, Poori Chole, Khadi Rice, Rice Chole and Halwa with Black Chanaduring different days of a week. Wheat and rice are provided free of cost to all schools by Government of India. The main objective of the scheme is to increase enrollment, retention, attendance and to improve the nutritional level of such children through supplementary nutrition.

It is an incontrovertible fact that Mid-Day Meal Programme exerts a positive influence on the enrollment and attendance in schools. But still there is a question mark: Does the Mid-Day Meal meeting their said nutritional norms? Therefore, the present study has been undertaken to assess the nutritional contribution of mid-day meal norms provided for the quantity for Upper Primary Classes.

## II. METHODOLOGY

The methodology included both the secondary data and primary data. For secondary data, recent government and nongovernment reports on primary education, government websites, newspaper articles and journals were relied upon. For primary data, random sample of Children, Teachers and Parents of the Children were taken from both the schools.

**Locale of the study:** The Study was carried out in two DOE schools, located in south zone of Delhi. Both the schools were catering to children belonging to lower socio economic strata of the society. These schools were:

**Govt. Girls Senior Secondary School (class VI to XII)—Girl's school (School A)**

**A.T.R.S.Vidhalaya (Class I to XII) – Boy's school (School B)**

The **tools and techniques** used for the data collection were:

**Questionnaire cum interview**

**Group discussions**

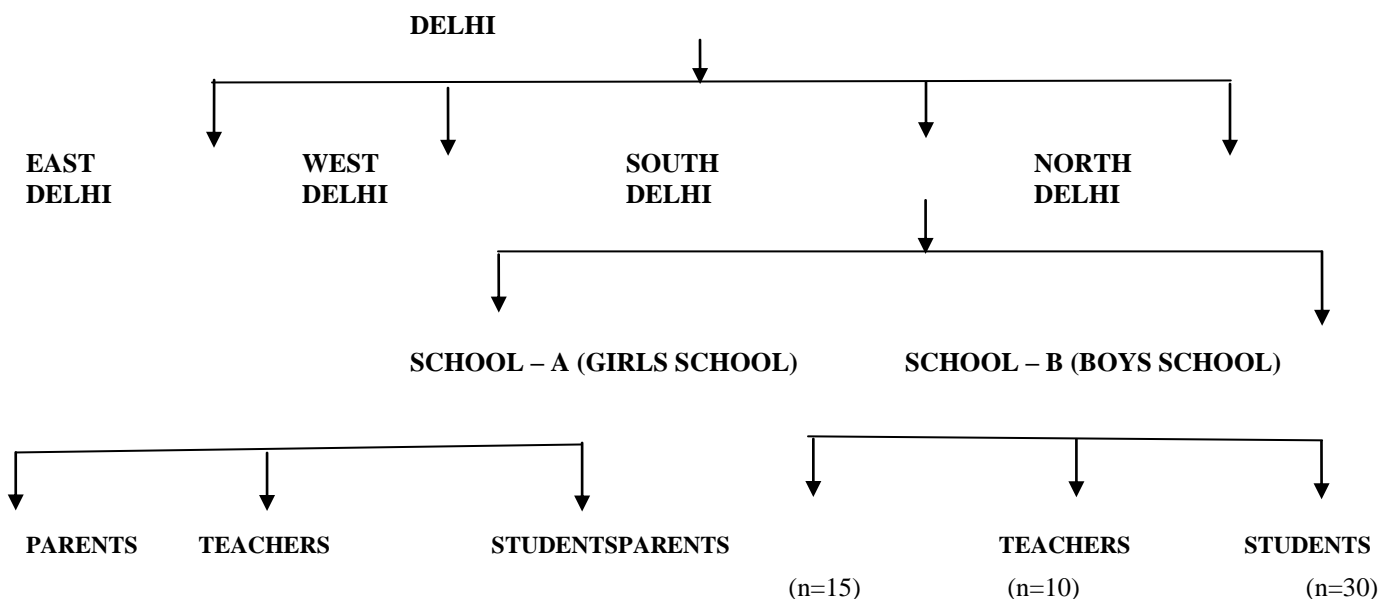
**Observation schedule / Checklist**

In the present study, the interview - cum- questionnaire schedule was designed for the students to elicit information on general profile of the sample, dietary practices of children (breakfast consumption, lunch tea, dinner) and also about their practices relating to tiffin carrying, pocket money and food purchased/ served at school. Questionnaires were also designed for parents and outline for group discussion was designed for teachers and standardization of MDMs recipes was calculated.

