International Journal of Community Medicine and Public Health
Kaur H et al. Int J Community Med Public Health. 2024 Jul;11(7):2852-2858
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20241849

Original Research Article

Assessment of quality of mid-day meal in Khamanon, Fatehgarh Sahib, Punjab

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Received: 21 May 2024
Revised: 16 June 2024
Accepted: 17 June 2024

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ABSTRACT

Background: Mid-day meal (MDM) is a scheme implemented by Government of India to combat the problem of malnourishment. Periodic assessment of the food and nutritional quality of mid-day meals being served to the school children for nutrient consumption is imperative. This study was designed to evaluate the quality of food served under MDM.
Methods: A cross-sectional study was conducted in randomly selected 11 government schools of Fatehgarh Sahib, Punjab (May-July, 2018). The cooked food samples were evaluated for assessing the food quality of MDM in different schools with respect to colour, consistency and taste by a panel of 5-6 judges. The amount of food grains, pulses, vegetables, etc. provided to all the upper primary school children were recorded and then evaluated for the nutritive content (calories, protein, fat) of MDM and its contribution per day.
Results: In the present study, energy as well as protein requirement was fulfilled by mid-day meal but was low for fat (2.4gm). The quantity of mid-day meal provided was adequate except for the vegetables (leafy also). Usage of green leafy vegetables was low (42gm), served once in a week. There was 76% adequacy of nutrient intake in the present study.
Conclusions: The present study shows that improvement in the quality and quantity of the Mid-day meal is essential to fill the nutrient gap. There is a need to improve fat content of the meal, as it was low. More leafy vegetables should be included in the meal or their substitutes should be encouraged.

Keywords: Food quality, Mid-day meal, Nutrient, Punjab, Schools

INTRODUCTION

Mid-day meal (MDM) is the famous name for school supper program in India. This program helps to eradicate hunger for millions of children and is contributing to their education, nutrition and health. The National Program of Nutritional Support to Primary Education (NP-NSPE) was propelled on fifteenth August 1995 as a midway supported plan to upgrade enrolment and participation at school and enhancing healthful dimensions by giving a cooked meal among the children. In October 2007, plot was additionally stretched out to incorporate the upper primary school children under the MDM program with the name changed from National program of Nutritional support to Primary Education to National Program of MDM in Schools. The plot was again overhauled to incorporate the perceived and also unrecognized Madarsa and Maqtabs upheld under Sarva Shiksha Abhiyan (SSA) and also the National Child Labour Project (NCLP) schools. MDM is one of the biggest school sustaining

program. In 2012-13,10.68 crore children were given the cooked supper in 12.12 lakh schools in India.[1]

MDM is a wholesome freshly cooked food which served to the children in government school as an afternoon lunch. According to this scheme, free cooked meals are provided to the primary and upper primary students of government/municipality schools, aiming at improving the nutritional status and the school enrolment. Under this scheme, one serving of MDM per day should provide 700 calories and 20 gm protein and this energy and protein requirement comes from 150 gm of food grains, 30 gm of pulses, 75gm of vegetables and 7.5 gm of oil and fat for upper elementary school children.[2] The MDM scheme began with the goals to enhance the viability of essential instruction by enhancing the nourishing status of the children in this manner decreasing lack of healthy sustenance. Moreover, this plan draws in children from other backward segments, particularly young girls from Dalits and Adivasi clans to class, along these lines expanding participation, decreasing dropout rates and advancing women strengthening through education and ultimately to advance a sentiment of unity and secularism among different distinctive religions and societies.[3]

In view of above, this is compulsory to periodically assess the healthful nature of nutritional quality and food safety of meals being served to the school children not only to check the food for nutrient consumption but also for hidden attributes of food. Lack of nutrients in food may lead to dual burden of diseases and lack of food safety is associated with presence of organic, compound and (virtual) concealed physical risks. In mid-day-meal scheme, biological food contamination is generally kept in check because of its consequences that are generally known immediately after the consumption, but hidden food safety attributes are ignored or rarely studied. Therefore, in present study primary focus is to check cooked and raw food for important nutrients and sensory quality attributes. As for the better sustenance and improvement in health status it is important to maintain the quality of food. The objective of our study was to evaluate the quality of MDM served in government schools of Chandigarh regarding the nutrients and sensory attributes.

