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# Nutritional Contribution of Mid Day Meal to Dietary Intake of School Children in Ludhiana District of Punjab

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## Abstract

Today the Mid Day Meal Scheme (MDMS) is the largest school lunch 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 to the actual daily dietary intake of children. For the purpose, two hundred school children in the age group 7-9 years were randomly selected with equal number from both rural and urban schools. It was observed that a cyclic menu for six days provided by State Mid Day Meal Cell was uniformly followed by all schools. The data revealed that kadhi chawal was the most liked meal (45%) followed by sabji roti and dhal chawal (35%), dhal roti (30%) and channa roti (29%). The least preferred meal was sweet rice (26%). 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 450 Kcal and 12 g protein. The comparison of average daily nutrient intake of children with RDA [1], showed that intake of all the nutrients was inadequate. The Mid day meal was found to be a substitute rather than a supplement for the home meal. The percent contribution of energy, protein and fat by the MDM to actual nutrient intake of children was 28.2, 51.7 and 27.5 respectively. The percent contribution of other nutrients was β carotene (22.7), thiamine (28.3), riboflavin (25.3), niacin (28.7), folacin (23.6), vitamin C (15.2), iron (25.7) and calcium (27.7). 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 to the dietary intake of school children.

**Keywords:** Mid day meal; Nutrient intake; % contribution; School children

## Introduction

Today the Mid Day Meal Scheme (MDMS) is the largest school lunch 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.

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 [2]. The Government of Punjab started cooked meal for all students of primary classes in Government and Government aided schools of the state from September, 2004. All the schools of total twenty districts are covered under this scheme. The meal is cooked and served in the school premises. Under the scheme, school children are being provided cooked food viz. mithe chawal, roti sabji, kadi chawal and dal chawal during 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 [3]. 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 improve the nutritional status of children too? Therefore, the present study has been undertaken to assess the nutritional contribution of mid day meal to the dietary intake of school children.

## Materials and Methods

### Selection of schools

The study was conducted in urban and rural areas of Ludhiana district of Punjab. A convenient selection of ten schools each from rural and urban area was made to study the nutrition interventions provided under mid day meal programme.

### Selection of subjects

Two hundred subjects in the age group of 7 to 9 years were randomly selected from schools in rural and urban areas. A random selection of 100 urban school children were made from Government Primary school, Sarabha Nagar with an equal number of rural school children were made from Government Primary school, Sohian.

### Collection of data

The required data were collected through personal interview technique using the especially structured schedule. The reference year of the study was 2010-11.

### Evaluation of quantity and quality of mid day meal

The menu served during the week and the amount of ingredient used for preparation of meal/day was recorded. Thereafter, the amount of ingredient/child was calculated. Further, the energy and protein content of the meal/child/day was calculated using Nutritive value of Indian foods [4].

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## Dietary intake

Information regarding the food consumption by the children was collected for three consecutive days by using 24 hours recall method. The different food items consumed was converted into their raw equivalents and average daily intake of food and nutrients was calculated by using 'MSU-Nutriguide' [5]. The nutrient intake was compared with Recommended Dietary Allowances [1]. The percent adequacy of nutrient intake was calculated. % contribution of mid day meal towards the nutrient intake and RDA was also calculated.

## Results and Discussion

### General and socio-economic status of urban and rural school children

The general profile of the selected subjects is presented in the table 1. The distribution of subjects on the basis of age revealed that 55% of the urban and 49% of the rural children were between the age group of 7-8 years. While the remaining 45% urban and 51% of rural children fall between 8-9 years. The percentage of boys was 65 and 45 from the urban and rural groups and that of girls was found to be 35 and 55% from the urban and rural area respectively. However, the number of boys were higher i.e., 65% in urban schools whereas the percentage (55%) of girl students was more in rural areas. The distribution of subjects according to the type of family revealed that majority of the subjects i.e., 78% of the urban and 61% of rural children belonged to nuclear families while 22% of urban and 39% of rural children were living in a joint family. It was found that the trend of nuclear families was more in urban areas. On the whole, it was concluded that total of 70 and 30% of children were living in nuclear and joint families, respectively. With respect to family income the data reported that 19% of urban subjects belonged to families earning up to Rs. 3,000 per month as compared to 10% of rural subjects. However, a relatively higher percentage of rural (75%) subjects belonged to families earning between Rs. 3,000 and 5,000 per month whereas 64% of urban subjects belonged to this category. Monthly income of 15% of rural and 17% of urban families was between Rs. 5,000 and 8,000 per month. The data highlighted that majority of urban and rural children were non-vegetarian. However the percentage of non-vegetarian children was higher in rural area (66%) as compared to urban (64%) area. On the contrary the percentage of vegetarian (29 vs 28%) and ova-vegetarian (7 vs 6%) children was higher in urban area. Kumar et al. [6] reported about half of the children (48%) as non-vegetarians in the study.