In the present study, an observation schedule was designed and the observation technique was used to supplement the information regarding the purchase of food, food item preferred / disliked by children in MDMs, hygienic practices being followed by children / food handlers, distribution procedures of consumption patterns of children were also noted.

### Sample selection and sample size

60 students were selected randomly (30 boys; 30 girls); group discussions were held with teachers (N=20) and questionnaire administered to parents of half these students to understand different aspects of MDMP and their suggestions for improving this programme.



### Data Collection and analysis

Data was collected using the above mentioned tools. All the tools were prepared, pre- tested and modified for the data collection. The subjects from both the schools were briefed about the objectives of the study.

### The study was conducted in 2 phases.

In the **first phase**, the designed questionnaires were administered personally to students and about their Dietary practices of students –MDM/ Tiffin related. Observations related to MDMs/ tiffin, purchase of foods from canteens/ hawkers, hygienic practices, distribution procedure of MDM and serving size per child temperature measurements of the mid-day meal being served.

In the **second phase**, group discussions were done with teachers to understand their perception regarding dietary practices of children w.r.t breakfast consumption, tiffin/ MDMs, pocket money, foods purchased from the hawkers. Questionnaire was

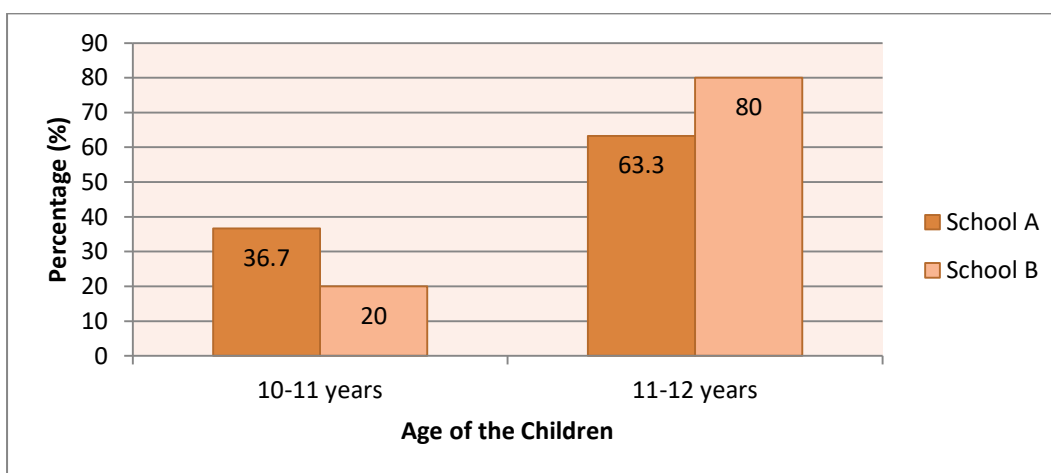
administered on the parents of half of the sampled children to understand their perception regarding these practices. The standardization of MDMs recipes were done and the average total nutritive contribution of MDMs.

**Data analysis:** The data obtained through various tools and techniques was tabulated on the master sheets, screened and errors (if any) were corrected. It was then subjected to statistics analysis using SPSS (statistical package for social science) computerized packaged. The Diet Soft software was used to calculate the average nutritive value contribution in MDMs.

### III. Results and Discussions

#### General profile of the subjects

The subjects for this study comprised of 60 children (aged 10-12 years) of which 30 were girls (school A) and 30 were boys (school B) both belonging to similar socio-economic backgrounds. The distribution of children on the basis of age revealed that 37 percent children from school A and 20 percent children from school B were between the age group of 10-11 years, while remaining 63.3 percent from school A and 80 percent from school B were between 11-12 years (Figure 3.1).



**Fig. 3.1: General profile of school children.**

The distribution of subjects according to the types of family revealed that majority of children (75%) belonged to nuclear families while 17 percent from school A and 33.3 percent from school B were living in a joint family. With respect to family income the data reported that 20 percent children belonged to families having a family income upto Rs. 4,000 per month; one-third belonged to families earning between Rs. 5,000 and 8,000 per month; nearly one-fourth (26.6%) children had family income between Rs. 9,000 and 12,000 per month while the remaining had family income ranging from Rs. 12,000 to 15,000 (Table 3.1).