METHODS

Study design and eligibility criteria

A cross sectional study of middle and high standard student of government/municipality schools (6-8 class) was selected as eligible.

Study area

Fatehgarh Sahib district is one of the twenty-two districts in the province of Punjab in North-West Republic of India, by its home office in the city of Fatehgarh Sahib. It is positioned between 30°-27’ and 30°-46’north latitudes and 76°-04’ and 76°-38’ east longitudes. The present study was led in Khamanon block of District Fatehgarh Sahib.

Sample size

Out of the total 112 schools, 10% schools were selected randomly i.e., approximately 11 schools.

Sampling and study duration

A convenience sampling technique was used to select 11 schools from the pool of total 112 government/ municipality schools operational in the area and children in the Khamanon block from May to July, 2018.

Data collection

To consider the food quality of MDM with respect towards the nutrients and sensory quality attributes, the set menu obliged throughout the week and the measure of raw material utilized for preparation of meal/day, the amount of raw material/child and energy and protein content of the meal/child/day was determined utilizing the Nutritive value of Indian foods.[4] The nutrient intake was related with recommended dietary allowances.

Sensory quality testing of the food was done by a panel of 8-10 judges (including the children) on 9-point hedonic scale. The prepared food was evaluated and accordingly the points were given. A pretested and approved questionnaire intended to capture the data relating to food and nutritive position of school children also served as the methods of information collection.[5]

Statistical analysis

Data were collected in Epicollect via ipad. Laboratory reports were entered in MS Excel. Data were analyzed using STATA v15 (StataCorp LLC, College Station, TX). Characteristics of participants were described as mean (standard deviation) or median (Interquartile range) for continuous variables. Frequencies and percentages were described for categorical variables. A two-way ANOVA was conducted that examined the food quality of various schools by analysing the parameters (colour, consistency and taste) of food served in the MDM. P-value <0.05 was considered statistically significant.

RESULTS

Food quality of MDM with respect to nutrients

MDM nutrient contribution in a day

The mean nutrient intake of calories, protein, calcium, iron and fat were 663.6 kcal, 20.12 g, 56.71 mg, 3.58 mg and 2.41 g respectively. The mean intake was compared with RDA and the input of MDM in total nutrient requirement of a day was calculated. 31% calories, 49%

protein, 7.7% calcium, 16% iron and 7% fat was contributed by MDM in a day (Table 1).

Table 1: Mean nutrient intake of MDM.

Variable	Mean nutrient intake ± SD	RDA (ICMR 2011)
Calories (kcal)	663.62±31.8	2110
Protein (g)	20.12±1.4	41
Calcium (mg)	56.71±23.6	733
Iron (mg)	3.58±0.79	23
Fat (g)	2.41±1.44	36

Daily nutrient intake by MDM

As per the recommended food norms prescribed by the Government of India as mentioned earlier, the quantity of food grains (143 g) and pulses (27 g) provided per child were fulfilled by MDM but was low for vegetables (42 g) and oil and ghee (5.5). The nutritive content provided by MDM per child was also fulfilled for calories (664 kcal) and protein (20 g) but was deficient for fat (2.4 g). According to the weekly menu, the various meals provided from Monday to Saturday were rich in protein (approx. 20 g), i.e. as per the recommended food norms of MDM. Calorie intake was low on Wednesday (613 kcal), with slightly lowered calorie content on Monday, Tuesday and Saturday. Thursday and Friday's menu was fulfilling the recommended calorie content. Fat content was very low for meals cooked from Monday to Saturday. Overall, 76% of the nutritional requirement was fulfilled by MDM.

Daily food intake by MDM

The mean intake of food items was calculated and compared with RDA (recommended food norms for MDM). The amount of food items intake was low for vegetables (42 g) and oil (5.5 g) but was approximately equal for food grains (143 g) and pulses (27 g) when compared with MDM food norms (Figure 1).