| Profile | Urban (n=100) | | Rural (n=100) | | Total (n=200) | |
|---|---|---|---|---|---|---|
| **Age (years)** | No. | %age | No. | %age | No. | %age |
| 7-8 | 55 | 55.00 | 49 | 49.00 | 104 | 52.00 |
| 8-9 | 45 | 45.00 | 51 | 51.00 | 96 | 48.00 |
| **Sex** | | | | | | |
| Male | 65 | 65.00 | 45 | 45.00 | 110 | 55.00 |
| Female | 35 | 35.00 | 55 | 55.00 | 90 | 45.00 |
| **Type of Family** | | | | | | |
| Nuclear | 78 | 78.00 | 61 | 61.00 | 139 | 69.50 |
| Joint | 22 | 22.00 | 39 | 39.00 | 61 | 30.50 |
| **Income (Rs./Month)** | | | | | | |
| > 3,000 | 19 | 19.00 | 10 | 10.00 | 29 | 14.50 |
| 3,000- 5,000 | 64 | 64.00 | 75 | 75.00 | 139 | 69.50 |
| 5,000- 8,000 | 17 | 17.00 | 15 | 15.00 | 32 | 16.00 |
| **Dietary Habits** | | | | | | |
| Vegetarian | 29 | 29.00 | 28 | 28.00 | 57 | 28.50 |
| Non-Vegetarian | 64 | 64.00 | 66 | 66.00 | 130 | 65.00 |
| Ova vegetarian | 7 | 7.00 | 6 | 6.00 | 13 | 6.50 |

**Table 1:** General and Socio-Economic Status of Urban and Rural School Children.

| Most liked meal | Urban (n=100) | | Rural (n=100) | | Total (n=200) | | z-value |
|---|---|---|---|---|---|---|---|
| | No. | %age | No. | %age | No. | %age | |
| *Kadhi Chawal* | 25 | 25.00 | 20 | 20.00 | 45 | 22.50 | $0.85^{NS}$ |
| *Dal Chawal* | 17 | 17.00 | 18 | 18.00 | 35 | 17.50 | $0.50^{NS}$ |
| *Sabji Roti* | 12 | 12.00 | 23 | 23.00 | 35 | 17.50 | 2.05* |
| *Dal Roti* | 14 | 14.00 | 16 | 16.00 | 30 | 15.00 | $0.40^{NS}$ |
| *Channa Roti* | 19 | 19.00 | 10 | 10.00 | 29 | 14.50 | $0.65^{NS}$ |
| *Mitthe Chawal* | 13 | 13.00 | 13 | 13.00 | 26 | 13.00 | $0.00^{NS}$ |

**Table 2:** Ranking of meal according to the likeness of children.

| S. No. | Days | Menu | Actual food ingredients used | Amount (g) | Energy (Kcal) | Proteins (g) |
|---|---|---|---|---|---|---|
| 1. | Monday | *Roti-sabji* | Wheat flour<br>Potato<br>Peas<br>Tomato<br>Onion<br>Oil | 70<br>40<br>20<br>4<br>4<br>5 | 350 | 11.0 |
| 2. | Tuesday | *Dal-chawal* | Rice<br>Bengal gram<br>Black gram<br>Tomato<br>Onion<br>Oil | 60<br>15<br>15<br>4<br>4<br>7 | 378 | 11.7 |
| 3. | Wednesday | *Channe-roti* | Wheat flour<br>Black channe<br>Potato<br>Tomato<br>Onion<br>Oil | 70<br>25<br>5<br>4<br>4<br>5 | 363 | 11.3 |
| 4. | Thursday | *Kadhi-chawal* | Rice<br>Besan<br>Butter-milk<br>Potato<br>Tomato<br>Onion<br>Oil | 60<br>20<br>30<br>10<br>4<br>4<br>7 | 362 | 11.9 |
| 5. | Friday | *Dal-roti* | Wheat flour<br>Green-gram<br>Tomato<br>Onion<br>Oil | 70<br>30<br>4<br>4<br>4 | 386 | 11.9 |
| 6. | Saturday | *Mitthe-chawal* | Rice<br>Sugar/jaggery<br>Oil | 60<br>10<br>5 | 361 | 10.9 |
| .7 | Any day | *Kheer* | Milk<br>Rice<br>Sugar | 80<br>20<br>8 | 154 | 4.5 |