**Table 3.1: Family type and total income of the family per month**

Type of family	School A (n <sub>1</sub> =30)	School B (n <sub>2</sub> =30)	Total students (N=60)
<b>Nuclear</b>	25 (83.3)	20 (66.6)	45 (75)
<b>Joint</b>	5 (16.6)	10 (33.3)	15 (25)

Income (Rs/month)			
<4,000	9 (30.0)	3 (10.0)	12 (20.0)
5,000-8,000	11 (36.6)	9 (30.0)	20 (33.3)
9,000-12000	9 (30.0)	7 (23.3)	16 (26.6)
12,000-15,000	1 (3.3)	11 (36.6)	12 (20.0)

(Figure in parenthesis indicate percentages)

### 3.2 Mode of commuting to school and time taken

It was leant that a great majority of children walked to school (School A, 73.3%; School B, 90.0%). Only handful students used any form of transport (bicycle/ bus/ rickshaw) to commute and there was no significant difference between both schools (Table 3.2).

**Table 3.2: Mode of commuting to school**

Mode of commuting	School A (n <sub>1</sub> =30)	School B (n <sub>2</sub> =30)	Total students (N=60)
<i>Walking</i>	22 (73.3)	27 (90.0)	49 (81.7)
<i>By bicycle</i>	3 (10.0)	0 (0.0)	3 (5.0)
<i>By bus</i>	3 (10.0)	2 (6.7)	5 (8.3)
<i>By rickshaw</i>	2 (6.7)	1 (3.3)	3 (5.0)

(Figure in parenthesis indicate percentages)  $X^2$  4.04;  $p < 0.05$

**Key:** School A - Girls School  
 School B - Boys School

Further, the children were asked about the **time taken to reach school**. Nearly one third (38.3%) children took less than 10 minutes; one-fifth children reached within 10 minutes and about 40 percent took between 20-30 minutes while only a handful took more than half an hour to reach school. There was a highly significant difference for time taken to reach school between the boys and girls (Table 3.3).

**Table 3.3: Time taken to reach school by school children**

Time taken to reach school	School A (n <sub>1</sub> =30)	School B (n <sub>2</sub> =30)	Total students (N=60)
< 10 minutes	5 (16.7)	18 (60.0)	23 (38.3)
10 minutes	12 (40.0)	0 (0.0)	12 (20.0)
20 minutes	8 (26.7)	7 (23.3)	15 (25.0)
30 minutes	4 (13.3)	4 (13.3)	8 (13.3)
More than 30 minutes	1 (3.3)	1 (3.3)	2 (3.3)

(Figures in parenthesis indicate percentages)

$$X^2=.19.414; p=.001$$

### STANDARDIZATION OF MDMs Served in the MDMP

The latest nutritional norms for MDMP for primary and upper primary classes are as follows:

**Primary classes (Class I to V):** 450 Kcals and 12 g of protein which is to be derived from 100 g of food grains (rice/wheat), 20 g pulses, 50 g vegetables (including GLVs) and 5 g oil.

**Upper Primary Classes (Class VI to VIII):** 700 Kcals and 20 g of protein, which is derived from 150 g of food grains (rice/wheat), 30 g pulses , 75 g of vegetables (including GLVs) and 7.5 g of oil.

**Table 3.4: Current nutritional norms for MDMs (2013)**

Nutritional content	Norms for primary classes (I-V)	Norms for upper primary classes (VI-VIII)
Calories	450 Kcals	700 Kcals
Protein	12 g	20 g
Micro– nutrients	Not prescribed	Adequate quantities of Micro nutrients like Iron, folic Acid and Vitamin A

(MDM.nic.in, 2013)

In order to compute the nutritional content of all the six MDMs served to the children of upper primary classes (VI-VIII) through the week (Monday to Saturday), several attempts were made to get the recipes from suppliers. However, they refused to share this information with the researcher. Therefore, an attempt was made to standardize the recipes of these six menus in the college lab. To match the recipes served in schools five samples of MDMs served in schools were brought in sealed polythene bags every day (in a ice box) to the Institute. They were weighed to obtain the mean weight of the MDM served. Cooking trials of each menu were done to prepare MDMs that matched the ones being supplied in terms of amount of ingredients, taste, amount, consistency and texture. Thereafter, using the standardized amounts of the ingredients used, the nutritive contribution of each menu was assessed. Further, an attempt was made to modify each of the six menus being currently served so as to include 75 g of seasonal vegetables (including GLVs), increasing the pulse content about 30 g and also adding about 10 g of soyabean (as granules/ flour) to met the suggested protein norm of 20 g / child/ day.