Nutritive value of meals per day

The nutritional value of various meals based on the weekly menu was calculated. Dal and chapatti cooked on Monday provided 659 kcal of energy, 23 g protein and 1.8 g fat. For Tuesday, khichdi provided almost the same 656 kcal of energy while the protein was 19 g with low amount of fat of 1.42 g. In comparison to black chana and chapatti cooked on Wednesday (613 kcal, 20 g and 1.52 g), kadhi-pakora and rice provided higher amount of energy (699 kcal) and fat (3.46 g). Seasonal vegetable, chapatti and kheer cooked on Friday provided the maximum nutrients with 699 kcal energy, 19 g protein and 4.89 g fat. Saturday's dal and rice provided 658 kcal energy and 19gm protein with low amount of 1.45 g fat (Table 2).

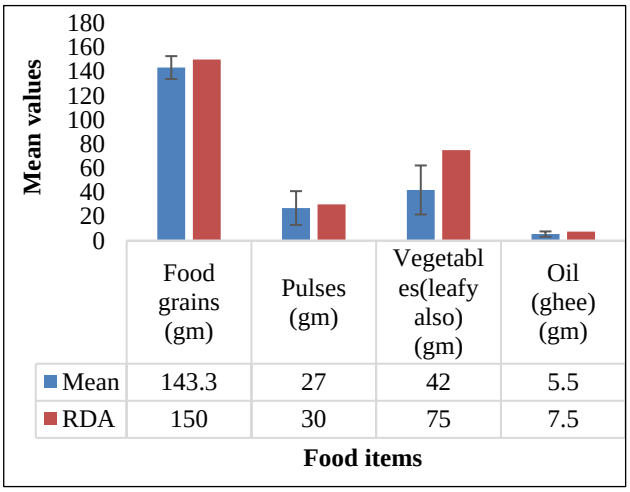

Figure 1: Amount of food items intake in MDM per day.

Table 2: Nutritive values of meals.

Nutritive values of meals					
	Ingredients	**Amount (g)**	**Energy (kcal)**	**Protein (g)**	**Fat (g)**
Monday					
Dal	Dal	34.8	112.78	8.02	0.59
	Onion	23.2	11.15	0.35	0.06
	Tomato	11.6	2.19	0.09	0.03
Chapati	Wheat flour	139.5	490.78	14.45	1.06
	Ghee	4.6	41.4	0	0
Total		213.7	658.3	22.91	1.74
Tuesday					
Khichdi	Dal	34.8	112.78	8.02	0.59
	Rice	139.5	490.45	10.89	0.77
	Onion	23.2	11.15	0.35	0.06
	Ghee	4.6	41.4	0	0
Total		202.1	655.78	19.26	1.42
Wednesday					
Black channe	Black gram	23.2	67.59	5.1	0.37

Continued.

Nutritive values of meals					
	Onion	23.2	11.15	0.35	0.06
	Tomato	11.6	2.19	0.09	0.03
Chapati	Wheat flour	139.5	490.78	14.45	1.06
	Ghee	4.6	41.4	0	0
Total		202.1	613.11	19.99	1.52
Thursday					
Karhi with pakora	Lassi	69.7	10.46	0.56	0.77
	Besan	34.8	128.41	7.83	1.81
	Onion	23.2	11.15	0.35	0.06
	Ghee	4.6	41.4	0	0
	Potato	23.2	16.19	0.36	0.05
Rice	Rice	139.5	490.45	10.89	0.77
Total		295	698.06	19.99	3.46
Friday					
Seasonal veg (Cauliflower)	Cauliflower	23.2	5.32	0.5	0.5
	Onion	23.2	11.15	0.35	0.06
	Potato	23.2	16.19	0.36	0.05
	Tomato	11.6	2.19	0.09	0.03
Chapati	Wheat flour	139.5	490.78	14.45	1.06
	Ghee	4.6	41.4	0	0
Kheer	Rice	23.2	81.57	1.81	0.13
	Milk	46.5	49.9	1.71	3.06
Total		295	698.5	19.27	4.89
Saturday					
Dal	Dal	34.8	112.78	8.02	0.59
	Onion	23.2	11.15	0.35	0.06
	Tomato	11.6	2.19	0.09	0.03
Rice	Rice	139.5	490.45	10.89	0.77
	Ghee	4.6	41.4	0	0
Total		213.7	657.97	19.35	1.45

Percent adequacy of nutrient intake from MDM

Nutrient Adequacy Ratio (NAR) was calculated from the mean intake of the nutrients. Further the Mean Adequacy Ratio (MAR) was calculated from NAR. There was 76% adequacy of nutrient intake from MDM (Table 3) (Figure 2).