* Values are per serving/child
* Kheer served on any day of the week

**Table 3:** Energy and protein content of the menu during the week.

### Ranking of meal according to the likeness of children

Table 2 showed that the children were fond of Kadhi chawal (25%) followed by channe roti (19%), dal chawal (17%), dal roti (14%), sabji roti (12%) and Mitthe chawal (13%) in urban areas. Whereas in rural areas sabji iroti (23%) was the most liked meal followed by kadhi chawal (20%), dal chawal (18%), dal roti (16%), mitthe chawal (13%) and channe roti (13%). There was significant difference ($P<0.05$) in the preference of sabji roti among urban and rural school children. It was further concluded that kadhi chawal (22.5%) was preferred by most of the children in urban and rural areas. Sabji roti and dal chawal was liked

| Nutrients | Urban (n=100) | Rural (n-100) | t-value |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | |
| Energy (Kcal) | 369 ± 64 | 369 ± 64 | 0.00$^{NS}$ |
| Protein (g) | 11.6 ± 2.5 | 11.5 ± 2.2 | 0.42$^{NS}$ |
| Fat (g) | 4.6 ± 1.7 | 4.5 ± 1.4 | 0.46$^{NS}$ |
| Thiamine (mg) | 0.15 ± 0.31 | 0.15 ± 0.31 | 0.00$^{NS}$ |
| Riboflavin (mg) | 0.12 ± 0.30 | 0.12 ± 0.30 | 0.00$^{NS}$ |
| Niacin (mg) | 1.8 ± 0.4 | 1.8 ± 0.4 | 0.00$^{NS}$ |
| Folacin (µg) | 16 ± 6 | 16 ± 6 | 0.00$^{NS}$ |
| β-carotene (µg) | 324 ± 71 | 323 ± 68 | 0.08$^{NS}$ |
| Vitamin C (mg) | 2.6 ± 0.5 | 2.6 ± 0.5 | 0.00$^{NS}$ |
| Iron(mg) | 2.3 ± 0.4 | 2.2 ± 0.5 | 1.52$^{NS}$ |
| Calcium(mg) | 108 ± 11 | 107 ± 12 | 0.48$^{NS}$ |

**Table 4:** Nutritional contribution of mid-day meal in daily diet of urban and rural school children.

| Nutrients | Urban (n=100) | Rural (n=100) | t-value |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | |
| Energy (Kcal) | 1268 ± 198 | 1350 ± 334 | 2.11* |
| Protein (g) | 22.6 ± 6.00 | 22.8 ± 8.0 | 0.73$^{NS}$ |
| Fat (g) | 16 ± 6 | 17 ± 7 | 0.41$^{NS}$ |
| Thiamine (mg) | 0.53 ± 0.16 | 0.53 ± 0.13 | 0.00$^{NS}$ |
| Riboflavin (mg) | 0.45 ± 0.14 | 0.46 ± 0.15 | 0.49$^{NS}$ |
| Niacin (mg) | 6.2 ± 1.4 | 6.4 ± 1.5 | 0.98$^{NS}$ |
| Folacin (ug) | 63 ± 34 | 77 ± 42 | 2.62** |
| β-carotene (ug) | 1560 ± 268 | 1572 ± 261 | 0.32$^{NS}$ |
| Vitamin C (mg) | 17 ± 8 | 17 ± 7 | 0.64$^{NS}$ |
| Iron(mg) | 8 ± 1.02 | 9 ± 1 | 1.91$^{NS}$ |
| Calcium(mg) | 375 ± 79 | 400 ± 128 | 1.61$^{NS}$ |

**Table 5:** Average daily nutrient intake by urban and rural school children.

by 18% of children in both urban and rural areas. Dal roti and channa roti was liked by almost similar number of children i.e., 15 and 14.50% Mitthe chawal was the least liked by the children (13%) in both urban and rural areas. Verma and Grover [7] reported that the roti and dal was most liked meal (43.4%) followed by rice with dal (25.6%), dalia (14.8%), vegetable pullao (6.71%) and rice chana pullao by school children in Punjab.