Given below are the calculations of the existing recipes (based on trials in the lab) and the suggested/ modified recipes (which could be adopted by the authorities).

#### **Monday menu: ALOO SABZI WITH POORIES**

The calculations indicated that the meals provided on Monday (Poori with Aloo sabzi) were not meeting the MDM norms. The energy calculated was 395 kcals whereas the MDM norms recommend 700 kcals/ day/ child. The protein was 6.42 g which was also not meeting the MDM norm of 20 g thus, nutritional contribution of this MDM was only about half of the suggested norm.

EXISTING RECIPE		ALOO WITH POORIES							
Aloo- Sabzi (Weight- 200 g) (2 ladles)	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)	
	Potato	30	29.1	0.9	3	0.14	0	5.1	
	Onion	20	12	0.4	8	0.24	0	0.4	
	Tomato	15	15	0.13	7.2	0.09	0	4.05	
TOTAL			44.1	1.43	18.2	0.47	0	9.55	
Poories (3) (weight- 75 g)	Wheat flour	45	153.5	5.4	21.6	2.20	0	0	
	Oil	In dough	3	27	5.4	21.6	2.20	0	0
		For frying	9	81	0	0	0	0	0
TOTAL			261.5	0	0	0	0	0	
GRAND TOTAL			306	6.8	39.8	2.67	0	9.55	
MODIFIED RECIPE		MIXED VEGETABLES WITH PAUSHTIK POORIES							
Mix Vegetables (weight- 350 g) (2.5 ladles)	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)	
	Aloo	60	58	0.9	6	0.28	1.8	10.2	
	Spinach	10	2.6	0.2	7.3	0.11	70	0.3	
	Beans	15	23.7	1.11	7.5	0.39	0.6	0.5	
	Pumpkin	30	7.6	0.4	3	0.12	1.86	0.6	
	Tomato	20	4.6	0.3	4	0.36	4.8	6.2	
	Soya granules	15	65	6.5	36	1.6	8	0	
	Oil	10	90	0	0	0	0	0	
TOTAL			251.5	9.41	63.8	2.86	87.06	17.8	
Paushtikpoories (4) (Weight- 100g)	Wheat flour	45	153.5	5.4	21.6	2.20	0	0	
	Besan	15	55.8	3.12	8.4	0.79	2.41	0	
	Oil	In dough	4	36	0	0	0	0	0
		For frying	12	108	0	0	0	0	0
TOTAL			353.3	8.52	30	2.99	2.41	0	
GRAND TOTAL			605	17.9	93.8	5.85	89.47	17.8	

This menu was modified by adding 75 g of seasonal vegetables (like beans, pumpkin & tomato), 10 g of spinach (GLV) along with 15 g of soya granules to enhance the protein content of this vegetable. Besan was added to atta (1:1) to make attabesanpausthikpoories. By these changes, the nutritive value of this Monday menu was greatly enhanced to 605 Kcals and was about 18 g of protein. The micronutrient content (calcium, iron, vitamin A and vitamin C) also improved considerably. The overall taste and acceptability of this modified recipe was much better than that of the original recipe. The pausthikpoories made were tastier than the attapoories and the greater yield (of 4 poories) was what children had always desired.

**Tuesday - SAMBHAR WITH RICE**

On Tuesday the MDM served was (Sambhar with rice) which provided 343 Kcals and 7.3 g of protein which was also far below the MDM norms. This menu was modified increasing the pulse content of sambhar to 20 g and increasing the vegetables to 75 g from 40 g in the original recipe. Also 10 g soya granules were added to the sambhar to make a total of 30g pulse (as suggested in the MDM norms) which yielded about 5 ladles. The quantity of the rice was increased from 45 g to 75 g which gave 250 g of cooked rice (about 5 ladles). The nutritive value of this modified recipe was far better than the original recipe providing 536 Kcals, nearly 18 g protein. There was a great improvement in the Calcium, Vitamin A and Vitamin C amount. The sambhar was much tastier and far acceptable than the one made from the existing recipe.