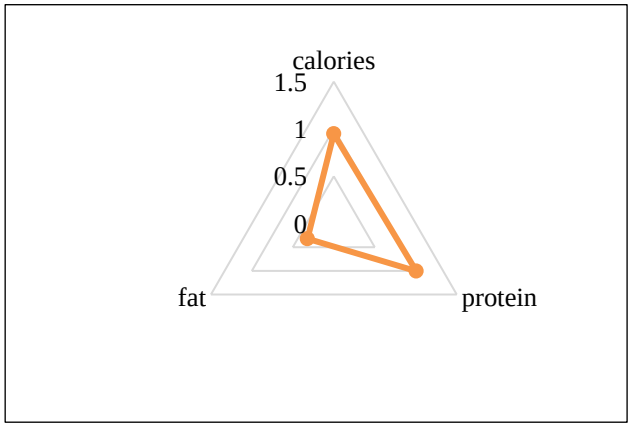

Figure 2: Nutrient adequacy ratio.

Table 3: Nutrient adequacy ratio.

Variable	Calories	Protein	Fat
Mean intake	663.62	20.12	2.41
NAR	0.948028571	1.006	0.32133

Mean Adequacy Ratio=0.758453968=75.8%

Sensory quality evaluation of MDM of different schools

The results pertaining to sensory quality evaluation of MDM food served at different schools are summarized in the tables below. The means and SD of various food samples from different schools were calculated. A two-way ANOVA was conducted that examined the food quality of various schools by analysing the parameters (colour, consistency and taste) of food served in the MDM. Significant ($p<=0.05$) effects were found for the main effect of schools, $F(10,99)=18.64$, $p=0.00$ and the parameter * school interaction, $F(20,99)=2.51$, $p=0.00$, but the main effect of parameters fall short of statistical significance, $F(2,99)=2.01$, $p=0.31$. However, these main effects were qualified by a significant interaction between parameter and schools. So it was found that there was significant difference in the food quality of the samples

from different schools from which these samples were taken.

To explain the interaction, simple main effects analysis showed that there was significant difference in the food quality of different schools as school 1 and 2 (p=0.00) , school 2 and 3 (p=0.00), school 5 and 6 (p=0.00), school 7 and 8 (p=0.00), school 8 and 9 (p=0.00), school 10 and 11 (p=0.04) by comparing the colour, consistency and taste but there was no difference in the food quality of school 3 and 4 (p=0.35), school 4 and 5 (p=0.15), school 6 and 7 (p=0.07), school 9 and 10 (p=0.10) (Appendix).

The food quality was of higher mark in the school 2 while the lowest was for the school 8 in terms of consistency, colour and taste (Figure 3).

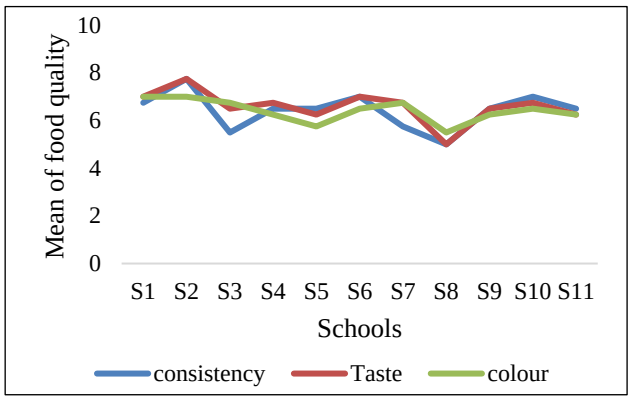

Figure 3: Difference between the food quality of schools.