## Energy and protein content of menu served during the week

A cyclic menu provided by the Mid Day Meal Cell, Punjab was uniformly adopted by all the schools in urban and rural areas. Table 3 and 4 showed that Roti-sabji cooked on Monday provided 350 Kcal of energy and 11 g protein. In most of the schools, depending upon the availability of seasonal vegetables like aloo matar/mixed vegetable/aloo gobhi/aloo gajar/aloo nutri was cooked. In comparison to channa-roti cooked on Wednesday (363 Kcal, 11.3 g), dal chawal provided higher amount of energy (378 Kcal) and protein (11.7 g). Green gram and Bengal gram dal was cooked in most of the schools. Rana [8] found that channa dal was used in khichdi due to higher cost of mung dal in Hisar district of Haryana. Kadhi chawal which was preferred by most of the children provided 362 Kcal and 11.9 g protein. The butter milk or curd was purchased for preparation of Kadhi in urban areas. However, it was supplied by the families in the rural area. Dal-roti provided the maximum calories and protein i.e., 386 Kcal and 11.9 g protein. However, it was found that sweet rice which was least liked by most of the children provided 361 Kcal energy and 10.9 g protein. Due to paucity of funds, they avoid using the dry-fruits like sogi, peanuts and coconut in sweet rice and it was replaced by pullaov in most of the schools due to least preference among children. The energy content of the menu varies from 350 to 386 Kcal which was below their recommended level of 450 Kcal and protein level almost meets the standard norm of 12 g. Rana [8] reported that soyabean chunks as recommended in recipes (sweet rice and porridge) were not included as the children did not like the taste of soyabean chunks. Cheap vegetables like potato and bottle gourd were used in place of costly green vegetables in pullaov in Hisar district of Haryana.

## Nutritional contribution of mid-day meal in daily diet of urban and rural school children

A variety of nutrients were provided to school-going children through mid-day meal programme. There was no significant difference in the mean contribution of nutrients between the urban and rural school children. It might due to the reason that a set pattern of menu were provided to urban and rural schools and the school teachers were religiously following the instructions given by the higher authorities. Secondly, the mid day meal was regularly and frequently inspected by the authorities to maintain its quality. Puri et al. [9] reported that the mid-day meal prepared in the schools provided each child with 150 Kcal meals consists of protein 7.5 g, retinol 20 µg and iron 1.7 mg per day. Satoto [10] also found that the cooked school meal provided 200-300 calories and 3-5 g protein.

## Nutrient intake

The data on nutrient intake (Table 5) showed that the rural school children had significantly ($P<0.05$) higher intake of energy (1268 vs 1350) and folacin (63 vs 77) as compared to urban school children. Whereas the non-significant difference were observed between the two areas for the intake of protein, fat, thiamine, riboflavin, niacin, β carotene, folic acid, iron, vitamin C and calcium.

## % adequacy of nutrient intake by urban and rural school children

% adequacy of nutrient intake by the school children showed that the energy intake was nearly adequate in urban and rural (75 vs 80) school children. Further, the intake of protein (74 vs 77), fats (55 vs 56), thiamine (67 vs 66), riboflavin (45 vs 46), niacin (48 vs 49), folacin (53 vs 64), β-carotene (32 vs 33), ascorbic acid (42 vs 44), iron (54 vs 56), and calcium (63 vs 67) was inadequate among both urban and rural school children. The diet of school going children was deficient in all the food groups ultimately resulted in the low intake of all the nutrients. Mid-day meal programme has been found to be a substitute rather than a supplement for the home meal. The deficiency in the intake of protein and micronutrient intake might be due to low intake of pulses, milk and milk products, green leafy vegetables and fruits. Hira et al. [11] reported