EXISTING RECIPE			SAMBHAR WITH RICE					
Sambhar (Weight- 250 g) (3 ladles)	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)
	Red gram dai	15	50	3.34	10.95	0.40	19.8	0
	Carrot	10	5	0.0	8	0.10	0	0.3
	Pumpkin	10	3	0.1	1	0.04	0	0.2
	Onion	20	12	0.4	8	0.24	0	0.4
	Oil	10	90	0	0	0	0	0
	Tamarind	10	28	0.3	17	1.7	0	0.3
TOTAL			188	4.14	44.95	2.48	0	1.2
Plain rice (weight- 150g) (3 ladles)	Rice	45	155	3.1	4.5	0.31	0	0
GRAND TOTAL			343	7.3	49.45	2.79	0	1.2
MODIFIED RECIPE			SAMBHAR (WITH VEGETABLES) AND RICE					
Sambhar with Vegetables (weight-	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)
	Red gramdal	20	67	4.5	14.6	0.54	3.3	0



350 g) (5 ladles)	Soyabean granules	10	43.2	4.3	24	1.04	5.3	0
	Beans	20	32	1.5	10	0.52	10.7	5.5
	Spinach	20	5.2	0.4	14.6	0.22	139.5	5.6
	Pumpkin	15	3.8	0.2	1.5	0.06	0.93	0.3
	Tomato	20	4.6	0.3	4	0.36	4.8	6.2
	Tamarind	10	28	0.3	17	1.7	0	0.3
	Oil	10	90	0	0	0	0	0
TOTAL			274	11.5	85.7	4.44	164.5	17.9
Plain Rice (weight-250g) (5 ladles)	Rice	75	262	6.4	7.5	2.1	0.84	0
GRAND TOTAL			536	17.9	93.2	5.28	165.3	17.9

### Wednesday- POORI WITH CHOLE

The MDM served on Wednesday (Poori with Chole) and its energy content was 448 Kcals and protein content was 11.4 g, both of which were much lower than the recommendation.

EXISTING RECIPE		CHOLE WITH POORIES							
Chole (Weight- 150 g) (3 ladles)	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)	
	Chole	30	108	5.13	60	1.38	7.08	1.8	
	Onion	20	11.8	0.36	8	0.24	0	0.4	
	Tomato	20	4	0.18	9.6	0.12	0	5.4	
	Oil	7	63	0	0	0	0	0	
TOTAL			186.8	5.67	77.6	1.74	7.08	7.6	
Poories (3) (weight- 75 g)	Wheat flour	45	153.5	5.4	21.6	2.20	0	0	
	Oil	In dough	3	27	5.4	21.6	2.20	0	0
		For frying	9	81	0	0	0	0	0
TOTAL			261.5	5.4	21.6	2.20	0	0	
GRAND TOTAL			448	11.07	99.2	3.94	7.08	7.6	
MODIFIED RECIPE		CHOLE (WITH VEGETABLES) AND PAUSHTIK POORIES							
Chole	Ingredients	Amount	Energy	Protein	Calcium	Iron	Vitamin	Vitamin	

<i>(weight- 360 g)</i> <i>(2.5 ladles)</i>		(g)	(Kcal)	(g)	(mg)	(mg)	A (µg)	C (mg)	
	Chole	30	108	5.13	60.0	1.38	7.08	1.8	
	Spinach	10	2.6	0.2	7.3	0.11	70	0.3	
	Beans	15	23.7	1.11	7.5	0.39	0.6	0.5	
	Tomato	20	4.6	0.3	4	0.36	4.8	6.2	
	Soya granules	10	43.2	4.3	24	1.04	5.3	0	
	Pumpkin	30	7.6	0.4	3	0.12	1.86	0.6	
	Oil	10	90	0	0	0	0	0	
TOTAL			279.8	11.44	105.8	3.4	89.54	9.4	
<i>Paushtikpoories</i> <i>(4)</i> <i>(Weight- 100g)</i>	Wheat flour	45	153.5	5.4	21.6	2.20	0	0	
	Besan	15	55.8	3.12	8.4	0.79	2.41	0	
	Oil	In dough	4	36	0	0	0	0	0
		For frying	12	108	0	0	0	0	0
TOTAL			353	8.5	30	2.99	2.41	0	
GRAND TOTAL			632	19.9	117.6	8.79	92.05	9.4	