DISCUSSION

In the present study, energy as well as protein requirement was fulfilled by MDM but was low for fat (2.4gm). The quantity of MDM provided was adequate except for the vegetables (leafy also). Usage of green leafy vegetables was low (42gm), served once in a week. There was 76% adequacy of nutrient intake in the present study. Similar results were found from the other studies.[4,5]

There is a need to improve the quality and also the quantity of the Mid day Meal to fill the nutrient gap. There was 45% vitality shortfall in the diets of the school children in Karnataka.[6] The quality of pulses, cereals, spices, salt, etc. in the present study was found to be satisfactory in almost all the schools. Proper storage facilities were available. Weevil as well as rodent infestations were below the recommended levels by PFA. Similar results were found from the study in Gujarat.[7] In comparison to the present study, low quality of food grains and poor storage facilities were found from a studies conducted in Andhra Pradesh and Madhya Pradesh.[8,9] Similar results of low quality of the MDM was found from many studies.[10-13]

Aflatoxin and uric acid levels were within the standard limits of quantification in the present study. Deodhar et al found high levels of uric acid and aflatoxins in MDM.[14] According to the joint review report of Himachal Pradesh, quality of MDM was also satisfactory but the count of broken grains was very high.[15]

This might be due to various factors like higher focus on coverage while ignoring the quality and quantity of food served; improper storage and cheap quality products might lead to poorer health; prevailing corruption leading to lack of accountability and transparency.[3,16,17] Caste and gender discrimination were major issues facing the flagship MDM plan in areas like Rajasthan, Orissa, Karnataka, and Madhya Pradesh.[18]

The strength of the study was the availability of pragmatic facts from the rural Punjab. There were several limitations also. As a cross-sectional study temporality could not be established. Repeated research activities with multiple follow ups are mandatory to draw a proper guideline which can be implemented through the nation. Even though the government introduced the MDM scheme, which has helped to increase student enrolment, still has several flaws. And to improve the MDM scheme's outcomes, the government must close these gaps by drafting appropriate legislation.

CONCLUSION

The mean nutrient intake of calories, protein, calcium, iron and fat were 663.6 kcal, 20.12g, 56.71mg, 3.58mg and 2.41g respectively. MDM contributes 31% calories, 49% protein, 7.7% calcium, 16% iron and 7% fat requirement in a day. As per the recommended food norms prescribed by the Government of India as mentioned earlier, the quantity of food grains (144gm) and pulses (27gm) provided per child were fulfilled by MDM but was low for vegetables (42gm) and oil and ghee (5.5). The nutritive content provided by MDM per child was also fulfilled for calories (664kcal) and protein (20gm) but was deficient for fat (2.4gm). Overall, 76% of the nutritional requirement was fulfilled by MDM.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of PGIMER (NK/4434/MPH)

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Cite this article as: Kaur H, Halder P, Srivastava R, Singh T, Khanna P. Assessment of quality of mid-day meal in Khamanon, Fatehgarh Sahib, Punjab. Int J Community Med Public Health 2024;11:2852-8.

APPENDIX

Table 1: Mean and standard deviation of food samples of different schools.

School no.	Colour		Taste		Consistency	
	Mean	SD	Mean	SD	Mean	SD
School 1	7.00	0.00	7.00	0.00	6.75	0.43
School 2	7.00	0.00	7.75	0.43	7.75	0.43
School 3	6.75	0.43	6.50	0.50	5.50	0.50
School 4	6.25	0.43	6.75	0.43	6.50	0.50
School 5	5.75	0.43	6.25	0.43	6.50	0.50
School 6	6.50	0.50	7.00	0.00	7.00	0.00
School 7	6.75	0.43	6.75	0.43	5.75	0.43
School 8	5.50	0.50	5.00	0.00	5.00	0.00
School 9	6.25	0.43	6.50	0.50	6.50	0.50
School 10	6.50	0.50	6.75	0.43	7.00	0.00
School 11	6.25	0.43	6.25	0.43	6.50	0.50