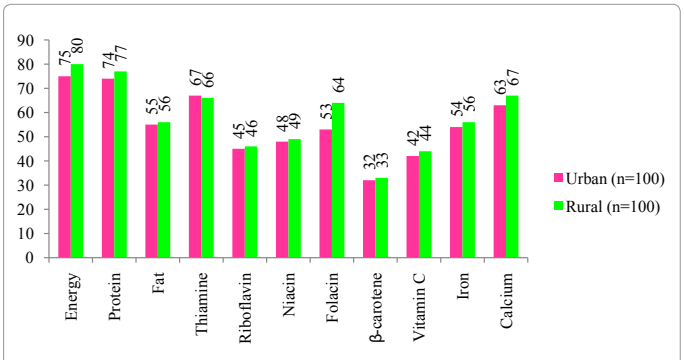


**Figure 1:** Percent adequacy of nutrient intake by urban and rural school children.

| Nutrients | Per cent contribution of mid day meal to nutrient intake | | | Per cent contribution of mid day meal to RDA intake | | |
|---|---|---|---|---|---|---|
| | Urban (n=100) | Rural (n=100) | Total (n=200) | Urban (n=100) | Rural (n=100) | Total (n=200) |
| Energy | 29.13 | 27.36 | 28.2 | 21.85 | 21.85 | 21.8 |
| Protein | 52.95 | 50.48 | 51.7 | 39.49 | 38.98 | 39.2 |
| Fat | 27.88 | 26.63 | 27.5 | 15.33 | 15.00 | 30.3 |
| Thiamine | 28.3 | 28.3 | 28.3 | 18.75 | 18.75 | 18.7 |
| Riboflavin | 24.44 | 26.09 | 25.3 | 11.00 | 12.00 | 11.5 |
| Niacin | 29.03 | 28.44 | 28.7 | 13.84 | 14.00 | 13.9 |
| Folacin | 26.12 | 21.09 | 23.6 | 13.75 | 13.58 | 13.7 |
| β-carotene | 20.77 | 20.56 | 22.7 | 6.75 | 6.73 | 6.7 |
| Vitamin C | 15.48 | 14.86 | 15.2 | 6.50 | 6.50 | 6.5 |
| Iron | 26.74 | 24.72 | 25.7 | 14.37 | 13.75 | 14.06 |
| Calcium | 28.75 | 26.80 | 27.7 | 18.00 | 17.86 | 17.9 |

**Table 6:** Percent contribution of mid day meal towards the actual nutrient intake and RDA of school children.

inadequate intake of almost all the nutrients in the diet of Punjabi children (6-9 years) (Figure 1).

### % contribution of mid day meal towards nutrient intake and RDA of school children

Table 6 showed that the % contribution of energy, protein and fat by the MDM to the actual nutrient intake and RDA was 28.2 and 21.8, 51.7 and 39.2, and 27.5 and 30.3 respectively. The percent contribution of other nutrients was β carotene (22.7 and 6.74), thiamine (28.3 and 18.7)), riboflavin (25.3 and 11.5), niacin (28.7 and 13.9), folacin (23.6 and 13.7), vitamin C (15.2 and 6.50)), iron (25.7 and 14.06) and calcium (27.7 and 17.9). Among all the nutrients, the daily contribution of protein by mid day meal to the actual nutrient intake was maximum i.e., one-half, whereas the energy and fat was one-fourth and other micro-nutrients varies from one-sixth to one-fourth. It might be due to the lack of milk and milk products, fruits and green leafy vegetables in the ingredients of mid day meal. As per the set norms, the mid day meal is required to meet one-third of energy and one-half of protein requirement (RDA) of school children but the findings depicts that mid day meal is fulfilling nearly one-fifth of energy and one-third of protein requirement as per the recommended dietary allowances [1]. Meme et al. [12] found that the energy consumption of school children with a feeding programme was higher (86% of RDA) than without feeding programme children (76% of RDA).

## Conclusions

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. It provides nearly one-fourth of energy and fat and half of protein towards daily nutrient intake of children but only meets the one-fifth of energy and one-third of protein towards the recommended dietary allowances. The contribution of micronutrients through mid day meal programme was negligible; it varies from one-fifth to one-fourth.

## Recommendations

1. The menu should be revised from time to time because it sustains interest in children.
2. 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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