In this modified recipe, the vegetable content was increased from 40 g to 75 g (including 10 g GLV) and also 10 g of soya granules. The poories were modified as in (Monday menu). These modifications greatly enhanced the energy (632 Kcal) and protein content (~ 20 g) and these were very close to the suggested MDM norms. The Calcium, Iron and Vitamin C improved but there was a tremendous increase in the Vitamin A content. The news recipe was much more acceptable both in term of taste and quantity.

#### **Thursday- RICE WITH CHOLE CURRY**

The menu for Thursday (Rice with Chole Curry) was also not meeting the MDM norms. The energy content of this meal was 342 Kcal and its protein content was 8.5 g.

EXISTING RECIPE		RICE WITH CHOLE CURRY						
<i>Chole</i> <i>(Weight- 150 g)</i> <i>(3 ladles)</i>	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)
		chole	30	108	5.13	60	1.38	7.08

	onion	20	11.8	0.36	8	0.24	0	0.4
	tomato	20	4	0.18	9.6	0.12	0	5.4
	oil	7	63	0	0	0	0	0
TOTAL			186.8	5.67	77.6	1.74	7.08	7.6
Rice ) (weight- 150g) (3 ladles)	Rice	45						
TOTAL			261.5	5.4	21.6	2.20	0	0
GRAND TOTAL			448	11.07	99.2	3.94	7.08	7.6
<b>MODIFIED RECIPE CHOLE (WITH VEGETABLES) AND RICE</b>								
Chole with Vegetables (weight- 360 g) (5 ladles)	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)
	Chole	30	108	5.13	60.0	1.38	7.08	1.8
	Spinach	10	2.6	0.2	7.3	0.11	70	0.3
	Beans	15	23.7	1.11	7.5	0.39	0.6	0.5
	Pumpkin	30	7.6	0.4	3	0.12	1.86	0.6
	Tomato	20	4.6	0.3	4	0.36	4.8	6.2
	Oil	10	90	0	0	0	0	
TOTAL			236.5	7.14	81.8	2.36	84.34	9.4
Rice with soya granules (Weight- 270g) (6 ladles)	Rice	75	262	6.4	7.5	2.1	0.84	0
	Soya granules	10	43.2	4.3	24	1.04	5.3	0
TOTAL			305.2	10.7	31.5	3.14	6.14	0
GRAND TOTAL			542	19.4	113.3	6.4	90.48	9.4

This menu was modified by increasing the vegetables content in the chole from 40 g to 75 g (including 10 g of GLV) and also 10 g of soya granules which yielded 4 ladles of chole curry. The rice content was increased to 75 g (from 45 g) which yielded 6 ladles. This modification enhanced the energy content to 542 Kcals and it also met the suggested protein norms. There was also a substantial improvement in the Calcium, Iron and Vitamin A content in this modified recipe. The yield was much larger and the taste/ acceptability were far better.

**Friday- HALWA WITH DRY BLACK CHANA**

The meal served on Friday (Halwa with Dry Black Channa) provided about 468 Kcals, which was much lower than the norm. However, its protein content was 18 g which was similar to the norms (20) g and it was the highest among all the menus served through the week.

EXISTING RECIPE SUJI HALWA WITH DRY BLACK CHANA									
Halwa (Weight- 75 g) (1.5 ladles)	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)	
	Suji	15	52	1.30	2.4	0.24	0	0	
	Sugar	10	40	0.01	1.2	0.01	0	0	
	Vanspati	5	45	0	0	0	1.68	0	
TOTAL			137	1.31	3.6	0.25	1.68	0	
Black chana (weight- 150g) (3 ladles)	Black Chana	75	241	16.6	215	5.07	6.6	0.75	
	Oil	10	90	0	0	0	0	0	
TOTAL			241	16.6	215	5.07	6.6	0.75	
GRAND TOTAL			468	17.9	218.6	5.32	8.28	0.75	
MODIFIED RECIPE SUJI HALWA WITH POORI AND DRY BLACK CHANA ALONG WITH FRUIT									
Halwa (Weight- 75 g) (1.5 ladles)	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)	
	Suji	15	52	1.30	2.4	0.24	0	0	
	Sugar	10	40	0.01	1.2	0.01	0	0	
	Vanspati	5	45	0	0	0	1.68	0	
TOTAL			137	1.31	3.6	0.25	1.68	0	
sBlackchana (Weight- 100g) (2 ladles))	Black chana	50	160.5	11	143.5	3.38	4.43	0.6	
	Oil	10	90	0	0	0	0	0	
Poores (3) (weight-75 g)			250.5	11	143.5	3.38	5.43	0.5	
	Wheat flour		45	153.5	5.4	21.6	2.20	0	0
	Oil	In dough	3	27	5.4	21.6	2.20	0	0
		For	9	81	0	0	0	0	

		frying							
Fruit (1) (weight-100g)	Guava		100	51	0.9	10	0.27	0	212.5
TOTAL				312.5	6.3	10	0.27	0	212.5
GRAND TOTAL				700	18.6	178.7	6.1	6.11	212.5

In this menu, the most frequent complaints were that the amount was not sufficient and halwa alone (with dry chana) was too sweet and both teachers and students desired inclusion of poories. In the modified recipe, the halwa ingredients were kept same, chana amount was decreased to 50 g and 3 poories were added (made from 45 g atta). This combination helped to provided the required satiety. Since there was no vegetables in this combination and consequently no vitamin C, inclusion of a seasonal fruit (like guava) helped provide the missing micronutrient and also fulfilled a long standing desire of having fruits in the MDM.

**Saturday- KADHI WITH RICE**

On Saturday (Kadhi with Rice) was served as mid-day meal. The energy content of this was 313 Kcals and the protein content was 6.7 g both of which were not meeting the suggest norms.

EXISTING RECIPE KADHI WITH RICE								
Kadhi (Weight-175g) (2.5 ladles)	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)
	Besan	10	37.2	2.08	5.6	0.53	0	0.1
	Curd	30	24	1.24	59.6	0.08	12.4	0.4
	Onion	10	5.9	0.18	4	0.12	0	0.2
	Spinach	5	1.3	0.1	3.65	0.05	0	1.4
	Oil	10	90	0	0	0	0	0
TOTAL			158.4	3.6	72.85	0.78	12.4	2.1
Plain rice (weight 15g) (3 ladles)	Rice	45	155	3.1	4.5	0.31	0	0
GRAND TOTAL			313.4	6.7	77.35	1.09	12.4	2.1
MODIFIED RECIPE KADHI (WITH VEGETABLES) AND RICE								
Vegetables Kadhi (weight- 300 g) (5 ladles)	Ingredients	Amount (g)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)
	Besan	20	74.4	4.16	11.2	1.06	0	0.2

	Curd	60	48	2.48	119.2	0.16	24.8	0.8
	Onion	15	15.1	0.27	7.5	0.18	0.28	0.3
	Spinach	20	5.2	0.4	14.6	0.22	139.5	0.6
	Beans	20	31.6	1.48	10	0.52	0.85	5.4
	Tomato	20	4.6	0.3	4	0.36	4.8	6.2
	Soya granules	10	43.2	0	24	1.04	5.3	0
	Oil	10	90	0	0	0	0	0
TOTAL			312	13.4	190.5	3.54	175.53	13.5
Plain Rice (weight-250g) (5 ladles)	Rice	75	262	6.4	7.5	2.1	0.84	0
GRAND TOTAL			574	19.8	198	5.64	176.37	13.5

In the modified recipe for Kadhi, the quantity of besan was increased to 20 g and also 10 g soya granules added to enhance the protein content. The increased amount of curd also improved both the protein and calcium content. The vegetables content of kadhi was increased from 15 g to 75 g (including GLV). The amount of rice was also increased from 45 g to 75 g. These changes helped to improve energy content to 574 Kcals and the protein was adequate (~ 20 g). There was a substantial improvement micronutrient like Calcium, Iron Vitamin A and Vitamin C content. The extra vegetables added to kadhi made it very tasty and highly acceptable.

The nutritive contribution of the 6 modified recipes is presented below (Table 3.5)

**Table 3.5: NUTRITIVE CONTENT OF MODIFIED MDM RECIPES**

Modified Recipes	Cooked weight/ Serving size	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)
Mixed veg. with Paushtikpoories	Wt. of veg.- 350g (2.5 ladles)	605	18	93.8	5.85	89.47	17.8
	Wt. of poori- 100 g Number- 4						
Sambhar (with veg.) + Rice	Wt. of sambhar- 350g (5 ladles)	536	17.9	93.2	5.28	165.3	17.9
	Wt. of rice-						

	250 g (5 ladles)						
Chole (with veg.) and paushtikpoories	Wt. of chole- 360g (4 ladles)	632	19.9	117.6	8.79	92/05	9.4
	Wt. of poori- 125 g Number- 5						
Chole curry (with veg) and Rice	Wt. of chole- 360g (4 ladles)	542	19.4	113.3	6.4	90.48	9.4
	Wt. of rice- 270 g (6 ladles)						
SujiHalwa with Poories and dry black channa along with seasonal fruit	Wt. of Halwa- 75 g (1.5 ladles)	700	18.6	178.7	6.1	6.11	212.5
	Wt. of poori- 75 g Number- 3						
	Wt. of chana- 100 (2 ladles)						
	Wt. of fruit- 100g (1 piece)						
Kadhi (with veg.) and Rice	Wt. of kadhi- 300 g (5 ladles)	574	19.8	205.5	7.74	176.37	13.5
	Wt. of rice- 250g (5 ladles)						
Average nutritive content of all the modified MDM recipes		598	18.9	133.68	6.69	103.37	46.8

The energy content of the modified recipes ranged from 536 Kcals to 700 Kcals. The only menu which could meet the energy norms was SujiHalwa + Dry black chana with Poories and a Guava. The protein content was almost close to the norm ranging from 17.9 g to 19.9 g. Chole with PaushtikPoories and SujiHalwa + Dry black chana served with Guava met the MDM norms. Addition of extra pulse, soyabean and vegetables also enhanced the micronutrient content of the MDM recipes. However, it was not possible to meet the energy norm (of 700 Kcals) in five out of the six menus despite increasing the cereal content to 75 g from 45 g. it does not seem that these children (Upper Primary Classes) will be able to eat more cereal than this. Thus, it seems difficult to increase the energy content more. Extra oil could help but the food item would be rather oily and besides oil is an expensive ingredient which will increase the cost of MDMS. The amount of cereal which the children can realistically eat needs to be looked into as the given amount (100g for [primary classes and 150 g for upper primary classes) seems too high. However, with a little increase in pulse amount and addition of soya can easily help meet the suggested protein norms of 20 g/child/ day/

However, additional ingredients (soyabean and vegetables) will add to the total cost of MDMS but the cereal content if decreased to half (75 g in place of 150 g) can offset some of these costs.

It can be concluded that addition of vegetables and soyabean can definitely help make these MDMS nutritive dense and the cereal allocation per child could be reduced to almost half to offset some of these costs and make the total serving size more acceptable and feasible to be finished by the child. However, the need for educating the teachers mothers and also children about the importance of MDMS to supplement and NOT substitute any meal needs to be stressed upon so that the very purpose of this programme does not get defeated.

Additional fruit as done on Friday menu help to greatly improve in Vitamin C quantity and quality of MDM. Although milk and milk product highly desirable for children, but owing to their perishable nature, it is not possible to serve them in such a large scale. However, in one menu (Kadhi with Rice) curd are used to make Kadhi and thus a milk product has been used which has a high shelf-life. Hence Kadhi (with vegetables) appears to be a very nutritious food for MDMP and it also possible to incorporate many vegetables in Kadhi.

#### IV. CONCLUSION

1. The diet of school going children was deficient in all the food groups ultimately resulted in the low intake of all the nutrients.
2. Mid-day meal programme has been found to be a substitute rather than a supplement for the home meal. The contribution of micronutrients through mid day meal programme was negligible; it varies from one fifth to one-fourth.

#### V. SUGGESTIONS

1. A teacher (MDM) incharge at school level should explain about positive aspects of MDM to the students as well as parents too. And also make them aware about that MDM is a supplement food not to substitute any other meal.
2. The menu should be revised from time to time because it sustains interest in children.
3. Inclusion of green leafy vegetables, fruits and milk products in the mid day meal programme to meet the micronutrient deficiency of school children.



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